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PREFACE

Since HaCIRIC started four years ago, we have expanded the scale of our activities and depth of our knowledge of healthcare infrastructure challenges. We are now established as an international centre of expertise and research.

But the world around us has not stood still. Our future programme is responding to the changing global context for delivering healthcare. The UK is no different from all major developed countries in its need to meet an expanding demand for healthcare while simultaneously controlling rising costs and improving quality and safety.

Business as usual will not be an option for governments and healthcare organisations. The solutions may require system redesign, involving new combinations of technology, services and infrastructure. Four steps are likely to be particularly important in the years to come: shifting care patterns between different healthcare settings, rethinking the use of technological and physical infrastructure to support that change, developing new organisational and funding models to make it work, and encouraging change by generating rigorous and accessible evidence to demonstrate the changes that really do work.

The right combinations of technology, people and infrastructure may be hard to identify and will involve difficult implementation challenges. The political environment – how to accommodate diverse stakeholders to optimise outcomes – will add another layer of complexity. And today’s preference for ‘local solutions’ can mean that decision-makers may lack expertise in tackling tricky issues, as well as leading to increased fragmentation of the system.

HaCIRIC’s work is therefore essential – unless the key questions are researched, with solutions properly modelled and the learning effectively disseminated, health systems may not be able to accomplish the innovations that are needed.

From a standing start, in a field where research was largely uncoordinated and almost entirely conducted in disciplinary silos, HaCIRIC has developed a programme focused on a series of healthcare infrastructure challenges. A research and practice community has begun to develop around HaCIRIC. Our annual conference forms an important part of this process. By bringing together our growing community of researchers we are able to share and discuss findings from the most up-to-date work in our field. The growth in the size of delegate numbers since 2008 has been impressive. Our first annual conference was held at Imperial College London in April 2008. This was attended by fifty researchers and representatives from industry and the government. The 2009 conference was held in Brighton and attended by ninety delegates. This year’s conference has over one hundred attendees from eleven countries around the world.

This year the conference theme is on ‘better healthcare through better infrastructure’. We received sixty-nine papers from around the world. Twenty one papers were offered either a platform or poster presentation. The papers and posters address a number of themes, from how to plan innovative new infrastructure, how to manage its delivery and how to engage different stakeholders.

These proceedings are the result of the hard work of many people. We would like to thank all the authors who submitted abstracts, papers and posters to the conference. We also very much appreciate the help provided by the referees. Finally we are extremely grateful to our sponsors Willmott Dixon, Tribal Group and Nightingale Associates.
On behalf of HaCIRIC, I would like to welcome you to our 2010 international conference.

James Barlow

Principal Investigator
TABLE OF CONTENTS

QUALITY INNOVATION & EVIDENCE IN HEALTHCARE PHYSICAL ENVIRONMENTS IN ENGLAND & SWEDEN – ESTABLISHING A COLLABORATIVE ROADMAP .................................................................6
Göran Lindhal, Michael Phiri, Grant Mills, Peter Fröst, Marie Strid and Andrew Price

THE RELATIONSHIP BETWEEN THE HUMANIZATION OF INPATIENT AREAS AND THE SATISFACTION AND PERCEIVED AFFECTIVE QUALITIES OF HOSPITAL USERS .............................................................................................................................................19
Ferdinando Fornara, Marino Bonaiuto and Mirilia Bonnes

EFFECTIVE STAKEHOLDER CONSULTATION: A COMPARATIVE ANALYSIS ......28
Sameedha Mahadkar, Grant Mills and Andrew Price

PROGRAMME DESIGN AND CONTINUITY OF HEALTHCARE REFORM: THE CASE OF GREEK MENTAL CARE ........................................................................................................................................42
Kyriakos Hatzaras

UNRAVELLING THE CHALLENGES OF MAINSTREAM REMOTE CARE: AN ORGANISATIONAL ANALYSIS OF THE WHOLE SYSTEM DEMONSTRATOR (WSD) ..............................................................................................................................................55
Theopisti Chrysanthaki, Jane Hendy and James Barlow

QUANTIFYING THE BENEFITS OF HEALTHCARE INFRASTRUCTURE INVESTMENT ........................................................................................................................................57
Derek Thomson, Laura Pronk, Chaham Alalouch and Ammar Kaka

NURSING UNIT DESIGN, COMMUNICATION, AND TEAMWORK: AN ECOLOGICAL APPROACH TO INTEGRATED HEALTHSCAPE STRATEGIES .......................................75
Franklin Becker

COST AND PERFORMANCE COMPARISON OF PFI AND NON-PFI HEALTHCARE INFRASTRUCTURE IN ENGLAND ...........................................................................................88
Graham Ive, Alex Murray, Andrew Edkins and Kai Rintala

ACHIEVING FLEXIBLE AND ADAPTABLE HEALTHCARE FACILITIES – FINDINGS FROM A SYSTEMATIC LITERATURE REVIEW .........................................................................................104
Jane Carthey, Vivien Chow, Yong-Moon Jung and Susan Mills

DEVELOPING AND IMPLEMENTING STRATEGY FOR BENEFITS REALISATION ....................................................................................................................................................119
John Rooke, Keith Hamblett, Stylianos Sapountzis, Michail Kagioglou and Jose Barreiro-Lima

INFRASTRUCTURAL PLANNING FOR HOSPITALS IN RELATION TO A PRIMARY PORTFOLIO STRATEGY ..............................................................................................................131
Karin Diez and Kunibert Lennerts

SHAPING FUTURE HEALTHCARE INFRASTRUCTURE: AN ACCESS AND CARBON STUDY ........................................................................................................................................141
Grant Mills, Sameedha Mahadkar, Andrew Price and Phil Astley

INFECTION CONTROL AND THE BUILT ENVIRONMENT OF ACUTE HOSPITAL WARDS ...........................................................................................................................................153
Jacqui McDonald, Phil Astley, Rosemary Glanville, Robert Montgomery, Mark Page, Herbert Robinson and Karen Sorensen
THE SIMULATION MODEL AS AN OBJECT BETWEEN BOUNDARIES.................171
   Maria Kapsali, Timothy Bolt, Steffen Bayer and Sally Brailsford

WHERE HAVE ALL THE PLANNERS GONE? CHALLENGES OF INTEGRATED
APPROACHES TO PLANNING OF MAJOR INFRASTRUCTURE RECONSTRUCTION
AND NEW WAYS OF SERVICES DELIVERY IN UNIVERSITY HOSPITALS IN
SERBIA ......................................................................................................................182
   George Boulton, Ivan Jekić, Annete Katrava and Nicholas Koumpis

CREATING SUSTAINABLE FRAMEWORKS FOR SERVICE REDESIGN AT
PRACTICE LEVEL IN THE NHS .............................................................................195
   Valerie Carr, Daniela Sangiorgi, Rachel Cooper, Monika Buscher and Sabine Junginger

AUTHOR INDEX .........................................................................................................213

KEY WORD INDEX ....................................................................................................214
QUALITY INNOVATION & EVIDENCE IN HEALTHCARE PHYSICAL ENVIRONMENTS IN ENGLAND & SWEDEN – ESTABLISHING A COLLABORATIVE ROADMAP

G. Lindahl¹, M. Phiri², G. Mills³, P. Fröst⁴, M. Strid⁵ and A. Price⁶

ABSTRACT

Regulators, providers and commissioners in healthcare worldwide are facing severe funding constraints that are putting increased pressures on the quality of healthcare delivery. Within England, NHS resources have grown unsustainably, and all organisations are engaged in initiatives to increase quality, innovation, productivity and safety while decreasing cost. Within the Swedish case the decentralised organisation of healthcare into County Councils faces similar problems. This comparison between a centralised English system (looking towards decentralisation) and a decentralised Swedish system (investigating the benefits of centralisation) may provide significant learning. This study investigates the English and Swedish healthcare systems examining their similarities and differences according to various factors - organisational roles, regulator standards, best practices and innovation in quality and organisation learning tools. It also evaluates the role of improving design quality via mandatory standards and compliance criteria on the one hand and others factors which drive excellence on the other. An international best practice framework is proposed that is capable of ensuring evidence based design and informing the balancing of compliance and excellence criteria.

KEYWORDS

evidence, design, standards, quality, innovation, QUIPP

BACKGROUND

A number of academic authors have written about healthcare system design, organisational structures, political relationships and governance (e.g. Winchester & Storey 2007, Martinussen & Magnussen 2009, and Kristiansen & Pedersen 2000). Crucially, there have been no studies on the interrelationships between organisational structures and quality and safety assurance systems (guidance/standards & tools). In most countries changes in the regulatory framework for healthcare facilities and real estate have mirrored those of political and governance re-structuring and re-organisation and thereby affecting both in the procurement, provision/delivery, productivity and quality of the physical healthcare environments. Despite this there is an increasing recognition that patient care and environmental quality improvements are dependent on the balance between standards and guidance systems, and factors for achieving excellence.

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The mission of this review based on a literature analysis, interviews and focus groups at Loughborough and Chalmers Universities is to understand the benefits of both these existing and to learn lessons that will shape further studies, innovation and ultimately enhanced design quality. No studies have been conducted or published comparing the two healthcare systems and their interrelationship to mandatory/compliance and excellence criteria. The two healthcare systems in England and Sweden are suitable case studies because they have a similar organising principle that is not solely market based and also because these countries represent the researchers science base. Both healthcare systems are founded on versions of the related principles of solidarity and universal coverage. Historically, England and Sweden have taken different approaches (the latter indicated in Figure 1 being less centralised than the former- Figure 2). Both diagrams indicate a structure that reflects the three roles of the regulator, commissioner and providers of healthcare services. Sweden (like other Scandinavian and European countries) has a decentralised healthcare governance model. This research offers opportunities to learn and identify benefits from Centralisation exemplified by the English NHS governance system compared with Decentralisation indicated by the Swedish Healthcare System which also represents the preferred governance model in Europe (Saltman et al. 2007).

Figure 1 shows a simplified model of the macro-structures of NHS England. Since its inception in 1948, the English NHS has always seemed very centralised, compared with other European healthcare systems. During its set up, the NHS was conceptualised as a national service, replacing the existing local health services. There was central parliamentary accountability, as characterised in the often quoted remark of Aneurin Bevan (the minister of health who was a key political proposer for the introduction of the NHS): ‘When a bedpan is dropped on a hospital floor its' noise should resound in the Palace of Westminster’ (Allen 2006). The British Parliament (Westminster) provides the legislative authority with the remit for policy occurring within the Department of Health. England is subdivided into eight Strategic Health Authorities (SHAs) whose remit is to act as the arm of the Department of Health within the regions. The SHAs oversee the functioning and development of the full range of health services within their territories. Within each of these geographic areas a variety of provider organisations exist.
Figure 2 shows a simplified model of the macro-structures of the Swedish healthcare model. The Swedish central government establishes the political agenda, principles and guidelines for healthcare but is not involved in the actual production of healthcare. Due to decentralisation and constitutional rights of self-determination stated in the Health & Medical Services Act 1982 and in the Swedish constitution (Swedish Code of Statutes); the regional authorities - County Councils (CCs), have far-reaching rights to manage the healthcare sector as well as to levy taxes to finance the provision of healthcare (Fredriksson & Winblad 2008). State grants represent the second largest source of healthcare funding, some of which is partially earmarked for special healthcare reforms and initiatives by the central government in its role of guaranteeing core values such as efficiency, equality and countrywide equivalence.

**ADDRESSING COMMON CHALLENGES: THE CENTRALISED NHS ENGLAND AND THE SWEDISH HEALTHCARE SYSTEM**

Despite taking different approaches in the evolution of their respective healthcare systems both England and Sweden are now focused on:

a. Driving up design quality while improving productivity as well as looking at the challenges of increasing demand for healthcare from a growing and ageing population, new sophisticated technology and ever higher patient expectations. In the provision of healthcare infrastructure worldwide changes in medicines, clinical practice, technological developments and the organisation of the healthcare sector occur more frequently and unpredictably than the updating of the guidance, which are directly related to the built facilities. Technologies, policies and services are subject to shorter lifecycles than the relatively inflexible built assets that support them.

b. Embracing evidence-based and patient-centred approaches to design quality and productivity challenge. Although all acknowledge that research shows that well designed hospital environments can have a real impact on patient recovery and well being. New knowledge is required on how this can be implemented in practice. Research found that evidence-based
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design is critical in determining capital and running costs of healthcare buildings and has the potential to significantly reduce these running costs by up to 20% because running costs typically exceed capital costs within 2 years of commissioning (Lawson & Phiri 2003).
c. Developing strategies and plans that will deliver tangible or evident benefits in the face of spiraling costs of running or operating healthcare facilities. In England the underlying basis of the NHS system is under threat. Similarly, in Sweden, the essential principles of the Nordic model for the delivery of community services, including healthcare, i.e. universal availability, high quality, finance through taxation and public provision may not be sustainable and public provision may need new strategies and structures to develop.
d. Providing built healthcare environments which enable delivery of high quality care for diverse patient populations in carbon neutral care settings. Healthcare facilities are heavy users of energy, water and other resources making them suitable candidates for sustainable environmental design.

In both England and Sweden, concerns have been growing about existing standards guidance in healthcare systems stifling innovation and associated difficulties of raising quality and safety in healthcare facilities. The existing ensemble of systems and standards guidance may be viewed by some specialists in their fields to be incomplete, out-of-date and not adapted to today’s National Health Service and most importantly not appropriate to guide well innovation in the future development of the service (Moss et al 2001). In Sweden the closure of the Healthcare & Social Welfare Planning & Rationalisation Institute (SPRI) in 1995 meant that national guidelines for planning healthcare facilities were no longer produced. This shifted focus from complying to standards to locally develop design processes has its own problems, one of which is the creation and maintenance of national learning and the benefits of nationally led standardisation, control of stakeholder expectations and procurement economies of scale. One of the advantages of locally lead processes is that quality assurance is more likely to be achieved through stakeholder consultation and the involvement multi-disciplinary specialists who have a broad ranging and up-to-date expertise.

The centralised NHS England and the decentralised Swedish Healthcare System have adopted evidence-based and patient-centred approaches. The importance of evidence-based design has increased since Ulrich (1984) first showed the measurable effects of views on patient health outcomes. Post-operative patients recovered faster and took less analgesic medications when windows faced a natural view rather than a brick wall. Since then many studies have supported and added to our knowledge. A review of available research to identify credible evidence relevant to design has been conducted (Rubin, Owens & Golden 1998, Ulrich et al 2004, Lawson & Phiri 2000, Phiri 2006). The review by Lawson & Phiri 2000 led to the development of the Sheffield Healthcare Environmental Database published by the Department of Health Knowledge & Information Portal. Ulrich 1997 proposed a theory of supportive design for healthcare that emphasizes reduction of stress, provision of personal choice, positive distraction and attention to nature. However, despite these reviews and all such theories, there are still unanswered questions regarding the nature of the evidence base for design. Calls in England, Community Health Partnerships 2008 and Darzi 2008 etc. indicate demands for high impact research and evidence-based design to improve healthcare outcomes and enhance quality and value for money. Unpublished reports in Sweden point to the need to utilise evidence-based decisions to achieve effective end-efficient solutions in the healthcare sector.
LESSONS FROM CENTRALISED NHS ENGLAND: RESEARCH & DEVELOPMENT

An important aspect of centralised planning has been its impact on the healthcare estate. Standards guidance were developed in 1962 to aid a large continuous and centrally financed national hospital building programme. The ‘Hospital Plan’, initiated by the Bonham Carter Report, provided a context in which there was development work, feedback and redevelopment. The famous Hospital (Health) Building Notes (Ministry of Health 1961) became the world’s first point of reference in the field of hospital planning. Health Building Notes (HBNs), Health Equipment Notes (HENs), Health Technical Memoranda (HTMs) and Capricode began publication in the 1960s in support of the 10 year programme of hospital building. Activity Database (ADB) and Room Layouts were also developed in the 1960s for the rapid computation of equipment schedules, department plans and whole hospital layouts in support of the hospital building programme for the 1962 ‘Hospital Plan’. Since the 1960s these systems and standards have built up into a ‘big-system’ of elaborate and comprehensive health facility planning information which requires and relies on heavy and continuous investment in professional work something. The trouble with such a system is its reliance on public funding and political support from Governments coming in and out of power, for centralized estates and facilities.

From 1990s onwards the centralisation approach brought in PFI (Private Finance Initiative) justified on ideological grounds that the private sector is better at delivering services than the public sector. The programme introduced the building of over 75 healthcare projects in the UK as a whole. Figure 3 provides an example. The global financial crisis which began in 2007 presents PFI with difficulties because many sources of private capital have dried up leaving central government to fund the so-called 'private' finance initiatives itself.

A comparison of information available for the healthcare project teams using 1980s guidance and 2000s guidance and design tools shows the extent of the problem. A review of HBNs alone shows that overall 139 documents have been produced since 1961 and the majority of these (87 out of 139 i.e. 63%) have been produced within the two decades of the 1990s and 2000s.
One issue arising from the introduction of the procurement methods of PFI, Procure 21 and the creation first of Hospital Trusts and second of Foundation NHS Trusts has been that mandatory adherence to standards has become merely advisory. The consequent removal of ownership of the healthcare facility from the Trust or healthcare provider and placing responsibility for design, construction and maintenance entirely in the hands of the contractor has made the status and implementation of systems and standards guidance dependent on and to be determined contractually by the output specification whose delivery in the built facility is out with any independent professional control.

Another important impact of the centralised healthcare planning and associated introduction of PFI has been the development of design tools and sponsorship of estates and facilities research.

LESSONS FROM DECENTRALISED SWEDISH HEALTHCARE SYSTEM: RESEARCH & DEVELOPMENT

In Sweden, as in England the 1960s and 1970s also saw a large expansion of hospitals; i.e. large, complex and entire hospitals built to norms/ standards specifying designs and functions. This occurred hand-in-hand with the (then) modernisation of the housing sector. The healthcare system is thus integrated in the welfare state based on equal access to healthcare for all citizens: costs shared and funded by taxation -about 80 % (Kristiansen & Pedersen 2000). The Healthcare & Social Welfare Planning & Rationalisation Institute (SPRI) was instrumental in this development, producing documents, reports and guidelines for planning. SPRI 1968 to 1995, aimed to support healthcare planners with quality development, economy and informatics. Although a core competence centre for research, development, effectiveness and processes, it was closed (in line with wider health policy decentralisation changes) when decentralisation became a more general rule for governing planning with criteria for specific designs left to the County Council. This decision was partly made on the basis that no new hospitals would be needed in the foreseeable future. With the abolishment of SPRI, national guidelines for healthcare facilities are no longer produced and the primary responsibility for knowledge development and planning of healthcare buildings were transferred to the individual County Councils.

Instead what apply are general guidelines for all buildings and quality standards for health & safety. Consequently, despite the strong tradition of centralised guidelines the effects are not immediately apparent. After having had a design culture based on standards, suddenly none exists and design is governed by the healthcare processes thereby shifting focus to accessibility, quality and efficiency of the healthcare systems and the emergence of healthcare logistics. However, there were problems with waiting lists, and even though treatment was working well, both access and quality of the architectural healthcare environment were unsatisfactory.

From the late 1980s market aspects had been introduced into the healthcare systems to allow competition among providers but because most of the healthcare system was public the effect was more of reorganisation through “quasi-market mechanisms” (Martinussen & Magnussen 2009). In 1995 the initial phase of decentralisation was by the end of the 1990s followed by the establishment of larger counties to exploit scales of economy for service provision within the public sector including healthcare. Decentralisation has not led to a new hospital building or modernisation programme let alone to the development of guidance and standards. The new millennium saw a focus on meeting challenges of scarce resources with aims for efficiency and
identification of new ways of delivering healthcare. At this time further development of choice models is implemented that facilitates competition albeit, the competitors have to be certified by the counties to be eligible for public funding. Today, based on the egalitarian approach from the welfare state, the focus is still on patient’s rights and patient-centred approach (Magnussen et.al 2010) and also large counties are still the main player in all these processes while planning happens at hospitals within the organizational framework of the county level and no common or national development plan exists, as for example is the case in Finland. The need for modernisation of architectural healthcare environments, based on development of medical processes, has seen a recent new development i.e. to build the new Karolinska hospital in Stockholm. The project has been politically decided to be carried out as a PFI project, the first in healthcare in Sweden (Stockholm County Council 2010).

A number of reports and decisions from 2001 and onwards established the need for a new university hospital, to replace the present Karolinska University Hospital in Stockholm. The question was Why should Karolinska Solna be replaced rather than be refurbished? The review of the existing property stock of Karolinska Solna was unequivocal: the hospital was spread over a large area with 40 buildings, with weak connections and logistics. Furthermore, many buildings were old, outdated and unsuitable for the provision of modern hospital services.

Fig. 4. The new Karolinska hospital, Stockholm (White Architects)
Redevelopment was also deemed to be too expensive, with an estimated cost of SEK 7 billion (€650 million) over 10 years (Stockholm County Council 2004), relative to the functionality of the refurbished site and by comparison with a new build. Constructing a new hospital was therefore considered to be more cost effective compared to renovating and refurbishing.

In April 2008, the decision was made by the Stockholm County Council to build a new university hospital in Stockholm, to treat patients previously referred outside of the region to receive some specialist treatments and to improve the integration of care pathways and shared diagnostics. In June 2008, it was decided that the new university hospital will be built using the PPP (or PFI) model which includes also financing as well as management of the building after the completion. Figure 4 and 5 show the early Karolinska hospital design.

The introduction of PFI in the decentralised Swedish Healthcare System suggests the need to learn from the experience of a centralised NHS England and to draw a comparison on how quality improvement can be better assured. The study by Barlow et al (2010) of the PFI process in England found a number of issues that may diminish innovation for each project i.e. barriers in communication between architects and hospitals; risk aversion due to the competitive bidding environment, the PFI funders’ need to protect their investment and the trusts’ need to transfer risk to the private sector; and limited knowledge transfer or learning from completed PFI projects. The competitive environment ensured that experiences of private partners typically remained within individual firms, with only some sharing within the PFI consortium. The study also found that the need to reduce capital costs to match affordability limits established by the ‘public sector comparator’ impeded design innovation especially as these limits were set at unrealistically low levels and aspirations.

In England use of design tools such as ASPECT/ AEDET Evolution and BREEAM Healthcare, is in part mandatory for healthcare projects. The absence of tools developed to be used by the
decentralised Swedish Healthcare System means a reliance on the experience of Local or International project teams. In some situations tools developed elsewhere may be applied in a Nordic situation. A statement from one project team member illustrates this: “The New Karolinska Solna will be designed to meet three main environmental assessment certifications: ISO 14001, LEED® and GreenBuilding” (Stockholm County Council 2010). Also local political objectives paired with the hospitals strategies combine with tool sets owned by international consultants who are experienced and competent in the use of tools such as LEED. National standards and tool development priorities in England have in some cases facilitated change and been used as a baseline from which to manage local political and stakeholder pressures.

AN INTERNATIONAL BEST PRACTICE FRAMEWORK TO ENHANCE THE DESIGN, CONSTRUCTION AND MANAGEMENT OF ARCHITECTURAL HEALTHCARE ENVIRONMENTS

The foregoing analysis of both the centralised English NHS and the decentralised Swedish healthcare system reveals a need for a framework to address the challenges of quality, innovation productivity and prevention. An international best practice framework is therefore proposed for validation. The main challenge for the framework is that it should facilitate implementation in situations where either centralisation or decentralisation of the healthcare governance model is the norm. The framework comprises a number of key components.

The first component of the framework is the development of guidance and mandatory standards that support outcomes such as sustainability; auditability; measurable benefits; sharing of best practice; patient safety values; revenue consequences; utilisation of space; inspirational guidance etc. Of crucial importance are guidance, design and modelling tools that facilitate the provision of built healthcare environments which enable delivery of high quality care for diverse patient populations in carbon neutral care settings.

At the base level guidance needs to fulfill requirements of:

a. Official and objective information from healthcare administrations and whose authority derives from a suitable evidence-base. This covers the provision of authoritative list(s) of standards/ guidance documents indicating bibliographical sources as well as their historical background, including methods of creating them.

b. Consistent healthcare facility information within topics and across them - i.e. minimum overlaps, effective cross-referencing to other regulations/ norms with no contradictions. This includes using standardised and concise descriptions, consistent space standards and technical specifications.

c. Up-to-dated information that recognises changing healthcare policies and regulations. Frequent updates are necessary to respond to ongoing changes in healthcare delivery and technological developments. The Internet and online publishing offer opportunities for regular updates while guarding against the temptation to build up elaborate unwieldy and comprehensive systems.

d. Good usability via user friendly navigation and sign-posting making the information easy to find and use; offering appropriate referencing that indicates what was published and when. This includes improved functionality through adding value to text-based information and enabling interfaces with other tools – such as planning design and management tools. Making it easy to find the relevant and essential information at the appropriate granularity or level to
One’s needs is helpful to utilise limited resources in the most cost-effective way in order to provide ‘must-have information’ for acute, primary and community healthcare settings.

All this suggests several key guiding principles. Simple unambiguous, streamlined and non-repetitive information with clear definition of what is mandatory and what is not, but is merely a recommendation is important. An essential guiding principle is for a clear strategy of seeking value for money and related to investment levels of the day. Yet another key principle is the need for an open and evolving set of both generic information and guidance on how and when bespoke information should be gathered as part of an emerging design and stakeholder consultation process. It is still uncertain whether this information should be generic over a range of building types or specialities, or should be more detailed a specialty and level of acuity driven. If the latter is to be achieved ways must be found to manage the complexity of what would be a comprehensive but unwieldy data set, that could contain considerable duplication.

The second component of the best practice framework is an appropriate evidence-base for mandatory standards and design modelling tools. This refers to activities of carrying well-designed research studies, collating and systematic evaluation of existing studies to facilitate retrieval and use by designers and other decision makers. Conducting original empirical investigations such as (Lawson & Phiri 2000; Stigsdotter & Grahn 2002 and Lawson & Phiri 2003) is essential to increase the number of well-designed scientific studies which indicate the importance of the physical environment on staff and patient healthcare outcomes. Stigsdotter & Grahn (2002) study of the outcomes of healing gardens in the Scandinavian countries is a useful example of gathering local knowledge. Collating, reviewing, structuring knowledge (Phiri 2006), compiling/building up electronic databases for example Sheffield Healthcare Environment Database concerns the adoption of criteria and rigorous standards of hard science: a) rigorous, in that use is made of appropriate research methods that allow reasonable comparisons, and discard alternative hypotheses (the research studies are therefore assessed on their rigor, quality of research design and methods, sample sizes and degree of control) and b) high impact, in that the outcomes explored are of importance to healthcare decision-makers, patients, clinicians and society.

The evidence-base is vital particularly in showing how the designed healthcare estate can impact on such things as length of stay, reduction of falls, rates of cross-infection, risks of clinical error, consumption of medication, sometimes including very detailed results such as heart rates, sleep patterns, staff absenteeism and the like. It can also indicate links to more qualitative measures such as patient satisfaction and staff recruitment and retention. Mechanisms for capturing, storing and retrieving qualitative and quantitative evidence during design to inform stakeholder judgment need to be defined as a necessity, taking into account the new developments and application of IT technologies (e.g. E-databases) and new interfaces for design tools.

The third component of the framework is the development of guidance and tools (such as ASPECT/ AEDET Evolution, BREEAM Healthcare, IDEAs etc.) to aid the design process (Lawson 2007). Research evidence can be invaluable in underpinning the guidance and tools giving them authority especially when challenged by clinicians whose background is in pure science. Research is also needed to ensure information is assembled in a format and style that facilitates retrieval and use by practitioners and updating so that it is always relevant to the latest clinical practice as this continually respond to changes including technological developments. In
1966 Donabedian introduced concepts of structure, process and outcome and these remain today the dominant paradigm for the evaluation of the quality of healthcare. He identified the need in healthcare to look at quality improvement essentials i.e. STRUCTURE (which includes the human, physical and financial resources of an organisation); PROCESS (which includes the set of activities and discreet steps in a process) and OUTCOME (the end result of care and service e.g. length of hospital stay health state, satisfaction, mortality and morbidity rates etc.). Research is justified because of the need to link structural and process measures of the healthcare estate and patient and staff outcomes if there is to be quality improvements in healthcare (Donabedian 1988).

The fourth component of the best practice framework is the creation of a defined strategic plan or route for research and development of the health facility planning information. The nature of development work and the associated levels of investment are crucial in determining whether value for money is being achieved and in demonstrating benefits and added value. The challenge is the creation of a robust plan which transcends the impact due political regime changes.

A fifth component of the framework concerns the development of a learning environment, incorporating feedback from completed construction projects and incorporating experiences from ongoing use of health care facilities, to ensure that successes are not overlooked and innovations do not miss their targets. Feedback is not routine within design, construction, procurement practices because there are many barriers and not enough drivers and as a consequence the means (the constructed facility) is not closely linked to the clients’ needs. A significant challenge concerns cultural, attitude and mind set change. For example the construction industry is known to be slow and unwilling to take up new technologies such as those advocated as offering energy savings. The majority of builders like to work with what they know preferring to manage the process this way using traditional methods such as calculating building costs based on materials and labour). The approach in the Nuffield Studies 1955 is a helpful indicator to foster design quality and innovation because it suggests ‘a balanced relationship’ between ‘the accumulated knowledge and experience of those whose daily work has been within the hospital or in hospital design’ and the input of ‘fresh minds and methods from outside’.
REFERENCES


THE RELATIONSHIP BETWEEN THE HUMANIZATION OF INPATIENT AREAS AND THE SATISFACTION AND PERCEIVED AFFECTIVE QUALITIES OF HOSPITAL USERS

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ABSTRACT

This contribution concerns a quantitative study on the relationship between the degree of spatio-physical humanization of hospital environments and the evaluative responses (i.e., environmental satisfaction and perception of affective qualities) of hospital users (i.e., patients, staff and visitors). The target of “more humane hospital environments” (Nagasawa, 2000) refers to spatial, physical and functional design attributes that health care environments should possess for both (i) reducing the stress level which can be very high for both patients and staff (given their daily contact with disease and pain), and (ii) promoting and increasing the well-being and the quality of life of hospital users.

The research sample included 233 hospital users (i.e., patients, staff and visitors) who were contacted in the in-patient areas of three General Surgery Units (located in three different hospitals of the city of Cagliari, Italy) which differed in their degree of spatio-physical humanization, as rated by two design professionals in an assessment grid. Research participants filled in a questionnaire including the 48-item Italian version of the scale measuring 4 bipolar dimensions of perceived affective qualities of places (Russell & Lanius, 1984), and a 3-item scale measuring satisfaction toward the hospital unit.

Results of factorial ANOVAs show that:
1. The higher the degree of humanization of the hospital unit, the higher is the satisfaction toward the hospital unit;
2. The higher the degree of humanization, the less distressing, unpleasant, gloomy, and sleepy are perceived the hospital units;
3. Staff members express an overall “active” modality of interaction with the hospital environment, whereas patients reveal a more “passive” modality of interaction.

These findings provide some empirical evidence that humanizing healthcare infrastructure counts for fostering users’ satisfaction and well-being, thus healthcare managers should invest financial resources in order to improve not only medical technology, but also the design quality of the hospital settings.

KEYWORDS

environmental satisfaction, healthcare design, spatial-physical humanization, hospital users (patients, staff, visitors), psychological responses

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INTRODUCTION

The field of environmental psychology has specifically pointed out how human behaviour and well-being are affected by the socio-physical environment (Stokols & Altman, 1987; Bechtel & Churchmann, 2002). Physical settings may in fact influence human activities, and contribute to shape the positive or negative character of life experience. More specifically, places affect people’s health by yielding well-being or distress feelings as well as conveying positive or negative information for people’s self-esteem, security, and identity (Evans & McCoy, 1998).

In the last decades it has emerged an increased demand for scientific evidence supporting the primacy of user-centred design (Gifford, 2002), i.e. a design view which puts the user in the core of the design process. A popular approach for testing the effect of design attributes on users’ perception is represented by Post Occupancy Evaluation (POE; see Zimring, 2002 for a review) studies, which have been carried out for different building typologies, hospitals included (Zimring, Reizenstein, & Michelson, 1987). On the whole, this research literature produced empirical data which should enhance healthcare medical and administrative efficiency. However, a crucial question is still debated in environmental psychological research, that is: why do people yet share a negative and inhuman image of healthcare buildings, despite the efforts of planners, architects and other professionals? A partial answer relies on the fact that POE studies have dealt mainly with technological “medical” issues, but they have not taken enough into account the issue of “quality of life” in healthcare environments. To this extent, specific contributions on the relationship between socio-physical settings and users’ perception in healthcare environments showed that a great issue actually relies in the difficulty to conciliate the various (and often conflicting) needs of different kinds of users, which differ for their familiarity with context, their passive or active role, and so forth (Shumaker & Pequegnat, 1989).

It is worth to note how the aim of building up user-friendly environments is particularly crucial for those places, such as hospitals and other healthcare structures, where users are likely to experience a psychologically difficult situation. In a situation of increased sensitivity, characteristics of the setting may affect individual disposition, thus attributes such as spatial layout, width, colours, and shapes of a healthcare place can play a key role in the emergence of healthy or unhealthy outcomes. Healthcare structures should aim at promoting health rather than treating illness. Such promotion aim should concern also people working in healthcare structures: spatial attributes may in fact influence staff’s motivations and skills, which in turn can deeply affect how the healthcare service is delivered. Within this frame, both functional and aesthetic aspects are likely to impact on users’ (both patients and staff) satisfaction and wellbeing. The latter two constructs are strictly connected, since it is assumed that “subjective” well being includes people’s emotional response, domain satisfactions (referred to the experiences related to specific aspects such as work, family, the self, etc.) and global judgement of life satisfaction (Diener, Suh, Lucas, & Smith, p. 277).

Besides, in “depersonalized” environments (as most hospitals are usually perceived) a crucial issue is users’ need for privacy and personal space. The fulfilment of these needs would allow individuals to judge their hospital experience as more “homelike”, i.e. closer to their daily routine. Recent developments in healthcare design have highlighted the importance of “humanizing” healthcare contexts by focusing on a set of design attributes, which should be provided in order to satisfy fundamental users’ needs (Evans & McCoy, 1998; Pressly & Heesacker, 2001). These
attributes include lay-out and spatial configuration; colors and materials of furniture, walls and floors; artwork; type, quantity and focalization of natural and artificial light; kind of views inside and outside; size of windows; cleanliness; climate –such as: spatial and sensorial comfort in visual terms (i.e., adequate lighting and panoramic views) or in auditory terms (i.e., avoidance of annoying noises) or in climatic terms (i.e., adequacy of temperature and humidity); orientation; sense of welcome; privacy and social interaction; perceptual consistency; control over space; clear affordance; restorativeness. To this regard, the target of “more humane hospital environments” (Nagasawa, 2000) refers to design requirements that healthcare environments should possess for both (i) reducing the stress level, which can be very high for both patients and staff, given their daily contact with disease, pain and (in some cases) death, and (ii) promoting and increasing the well-being and the quality of life of patients and staff.

Examples of comparative investigations among hospitals with a different degree of spatial-physical humanization are provided by the studies of Davidson (1994) and Devlin (1995).

Davidson (1994) showed that patients assess a recently renewed oncology unit more positively than an older - not renewed - oncology unit. Similarly, in the comparison between two renewed wards and a not-renewed ward carried out by Devlin (1995), all the three main categories of hospital users (i.e., patients, staff, and visitors) express higher satisfaction for the first as regards communication level, relationship between patients and staff, comfort, and the surrounding environment.

Following this conceptual framework, specific tools were developed in order to measure both the “subjective” responses to healthcare units, i.e. users’ Perceived Hospital Environmental Quality Indicators (PHEQIs; see Fornara, Bonaiuto, & Bonnes, 2006), and the “objective” quality of healthcare places presenting a different degree of architectural humanization, which was rated by means of an expert grid to be filled in by design professionals. On the whole, more humanized units received a higher score than less humanized units in PHEQIs dimensions (i.e., upkeep & care, building aesthetics, green spaces, spatial-physical comfort, views and lighting, orientation, quietness, care for relationships and organization, and privacy). Such difference was usually wider and clearer in patients and visitors, whereas staff members appeared as less sensitive to quality differences of places. This distinctiveness of staff responses, previously remarked by Shumaker & Pequegnat (1989), was confirmed in other studies carried out on the perceived affective qualities of hospital units with different level of architectural humanization (Fornara, Bonaiuto, & Bonnes, 2007). In this case, besides the more positive affective qualities evoked by the more humanized units, a difference between staff members on one side, and patients and visitors on the other side emerged. More specifically, staff members expressed an overall “active” modality of interaction with the hospital environment, in both positive (i.e., more exciting and stimulating) and negative (i.e., more distressing) terms, whereas patients and visitors revealed a more “passive” modality of interaction, in both positive (i.e., more relaxing) and negative (i.e., more gloomy and sleepy) terms.

OBJECTIVES AND HYPOTHESES

The principal aim of this contribution is to provide further empirical evidence to users’ preference for more humanized hospitals. In particular, the purpose is to verify whether outcomes of previous studies could be replicated in (and extended to) different units (in terms of care specialization) of
different hospitals of a different city. Here the focus was placed on the affective dimension of users’ assessment, considering that the first level of response toward the environment is of emotional nature, as was emphasized by Ittelson (1973) since the early stages of environmental psychology. Thus, the dimension under analysis is represented by the affective properties evoked by the places while they are experienced. All the principal categories of hospital occupants (i.e., the “place users”) were considered, namely patients, staff members, and external visitors.

The research hypotheses are thus the following:

H1. The higher the degree of humanization, the higher is the satisfaction toward the hospital unit.
H2. The higher the degree of humanization, the higher is the score in positive affective qualities received by hospital places.
H3. Staff members score higher in the “active” affective qualities (both positive and negative), whereas patients and visitors score higher in the “passive” affective qualities (both positive and negative).

**METHOD**

**CONTEXTS**

Three General Surgery Units, which are located in three different hospitals of the city of Cagliari (Italy), were chosen for their different degree of architectural humanization (i.e., high vs. medium vs. low). Such difference was stated on the basis of an “expert” evaluation, which was provided by two design professionals who visited all the three places and rated their “objective” quality on a list of parameters (see Fornara et al., 2006).

**PARTICIPANTS**

233 hospital users roughly balanced for the main sociodemographics were recruited for the data collection. The sample size can be considered as acceptable for eliciting stable and reliable results from the statistical analyses.

As regards the kind of user, 120 (51%) were patients, 74 (32%) were visitors, and 39 (17%) were staff members.

As concerns places, 88 (38%) were recruited in the low-humanization hospital unit, 75 (32%) in the medium-humanization hospital unit, and 70 (30%) in the high-humanization hospital unit. As regards gender, females were 117 (about 50%) and males were 116 (about 50%).

Concerning age, 46 (20%) aged 18-30 years, 58 (25%) aged 31-40 years, 68 (29%) aged 41-50 years, 30 (13%) aged 51-60 years, and 31 (13%) aged more than 60 years.

About education, 17 (7%) had only a Primary School education, 73 (31%) up to Junior High School, 107 (47%) up to Senior High School, and 36 (15%) were graduated.

**TOOLS**

The tools had the format of a self-report questionnaire, which includes the following measures:
The scale on Perceived Affective Qualities (PAQs) of Places, based on the circomplex model of Russell and colleagues (e.g., see Russell and Pratt, 1980). This scale, adapted and validated for the Italian contexts (Perugini, Bonnes, Aiello, & Ercolani, 2003), consists of a list of 48 adjectives included in 4 bi-polar dimensions (6 items for each of the 8 poles), i.e. Relaxing vs. Distressing, Pleasant vs. Unpleasant, Exciting vs. Gloomy, and Stimulating vs. Sleepy. The response scale is a 7-step Likert-type, where participants are asked to assess how well each adjective is appropriate to describe the target-place (e.g., the hospital area).

A 3-item scale on Satisfaction toward the hospital unit (Fornara, 2005). The response scale is a 5-step Likert-type, from “totally disagree” to “totally agree”.

Main sociodemographics (i.e., gender, age, education, etc.) were also collected.

DATA ANALYSIS

Monofactorial structures of both the satisfaction index and the four bi-polar PAQs were verified. Internal consistency of all dimensions was then calculated (by using the Cronbach’s Alpha value), in order to compute aggregate scores and use them in the subsequent analyses. A series of 3X3 factorial ANOVAs (testing for both the main effects and the interaction effect) was run, where the satisfaction and the 4 PAQs were the DVs, and the Degree of Humanization and the Type of User were the IVs.

RESULTS

Monofactorial structures of both the Satisfaction scale and the 4 PAQs were confirmed. Cronbach’s Alpha was quite satisfying for all dimensions, given that the score was .94 for the Satisfaction scale, .84 for Relaxing vs. Distressing, .90 for Pleasant vs. Unpleasant, .87 for Exciting vs. Gloomy, and .81 for Stimulating vs. Sleepy.

Tables 1 and 2 show the results of post-hoc comparisons among mean scores of respectively Satisfaction and PAQs, whereas the overall significant ANOVA effects are presented below in the text for each dimension.

Satisfaction toward the hospital unit. The main effects of Degree of Humanization (F (2,224) = 41.22, p<.001) and of Type of User (F (2,224) = 4.59, p<.05) were both significant. The high-humanization hospital unit received a higher satisfaction score than the medium-humanization one, while the latter scored higher than the low-humanization one; visitors scored lower than patients and staff, while the latter two showed no significant differences.

Relaxing vs. Distressing. The main effects of Degree of Humanization (F (2,224) = 39.91, p<.001) and of Type of User (F (2,224) = 16.67, p<.001) were both significant. The high-humanization hospital was perceived as more relaxing (or less distressing) than the medium-humanization one, while the latter received a higher relaxation score than the low-humanization one; staff scored lower than patients and visitors, while the latter two showed no significant differences.

Pleasant vs. Unpleasant. The main effects of Degree of Humanization (F (2,224) = 87.20, p<.001) and of Type of User (F (2,224) = 6.93, p<.01) were both significant. The high-humanization hospital was perceived as more pleasant than the medium-humanization one, while the latter received a
higher pleasantness score than the low-humanization one; staff scored higher than patients, who in turn scored higher than visitors.

**Exciting vs. Gloomy.** The main effects of Degree of Humanization \( (F_{(2,224)} = 43.33, p<.001) \) and of Type of User \( (F_{(2,224)} = 18.43, p<.001) \) were both significant. The high-humanization hospital was perceived as more exciting (or less gloomy) than the medium-humanization one, while the latter received a lower gloomy score than the low-humanization one; staff scored higher than patients, who in turn scored higher than visitors.

**Stimulating vs. Sleepy.** The main effects of Degree of Humanization \( (F_{(2,224)} = 16.83, p<.001) \) and of Type of User \( (F_{(2,224)} = 13.11, p<.001) \) were both significant. The 2-way interaction was also significant \( (F_{(4,224)} = 2.49, p<.05) \). The high-humanization hospital was perceived as more stimulating (or less sleepy) than the medium-humanization one, while the latter received a higher stimulating score than the low-humanization one; staff scored lower than patients and visitors, while the latter two showed no significant differences. The analysis of mean scores disaggregated for Degree of Humanization and Type of User shows that only for patients the higher the humanization, the higher is the stimulation, whereas for visitors this tendency emerged only between the low- and medium-humanized hospital units (and not between the medium- and high-humanized units), and finally for staff the scores are quite similar across the three units.

**DISCUSSION AND CONCLUSION**

The first and the second hypotheses were evidently confirmed, since there was a significant discrimination across different levels of architectural humanization of places for all the considered dimensions. In other words, healthcare units are perceived as more satisfying, pleasant, relaxing, exciting and stimulating as design quality increases. These results, which emerged from the comparison among three General Surgery units of the city of Cagliari, represent a far clearer confirmation of previous findings in other hospital units (e.g., Orthopaedic, Urology, Cardiology, Oncology units; see Fornara et al., 2007) of different cities.

Thus, despite of diversities in hospital units and urban contexts, a recurrent outcome emerges, since the improvement of design quality seems to increase the attribution of positive affective qualities and decrease the attribution of negative affective qualities by users. That provides some empirical evidence to the importance of architectural humanization for users’ psychological well-being.

As regards the third hypothesis, it is substantially confirmed the specificity of staff members’ response in terms of “active” vs. “passive” modality of interaction with the hospital environment (Fornara et al., 2007), in line with their different role (in comparison especially with patients) as reported by Shumaker and Pequegnat (1989). In particular, staff members averagely perceive the hospital unit as more exciting and stimulating (i.e., “active” positive qualities), but also as more distressing (i.e., an “active” negative quality) than patients and visitors. Staff members also judged the places as less unpleasant than the other two place users, that maybe reflects a psychological mechanism of adaptation to the environment (Gifford, 2002).

Differently from previous studies, here it emerged (in a negative direction) the distinctiveness of visitors, who appeared as the less satisfied, and rated the places as more unpleasant and gloomy
than patients and staff. It is likely that the neglecting of visitors’ needs in the healthcare designer’s mind, as claimed by Zimring and colleagues (1987), can at least partially explain this outcome.

In conclusion, the different response level of affective nature to the different degrees of humanization is a particularly relevant aspect in the light of the fact that the emotional impact toward the situation is likely to influence the following relationships with the environment (Ittelson, 1973, p.16). Hence, setting up parameters of humanization for building or renewing hospitals structures would be a salient criterion in the direction of a “user-centered” design view, in order to better satisfy needs and expectations of the various kinds of users, thus providing a little step toward the promotion of their psychological well-being and the improvement of their quality of life.
Table 1. Satisfaction and PAQs: Means (SDs) and post-hoc comparisons (Duncan Test, $\alpha = .05$) in relation to Degree of Humanization

<table>
<thead>
<tr>
<th></th>
<th>Low Humanization</th>
<th>Medium Humanization</th>
<th>High Humanization</th>
<th>Tot N = 233</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 88</td>
<td>N = 75</td>
<td>N = 70</td>
<td></td>
</tr>
<tr>
<td>Satisfaction</td>
<td>2.77a (1.07)</td>
<td>3.36b (.97)</td>
<td>4.20c (.53)</td>
<td>3.39 (1.07)</td>
</tr>
<tr>
<td>Relaxing vs. Distressing</td>
<td>3.88a (1.05)</td>
<td>4.43b (.92)</td>
<td>5.20c (.89)</td>
<td>4.46 (1.10)</td>
</tr>
<tr>
<td>Pleasant vs. Unpleasant</td>
<td>2.64a (1.17)</td>
<td>3.66b (.84)</td>
<td>4.94c (.88)</td>
<td>3.66 (1.36)</td>
</tr>
<tr>
<td>Exciting vs. Gloomy</td>
<td>2.77a (1.12)</td>
<td>3.63b (.69)</td>
<td>4.29c (.88)</td>
<td>3.51 (1.12)</td>
</tr>
<tr>
<td>Stimulating vs. Sleepy</td>
<td>3.65a (1.19)</td>
<td>4.43b (.78)</td>
<td>4.78c (.78)</td>
<td>4.24 (1.07)</td>
</tr>
</tbody>
</table>

Note 1: Range from 1 = most negative to 7 = most positive.
Note 2: Different letters refer to significantly different means.

Table 2. Satisfaction and PAQs: Means (SDs) and post-hoc comparisons (Duncan Test, $\alpha = .05$) in relation to Type of User

<table>
<thead>
<tr>
<th></th>
<th>Staff N = 42</th>
<th>Patients N = 120</th>
<th>Visitors N = 71</th>
<th>Tot N = 233</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction</td>
<td>3.44a (.98)</td>
<td>3.53a (1.07)</td>
<td>3.11b (1.10)</td>
<td>3.39 (1.07)</td>
</tr>
<tr>
<td>Relaxing vs. Distressing</td>
<td>3.78a (.96)</td>
<td>4.66b (.99)</td>
<td>4.52b (1.21)</td>
<td>4.46 (1.10)</td>
</tr>
<tr>
<td>Pleasant vs. Unpleasant</td>
<td>4.16a (1.00)</td>
<td>3.67b (1.38)</td>
<td>3.34c (1.43)</td>
<td>3.66 (1.36)</td>
</tr>
<tr>
<td>Exciting vs. Gloomy</td>
<td>4.23a (.66)</td>
<td>3.48b (1.14)</td>
<td>3.12c (1.10)</td>
<td>3.51 (1.12)</td>
</tr>
<tr>
<td>Stimulating vs. Sleepy</td>
<td>5.02a (.65)</td>
<td>4.07b(1.02)</td>
<td>4.07b (1.15)</td>
<td>3.39 (1.07)</td>
</tr>
</tbody>
</table>

Note 1: Range from 1 = most negative to 7 = most positive.
Note 2: Different letters refer to significantly different means.
REFERENCES


EFFECTIVE STAKEHOLDER CONSULTATION: A COMPARATIVE ANALYSIS

S.S. Mahadkar¹, G.R. Mills² and A.D.F. Price³

ABSTRACT

The healthcare sector is subject to many rapid changes in: technology, policy, demographics and financial investment. It is thus essential that an effective dynamic infrastructure planning system integrates care service design, estates planning, accessibility and carbon analysis. In this change oriented scenario, the importance of stakeholder consultation and public participation is highly topical with widespread advocacy in government policy literature and healthcare literature. The main aim of this paper is to explore how decision making and stakeholder consultation can drive value within infrastructure decision making in line with Section 242 of the NHS Act 2007. This has been achieved through interpretation of mini web-based case studies of consultation exercises conducted within various PCTs in England. Stakeholder consultation is investigated through different perspectives and at different levels of detail. A framework is further developed based on the literature review as proposed by various authors in order to ensure that stakeholder consultation policy and practice is more efficient and effectively delivered.

KEYWORDS

consultation, community engagement, stakeholders

INTRODUCTION: POLICY CONTEXT

The current healthcare landscape is influenced by complex funding mechanisms, legacy of out-dated buildings and changing patterns of demand for healthcare services, along with the complex involvement of many stakeholders. Public involvement has today and in the past been expressed as the central pillar of the health policy process across the developing world (Wait and Nolte, 2006); its importance as a policy driving tool has also been expressed in recent healthcare improvement initiatives such as the Darzi ‘Next Stage Review’ and World Class Commissioning which require Primary Care Trusts (PCT’s) to lead and seek continuous and meaningful engagement with people, patients and communities to help shape services and improve health (Darzi, 2007, Darzi, 2008, Department of Health, 2007b, Woodin and Wade, 2007).

Stakeholder consultation and public involvement in the healthcare planning process is significantly driven by legislation at a NHS Trust board level. Trusts are becoming increasingly aware of the responsibilities and liabilities placed on them to consult stakeholders and the risks that they can face if consultation is inadequate. As a result, many are defining legal and operating frameworks to ensure compliance with national guidelines and legislation. Service review and estates reconfiguration programmes may be among the most important to consult on, as county

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wide Master Plans impact on large populations and inequalities can be widespread. The NHS sits within a well developed regulatory structure, for example:

- The Health and Social Care Act (2001), specifies the need for NHS organisations to obtain approval from the appropriate Local Authority Overview and Scrutiny Committees (OSC) on substantial change proposals.
- Section 242 of the Local Government and Public Involvement in Health Act requires that Trusts involve, consult and respond to users and the public and make explicit the decision making framework and the trade-off between: affordability, acceptability and clinically safe and effective outcomes (Figure 1).

The National Health Service Act 2006 consolidates much of the legislation concerning the health service. Section 242 of the Act (2006) of the Local Government and Public Involvement in Health Act came into force on 1 March 2006. It originally stated that Strategic Health Authorities, Primary Care Trusts, NHS Trusts and NHS Foundation Trusts must: “...make arrangements with a view to securing, as respects health services for which it is responsible, that persons to whom those services are being or may be provided are, directly or through representatives, involved in and consulted on: (a) the planning of the provision of those services, (b) the development and consideration of proposals for changes in the way those services are provided, and (c) decisions to be made by that body affecting the operation of those services.” However, the duty placed on Trusts to involve patients has been further strengthened after Royal Assent on 30th October 2007 (Department of Health, 2006a, Department of Health, 2007a).

This requires a number of changes to the way the NHS is expected to involve and consult communities in the planning and development of services that came into force 1st April 2008. Further to the previous statement: “...everybody that is responsible for delivering health and social care services (commissioners and providers) to involve, consult and respond to users and the public in, (a) the assessment of needs and preferences of their user population; (b) setting local priorities and deciding what services are commissioned; (c) the decision making process of commissioners...; (d) the reconfiguration of services and significant structural change; and (e) the ongoing quality improvement process as a result of feedback.”

This statement places responsibility on all commissioners and providers, including those responsible for estates and facilities. It also defines the need for authorities and Trusts to involve,
consult and respond to their decision making processes especially when there is significant structural change involving reconfiguration of services. As such, stakeholder consultation will have to become part of estates and facilities departments’ toolkits and construction consultant firms’ service offering.

**GENERIC CODE OF PRACTICE ON CONSULTATION**

The majority of Trusts are citing Section 242 of the NHS Act 2006 because of the legal imperatives that it places on PCTs, however, a more recent multi-sector (non-statutory) consultation code has been released. The first edition of this code of practice was written in 2000 and introduced by the Cabinet Office to ensure better written consultation (Modernising Public Services Group, 2000). The current Code of Practice was developed following a review of government consultation practices in 2007. A number of public sector organisations have signed up to the Code of Practice on Consultation, including the Department of Health. The Code only sets out government’s general policy on formal, public, written consultation exercises and does not have a legal standing and cannot prevail over statutory or mandatory requirements (Better Regulation Executive, 2008), which sets it apart from Section 242 which is legally mandatory. This Code of Practice provides useful guidance on when to consult; duration, scope, accessibility and clarity of consultation; responsiveness of the exercise along with the capacity to consult while executing written consultations. This paper starts to document the approaches taken towards consultation across England and highlights the need for better integration between estates and patient and public involvement functions during healthcare planning activities. Based on Section 242 of the NHS Act 2006, the following legislative structure was developed which was used to capture the PCT case studies within this paper (Table 1). Along with this, an evaluation framework was also developed, which will be discussed further in the paper.

**Table 1. Legislative structure based on Section 242 of the NHS Act 2006**

<table>
<thead>
<tr>
<th>NHS Act 2006</th>
<th>NHS Act Dec-07</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) The planning of the provision of those services</td>
<td>(1) The assessment of needs and preferences of their user population</td>
</tr>
<tr>
<td>(b) The development and consideration of proposals for changes in the way those services are provided</td>
<td>(2) Setting local priorities and deciding what services are commissioned</td>
</tr>
<tr>
<td>(c) Decisions… affecting the operation of those services</td>
<td>(3) The decision making process of commissioners</td>
</tr>
<tr>
<td></td>
<td>(4) The reconfiguration of services and significant structural change</td>
</tr>
<tr>
<td></td>
<td>(5) The ongoing quality improvement process as a result of feedback</td>
</tr>
</tbody>
</table>

**RESEARCH METHOD**

Consultations are complex planning processes that involve many stakeholders in different activities over considerable periods of time. A Trust’s consultation process and their decision making process are related; in that broader stakeholder views inform or are informed by key stakeholder decisions. In this paper, consultation and decision making processes are seen as separate but interrelated. As such, it is necessary for making an evaluation of a consultation to understand both this process and the decision making process to assess how successful it has been. A multi-method action and desk-based triangulation approach was adopted to evaluate the
consultation processes. This paper documents how this was achieved from two prospective: the first is a broad national perspective using web based document analysis; and the second a deep local perspective using action based research. These perspectives have been combined to develop an evaluation framework that can be used to assess consultations as they align within the broader multi-stakeholder strategic planning process.

LITERATURE REVIEW: CROSS COMPARISON OF CONSULTATION EVALUATION FRAMEWORKS

A literature review of stakeholder involvement theory and practice was conducted and assigned to a matrix for review and comparison. This matrix compared the various principles and broader benefits of stakeholder consultation and public involvement as suggested by MacFarlene (1996), Zakus and Lysack (1998), Philips and Orsini (2002), Pivik (2002), Crawford, Rutter et.al. (2002), and Zena Simecs and Associates (2003). From this comparison of evaluation criteria put forth by various authors seven higher order categories were identified for evaluating stakeholder involvement (Table 2). The evaluation framework is the final outcome of this review that can be applied across NHS PCT case studies in a more specific and detailed review.

ACTION RESEARCH: LOCAL PRIMARY CARE TRUST CONSULTATION CASE STUDY

The stakeholder consultation process is a complex process that emerges alongside the infrastructure planning and design process. An action based methodology was adopted to investigate the multi-stakeholder approach to infrastructure planning within a local Primary Care Trust which was undergoing service reconfiguration. This facilitated the opportunity to witness firsthand the multi-intuitive and multi stream approach adopted by the PCTs to execute their planning processes; it also involved active engagement in the consultation exercise conducted by the PCT. As part of this, the research team was dynamically working with the communications and engagement team at the PCT and was also involved in the development of a live public consultation and service review. Questionnaire responses were received by email, in paper-based form and a web based questionnaire (this also included petitions and letters from various organisations). A total of 876 questionnaires and 78 letters were received. As such, action research was a necessary part of understanding the specific details of the interrelation of these processes. A grounded analysis of public comments was undertaken, to identify any additional aspects and ideas emerging from the data. Along with quantitative analysis of the questionnaires. A structured strategic analysis of the alignment of public comments with strategic plans and proposals was also conducted to provide a direct response and highlight positive and negative comments against the PCT’s aims and proposals (extracted using document analysis). Further to this, a document and content analysis of all 80 letter responses was conducted, using coding to provide an overall view and site specific perspective (Mills, 2009).

WEB DOCUMENT ANALYSIS: REVIEW OF PCT WEB PUBLISHED CONSULTATIONS

This included a broad and unstructured analysis of all NHS PCT websites in England to extract available consultation documents and Public and Patient Involvement activities. This analysis, while complete, may have some limitations that will need to be validated with PCT representatives during the next phase of the research, as PCT websites had a very broad and varied organisational map, which meant that consultation reports or references to consultation websites or board minutes were categorised in sections that varied from “estates planning”, to “consultation”, “PALs”, “PPI”, “Statutory Consultations”, “Have Your Say” or “Get Involved”.

31
Other PCTs had devised their own brands specifically for public consultation and engagement. The matrix used for the evaluation of the consultations conducted by the PCTs is structured around the Legislative structure of Section 242 of the NHS Act 2007. This provided a mandatory framework of compliance criteria that could initially be used and which could later be replaced by the framework formulated by this work.

**LITERATURE REVIEW**

**ALIGNMENT OF STAKEHOLDER CONSULTATION ASSESSMENT METHODS**

There have been various guidance documents supporting Patient and Public Involvement in England, however, few have been focused on activities to be performed by estates and facilities teams, who are often at the centre of estates reconfigurations and significant structural changes. Some clinical guidance is starting to provide guidance specific to clinical pathways, against those identified in ‘High Quality Care for All’ (Darzi, 2008). A report published by the Picker Institute summarises the results of a survey which assessed the impact of the World Class Commissioning framework on patient and public engagement (PPE) in commissioning (Picker Institute Europe, 2009). The findings show that PCTs have reported significant changes to their organisation of PPE in commissioning amounting to the beginnings of a cultural shift. Various authors have proposed different principles for the assessment of stakeholder consultations. These principles and the broader benefits of stakeholder consultation and public involvement as suggested by MacFarlene (1996), Philips and Orsini (2002), Pivik (2002), Abelson et al. (2003), Crawford, Rutter et.al. (2002), and Zena Simecs and Associates (2003) have been compared and can be found in Price et al. (2009). In order to facilitate this discussion, these are categorised around the following themes: communication, outcomes, participant support, patient involvement, public engagement, resource utilisation, patient and public participation and leadership and evaluation. It is important to provide information and feedback to the participants of the consultation. In order to promote sharing of experiences and information Zena Simecs and Associates (2003) and MacFarlene (1996) suggest inclusiveness within the consultation so that it meets the interests and needs of all the participants. It is imperative to enhance community awareness of health issues and educate citizens to control their healthcare, become more informed about issues and also have a readiness for effective involvement with an assessment of resources, costs, capacity, influence and accountability (Phillips and Orsini, 2002; Zakus and Lysack, 1998; Pivik, 2002; Crawford et al. 2002; Zena Simecs and Associates, 2003). Majority of the authors felt that consultation assessment methods should generate better options by providing different perspectives along with policy outcomes. All the authors felt that patient involvement was also important as it decreased feelings of alienation along with increasing feelings of inclusion, sense of control and problem solving. It also increased networking between provider and community members which could also lead to changes in attitudes of the organisations involving patients e.g. staff attitudes towards patients became more favourable and open; effects on users e.g. patients welcomed the opportunity to participate, self-esteem was increased. However some patients also reported dissatisfaction with the process. Four out of the six authors also suggested that public engagement fosters and teaches skills for being a responsible citizen and a heightened sense of responsibility and conscientiousness regarding health. Enhanced sense of control and empowerment within the community is necessary as people should have a say in the decisions that affect their lives. Zakus and Lysack (1998); Pivik (2002) and Zena Simecs and Associates (2003) also stress the importance of resource utilisation by directing them to the highest needs as defined by the community. Healthcare decisions should reflect the needs, values and culture of the community.
along with the efficient use of scarce resources. The resource utilisation process should be fair and competent, a right fit with goals, and should utilise methods of involvement that have an impact and a collaborative dialogue. Zena Simecs and Associates (2003) further describe the right type of participants as individuals who are willing to participate and are representative, broad and diverse and the right leadership where the leader guides the process towards the desired results, facilitating working together, adapting to changes and follows-up. Getting the right participation is also important along with seeking out representation from every stakeholder group involved and affected.

The following evaluative framework (Table 2) has been developed on the basis of a literature review and cross comparison between different principles of stakeholder assessment. This framework serves as a checklist of measures to ensure that a consultation is well rounded and effective; along with ascertaining that the consultation exercise and the feedback received is appropriately fed into the decision making process. It also ensures that future NHS structural changes are delivered efficiently and effectively and PCT decisions do not get escalated to the Secretary of State and overturned resulting in huge delays and budget overruns, and more importantly the Trusts can demonstrate good stakeholder value for money. It is important for managers and planners to cope with the constantly changing dynamic healthcare environment in order to reduce uncertainty and indecision that surrounds the debate of reconfiguration of healthcare facilities This framework has been developed to enhance public consultation from a ‘must do’ exercise to deliver value and practical improvement to a project. However, it must be noted that certain criteria such as ‘accountability of decision making’, ‘transparency of decisions’, ‘impacting policy’, ‘degree of citizen control’ will always be subject to interpretation and the degree of measures will be left up to the decision makers.
Table 2. Evaluative framework: checklist and measures for effective consultation

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1) Representativeness of Participants</strong></td>
<td>Identify stakeholders</td>
</tr>
<tr>
<td></td>
<td>Balance selection and monitor representativeness</td>
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<tr>
<td></td>
<td>Getting in touch with ‘Hard to Reach Groups’</td>
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<td></td>
<td>Demographic criteria</td>
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<td></td>
<td>Geographic selection</td>
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<tr>
<td></td>
<td>Stakeholder weighting</td>
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<tr>
<td></td>
<td>Total response and response rate</td>
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<tr>
<td><strong>2) Participant Independence</strong></td>
<td>Unbiased process</td>
</tr>
<tr>
<td></td>
<td>Checks on independence of process</td>
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<tr>
<td></td>
<td>Characteristic, accessibility, readability, digestibility of information</td>
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<tr>
<td></td>
<td>Information interpretation, choice of experts/information</td>
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<td></td>
<td>Ethics, data protection, screening</td>
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<tr>
<td><strong>3) Influence on Policy</strong></td>
<td>Output of procedure impacting policy</td>
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<tr>
<td></td>
<td>Legitimacy and accountability of decision making</td>
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<td></td>
<td>Achievement of consensus over the decision</td>
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<tr>
<td><strong>4) Process Transparency</strong></td>
<td>Transparency on the type of decisions</td>
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<tr>
<td></td>
<td>Legal / Regulatory, Publicity, Auditibility, Availability, Accessibility of process to public</td>
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<td></td>
<td>Degree of citizen control/point of input into agenda</td>
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<td></td>
<td>Level of staff (influential/junior) at the point of decision making</td>
</tr>
<tr>
<td></td>
<td>Clarity of: purpose &amp; feedback of consultation, resources and sample</td>
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<tr>
<td></td>
<td>Transparency on consultation</td>
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<tr>
<td></td>
<td>Impact of consultation on plans</td>
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<tr>
<td><strong>5) Resources</strong></td>
<td>People: evidence of training, efficiency in execution</td>
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<tr>
<td></td>
<td>Time demands: realistic &amp; sufficient timetable</td>
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<td></td>
<td>Facilities: appropriate</td>
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<td></td>
<td>Expertise: to execute the task and participate</td>
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<td></td>
<td>Finance: cost + uncertainties</td>
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<td></td>
<td>Well designed surveys with overarching strategy</td>
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<td></td>
<td>Involvement in planning</td>
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<td></td>
<td>Cost effectiveness, benefit/cost</td>
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<td></td>
<td>Directed towards the highest needs as defined by the community</td>
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<tr>
<td><strong>6) Task Definition</strong></td>
<td>Context justification: regulatory, social, organisational</td>
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<td></td>
<td>Scope of exercise</td>
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<td></td>
<td>Defined aims and outputs</td>
</tr>
<tr>
<td></td>
<td>Rationale for exercise</td>
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<td></td>
<td>Choice of questions provider/access/waiting times/information/communication etc. specific</td>
</tr>
<tr>
<td><strong>7) Structured Decision Making</strong></td>
<td>Procedures: format specification, group decisions &amp; consensus</td>
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<tr>
<td></td>
<td>Flexibility: worse case scenarios and strategy</td>
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<td></td>
<td>Appropriate approach selection</td>
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<tr>
<td></td>
<td>Consistency &amp; competence level of participants specified</td>
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<tr>
<td></td>
<td>Validation of methods utilised</td>
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<td></td>
<td>Agreed standards and indicators</td>
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<td></td>
<td>Monitor trends and benchmark against comparators</td>
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<tr>
<td></td>
<td>Priorities for measurement (topical/clinical)</td>
</tr>
<tr>
<td></td>
<td>Publication of results</td>
</tr>
<tr>
<td></td>
<td>Process and impact evaluation along with right leadership</td>
</tr>
</tbody>
</table>

An Independent Reconfiguration Panel (IRP) is a body appointed to evaluate any schemes referred to the secretary of state by the Overview and Scrutiny Committee. They are appointed to investigate if the proposals and the subsequent consultations are appropriate to deliver safe, sustainable and accessible services. As such the lessons learnt by PCTs who have undergone an evaluation conducted by the IRP can also be a form of guidance that may establish the need for
more specific best practice consultation advice and an evaluation framework. Key issues identified by the IRP include accessibility of the literature distribution, representative demographics, poor questionnaire design, inadequate choices, provision of financial information and ‘journey times’ with the proposals, sufficient weight for health inequalities and relative deprivation. These have also been considered in the framework formulation (Independent Reconfiguration Panel, 2008).

FINDINGS

WEB DOCUMENT ANALYSIS: REVIEW OF PCT WEB PUBLISHED CONSULTATIONS

A web based review was conducted in order to investigate the consultation exercises with regards to significant estates and service changes within 149 Primary Care Trusts in England. These were initially categorised based on the legislative structure developed in line with Section 242 of the NHS Act 2006 (Rev.07); represented in Table 1. Information regarding the assessment of needs and preferences of their user population was recorded, for each PCT, based on the documentation available on each PCT’s website (for example: Joint Strategic Needs Assessment). Following this, further information regarding the main consultation activity along with development and consideration of various proposals related to estates and services was also noted and analysed.

The majority of the consultation data collected were service (61%) and estates (38%) related. There were hardly any transport related consultations (1%). This re-instates the need to have an encompassing approach which integrates the three areas (estates, services and transport) and also has a definitive approach for introducing consultation within the infrastructure planning and decision making process.

Based on current consultation practices, the consultations were further categorised according to their sampling method: questionnaire, email feedback, telephone survey, public meetings, focus groups, PPI, forums, written submissions and comments, health fairs and events. It can be seen from the following diagram that the data collected showed that the most common method for collecting a sample was questionnaires and Patient Public Involvement events (56%), while patient forums were one of the least utilised methods. It should be noted that at a national level (Department of Health) consultations, patient forums are widely used, but it is not the same at a PCT level.

![Fig. 2. Sample method categorisation](image-url)
Although a number of PCTs engaged in active consultation, very few received a good feedback response. Within the data collected from web-based case studies only 28 cases reported receiving over 100 responses (in a large number of cases the PCTs did not state the number of responses received). In most cases, PCTs either conduct patient centric focus groups or hold public meetings and events.

This web document review provided the following findings:

- There are large variances in the level of information provided to the public for their comments. Some PCTs provide broad regional visions in consultation documents that will affect a programme of infrastructure projects, while others centre on specific specialty services or facilities within a defined project.
- Few PCTs have consulted stakeholders on specific building qualities; the most frequent consultation issues are those relating to Master Planning, such as which site is the best location for a new service or facility.
- Those that have concentrated consultation on specific services or estates have frequently not provided a broader regional Master Plan or region wide service design strategy which could help stakeholders understand the context for change.
- Some Trusts are ineffective in organising specific public consultation events and engagement work streams; rather they are reliant only on open meetings and board room minutes to provide feedback. When this is the case there is little auditable evidence of a consultation.
- Some Trusts target specific user consultation groups and representative focus groups more than broad surveys. This could provide further specific detail of the subject area at issue and can allow proposals and options to be tested and feedback obtained quickly (for example: Buckinghamshire PCT).
- Some Trusts have worked with regulators such as DH and other agencies such as Healthcare for London to deliver broad consultation. As such these benefit from large sample sizes, however, if data are not provided for analysis at a local level this may prevent the delivery and evaluation of proposals as they address local needs.
- Some Trusts provide detailed and transparent evidence on the entire consultation process and provide feedback comments received from the public.
- Some PCTs have provided individual community health profiles for each of their areas as part of their Joint Strategic Needs Assessment (JSNA). These community health profiles provide information (health snap shot) in terms of inequalities, income, health, ethnicity and also a health summary which provides comparison against the national and regional average (for example: County Durham PCT).
- Some PCTs have detailed patient, carer, public involvement (PcPI) needs analysis and plans which facilitates the engagement process (for example: County Durham PCT).
- Some PCTs also have a Consultation Planning Group, established to advise on the process of consultation (for example: Cumbria PCT).
- Very few PCTs provided a response to the feedback received from the consultation and have indicated in detail how their plans have or have not changed due to the responses.
- Some PCTs engaged an independent organisation for the review of part of the public consultation (for example: University of Cumbria) and also for the entire consultation as well (commercial organisations such as Proportion Marketing, Durham County and
Darlington NHS Foundation Trust; Opinion Research Services, East and North Hertfordshire PCT).

- A few PCTs have distributed the questionnaires on the basis of patient flow within their county (for example: Darlington PCT).
- It should be noted that for the JSNA some PCTs include transport issues (for example: Darlington PCT), social inclusions, fear of crime and feeling of safety (for example: Derby PCT).
- Some PCTs have used scenario planning approaches that enable the balancing of benefits, simulation, and realistic decision making on the basis of hypothetical decisions designed to highlight trade-offs between either different values (e.g. equity and equality) timescales (short term/long term) or priorities (e.g. investment in prevention versus treatment) for example: Derbyshire PCT with Loop2, Unplanned Care at Doncaster PCT.
- Some PCTs have a stakeholder engagement strategy that broadly defines the principles and approaches taken to consultation, however, these have often not answered the more complex question of ‘What importance does each stakeholder hold throughout the decision making process? What should be the content of decision making?’ (for example: Devon PCT, Nottingham PCT).
- Some PCTs have used independent consultants to make an analysis of the effectiveness of pre, during and post consultation phases. Due to the nature of consultation and its alignment with the decision making process, evaluation often requires considerable amounts of information and a description of what stakeholders and value criteria drove both the consultation and decision making process (for example: East Sussex downs and Weald PCT, Haringey PCT).

Based on an initial analysis of the various case studies, the following cases were identified as exemplar cases either for their approaches to the consultation or their method for execution along with the analysis.

**Liverpool Primary Care Trust Consultation Case Study Highlights:**

In 2002, the NHS across north Merseyside developed a new Model of Care to fundamentally shift the planning of local health services. This move gained momentum with the White Paper, Our Health, Our Care, Our Say (Department of Health, 2006b) which outlined the need for a wider range of community based services offering patients choice, convenience, fairness and a better NHS experience. In order to modernise their primary care along with differentiating between health care that should be provided inside hospitals and those services which could be delivered more appropriately outside of hospitals Liverpool PCT decided to develop a sound out of hospital strategy. In order to achieve this, it was necessary to involve all stakeholder groups and this was devised as the ‘Big Health Debate’ which comprised the following three phases of work:

- A self-completed questionnaire along with several visits to community groups and neighbourhood committees during August and September of 2006. Over 10,000 responses were received and a number of topics were generated for further investigation (Liverpool Primary Care Trust, 2007).
- Using the outputs of the first phase a deliberative event workshop was held with 150 participants to raise the issues of various trade-offs (not all services can be delivered in all localities) and also viability and affordability constraints. Out of the 150 participants, 100 were a cross section of the population of Liverpool aged 18-75 from a variety of
locations and further 50 participants were healthcare professionals (GPs, pharmacists and dentists).

- Based on the finding of the first two phases, four service attributes were identified and in May 2007 the PCT employed a marketing research technique known as conjoint analysis for a sample of over 600 frequent users of primary care services. This enabled a quantification of the trade-offs of four attributes; differing opening hours, maximum travel times, willingness to see a GP other than their usual GP and a differing range of services (The Murray Consultancy, 2007).
- Alongside this survey, Liverpool PCT ran a set of 13 focus groups with a variety of harder-to-reach groups, a multi disciplinary workshop for health and social care staff along with 3 road shows for health professionals.

In order to inform transport and location issues, the PCT approached Merseytravel and the Highways Management Department of Liverpool City Council to undertake a study on accessibility planning using GIS. This study was conducted to identify a range of sites that would offer good accessibility based on the range of existing density and geographic spread of facilities. The Primary Care Trust Estates Department of the PCT also undertook a four-facet review of all the primary and community health care buildings in Liverpool investigating physical condition, functional suitability, space utilisation and ability to meet statutory requirements. They also developed a primary care infrastructure model based on space allocation data used by DistrictValuers. This was used to establish the relationships between practice list sizes and the recommended building space allocations and also allowed the exploration and flexibility of a range of services, opening hours and populations served. It also enabled schedules of accommodation to be linked to patient activity and running costs which was further used in the financial modeling. This infrastructure model can also enable to test if a facility is flexible as future services develop. While developing its proposals for reconfiguration of services the PCT also took into account its workforce and information management and technology (IM&T) issues. Thus, Liverpool PCT has used a range of innovative techniques in stakeholder engagement, market research, accessibility planning and capacity planning, to produce a robust and rational way forward for its reconfiguration plans.

**Salford Primary Care Trust**

Since 2005 and up to 2009, Salford PCT had conducted 59 consultations. These range from being very specific consultations for certain conditions such as unscheduled care, cardiac rehabilitation, diabetes equality scheme to generic ones involving policy and commissioning such as primary care commissioning strategy, involvement of better care higher standards, involvement of refugee health. They have also conducted consultations around big public health issues such as ‘big drink debate’, ‘the big listening’, ‘public health-big listening- smoking cessation’ and public health lifestyle consultation. One of the main reasons for selecting this PCT is the sheer number of consultations conducted. Although the PCT provides the feedback analysis for all the consultations, it does not depict how this has been implemented within the PCT plans.

**Trafford Primary Care Trust**

Trafford Healthcare Trust undertook a public consultation on inpatient beds at the Altricham General Hospital. The responses to this consultation were evaluated by an independent analyst,
Market Intelligence Unit and the School of Nursing at the University of Salford. This case has been selected due to the uniqueness of mapping the consultation process against the criteria put forth by the Cabinet Office Guidelines. The data were collected using consultation document response form. Quantitative analysis of the data using SSPS software was conducted using descriptive statistics such as frequencies and cross tabulations. Qualitative data from the open questions was reported using access queries, furthermore each response was analysed using thematic coding framework to categorize the comments into themes (Market Intelligence Unit and the School of Nursing University of Salford, 2007). The consultation process was benchmarked against the Cabinet Office Guidelines using subjective grading by each researcher against criterion and sub-criterion based on the evidence provided (communication strategy, consultation document, details of distribution and responses).

LIMITATIONS AND FUTURE RESEARCH

- Data have been collected using document analysis of web-based case studies. It must be noted that although some Primary Care Trusts may have conducted the consultation exercise, they may have not published the documents or results on their respective websites. These cases have not been accounted for in the research database.
- The data collected in relation to the consultation exercise were not uniform. In some cases, the Trusts have been explicit about the pre-consultation and consultation phases, providing detailed information about all the consultations that have been undertaken. In other cases, only references to the consultations were provided through the PCT meeting notes, newsletters etc. Thus, the analysis of the information gathered was subjective.
- All Trusts have undertaken consultation in line with Section 242 of the NHS Act 2007 (Department of Health, 2006a, Department of Health, 2007a); but this legislative act has been subject to varied interpretations by each Trust.

Described here are broad future research questions that have been highlighted as worthy of further investigation. The next phase of this research will involve contacting the community engagement officer for each Primary Care Trusts and validating the data collected against the type and number of consultations. The research questions that are proposed for this enquiry are:

- What are all the stakeholder involvement approaches and methods that have been used by PCTs?
- How can stakeholder consultation processes be further defined and aligned with decision making processes?
- What are the detailed measures and analysis instruments that can be used to measure the success of stakeholder consultation?
- How can stakeholder consultation processes be evaluated and what are the best approaches and methods in practice?
- How can modelling, simulation and visualisation tools be used for the purpose of stakeholder consultation to better provide information and enable stakeholder judgements?
- How can a new consultation approach, process and method be developed and used to involve stakeholders in accessibility and transport infrastructure planning?
CONCLUSION

All Primary Care Trusts have conducted public consultation which appears to be in line with legislation, however, there have been wide and varied interpretations of how this should be done. There is a lack of a clear definition and guidance to determine when care, estates or transport structural change consultation should be conducted and also a definitive approach should be introduced to determine at what point of the infrastructure planning process should these be carried out. Policies such as The Darzi Review, World Class Commissioning and other improvement initiatives such as ‘Care Closer to home’, ‘Equitable access to Primary Care’, ‘Sustainable Community Strategy’ etc are driving consultation practice improvements, however, further tools and guidance is also needed. There is little empirical evidence that supports or refutes the hypothesis that consultation and public involvement can contribute to the quality of healthcare planning and delivery. Studies making an evaluation of the involvement of stakeholders in the definition and assessment of value, suggest that the public are uncomfortable making resource allocation choices, however, others state that this is not the case when stakeholders are given sufficient time and adequate support and information. They also show that stakeholders are more comfortable making evaluations of broad benefits and priorities at a general level than making specific decisions that may require technical expertise and experience.

Very few Trusts are using the most advanced approaches to priority setting. Instead they are selecting to use measurement methods that may bias outcomes or samples that may be inadequate. Few Trusts appear to use modelling, simulation or visualisation tools (e.g. GIS) the stakeholder consultation practice would benefit from the utilisation of these tools and will also help to improve stakeholder judgement making. There is a lack of understanding within Trusts on how stakeholder involvement should integrate with the business planning process, further detailed guidance is required to ensure that consultation is integrated into the decision making process and that the public are provided with enough information to make effective judgments.
REFERENCES:


Department of Health (2006a) National Health Service Act 2006, OPSI.

Department of Health (2006b) Our Health, Our Care, Our Say: White Paper.


Liverpool Primary Care Trust (2007) Developing a new health service for Liverpool: an outside of hospital strategy, Liverpool Primary Care Trust’s Design Studio.


Market Intelligence Unit and the School of Nursing University of Salford (2007) Analysis and Evaluation of the responses to the Public Consultation on In-patient Beds at Altrincham General Hospital, Salford, University of Salford, A Greater Manchester University.


The Murray Consultancy (2007) Liverpool Primary Care Trust Big Health Debate Phase 3, Liverpool Primary Care Trust.


PROGRAMME DESIGN AND CONTINUITY OF HEALTHCARE REFORM: THE CASE OF GREEK MENTAL CARE

K. S. Hatzaras

ABSTRACT

This paper examines Greek mental care reform through a stakeholder engagement perspective. Programme “B”, “Psychargos A” and “Psychargos B” aimed at the delivery of a modernized network of acute care, primary care and community-based rehabilitation services for chronically ill patients. The recent reform programme, “Psychargos B”, has been implemented as per the EU requirements of monitoring, management, stakeholder partnership, national and EU funding additionality.

We test for the hypothesis that intermittent stakeholder engagement and expertise input in the design and implementation of mental care reform programmes induces deficiencies in their design and implementation.

The paper draws on qualitative content analysis of academic papers, policy documents, studies and press reports published in the period 1995-2010, and a series of semi-structured interviews with executives of the European Social Fund Monitoring Agency supervised by the Greek Ministry of Labour.

Our research reveals that intermittency in stakeholder engagement and expertise contribution in the case of Greek mental care reform has induced delays in fund absorption and programme implementation, and an emphasis on patient de-institutionalization in the policy approach and design of the financing plan of the latest reform programme. Other deficiencies induced centre on patient inclusion relevant to their degree of psychopathology and the selection of geographical locations for new services.

Our findings suggest that intermittent stakeholder engagement and expertise input, particularly in a pluralist politics and policy-making context as per the case of Greece, translate to weaknesses in healthcare reform design and, consequently, in implementation. They cast doubt on the assertion that finance systems supporting reform do not affect sustainability and continuity of care.

KEYWORDS

mental care, stakeholders, financing, reform, Greece

INTRODUCTION

This work examines the reform programmes of Greek mental care over the period 1984-2009. This examination proceeds through a review of programme documentation, academic papers and

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policy studies, reports of the Greek and British press, and interview transcripts with Greek ministerial staff.

To date, studies of Greek mental health reform offer reviews of specific reform programmes undertaken in Greece from the 1980s onwards. Many of these adopt a piecemeal focus on individual aspects, often based on single mode empirical research. The objective of this work is to identify, appraise and synthesise this literature, draw on further qualitative material from interviews, policy documents and press reports, and reveal the salient programme design issues of Greek mental care reform.

Our research suggests that issues with programme design and continuity of mental care reform in Greece appear to emerge in successive reform attempts. In particular, we find that stakeholder engagement has been recurrently intermittent, leading to specific deficiencies in the implementation of each programme. The paper concludes with a review of the main contributions and limitations of this work, consideration of appropriate theoretical lenses and further research towards developing a formal structure for reviewing stakeholder engagement in mental care and healthcare reform more generally.

RESEARCH DESIGN

The paper advances the hypothesis that intermittent stakeholder engagement and expertise input during the design phase and implementation of healthcare reform programmes induces deficiencies in their delivery and puts reform at risk. Stakeholders are defined as those individuals, groups and organizations that have (i) an interest in the actions of an organization, (ii) expertise in different aspects of the organization’s business and (iii) the ability to exert influence (see Blair & Fottler, 1990; Savage et al., 1991; Moss, 2002:4-5). This definition facilitates the conceptualization of the Greek mental care system as an ‘organization’ and its reform as an instance of ‘organisational action’. In the context of Greek mental care, stakeholders comprise the Greek government, the EU and (to a lesser extent) the WHO, mental care frontline and management staff, foreign experts, patients and their families, citizen, human rights and patient groups, and residents of communities where reform is taking place. Stakeholder engagement is defined as participation and expertise contribution by stakeholders during reform programme design and implementation with a view to positively influence reform. Conversely, intermittent engagement is defined as inactivity of and absence of expertise input by one or more stakeholders.

This hypothesis is tested against evidence elicited in four qualitative research tasks:

- a systematic review of programme documentation;
- a systematic review of academic papers and policy studies;
- a systematic review of British and Greek newspaper reports published electronically;
- transcription and content analysis of semi-structured interviews with staff of the European Social Fund Coordination and Monitoring Authority (ESFCMA) of Greece.

A systematic search of programme documentation relevant to Greek mental care reform has been conducted using the keywords of “mental reform Greece”, “Ψυχαργώς [“Psychargos” programme]” in Greek government ministry, official EU and European studies’ portals. Six documents of direct relevance to Greek mental care reform were identified. Secondly, a systematic search of papers and policy studies has been performed using the keywords of “mental
reform Greece” in Google Scholar, business, humanities, life sciences and medicine electronic journal databases accessible through the MetaLib information portal offered by Imperial College Library. A total of thirty eight items of direct relevance to Greek mental care reform were identified; these exclude items discussing Greek mental care in comparison to other national reform initiatives. Twenty four of these have been fully accessible and studied for the purposes of this paper; bibliography includes citations only.

Thirdly, a systematic search of press reports available on the internet has been conducted in WWW portals of the Guardian (www.guardian.co.uk), Kathimerini (www.ekathimerini.gr), and Eleftherotypia (www.enet.gr). Using the key words “Greek mental care reform”, “mental health reform in Greece”, and “Ψυχαργώς [“Psychargos” programme]”, fifty seven press reports were elicited. Lastly, interviews with ESFCMA, an authority supervised by the Greek Ministry of Labour and Social Solidarity, were conducted as part of the ex post evaluation of the European Social Fund for the period 2000-2006. The author has been part of the research group for this evaluation; views expressed herein are solely those of the author.

The above material was reviewed and analyzed through the qualitative content analysis method outlined in (Flick, 2002:190-192). The following steps were undertaken:

- identification of the relevant material to answering the research question;
- analysis of the data collection situation;
- composition of the research question;
- definition of the analytical technique;
- definition of analytic units;
- conduct of the analysis;
- interpretation of results.

The following research questions were formulated towards the objectives of this work:

- What are the types of services, stakeholders involved, and geographic distribution of the Greek mental care system prior to reform?
- What are the objectives of reform programmes in terms of changes to services offered, their spatial distribution, stakeholders involved?
- What is the nature and regularity of stakeholder engagement during the design and implementation of reform programmes?
- What deficiencies does intermittency in stakeholder engagement induce in the design and implementation of programmes?

The analytical technique used has been the one of summarizing content analysis, using key words in data as analytic units (Flick, 2002:191). Social constructivism has been used as the method of examining stakeholder action on the basis of their ‘embeddedness’ in the context of their organization, national political economy and EU policy-making (see Granovetter, 1985). Lastly, our research suggests that the entire reform period of 1995-2009 may be partitioned between 1996-2001 and 2002-2009. The main findings elicited are as follows.
GREEK MENTAL CARE REFORM DURING 1984-1995

Historically, mental care in Greece has been provided in large psychiatric hospital institutions. In the 1950s there were five public and a small number of private hospitals in operation. Severe overcrowding after WWII and the Greek civil war of 1945-1949 prompted an increase in patient intake in these and the establishment of four further public hospitals, among which a hospital on the remote Aegean island of Leros, situated approx. 350km east of the capital Athens and 25km west of the Turkish coast (Karastergiou et al., 2005:198). This model of institutional care endured well into the 1980s. Patients were treated in nine overcrowded mental care hospitals, one special institution for children, and a number of private hospitals (Madianos, 1999:462). The spatial distribution of these was uneven; patients from a number of regions had to relocate and receive care at considerable distance away from their family and community (CEC, 1995; Seyfried & Ziomas, 2006:6). Other salient features were the lack of any alternative services to patients, and a serious shortage of qualified staff.

Greece joined the EU in January 1981; a year later, a newly elected government submitted a memorandum to the European Commission (EC) requesting financial support to address suggested imbalances arising from EU membership (Papageorgiou & Verney, 1992). In the course of examining this memorandum, the EC engaged a team of experts who reported the urgent need to reform mental care in Greece, citing a number of serious shortcomings in patient care, treatment methods and lack of rehabilitation services in psychiatric hospitals, in particular those of Leros and “Dafni” in Attica. The Greek government confirmed their undertaking of a review of mental care as part of the establishment of the Greek National Health System in 1983. A mental care reform programme was designed based on expertise drawn from the EC review and assistance from the World Health Organization (WHO), in accordance with the WHO “Health for All” policy (Seyfried & Ziomas, 2006; CEC, 1995).

The objectives of ‘Programme “B’” as it was named were to improve care conditions in existing hospitals and to launch new services aimed at illness prevention, social and vocational integration of the mentally ill and handicapped. Specifically, it aimed at:

- the replacement of institutional care by a network of spatially distributed, flexible prevention and treatment mental health services in communities and general hospitals;
- the de-institutionalization and reduction of long-stay patients in psychiatric hospitals via the deployment of community-based vocational and social rehabilitation services;
- the upgrade of care and living conditions of patients in psychiatric hospitals;

The programme’s financing plan included national and EU matched funding at 55% (ECU 60mio), termed as “exceptional financial support…for the reform of the psychiatric care system in the whole of Greece”, and for strengthening the vocational training infrastructure in the Greater Athens area, granted through Council Regulation No 815/84 (CEC, 1995:4, 7-8). Programme “B” was to be implemented during 1984-1989. Clear actions planned for the entire period and specific, annual requests for assistance were the basis for providing matched funding. However, the aim of modernizing and diversifying mental care implied that the qualitative aspects of EC assistance, i.e. monitoring and evaluation, planning and expertise were considered equally important to financial support; “expenditure arising on infrastructure had to be subordinate to this objective rather than an end in itself” (CEC, 1995:8-9).
The Greek government and mental care professionals faced a considerable challenge in implementing Programme “B”. There was a lack of domestic primary mental care expertise, while difficulties arose in the selection of locations where to build new facilities. During 1984-1988 the EC organized several actions to facilitate transfer of international expertise, e.g. staff training and links with rehabilitation centres across Europe, exchanges of Greek mental care professionals with experts from other Member States, and demonstrations of new care modes carried out by international teams in Greek hospitals. However, considerable delays were still caused by the inflexibility of the domestic administrative framework governing the construction of public care facilities (CEC, 1995:22).

The Greek government did not play a part in addressing these limitations. Moreover, small numbers of staff were seizing opportunities for training, while attempts to positively engage local government in the reform process in regions were unsuccessful (Blue, 1993: 314; Madianos, 1999:466). In 1988 the government submitted a revised programme and requested a three-year extension to 1991. The EU Council approved this extension with Regulation 4130/88 and requested the launch of a monitoring and evaluation system for the programme. However, in 1989 the EC conducted spot checks and discovered that (i) several projects had not started, (ii) the spatial distribution of new facilities was very uneven, and (iii) conditions in hospitals remained unbearable. The Leros hospital received international media attention and the case was discussed in the European Parliament (CEC, 1991:24; 1995; Grove, 2010). The EC responded by requesting “concrete and realistic measures”, a new implementation schedule towards the programme’s success, commitment to improve conditions on Leros, and cancelled seventy six uninitiated projects. It then introduced three expert groups to review the programme with the Greek government, and approved a special action on Leros presented by the government (CEC, 1995:23; Grove, 2010).

This EC’s intervention in 1989 marks the beginning of a time of active, repeated engagement of stakeholders in the programme’s final phase (1991-1995). In early 1991 the Greek government presented a set of actions for the next three years, and a revised programme for the entire period of 1991-2000. These were based on contributions by international experts in preventive care, early intervention and primary care, new legislation to facilitate implementation, emphasis on a balanced geographic distribution of services and improving conditions of care. In 1991, monitoring started being conducted by a technical assistance unit and an international expert evaluation team. In Leros, the operation of new cooperatives and hostels on the island and locations on mainland Greece provided a concrete patient de-institutionalization pathway. These results induced the EC to reactivate and extend financial support, and collaborate with Greek authorities to strengthen ongoing work on Leros, monitoring and evaluation. In 1992 the Greek government introduced new legislation, and by 1995 concerted efforts among the EC, the Greek government, hospital management and experts produced a “remarkable transformation” of Leros hospital, and a nascent network of alternative mental care services spanning the whole of Greece (CEC, 1995:24-27, 33).

At the start of Programme “B”, intermittent stakeholder engagement is chiefly manifested in the Greek government not addressing issues with location selection and facilities build-out, as well as in the majority of Greek mental care staff not following training opportunities. These, in tandem with the absence of programme monitoring, induced cumulative implementation delays, led to severe funding decommitments and put reform at risk. After the steps taken by the EC in 1989, a coordinated effort among the Greek government, the EC, domestic care professionals and
international experts ensued and served to accelerate implementation. Table 1 shows the impact of this pattern of stakeholder engagement in financing; absorption of EU matched funding slows down during 1987-1990, and steps up after 1991. A consequent impact is observed in the completion of approved projects over the period (CEC, 1995:25).

Table 1. Programme “B” EC matched funding 1984-1995

<table>
<thead>
<tr>
<th>Year</th>
<th>Planned Matched Funding 1983 (ECU million)</th>
<th>Commitments (ECU million)</th>
<th>Decommitments (ECU million)</th>
<th>Payments (ECU million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1984</td>
<td>10.0</td>
<td>6.33</td>
<td>0</td>
<td>2.00</td>
</tr>
<tr>
<td>1985</td>
<td>14.0</td>
<td>13.0</td>
<td>1.49</td>
<td>3.16</td>
</tr>
<tr>
<td>1986</td>
<td>16.0</td>
<td>12.7</td>
<td>0</td>
<td>3.69</td>
</tr>
<tr>
<td>1987</td>
<td>25.0</td>
<td>5.95</td>
<td>0</td>
<td>1.43</td>
</tr>
<tr>
<td>1988</td>
<td>5.00</td>
<td>12.4</td>
<td>0.415</td>
<td>2.72</td>
</tr>
<tr>
<td>1989</td>
<td>0</td>
<td>0</td>
<td>0.277</td>
<td>0.961</td>
</tr>
<tr>
<td>1990</td>
<td>0</td>
<td>5.57</td>
<td>20.8</td>
<td>2.18</td>
</tr>
<tr>
<td>1991</td>
<td>0</td>
<td>23.03</td>
<td>0.585</td>
<td>7.31</td>
</tr>
<tr>
<td>1992</td>
<td>0</td>
<td>0</td>
<td>10.37</td>
<td></td>
</tr>
<tr>
<td>1993</td>
<td>0</td>
<td>0</td>
<td>2.79</td>
<td></td>
</tr>
<tr>
<td>1994</td>
<td>0</td>
<td>0</td>
<td>0.145 (1991-1995)</td>
<td>7.34</td>
</tr>
<tr>
<td>1995</td>
<td>0</td>
<td>0</td>
<td>4.77</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>60.0</td>
<td>55.4</td>
<td>6.57</td>
<td>48.7</td>
</tr>
</tbody>
</table>

GREEK MENTAL CARE REFORM DURING 1995-2009

The impact of Programme “B” is identified in the launch of extramural, psychosocial and vocational rehabilitation structures in all Greek regions, de-institutionalization and reduction of long stay psychiatric hospital patients (CEC, 1995; Madianos et al, 1999). A fall of hospital beds from 8,516 in 1984 to 5,241 in 1995 is thought to have ensued through the creation of 2,334 psychosocial rehabilitation places by 1995, but also due to patients’ natural morbidity. On this basis, Programme “B” was considered to have concluded successfully, and the Greek government was expected to ensure continuity of reform by applying for support through the EU’s Structural Funds. Moreover, the EC emphasized specific requirements that needed be addressed in order to ensure continuity of reform, reflecting the need for and importance of active stakeholder engagement and expertise input. Concerted actions similar to those on Leros had to be pursued in other hospitals. A key requirement was to grow the engagement of highly motivated, qualified care staff and develop opportunities for their training (see Blue, 1993). Lastly, the aspects of balanced spatial planning and an improved administrative and legal framework to facilitate the operation of new care structures, along with strengthening of monitoring, also needed to be looked after (CEC, 1995:24-27, 33-35).

The Greek government submitted a new national action plan at the end of Programme “B” to ensure continuity of reform through the 2nd Community Support Framework for Greece, co-financed by the EU’s cohesion policy (MHSS, 2007a; CEC, 1994). The government provided support to new care structures in the years prior to 2000 principally through “Psychargos A”, an action part of the “Health-Welfare” programme of 1994-1999, and the Community Initiative EQUAL. These are found to have enhanced the expertise of frontline mental care professionals and organizations, and prepared the ground for a larger scale de-institutionalization and
development of alternative services (MHSS, 2007a). In addition, the government regularly invited the contribution of international experts during this time (Grove, 2010; Kathimerini, 2001). However, the legal and administrative improvements highlighted by the EC were only introduced in 1999 with Law 2716/99.

In 1999, the EC put in place a new management and delivery structure for EU programmes co-financed through cohesion policy. Stakeholder consultation was formalised, in that key stakeholders e.g. Greek national and regional government, the EC, patient groups and professional organizations came to participate and contribute to the design of programmes, and became members of Monitoring Committees (MC) that reviewed implementation progress of programmes biannually. A new government agency, the Managing Authority (MA) was now responsible for managing implementation and report periodically to the MC and the EC. Additional, rigorous monitoring and evaluation requirements meant that nearly all stakeholders, including implementation and frontline service providers, were contributing to and learning from monitoring and evaluation (CEC, 1999).

This state of affairs and the greater availability of EU funding implied that mental care reform could be pursued more actively in Greece’s 3rd Community Support Framework (CSF III) of 2002-2008. The qualitative aims of the CSF III “Psychargos B” programme were similar to those of Programme “B”, namely patient de-institutionalization, social inclusion and integration in the labour market, illness prevention and staff training. The importance of a spatial distribution of services based on population density, and that of monitoring, were again emphasized (MHSS, 2007a). “Psychargos B” entailed four measures on:

- patient de-institutionalization and transfer to community-based rehabilitation centres;
- expansion and diversification of mental care services at community level, care conditions upgrades in psychiatric hospitals, development of an integrated service network of primary and acute care services;
- promotion of illness prevention, social solidarity and labour market inclusion;
- staff training to support patient de-institutionalization and socio-economic integration.

The scale of reform was greater than ever before, as the programme aimed to double the number of de-institutionalization structures and their total capacity, transfer 3,000 patients and reduce psychiatric hospital beds by 50%. New and improved care infrastructure of 16,000m², 200 new beds in general hospitals, 132 primary care centres, hostels and cooperatives, 3,259 full-time employment and 1,000 apprenticeship posts were to be delivered as part of the programme, complemented with 72,000 man-hours of training for 3,000 care professionals (MHSS, 2007b). The finance plan of “Psychargos B” featured a total of €216.2mio, supported by the EU at 80% co-financing rate. Funding was earmarked for the entire period of 2000-2006; annual amounts had to be absorbed within two years. The Greek government committed to “supporting a dynamic process of rehabilitation so that the greatest number of de-institutionalized persons avail of services and are mainstreamed in the labour market”, fully implementing Law 2716/99, utilising all structures set up in foregoing programmes, retaining extant personnel while introducing staff performance appraisals, ensuring the uninterrupted operation of all new services and respect of patient rights (MHSS, 2007a).

2 This measure included continuity of the special action on Leros and launch of one in “Dafni”. The upgrade of care conditions in “Dafni” was previously included in Programme “B” and the 1996-1999 national action plan.
The financing plan of “Psychargos B” reveals an emphasis on achieving early progress with patient de-institutionalisation, while new alternative services have yet to be developed. The table below, based on the “Psychargos B” programming complement, outlines funding planned for each of the programme measures for the period 2001-2006 (MHSS, 2007b). It shows that total funding earmarked for de-institutionalization is greater than that of other objectives, and is evenly distributed over the period compared to that of measures 2, 3 and 4. Annual funding for other measures suggests that support for new extramural, primary care and rehabilitation services, socio-economic integration and training would peak at the end of the programme. This emphasis on “creating a dynamic process of rehabilitation” and achieving early progress with de-institutionalization contrasts with the EC and the Greek government’s awareness of the insufficiency of extant primary care and rehabilitation services at the start of the period (MHSS, 2007a; MHSS, 2007b). Further, earlier delays in location selection and new service launch do not seem to bode well with a disproportionate (80%) reliance on EU assistance required to be expended within two years. Thirdly, a lack of other funding modes is apparent, such as private or voluntary finance (see e.g. Turning Point, 2004:13). Overall, these aspects raise questions over the extent and nature of stakeholder engagement and expertise input during consultation in the programme design phase.

Table 2. “Psychargos B” financing plan 2001-2006

<table>
<thead>
<tr>
<th>Measures</th>
<th>Year</th>
<th>EU funding (€ million)</th>
<th>National funding (€ million)</th>
<th>Other funding (€ million)</th>
<th>Total funding (€ million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Patient De-institutionalization</td>
<td>2001</td>
<td>9.75</td>
<td>3.25</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>14.4</td>
<td>4.80</td>
<td>0</td>
<td>19.2</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>18.5</td>
<td>6.17</td>
<td>0</td>
<td>24.7</td>
</tr>
<tr>
<td></td>
<td>2004</td>
<td>15.6</td>
<td>5.19</td>
<td>0</td>
<td>20.8</td>
</tr>
<tr>
<td></td>
<td>2005</td>
<td>22.3</td>
<td>0.726</td>
<td>0</td>
<td>23.0</td>
</tr>
<tr>
<td></td>
<td>2006</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2 – Expansion of Services</td>
<td>2001</td>
<td>3.00</td>
<td>1.00</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>4.60</td>
<td>1.53</td>
<td>0</td>
<td>6.13</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>0.600</td>
<td>0.200</td>
<td>0</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>2004</td>
<td>0.600</td>
<td>0.200</td>
<td>0</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>2005</td>
<td>0.600</td>
<td>0.200</td>
<td>0</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>2006</td>
<td>9.60</td>
<td>1.62</td>
<td>0</td>
<td>11.2</td>
</tr>
<tr>
<td>3 – Prevention, Socio-economic Integration,</td>
<td>2001</td>
<td>1.01</td>
<td>0.337</td>
<td>0</td>
<td>1.35</td>
</tr>
<tr>
<td>Solidarity</td>
<td>2002</td>
<td>1.68</td>
<td>0.559</td>
<td>0</td>
<td>2.24</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>1.99</td>
<td>0.663</td>
<td>0</td>
<td>2.65</td>
</tr>
<tr>
<td></td>
<td>2004</td>
<td>2.77</td>
<td>0.922</td>
<td>0</td>
<td>3.69</td>
</tr>
<tr>
<td></td>
<td>2005</td>
<td>5.47</td>
<td>8.54</td>
<td>0</td>
<td>14.01</td>
</tr>
<tr>
<td></td>
<td>2006</td>
<td>39.6</td>
<td>2.10</td>
<td>0</td>
<td>41.7</td>
</tr>
<tr>
<td>4 – Personnel Training</td>
<td>2001</td>
<td>0.841</td>
<td>0.280</td>
<td>0</td>
<td>1.12</td>
</tr>
<tr>
<td></td>
<td>2002</td>
<td>1.40</td>
<td>0.466</td>
<td>0</td>
<td>1.87</td>
</tr>
<tr>
<td></td>
<td>2003</td>
<td>1.66</td>
<td>0.552</td>
<td>0</td>
<td>2.21</td>
</tr>
<tr>
<td></td>
<td>2004</td>
<td>3.81</td>
<td>1.27</td>
<td>0</td>
<td>5.08</td>
</tr>
<tr>
<td></td>
<td>2005</td>
<td>2.48</td>
<td>0.825</td>
<td>0</td>
<td>3.30</td>
</tr>
<tr>
<td></td>
<td>2006</td>
<td>10.7</td>
<td>1.84</td>
<td>0</td>
<td>12.5</td>
</tr>
</tbody>
</table>
Patient de-institutionalization ensued in the first few years as a number of new psychosocial rehabilitation and residential centres were established in the form of cooperatives, hostels and sheltered apartments, staffed with newly qualified care staff receiving training (Karastergiou et al, 199-201; Belalli & Kalafati, 2006:38). This led to four psychiatric hospitals scheduled for closure in 2006. The government instituted a new mental care staff appointment procedure and prepared legislation on specific accounting rules concerning the operation of new mental care structures. However, after 2005 the government did not develop the legal framework further by e.g. instituting care quality assessment. Also, there was a growing apprehension of care professionals that EU co-financing was coming to an end, and that new services were to be mainly supported by national funding. Care structures management and senior domestic mental care experts repeatedly expressed concerns of risks of interruption of operations, of a precarious financial situation resulting in lower levels of quality of care for patients, creating risks to their care and the prospect of return to psychiatric hospitals.

As patient de-institutionalization progressed, concerns were also expressed by patient families about inconsistent quality of care offered in new psychosocial rehabilitation centres. The lack of periodic care quality assessment and control was highlighted by the press, along with delays in establishing new services for children and adolescents. In at least one case, that of the Penteli Child Mental Hospital closure, press reports suggest that three fatal cases of patients leaving that hospital may be attributed to low quality of care and the lack of extramural or general hospital care capacity for children. Moreover, a number of press reports highlighted negative reaction to the opening of hostels and cooperatives by local residents. Policy documents reviewed do not specify types of action that would seek to positively consult with and engage local stakeholders such as local government, resident associations, or the Church of Greece and its charitable organisations, in selecting geographical locations in which new services could be launched (Karastergiou et al, 2005: 200).

On the ground, the programme was receiving a mixed response by Greek care professionals. Differences in attitude centre on the manner and procedures of patient de-institutionalization. Stylianidis et al (2008) report much debate among frontline care staff, including discord between psychiatric hospital staff and care professionals preparing patients for transfer, on the application of patient criteria such as place of birth, psychopathology, self-care level and physical capability. Hospital staff seemed to have favoured de-institutionalization that would warrant adequate levels of patient care. Most frontline rehabilitation and residential care staff were newly appointed and showed commitment to the reform by continuing to provide care whilst reportedly unpaid for many months during 2005-2008. Senior Greek care professionals seemed not united in favouring de-institutionalization, as some appeared to favour a return to the asylum mental care paradigm (see e.g. MHSS, 2007b; Bouloudza, 2009). Overall, the uneven progress of the programme, patient safety incidents and delays in developing a fully-fledged legal framework to facilitate reform based on Law 2071/92 and 2716/99 may have served to swing attitudes of care professionals away from the reform objectives.

By the end of 2008, the expansion of psychosocial rehabilitation and residential care had progressed. Conversely, the expansion of extramural services of primary care centres, general hospital and child mental care units seemed to lag behind, with the exception of services launched in the Attica mental and Chania general hospitals. Moreover, the government had not established licensing and audit regulations for new care centres on the backdrop of Law 2716/99, while national budget contributions to the programme were becoming irregular. As a result, a number of
negative developments were reported in the press. Psychiatric hospitals were in debt and facing staff shortages. New cooperatives and hostels were underfunded, losing staff and continued to operate unregulated. In some cases, frontline staff had not been paid for months and therapeutic work was reduced or terminated due to mounting debts.

Two key stakeholders, the EC and subsequently the Greek government, moved to address these difficulties. The EC suspended financial support until stability of national funding contributions was restored. In April 2009 emergency finance was secured by the government and a memorandum of collaboration was then signed with the EC. This required the Greek government to meet staff shortages, conduct the evaluation of “Psychargos B” and introduce service level agreements between service operators and the Health ministry. It further provisioned the establishment of a quality management, control and monitoring system specific to the operation of mental care services. These interventions have been welcomed by care professionals and resulted to more favourable recent press coverage for the programme. However, the issues highlighted previously, service termination and staff losses in particular, imply that the large-scale planned upgrade of infrastructure, diversification, balanced expansion and integration of mental care services seems to have been rather unsuccessful.

Greek government executives of ESFCMA find “Psychargos B” to have been a successful reform programme due to its coherence with EU policies, notably the Lisbon and European Employment Strategy, as well as due to the positive perception of the programme by citizens. Stakeholder engagement, a requirement of cohesion policy, is thought to have been realised in the form of a stakeholder consultation during the programme design phase and subsequent participation in the MC. The aegis of the ESF and its long-standing focus on people and individual potential are found to have had a critical role in the programme. Difficulties relevant to programmes co-financed by the EU are found to emanate from the domestic delivery framework; clarity and simplification are required to facilitate multi-stakeholder programme collaborations. In turn, the need to improve capacity and skills for delivery across all levels of government has been acknowledged, leading to the launch of a new programme on improving public administration efficiency for the period of 2007-2013.

CONCLUSIONS

In drawing conclusions, the limitations to this research need be acknowledged. Our systematic search yielded thirteen academic papers relevant to the particular sections of the period 1984-2009, which could not be accessed for review. Also, a formal evaluation of “Psychargos B” has been commissioned in February 2010, and relevant publications are expected in late 2011. Moreover, a further round of qualitative research involving key stakeholders, such as the EC, members of the “Psychargos B” MC and MA personnel, patient representatives, local organizations and evaluation experts would be required for a more refined view of stakeholder engagement, particularly in the programme design phase, and of the manner in which expertise has been channelled into the latest reform programme. In this regard, our findings may only be understood as preliminary.

This examination of successive reform programmes undertaken in the policy-making context of Greece and the EU lends evidence to our original and inverse hypotheses. Intermittent engagement is identified on the part of key stakeholders in various instances over the period. In the first phase of Programme “B”, the Greek government’s inattention to improving the
administrative and legal framework, effecting a spatially unbalanced expansion of new care structures and the sporadic take-up of training by inland care professionals led to lower funding absorption, a slower rate of approved project completion, and an uneven nationwide distribution of new services. In the case of “Psychargos B”, the programme’s financing plan did not reflect the experience of previous programmes or expertise in care financing and induced early progress with patient de-institutionalization while a fully-fledged network of primary care and community-based services had yet to be established. The inadequacy of this network, the undeveloped legal framework and financial uncertainty after 2005 resulted to new structures being underfunded, created patient safety risks, and led care professionals to disengage from and reconsider the reform’s objectives (see Christodoulou, 2009). By contrast, active stakeholder engagement and expertise contributions during the years 1991-1999 brought about the successful completion of Programme “B”, programmes of the period 1996-2000, and ensured continuity of mental care reform as part of the 2nd Greek CSF.

Further, our results cast doubt on the assertion that finance systems supporting reform do not affect continuity of care (see e.g. Brandon, 2009:298). Rather, the choice, combination and timing of use of financing instruments seem to matter for success of healthcare reform; an ex ante ethical examination of the impact of different possible funding schemes transpires as a key requirement (Morrison, 2009: 398). Beyond financing however, discord among care professionals in this case suggests a need for a detailed ex ante needs assessment of personnel training, and strengthening training on ethical standards and practice guidelines on managing vulnerable patients where appropriate (Koukia et al, 2009). This is especially relevant to a national context where the rights of mental patients had historically been subordinate to perceived community and societal rights (see Karastergiou et al, 2005:202; Ploumbidis et al, 2001:69; Blue, 1993:308).

These results prompt the quest for a suitable theoretical lens to develop a formal structure for review of stakeholder engagement in healthcare reform. Throughout the period, the EC intervened in specific points in the implementation timeline, such as the start and end of programmes, as well as when implementation seemed to falter. This reflects the notion of “management by exception” in public sector projects, where the project board monitors progress via reports, provides expertise in case of exceptional events, and exercises control at a number of decision points during implementation (OGC, 2005:14). The literature on healthcare project management might hence provide an appropriate conceptual basis for further analysis. A further requirement is the inclusion of an alternative country case study or a scenario-based, ideal approach to mental health reform.

National government engagement in reform may also reflect interests of stakeholders such as care professionals, patients, local government, and other domestic actors at any point during a programme. The literature on Greek mental care reform and Greek politics and policy more generally point to a pluralist nature of Greek politics and policy, and the existence of a weak or nascent civil society in Greece (Karastergiou et al 2005:200; Mitsos & Mossialos, 2000). This may explain the relative lack of engagement of local organizations in Greek mental care reform during 1984-1989 and the partial disengagement of care professionals after 2005. Hence, a fruitful avenue for further research would be to interweave contributions on stakeholder management in healthcare reform with those on institutions and policy-making, examining the role of elites as stakeholders and their engagement in programme design and implementation. This may lead to a greater understanding of healthcare reform success and failure, help develop appropriate strategies towards regular and direct stakeholder engagement, and thus mitigate deficiencies in reform programme design and continuity.
REFERENCES


UNRAVELLING THE CHALLENGES OF MAINSTREAMING REMOTE CARE: AN ORGANISATIONAL ANALYSIS OF THE WHOLE SYSTEM DEMONSTRATOR (WSD)

T.Chrysanthaki¹, J. Hendy² and J. Barlow³

ABSTRACT

There is a steady increase in the incidence and prevalence of long term conditions such as diabetes and chronic obstructive pulmonary disease (COPD) and the frail older ‘old’. In a response to these challenges, the Department of Health (DH) has launched the Whole System Demonstrator Programme (WSD). This is one of the largest Randomised Control Trials (RCT) ever taken. It explores the role of the advanced assistive technologies which deliver remote care in three pilot sites (Cornwall, Kent & Newham). A main objective of the programme is to demonstrate that these new technologies allow 1) patients to manage better their condition and improve their quality of life 2) give patients empowerment to take a greater and active role in their care and 3) deliver gains in the integration of service delivery and cost effectiveness of care. Imperial College Business School is part of a large consortium of partners in charge of the 2 year evaluation programme. Our aim is to explore the organisational factors that facilitate or inhibit the successful introduction of remote care services in the WSD sites. WSD is an interesting case to study because it is a platform for delivering clinical evidence to support the effectiveness of remote care. WSD represents a unique opportunity to phase in integration of remote care services. Focusing on findings from the early stages of the programme, the present paper aims to identify and discuss pragmatic organisational challenges in the deployment of these technologies.

Semi-structured interviews (N= 45) were carried out with stakeholders (managers & commissioners) in health and social services across the 3 demonstrator sites. Interviews aimed to assess views on and the implications of roll-out.

The results corroborate that implementing remote care services in an RCT and a whole system context is a complex endeavour. Successful implementation requires collaborative thinking, the re-evaluation of organisational approaches in the delivery of care, and personal and organisational flexibility to new opportunities. WSD’s aims and visions were framed within a patient centred discourse which in most instances was perceived by the stakeholders as a mean of dealing with or silencing conflict and of bridging organisational boundaries. Issues of asymmetrical power amongst the organisations and the role of professionals and patients in the design and delivery of remote care were apparent.

WSD represents a unique research opportunity in that it identifies in real time what processes should be in place when rolling out remote care and how they can be organisationally translated. The study will increase our understanding of how sustainable innovations across health & social care can be successfully implemented.

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KEYWORDS

whole system change, remote care delivery, organisational communication, integration
QUANTIFYING THE BENEFITS OF HEALTHCARE INFRASTRUCTURE INVESTMENT

D. Thomson¹, L. Pronk², C. Alalouch³ and A. Kaka⁴

ABSTRACT

UK government seeks the use of Benefits Realisation Management Processes (BRMPs) to direct capital investments that are technically complex and must satisfy a diverse range of stakeholder needs. Although BRMP frameworks are available, methods to inform them with reliable quantifications of stakeholders’ judgements of benefits realisation are currently absent.

The articulation of benefits in current practice is reviewed to establish the context of benefits realisation. Benefit-related healthcare policy is reviewed by desktop survey of government publications and NHSScotland business cases. A conceptual framework for benefits quantification which characterises benefits realisation using stakeholders’ judgements and perceptions of benefit worth is contributed.

Translation of stakeholder judgements of benefit provision magnitude into indications of benefit worth by means of benefit functions is explored and related to BRMP operation. The use of utility functions to translate judgements of magnitude into representations of ‘worth’ is found to be an appropriate premise for benefit quantification.

KEYWORDS

benefits, investment, judgement, stakeholders, utility

INTRODUCTION

The notion of “benefits realisation” is prominent in public sector capital investment policy and guidance. Investment approval requires a defensible prediction that stakeholders will receive sought benefits. Investment performance is evaluated by stakeholders’ views of the extent to which these benefits have been realised.

With the understanding that a ‘benefit’ is a desired change, a broad view of benefits has emerged which embraces their often intangible nature. Investors are increasingly expected to implement a “Benefits Realisation Management Process” (BRMP) which, alongside quantitative measurement of tangible benefits, gathers stakeholder judgements of intangible benefit delivery. A BRMP requires a structured and reliable way of eliciting and documenting stakeholders’ evaluations to characterise investment success. In the healthcare sector, a method of characterising stakeholders’ views must accommodate the evaluation of benefits defined variously, from:

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“The creation of a short stay assessment unit, an approach which has been pioneered widely in UK hospitals, will facilitate children to be assessed, observed and treated and discharged normally within 24 hours.” (NHS Ayrshire & Arran, undated)

to

“Flexibility and adaptability” (Mitchell et al., 2006).

Benefit diversity is partly caused by differences between the needs of the healthcare providers investing in health services and those creating and operating the buildings housing those services. Further diversity arises among innumerable stakeholder subgroups. Stakeholders have unique bodies of knowledge, yet must express their views of performance using a common set of project benefits. A BRMP must accommodate diverse definitions and judgements of benefits gathered across multiple stakeholder groups to evaluate benefits realisation performance throughout project delivery.

This paper proposes a Benefits Quantification Method (BQM) to reliably engage stakeholders in the quantification of healthcare investment benefits when faced with: diversity in the nature of the benefits sought; diversity in the communities of evaluating stakeholders; and the need to evaluate intangible benefits using judgement, opinion and preference. The problem is explored with reference to UK government policy and the projects of NHS Boards in NHSScotland.

THE NATURE OF HEALTHCARE BENEFITS IN POLICY AND PRACTICES

Benefits can be tangible (such as design metrics and budgetary outcomes) or intangible (such as perceptions of attractiveness and feelings of safety). Patients are particularly affected by the intangible aspects of buildings and services. Patients are often weak, stressed, and unable to control their environment, amplifying the impact of intangible benefits on their well-being. Alongside service improvements, healthcare investments are expected to produce buildings that promote a desire to get well (DCMS, 2000; van den Berg, 2005), stimulate emotional responses (Baker and Lamb, 1992), or improve health outcomes (NHS Estates, 2003; Ulrich et al., 2004). Proving the realisation of such intangible benefits is problematic. Despite this, the realisation of both benefit types is increasingly considered indicative of project success.

THE ROLE OF BENEFITS AND BENEFIT REALISATION IN CHARACTERISING PROJECT SUCCESS

Our understanding of project success is evolving. Jugdev and Muller (2005) suggest that “success” has broadened to acknowledge the importance of stakeholders’ views. In construction, stakeholders have been positioned as arbiters of project success by the Commission for Architecture and the Built Environment (Macmillan, 2006), the Design Quality Indicator (Gann et. al., 2003) and VALiD (Austin and Thomson, 2005).

Project success has latterly been related to benefits (Cooke-Davies, 2007). Reiss et al. (2006) suggest that projects perceived as unsuccessful often fail to acknowledge or articulate their role in providing the benefits stakeholders seek. BRMPs address this problem. The Office of Government Commerce (OGC, 2003) recommended BRMP use to guide the “realisation” (i.e. provision to the stakeholders that seek them) of benefits.
Several BRMP models have been developed including OGC (2003), Bradley (2006), Reiss et al. (2006) and Sapountzis et al. (2009). BRMPs define activities in which benefits delivery performance (actual or predicted) is periodically evaluated to gauge project performance and inform decisions. As of writing, however, no means of quantifying benefit provision exists.

BRMPs require a Benefits Quantification Method (BQM) to characterise benefits realisation at any stage in the investment process, from the perspective of the stakeholders to whom those benefits will accrue. A BQM must respond to current understanding of benefits. To this end, articulations of “benefits” were studied in government policy and the practice of recent NHSScotland projects. Required BQM functionality was inferred from these insights and is discussed below.

**BENEFITS IN GOVERNMENT POLICY**

Policy definitions of project success are provided by the HM Treasury “Green Book” which distinguishes “outcomes” from “outputs.” Outcomes are “the eventual benefits to society that proposals are intended to achieve.” Outcomes can “sometimes cannot be directly measured” (HM Treasury, 2003, p. 13), requiring outputs (such as buildings) to indicate their delivery. HM Treasury (ibid.) defines four benefit types: financial quantitative; non-financial quantitative; non-financial qualitative; and outcomes. “Improved standards of healthcare” are cited as an example of outcomes (ibid., p. 44). Guidance thus establishes that investments can realise intangible benefits that are evidenced by outputs such as buildings. The Scottish Capital Investment Manual (SCIM) Business Case Guide (Scottish Government, 2009a, p. 25) associates programmes with outcomes and, specifically, benefits, while associating projects with outputs such as “buildings.” Thus, Scottish Government policy contradicts the Treasury’s association of benefits with projects.

**BENEFITS IN HEALTHCARE INFRASTRUCTURE INVESTMENT POLICY**

Realisation of “benefits” from infrastructure investments is treated variously by the guidance of HM Treasury; the Office of Government Commerce; the Department of Health; and, in Scotland, Scottish Government. Governing mid-value projects, ProCure21 makes little mention of benefits, only requiring a “benefits realisation plan” in Full Business Case (FBC) submissions (Department of Health, 2007). Frameworks Scotland guidance also requires FBCs to include such a plan (Health Facilities Scotland, 2008) but no other consideration of benefits. Negligible healthcare-specific benefit realisation guidance is available to healthcare providers. Instead, the need to realise benefits is inherited by from central government guidance and policy. This may be problematic as generic central government requirements do not always translate into healthcare.

**BENEFITS IN HEALTHCARE PROVIDERS’ INFRASTRUCTURE INVESTMENT PRACTICE**

Desktop survey reviewed the application of benefit-related guidance to healthcare projects. The study reviewed current practice; the role of guidance in shaping it; and practices that require improvement. The survey sought to determine if components of a BRMP are present in current practice and if benefits are quantified appropriately. The study reviewed submissions to each stage of the SCIM gateway process (Fig. 1) to determine how benefits are articulated at all formal stages of investment progression. The nomenclature identifying each case below is presented in the Appendix.
Treatment of Benefits in Initial Agreements

Initial Agreements (IAs) bridge the healthcare provider’s investment programme with the projects that advance programme strategy. The purpose of an IA is “firstly to establish the case for change and the need for investment; and secondly, to provide a suggested way forward for the scheme for the early approval of management” (Scottish Government, 2009b). An IA is typically the healthcare provider’s first formalisation of a project and, as such, those reviewed were found to place notional importance on benefits.

Benefits were observed to be mentioned in passing; related contextually to the programme outcomes of which the project’s outputs will provide evidence. Several NHS Boards exhibited awareness of the need to provide “proposed outcomes” but, by the terminology used, perceived these as related to the investment programme rather than the project that the IA justifies. These observations suggest that current practice does not provide sufficiently well-developed understanding of benefits to guide investment management at this embryonic project stage.

IA.5 and IA.7 included a “benefits realisation plan.” These re-stated benefits along with ‘indicators’ (e.g. “Increase in number of referrals” to indicate the benefit of “To provide a choice of birth centre for women at low risk” (IA.5)), timescales for delivery and responsible individuals. These plans were accordingly interpreted as an attempt to construct the “benefits profiles” required by OGC (undated, a).

Treatment of Benefits in Standard Business Cases

As Standard Business Cases “do not have to be submitted to SGHD for approval but may be requested for information purposes” (SGHD, undated), guidance on their content is lacking. The SBCs studied exhibited moderate awareness of the need to provide benefits, which were described as “proposed outcomes - benefits to patients” (SBC.1) or “proposed outcomes and benefits to clients” (SBC.2), again suggesting conceptual links to their originating programme and sought investment outcomes.

Two extremes of benefits articulation were observed: a verbose form without the specificity required by a BRMP; and a terse form too ambiguous for BRMP application. SBC.1 verbosely described its sought outcomes (e.g. “Dedicated facilities for teenagers will be provided with separate rooms for teenagers, and a separate relaxation area, which will help bridge the gap with the inappropriate placement of teenagers in adult or children’s wards.”), while SBC.2 provided
terse descriptions (i.e. “clinical effectiveness; access; flexibility; comprehensiveness; impact; appropriateness”).

**Treatment of Benefits in Outline Business Cases**

Projects of capital value above £5m prepare an Outline Business Case (OBC). All observed OBCs complied with the SCIM Business Case Guide (Scottish Government, 2009b) required for “benefits appraisal” to select a preferred option by comparing potential benefits with capital costs. In recognising that “some benefits are not amenable to monetary values” the SCIM requires “non-financial benefits” to be weighted and scored (see Scottish Government, 2009c, pp. 119-120 for an illustration). However, the observed OBCs treated *all* benefits in this way. Further, and more significantly, rather than further understanding benefits established by the IA, most OBCs introduced a new set of benefits described as “benefit criteria.” OBC.4 defined these criteria as “non-financial benefits that could be gained from redesign of current services.”
<table>
<thead>
<tr>
<th>SRC-1</th>
<th>OBC-1</th>
<th>Access</th>
<th>Quality of service provision</th>
<th>Flexibility</th>
<th>Strategic fit</th>
<th>Clinical effectiveness</th>
<th>Appropriateness</th>
<th>Sustainability of services provision</th>
<th>Interaction of services</th>
<th>Unallocated</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRC-2</td>
<td>OBC-2</td>
<td>Location / Ease of access</td>
<td>Flexibility</td>
<td>Quality of the physical environment</td>
<td>Impact</td>
<td>Clinical effectiveness</td>
<td>Appropriateness</td>
<td>Sustainability of services provision</td>
<td>Interaction of services</td>
<td>Unallocated</td>
</tr>
<tr>
<td>SRC-3</td>
<td>OBC-3</td>
<td>Improved accessibility</td>
<td>Flexibility and adaptability</td>
<td>Quality of environment</td>
<td>Strategic context</td>
<td>Clinical effectiveness</td>
<td>Appropriateness</td>
<td>Sustainability of services provision</td>
<td>Interaction of services</td>
<td>Unallocated</td>
</tr>
<tr>
<td>SRC-4</td>
<td>OBC-4</td>
<td>Comprehensive range of integrated services</td>
<td>Accessibility</td>
<td>Quality of environment</td>
<td>Impact</td>
<td>Clinical effectiveness</td>
<td>Appropriateness</td>
<td>Sustainability of services provision</td>
<td>Interaction of services</td>
<td>Unallocated</td>
</tr>
<tr>
<td>SRC-5</td>
<td>OBC-5</td>
<td>Improved accessibility for patients, relatives and staff</td>
<td>Ability to implement options</td>
<td>Quality of environment</td>
<td>Impact</td>
<td>Clinical effectiveness</td>
<td>Appropriateness</td>
<td>Sustainability of services provision</td>
<td>Interaction of services</td>
<td>Unallocated</td>
</tr>
<tr>
<td>SRC-6</td>
<td>OBC-6</td>
<td>Enhanced accessibility</td>
<td>Accessibility for patients, relatives and staff</td>
<td>Quality of environment</td>
<td>Impact</td>
<td>Clinical effectiveness</td>
<td>Appropriateness</td>
<td>Sustainability of services provision</td>
<td>Interaction of services</td>
<td>Unallocated</td>
</tr>
<tr>
<td>SRC-7</td>
<td>OBC-7</td>
<td>Accessibility for patients, relatives and staff</td>
<td>Accessibility</td>
<td>Quality of environment</td>
<td>Impact</td>
<td>Clinical effectiveness</td>
<td>Appropriateness</td>
<td>Sustainability of services provision</td>
<td>Interaction of services</td>
<td>Unallocated</td>
</tr>
<tr>
<td>SRC-8</td>
<td>OBC-8</td>
<td>Accessibility</td>
<td>Quality of environment</td>
<td>Quality of environment</td>
<td>Impact</td>
<td>Clinical effectiveness</td>
<td>Appropriateness</td>
<td>Sustainability of services provision</td>
<td>Interaction of services</td>
<td>Unallocated</td>
</tr>
<tr>
<td>SRC-9</td>
<td>OBC-9</td>
<td>Accessibility</td>
<td>Quality of environment</td>
<td>Quality of environment</td>
<td>Impact</td>
<td>Clinical effectiveness</td>
<td>Appropriateness</td>
<td>Sustainability of services provision</td>
<td>Interaction of services</td>
<td>Unallocated</td>
</tr>
</tbody>
</table>

Table 1. Classification of observed benefit criteria
Benefit criteria were typically introduced by a “project board” comprising patient, manager, and clinician stakeholder representatives (OBC.1); stakeholders themselves (OBC.4); or an undefined “project group” (OBC.6). This practice created the potential for the selected option to address a set of benefits distinct from those justifying the project in its IA. Given the relationship of project outputs to programme outcomes and the need for alignment between them, continuity of understanding of project-specific benefits should be sustained through the programme strategy, its implementation via projects, and the progression of those projects. The introduction of newly-defined benefit criteria potentially disrupts this continuity. It creates the risk of considering benefits that are not aligned with programme strategy.

The observed benefit criteria were remarkably similar in all OBCs (Table 1). The generic nature of benefit criteria inserted at OBC stage suggests that option appraisal must represent a value system common to all healthcare investments. Whether these values are the result of overarching government policy, the professional values of healthcare providers, or an innate societal understanding of what is ‘appropriate’ for healthcare provision is beyond the scope of this study. This observation does, however, establish investment option viability is being evaluated against generic benefits, rather than the project-specific benefits required by policy. This practice is potentially harmful as it divorces programme intent from project action.

**Treatment of Benefits in Full Business Cases**

Full Business Cases (FBCs) are required for all projects requiring a capital investment over £5m. The FBCs reviewed both contained benefits realisation plans, as required by guidance. These plans translated the objectives of the instigating investment programme into project level benefits (albeit expressed with varying terminology) to provide alignment. As above, the progressive definition of benefits through project delivery was not observed, creating the potential for interpretation of programme objectives to define benefits at FBC that contradict those defined in preceding IA and OBC gateways.

The benefits defined were somewhat generic in nature, although this is arguably a consequence of the scale of the FBC investments (FBC.3 and FBC.4, for example, address a c. £300m acute hospital). The practice of disaggregating benefits into a series of more-specific benefits to provide clarity was observed. FBC.1 disaggregated six benefits (termed “objectives”) into an average of four or five sub-benefits each. FBC.3 split four benefits (termed “services”) into c. five sub-benefits each. This disaggregation activity has significant consequence for the development of a BQM, as discussed below.

**IMPLICATIONS OF OBSERVATIONS FOR BENEFITS REALISATION PRACTICE**

The desktop survey concluded that benefits, in practice, are treated variously. Understanding and practice varies between NHS Boards due to multiple guidance sources, each of which articulates ‘benefits’ differently. A tendency towards overly-operationalised treatment of benefits was observed. A focus on implementing a process rather than ensuring the process was appropriate was noted. Such approaches were typified by the use of proxy metrics (such as assessing patient satisfaction by the number of complaints received, cf. OBC.7) to implement a standard process, without questioning the ability of that process to realise benefits effectively.
Practice generally made a fair attempt at following guidance, aside for the introduction of benefit criteria in OBCs. While the procedures used to generate benefit criteria can be construed to comply with current guidance, the question of why the elicitation processes always yield a similar set of effectively-generic criteria from project-specific stakeholder groups must be raised. Facilitator and non-response bias are issues of concern.

Current benefits delivery practice can be characterised as confused and conflicted. Some traits of a BRMP were observed, namely: the provision of Benefits Realisation Plans (albeit limited in scope) in FBCs; and the inclusion of functional-equivalents of Benefits Profiles in some cases. In the absence of an explicit and coherent BRMP, however, bespoke practice often failed to define benefits in ways that allow their realisation to be clearly demonstrated. Indeed, there is no evidence that anticipations of benefits realisation supporting gateway approvals are revisited later to confirm their accuracy. There is a clear need for a healthcare-specific BRMP to define best practice and for an associated BQM to characterise benefits realisation at key stages in the investment process.

THE NEED TO DISAGGREGATE BENEFITS

An observation of particular note is the emergent practice in some cases (OBC.2; OBC.9; FBC.1; FBC.2) of ‘disaggregating’ otherwise amorphous or ambiguous definitions of benefits to provide clarity. As this practice is emergent, it is not yet codified by guidance and, as such, is performed variably. OBC.2, for example disaggregated the amorphous “inpatient and ambulatory care services” benefit into nine sub-benefits, two of which related to the provision of buildings, four to healthcare service provision, and three to NHS Board operation. FBC.1, in contrast, disaggregated a generic benefit of “improved clinical effectiveness” into five sub-benefits each of which was described verbosely (e.g. “Development of more GPs with Special Interest to deliver services more locally”) and none of which could be clearly associated with buildings, services, or board operation.

As it has emerged independently in different NHS Boards and in different forms of business case, it is concluded that the practice of disaggregating benefits into a series of sub-benefit components, albeit in part caused by the absence of BRMP-derived benefits definition guidance, is proving useful. Engaging stakeholders in benefits definition would build common understanding and increase consistency of subsequent evaluations. Further, the disaggregation process would provide an opportunity to associate qualities of the emerging service or asset with the benefit whose provision they represent. As these qualities could be experienced or observed by stakeholders, judgements of their magnitude could usefully indicate the extent of realisation and perceived worth of their associated benefit. This emergent practice was clearly helpful.

FOUNDATIONS OF A BENEFITS QUANTIFICATION METHOD

The above has established the nature of benefits as currently conceived by Scottish investors in healthcare services and infrastructure. This section suggests four functions that a Benefits Quantification Method (BQM) must perform in light of current understanding of the need to inform a BRMP.
PRINCIPLE 1: ARTICULATION OF BENEFITS

Because stakeholders embark on projects to improve their situation, the benefits sought are ‘desired outcomes.’ A BQM must adopt stakeholders’ perceptions of benefit as the most meaningful measure of their realisation.

PRINCIPLE 2: REPRESENTING TANGIBLE AND INTANGIBLE BENEFITS IN MEASURABLE TERMS

Benefits must be broken down into the benefit generating qualities that stakeholders collectively associate with them and would accept as evidence of their realisation. Benefit disaggregation methods must establish the evidence that demonstrates benefits realisation.

PRINCIPLE 3: TRANSLATING BENEFIT PROVISION MAGNITUDE INTO BENEFIT REALISATION WORTH

The diminishing marginal utility associated with increasing magnitudes of good or service provision must be acknowledged. An intermediate step is required to elicit the utility function that translates stakeholders’ judgement of benefit generating qualities provided by investment outputs into the perception of its benefit. These perceptions of worth (rather than magnitude) must indicate benefit realisation.

PRINCIPLE 4: RELIABLY ASCRIBING WORTH TO BENEFIT PROVISION

A BQM must elicit stakeholder perceptions of benefit worth using carefully designed elicitation processes to overcome the many biases in stakeholder judgements. Anchoring bias, in particular, must be controlled by using project-specific comparator projects to frame judgement.

CHARACTERISING THE MAGNITUDE OF BENEFIT REALISATION

The observation of benefit realisation requires a concept to parallel consumption so that the magnitude of each benefit’s realisation can be expressed. The provision of benefits from healthcare service provision is related to, and constrained by, properties of supporting infrastructure (such as buildings).

Reflective design and learning processes make stakeholders’ understanding of the relationships between services and supporting infrastructure explicit, allowing it to be formalised and captured. This stimulates the double loop learning (Schön, 1983) by which initial conceptions of what a benefit would ‘look like’ when realised can be challenged by cycles of monitoring, mapping and observation (Fried, 2010). Evaluating the magnitude of benefit realisation among a group of stakeholders can, in itself, socially construct the common understanding required for a satisficing (Simon, 1969) investment output. The BQM will provide a two-stage process, wherein the physical or functional (note: not financial) qualities of infrastructure – defined as ‘Benefit Generating Qualities’ (BGQs) – are elicited from stakeholders during project initialisation and then judged by them during project delivery.

The desktop survey confirmed the appropriateness of disaggregating benefits into their constituent BGQs. This emergent practice was observed in FBC.1 wherein each of the “benefits to patients” required from the chosen option was disaggregated into several desired qualities of the investment.
output (Table 2). Such qualities can be interpreted as benefit generating qualities. Disaggregation of the benefit into a series of BGQs unpacks the understanding assigned to that benefit by a group of stakeholders in a specific situation. The BGQs associated with a benefit on one project could not be transposed to another project as a benefit that superficially appears the same (i.e. has the same description) would be ascribed a different meaning by different stakeholders.

Table 2. Example disaggregation of an example “Benefit to Patients” into Benefit Generating Qualities, after NHS Ayrshire & Arran (2006)

<table>
<thead>
<tr>
<th>Benefit to Patients to Disaggregated Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved facilities</td>
</tr>
<tr>
<td>• Easier physical access to the building and to the range of services within.</td>
</tr>
<tr>
<td>• An energy efficient building should reduce energy costs and thus the impact on the environment.</td>
</tr>
<tr>
<td>• Backlog maintenance costs for Davidson Community Hospital and Girvan Health Centre will be reduced to nil.</td>
</tr>
<tr>
<td>• Risk of harm or damage from building failure is significantly reduced.</td>
</tr>
<tr>
<td>• The functional relationship of departments and rooms will be patient centred and therefore offer substantial improvement in effective service delivery.</td>
</tr>
<tr>
<td>• There will be sufficient space to be able to offer an enhanced range of healthcare services.</td>
</tr>
<tr>
<td>• Improved functionality and internal environment should improve staff morale and enhance recruitment and retention of staff increasingly wanting to work at the facility.</td>
</tr>
<tr>
<td>Improved acceptability from patients, staff and the public.</td>
</tr>
<tr>
<td>• Patients and public have a positive impression of health and social care services in Girvan.</td>
</tr>
<tr>
<td>• Increased patient and staff satisfaction created from a positive ambient environment.</td>
</tr>
<tr>
<td>• Successful staff recruitment and retention to posts needing to be filled and others retained in the new hospital.</td>
</tr>
<tr>
<td>• Inpatients are afforded a greater degree of privacy and dignity, if they desire it.</td>
</tr>
</tbody>
</table>

The BGQ process is justified by two conceptual links to existing practice. First, it reflects HM Treasury Green Book policy which states that investment outputs can be considered evidence of the benefits sought as investment outcomes. Second, it considers qualities as attributes of the artefact resulting from the investment. It is access to these qualities that stakeholders seek rather than, beyond symbolism, the artefact itself. Some BGQs will be qualities of the artefact (i.e. building features) and others of the healthcare service it accommodates.

CHARACTERISING THE WORTH OF BENEFIT REALISATION

SELECTING AN APPROPRIATE BENEFIT VALUATION TECHNIQUE

Goods and tangible services can be traded. This allows their value to be derived from stakeholders’ ‘revealed preferences’ (Pearce and Özdemiroglu, 2002) in open market function: the benefits of these goods or services are worth the price that individuals will pay for them. HM Treasury (2003) also requires all the “non-market impacts” of investment programmes to be valued. The healthcare service public good, and the buildings facilitating same, typify such impacts. As the intangible benefits associated with same cannot be readily traded, ‘stated preference’ valuation methods must ask stakeholders about the value of such commodities.

The Green Book (HM Treasury, 2003, p. 57) recommends Willingness to Pay (WTP) as the “preferred method of valuation to simulate the market” when valuing non-market goods and services. WTP and the related Contingent Valuation (CV) can elicit stakeholder judgements of all
types of healthcare investment benefit using carefully designed methods to accurately determine what stakeholders would pay for these public goods if they could be traded. However, despite their endorsement by the Treasury, stated preference valuation methods remain inherently weak because, as van Exel et al. (2006) note, “‘saying’ and ‘doing’ may differ.”

TRANSLATION PRINCIPLES

Benefits realisation in practice requires the benefit ‘worth’ (i.e. the amount that stakeholders would pay for it) to be determined. This worth can be expressed in monetary terms, although any other notional unit of consistent scale over time can be used. By relating this unit to levels of benefit magnitude by means of ‘comparator’ project outputs, the BQM will assist stakeholders in socially constructing a common understanding of benefit worth. Provided that the worth unit is commonly understood, it can translate an observed magnitude of BGQ provision into a common understanding of the worth of the benefit they generate. Integrating worth and magnitude into a function permits assessment of marginal changes in worth. This is achieved by an adaptation of a utility function that the BQM calls a benefit function.

Utility theory models the relationship between the amount of a good or service consumed or experienced and the resulting perception of utility. When applied to benefits quantification, utility theory allows the observed magnitude of BGQs to be related to the benefit arising from them, as judged by each stakeholder. The utility function that performs this translation of infrastructure qualities into benefit worth allows the many inputs to the function (and broader influences on the positioning judgement) to be taken into account. This is illustrated by Fig. 2. Assume that points a, b and c are equidistant. An increase in the magnitude of provided infrastructure or service qualities (i.e. an increase in quality) generates a larger increase in stakeholders’ perceptions of benefit worth when moving from point a to b than from point b to c. At a certain point, additional increases in BGQ provision would not be worthwhile due to diminishing marginal increases in perceived benefit worth. Monotonic benefit functions such as this can inform the selection of an optimum provision of each benefit.

The eliciting of benefit functions is difficult. As the UK National Health Service is a public good, the majority of UK residents do not directly pay for its services. This can cause consumers to
consider that healthcare and, therefore, healthcare benefits have no intrinsic ‘worth.’ This problem is also faced when valuing environmental goods and services. There are generally no means of ascertaining exactly who benefits from such assets, or the manner or degree to which they benefit (Smith et al., 1999). Environmental non-market goods have a value to society, but their worth is unknown (Cookson, 1998). ‘Willingness to Pay’ is a stated valuation technique that has proven particularly effective at evaluating the worth of these intangible goods. Evidence of its insightfulness in the healthcare sector is also present.

WILLINGNESS TO PAY

Willingness to Pay (WTP) is a stated preference valuation technique ideally suited to eliciting stakeholders’ judgements of benefits worth. The technique is applicable to intangible benefits and public goods; is proven in healthcare; and is reasonably reliable, provided certain biases are controlled. It can be readily operationalised to inform gateway reviews, design reviews, and so forth.

WTP is a representation of “total economic value” (Samuelson, 1954). That is, a stakeholder’s statement of their willingness to pay captures their perceptions of their change in their human wellbeing that will arise as a consequence of a variation in benefit magnitude (ibid.). The expressions of benefit worth elicited by WTP as operationalised in the BQM arise as a consequence of stakeholders’ perceptions of the change in their wellbeing arising from the project.

The BQM uses WTP to ask individual stakeholders the amount of a notional ‘currency of worth’ that they would sacrifice to preserve or gain a level of (tangible or intangible) good or service or, alternatively, how much they would accept as compensation for its loss or reduction. WTP techniques thus create a proxy market in which varying magnitudes of benefit provision are evaluated, assuming that an individual’s stated shadow prices (Pearce, Özdemiroglu, et al., 2002) are related to their preferences (Mourato, 1998).

The ability of WTP to evaluate intangible benefits is proven by widespread use of its techniques to value environmental public goods (e.g. Ahlheim, 1998; Hanley et al., 2003), where it is often implemented using contingent valuation (DEFRA, 2007; Schläpfer, 2008), and infrastructure improvements (McFadden, 1997; Pearce, Özdemiroglu, et al., 2002; Andersson et al., 2009). Further, precedent for using WTP to evaluate immaterial healthcare goods and services exists, including: short term outcomes in heart surgery patients (Greenberg et al., 2004); the non-health benefits of health programmes (Borghi and Jan, 2008); pain reduction and pain-related disability (Anderson et al., 2007); and demand for healthcare (Gyldmark and Morrison, 2001). In healthcare, WTP helps stakeholders consider “the entire range of attributes [read: benefit generating qualities] (both benefits and non-benefits)” of the good or service (Blumenschien and Johannesson, 1999). In group settings, WTP can specifically stimulate the “stakeholder dialogue” (Cass, 2006) required to deliberate and negotiate group valuations.

WTP is not without problems, however. WTP is vulnerable to hypothetical bias, as stakeholders find it difficult to reliably evaluate unfamiliar goods unless the choice context provides reliable cues to help the stakeholder create heuristics for their valuation (Schläpfer, 2008). Pearce, Özdemiroglu, et al. (2002) consider all stated preference valuation techniques “costly and time consuming.” “Benefits transfer,” where the results of prior WTP evaluations are transferred
directly into later ones or averaged over several evaluations to provide a “meta-analysis,” can overcome this. Its appropriateness to healthcare infrastructure investments, where sought benefits are project-specific and stakeholder composition differs between projects is unlikely.

WTP biases have been detected in some studies, and disproven in others, indicating that WTP design critically influences results validity. The choice of payment vehicle, evaluation question framing, payment vector, and mode of delivery all require careful consideration. WTP applications control for inherent judgement biases. Comparator projects or benefit delivery scenarios must be defined to frame stakeholders’ evaluations by providing implied value cues (Blumenschein and Johannesson, 1999) that control for anchoring bias which, along with availability and representativeness biases, is implicit in all cognitive judgement (Browne and Ramesh, 2002). Although the single-choice WTP technique can be readily operationalised into the workshop settings of a BRMP, WTP remains particularly sensitive to anchoring bias in such “referendum” settings (Green et al., 1998). The BQM will control this bias using comparator projects to provide dimension and units to the judgement scale on which the magnitude of BGQ presence is perceived.

DISCUSSION AND FUTURE DIRECTION

By identifying diversity of benefits and inconsistencies in their definition methods the desktop study has demonstrated the need for a unified approach to benefits management. A BQM associated with a BRMP has been outlined to characterise investment performance in realising sought benefits. Linking the concepts of infrastructure provision, resulting benefits, and stakeholder perceptions of worth through the use of benefits functions, the BQM will tackle a range of management issues: stakeholder engagement and consultation; improved communication of benefits in the business case; and ongoing monitoring of benefit realisation throughout project life. A BQM and BRMP developed to achieve this will inform the management of technically complex projects which lack financial (or otherwise directly measurable) success criteria and involve a diversity of stakeholders with varying and often conflicting expectations.

Having characterised the benefits realisation problem, the underlying study is now establishing the BQM processes. Stated preference methodologies are being adapted to determine stakeholder perceptions of worth and, at the time of writing, workshop sessions are testing elicitation, anchoring and framing techniques to implement BQM stages (Table 3). Possible methods are being tested with several NHSScotland Boards and professional consultants to establish their insight and ability to be operationalised into a workable tool.
Table 3. Preliminary definition of BQM stages

<table>
<thead>
<tr>
<th>Initiation stages</th>
<th>Possible method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identify benefits</td>
<td>Adopt directly from business cases; Elicit from stakeholders; Adopt from business cases; with validation; Pick from generic list; Align with prior benefit maps; Translate strategic goals from programme; Pick from generic list; with addition of specific</td>
</tr>
<tr>
<td>2. Reduce benefits</td>
<td>Card sorting / affinity diagramming; Rank by priority with cut off point; Management decision; Impact assessment</td>
</tr>
<tr>
<td>3. Validate benefits</td>
<td>Validate against programme strategy; Validate against required properties; Agree among stakeholders</td>
</tr>
<tr>
<td>4a. Identify comparators, per benefit</td>
<td>Adopt sector exemplars; Identify from stakeholders’ experience; Agree good, bad, indifferent; Compose using PCT; Adopt preferred options from other projects; Construct artificial comparators from benefit generating qualities; Construct artificial comparators from exemplar benefit generating qualities</td>
</tr>
<tr>
<td>4b. Elicit benefit generating qualities, per benefit</td>
<td>Freelist by user stakeholders; Function analysis; Nominal group technique applications; Freelisting by wider stakeholders</td>
</tr>
<tr>
<td>4c. Position comparators, per benefit</td>
<td>Score using NGT; Score using NGT with stakeholder weightings; Score synthesising stakeholders’ individual evaluations; Allocate “beans”</td>
</tr>
<tr>
<td>4d. Elicit stakeholder benefit functions, per benefit</td>
<td>High / low bidding workshop; Individual bidding; Group bidding; Individual bidding with tolerance; Market stall; Framing and open ended; Budget allocation</td>
</tr>
<tr>
<td>4e. Synthesise aggregate benefit function, per benefit</td>
<td>Derive single partial function; Regress individual functions; Synthesise single using stakeholder weightings</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Delivery stages</th>
<th>Possible methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Observe benefit provision magnitude</td>
<td>Iterative performance evaluation cycle to be defined.</td>
</tr>
<tr>
<td>B. Translate benefit worth</td>
<td></td>
</tr>
<tr>
<td>C. Update dashboard(s)</td>
<td></td>
</tr>
<tr>
<td>D. Target benefits for address</td>
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In addition to informing a BRMP, the BQM can inform specific investment decisions, most notably option appraisal conducted at Outline Business Case. Irrespective of whether health service provision (Scottish Health Council, 2010) or capital investment (Scottish Government, 2009c) options are being evaluated, ‘non-monetary costs and benefits’ must be “weighted and scored.” The review of the OBCs presented determined that this policy is seldom implemented. When attempts to comply with policy are made, superficial judgements (e.g. marks out of ten, or percentages) are arbitrarily assigned to benefits. Rigour, auditability and defendable stakeholder engagement are not present. Using the BQM to quantify benefit realisation will address this significant shortcoming.
## APPENDIX: INDEX OF BUSINESS CASES INFORMING DESKTOP SURVEY

### Initial Agreements:


### Outline Business Cases:


### Standard Business Cases:


### Full Business Cases:

REFERENCES


Evidence-based design (EBD) has been defined as “the process of basing decisions about the built environment on credible research to achieve the best possible outcomes” (The Center for Health Design, 2008). It is viewed as analogous to evidence-based medicine, and an important way of improving healthcare quality. This paper explores the different roles evidence-based design (EBD) research plays, the kinds of research approaches appropriate for the different roles, the need for theoretical frameworks guiding research that reflect the complexity of the systems studied, and the need to consider not just the nature of “evidence” but also the process for interpreting and applying that evidence to improve quality of care. The concept of the “Integrated Healthscape Strategy” is proposed as a means of integrating these four facets of the evidence-based design process. In this paper the concept of the Integrated Healthscape Strategy is developed in relation to the importance of teamwork and collaboration in the hospital setting.

**ABSTRACT**

The healthcare literature consistently cites ineffective communication and teamwork among caregivers as a critical factor contributing to poor quality of care; yet little research has explored how nonsocial factors (i.e., the physical design of the nursing unit) impact them. This paper summarizes the results from three pilot studies exploring the spatial ecology of communication patterns. A common thread from these case studies is that virtually no communication occurred between nurses and doctors; decentralized designs did not function in practice as anticipated; and that small design details influenced observed behavior. While the research generated useful insights, the author argues that going forward an Integrated Healthscape Strategy (IHS) is needed that pays more attention to the development of ecological frameworks to guide such research, to the intended purposes of the research, and to ways for engaging key decision makers in using the EBD process to improve quality of care, the patient experience, and the staff work environment.

**KEYWORDS**

design, healthcare, hospital, communication, systems

**INTRODUCTION**

Evidence-based design (EBD) has been defined as “the process of basing decisions about the built environment on credible research to achieve the best possible outcomes” (The Center for Health Design, 2008). It is viewed as analogous to evidence-based medicine, and an important way of improving healthcare quality. This paper explores the different roles evidence-based design (EBD) research plays, the kinds of research approaches appropriate for the different roles, the need for theoretical frameworks guiding research that reflect the complexity of the systems studied, and the need to consider not just the nature of “evidence” but also the process for interpreting and applying that evidence to improve quality of care. The concept of the “Integrated Healthscape Strategy” is proposed as a means of integrating these four facets of the evidence-based design process. In this paper the concept of the Integrated Healthscape Strategy is developed in relation to the importance of teamwork and collaboration in the hospital setting.

**TEAMWORK AND COMMUNICATION**

Within the context of increasingly multidisciplinary and complex healthcare delivery systems, research in healthcare service indicates that an environment in which teamwork thrives leads to greater job satisfaction of caregivers, more responsive and patient sensitive service, and the

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2 This paper extends the thinking developed in a forthcoming article in HERD, the Health Environments Research and Design journal by the author and Marino Bonaiuto, Elena Bilotta, and Marilia Bonnes.
delivery of more clinical- and cost-effective healthcare (Campbell et al., 2001; Coiera, 2000; Shortell et al., 1994; Wood et al., 1994). When examining factors that foster teamwork and performance, effective team member communication is among the most critical and influential aspects for the delivery of quality nursing care. Several studies have quantified the impact of poor communication on patient safety and clinical work environment, suggesting that communication is a likely cause of systematic error in the health system (Coiera, 2000; Coiera & Tombs, 1998). For example, Coiera et.al. (2002) noted that inadequate communication has been associated with 17% of system problems, and, of these, 84% were deemed potentially preventable. Thus, the evidence strongly suggests that poor communication threatens the quality of patient care, and may be one of the primary factors leading to preventable adverse events in clinical practice.

The role that the physical environment plays in communication is less clear. In the corporate work setting, the design of workstations and the layout of office floors have been shown to influence, the frequency of communication, collaboration and teamwork (Allen, 1976; Becker and Sims, 2001; Kraut et al., 1990). Becker and Sims (2001) found, for example, that while employees prefer cellular (full height walls, single occupancy) offices because they offer more privacy and fewer distractions, they were less effective in supporting team-based communication. Most effective in terms of communication and interaction were small team-oriented clusters of desks not separated by high panels.

The relationship between spatial layout and other design factors and communication patterns in the healthcare environment is less understood, despite the attention that has been paid to the importance of communication generally. A significant amount of communication among clinical care team members occurs opportunistically. This type of communication typically occurs in and around nursing stations, medication rooms, patient rooms, and corridors, as well as in “backstage” areas, such as break rooms, supply rooms, and locker rooms (Becker, 2007; Carthey, 2008; Iedema et al., 2006). This type of impromptu or opportunistic communication creates opportunities for on-the-job mentoring and learning within and across professional disciplines. Benefits of this type of communication include professional behavioral modeling (learning by observing) as well as improving the timely sharing of clinical information and professional expertise among the healthcare team members that is critical to improving patient care safety and quality.

In one of the few published studies focused specifically on design and communication Gurascio-Howard and Malloch (2007) examined how a centralized versus decentralized nursing unit layout affected communications among nurses and other caregivers. They concluded that while patients felt nurses responded in a more timely fashion in the decentralized unit (in part because the ratio of staff-patients was higher in this type of physical layout), nurses reported fewer opportunities to network, less cooperative behavior, and less informal mentoring—all of which nurses considered important to providing high quality care.

THE CORNELL STUDIES

Given the importance of effective communication processes among care providers, and the few studies done exploring this relationship, the Cornell International Workplace Studies Program (IWSP) initiated a series of three pilot projects to explore how the physical design of the nursing unit affected communication and interaction patterns among diverse care providers including
nurses, doctors, and allied health professionals. Study 1 examined on an ICU communication and interaction patterns, job stress, teamwork, and job satisfaction one month before and three months after the move to a new ICU with a decentralized nursing station design. Study 2 essentially replicated Study 1 at a point two years following the move to the new ICU. Study 3 examined the communication patterns, job stress, and gaining of competencies of new nurse graduates on two Med/Surg units during the first 12 weeks on the job as RNs. In all three studies the focus was on how the physical design of the nursing unit influenced communication and interaction patterns, as well as job stress, job satisfaction, and teamwork.

The intent here is not to present these studies in detail. Rather, it is to provide an overview of the conceptual framework, methods, and results—the “common threads” of the research from the three studies—with the ultimate aim to use the experience of these projects to explore the need and potential value of developing theoretical frameworks and ecological approaches to understanding teamwork and collaboration on the nursing unit that better reflect the complexity of these processes.

CONCEPTUAL FRAMEWORK

Conceptually, the guiding framework for the Cornell studies was the concept of “communities of practice” (Brown & Duguid, 1991; Lesser & Pru sak, 2000) and “organizational ecology” (Becker & Steele, 1995; Becker, 2004; Becker, 2007). Basically, the communities of practice” framework seeks to understand the role informal social networks play in helping people learn how to perform their work. One learns, for example, who to contact among co-workers and friends to ask for help, feedback, information or support when a problem or question arises at work. These informal social networks provide on-the-job on-demand learning, mentoring, and training, and supplement any formal orientation or training programs. Organizational ecology views communication in the workplace being shaped by a complex web of interdependent factors that include physical design, information technologies, work processes, organizational culture, and employee demographics (Becker, 2007). In high performing workplaces these system elements are in harmony (they support and reinforce each other); in low performing environments they conflict or are missing or minimally present.

METHODOLOGICAL APPROACH

Methodologically, the Cornell studies have used a variety of methods to understand the nursing unit as a system with a focus on communication patterns on a nursing unit and factors that influence them. These include:

1) **Direct observation** of communication patterns by researchers shadowing nurses over days and weeks using specially programmed PDA’s to record with whom the nurses interact (e.g., RN, physician, allied health professional), where on the nursing unit (e.g., nursing station, corridor, medication room); about what (e.g., consultation, social, task assistance), and for how long (e.g., duration of interactions). (Study 1,2,3)

2) **Surveys** of job satisfaction, teamwork and collaboration, organizational culture, and stress. (Study 1,2,3)

3) **Interviews** to gain deeper insight into nurses’ perspective on why they communicate as they do and how the physical design affects their behavior. (Study 1,2,3)
4) **Physiological Stress** measures using repeated blood pressure readings over the course of the day and weeks. (Study 3)

5) **Competence ratings** in which senior nurse preceptors rate new nurse graduates on the extent to which they are gaining necessary competencies in order to be able to work independently (without a senior nurse supervising). (Study 3)

6) **Description of the physical design, technology, and organizational culture of the nursing unit**, to consider how they affect behaviors observed. (Study 1, 2, 3)

**OVERVIEW OF RESULTS: COMMON THREADS**

**Interaction**
- Interaction occurs in short (<30 sec.) spurts
- Significant amount of interaction is social.
- Social interaction embedded in other types of communication

**Spatial Patterns**
- Micro design features (e.g., sightlines, orientation of seating, backstage areas) influence opportunities for building social networks and trust that underpins teamwork and collaboration.
- Nurses in constant motion; do not stay in single decentralized pod.
- Most interaction in nursing pods, but not only in the one assigned.
- Relatively little time spent in patient rooms.
- How space used in one location affected by nature of other spaces available.
- Little shared space; neutral zones important for communication across disciplines

**Teamwork**
- Very little interaction between nurses and doctors and allied health professionals.
- Need to consider what constitutes a “team.” Nurses think of “team” as other nurses.
- Physical barriers limit sightlines and teamwork.
- Nurses ask for help from whomever visible, not necessarily person with right expertise.
- Visual transparency increases chance encounters; on-demand assistance.
- Most interaction social and informational; relatively little “consulting.”

**Informal Learning**
- For nurses, learning/teaching w/nurses’ aides as important as learning from RNs.
- “Reactive” or “opportunistic” learning occurs in the middle of action, when there is little time to think.
- On-the-job learning embedded in informal social networks.

**Outcomes**
- Medical outcomes unclear based on institutional data available.
- Unclear that staff job satisfaction significantly better after than before new design. It was better than immediately after the move to the new ICU.
• In Study 2 patient satisfaction improved 10 percent (68-78%) from point before the move to the new ICU to a point two years later. Patient satisfaction was still not high.

ECOLOGICAL THEORY

As noted above, “organizational ecology” (Becker 2007) examines work processes from a systems perspective. Becker et al. (2010) have argued that the organizational ecology framework is useful, but may not sufficiently reflect the complexity of the multiple systems that comprise the hospital environment. Bonnes and Secchiaroli (1995), for example, discuss the concept of interlocking physical systems in their multi-place perspective. The hospital setting overall, for example, is viewed as a system of places (a multi-place system) composed of various subunits (or sub-places) which are loosely-coupled with reference to users’ goals, activities, and representations.

Mohr, Batalden and Barach (2004) and Johnson and Barach (2006) describe the concept of clinical Microsystems in their research examining factors the affect the effectiveness of clinical teams. They defined the microsystem as “a group of clinicians and staff working together with a shared clinical purpose to provide care for a population of patients. The clinical microsystem includes the clinicians, the staff, the technology, and the care processes that are needed in order to deliver high quality patient care. It co-exists with other clinical Microsystems within a macro organization” (Mohr, Batalden & Barach, 2004, p. 34). Conspicuously, it does not explicitly consider the physical settings in which the activities, relationships, and technology that comprise the micro-system are carried out.

Urie Bronfenbrenner’s (1979) multi-level ecological systems perspective, developed in the context of human development, is similar in some ways to micro-system theory, but broader. His “ecological approach” aims primarily to “consider the systemic, and thus, interactive and holistic, perspective of naturalistic ecology” (Bonnes & Secchiaroli, 1995, p. 55). Bronfenbrenner’s model distinguishes among four different – but interrelated – systems: the microsystem, the mesosystem, the exosystem and the macrosystem (Bronfenbrennner, 1979).

The microsystem (e.g., a nursing unit) focuses on the interactions between individuals and the members of their immediate environment. The mesosystem considers the relationships and connections among different Microsystems (e.g., work and family). One’s response to and evaluation of the work microsystem may be affected, for example, by what one’s spouse or other family members think about the nature of the work system. The exosystem includes organizations and social systems with which individuals may or may not have a formal contact but still are part of their lives, such as the legal system or the medical/health one. Finally, the macrosystem includes societal norms, expectations, and beliefs that characterize the larger social environment in which the other systems operate. The central tenant is that the focus of ecological research should be on identifying the properties and relationships among these interdependent, loosely-coupled systems rather than on hypotheses testing or even a single micro-system considered in isolation.

Given its broad approach, this ecological model represents a useful framework for thinking about complex systems like hospitals. The properties of and changes at any level of the system may have extended effects at other levels. Changes in the design of the microsystem (for example, a
nursing unit) may make a difference in the microsystem itself (for example, increasing face-to-face interaction between nurses and doctors on a medical unit by designs that improve visual sight lines). This, in turn, may lead to improvements at the mesosystem level by fostering changes in different but related microsystems (e.g., the hospital administration and its commitment to creating a culture of teamwork). As microsystems change through their reciprocal influence on each other, the exosystem (e.g., important financial donors) may also be affected, generating additional funding that supports the activities and emerging culture begun at the level of the microsystem. These kinds of dynamic system interactions across different system levels shape the “hospital” as a place of work and healing. An important characteristic of an Integrated Healthscape Strategy are research strategies that capture and reflect this system complexity, as well as the different purposes research serves.

**EVIDENCE-BASED DESIGN (EBD) RESEARCH FUNCTIONS**

EBD research can be seen to serve three complimentary but distinct organizational functions: 1) Research for Innovation; 2) Research for Incremental Change; and 3) Research for Justification. Each primary research function draws on similar data collection methods (e.g., survey, interview, behavioral observations, etc.), but often uses different research designs and analytical tools to structure how the research is organized and analyzed. Much of the discussion and debate around the nature of evidence appropriate for EBD has focused, implicitly, on research for justification. In practice, all three forms need to be considered.

**RESEARCH FOR JUSTIFICATION**

Perhaps the most typical form of EBD research is Research for Justification. The primary purpose here is not to inspire innovative thinking or to identify relatively small scale improvements for a product or building. It is to justify major design proposals to stakeholders ranging from nurses and physicians to hospital administrators and Boards of Directors who may be skeptical about whether the claimed benefits of a proposed major design change are valid. Changing this mindset can be a high hurdle, given entrenched beliefs and well-established patterns of policy and practice that do not appear to those comfortable with and responsible for them to have caused major problems necessitating new design approaches. That the proposed changes may be expensive and require changes in how things are done and who does them only adds to the burden of proof required.

What distinguishes this kind of experimental EBD research from Research for Innovation and Research for Incremental Change are not the methods for data collection per se. It is the use of experimental and quasi-experimental (Cook & Campbell, 1979) research designs, sophisticated statistical analytical techniques, and positing and testing for mediating processes and moderating factors which shape and influence the system’s performance (Winkel, Saegert & Evans 2009). Iedema, Long, Carroll, Stenglin and Braithwaite (2006), for example, found that doctors and nurses communicate in very different ways in “neutral zones” like corridors. Nurses are more likely to offer their views on diagnoses and treatment plans, and doctors are more likely to listen and consider them. Iedema and his colleagues postulate that the underlying mechanism is the relative absence of hierarchy and status in these zones, leading to more open communication.

Taken together, the key characteristics of Research for Justification are: 1) More experimental and quasi-experimental comparative research design; 2) more sophisticated statistical and analytic techniques; 3) more quantitative analyses focusing on critical outcome variables (e.g., safety, cost).
RESEARCH FOR INCREMENTAL CHANGE

In the evaluation literature (Struening & Guttenberg, 1975) a distinction is made between “summative” and “formative” research. The former provides a final grade; e.g., nosocomial infections decreased by 15 percent after more wash basins were installed in patient rooms. The latter provides information and insight that can be used to continually improve the process or product. Robert Sommer (1972) called this incremental improvement approach the “Volkswagen model” of design. What one learns from experience with a current design feeds forward into the next design iteration. In the case of a hospital, this might be a small scale renovation like replacing or rearranging furniture and equipment in an existing space to improve sightlines or reduce crowding.

The key characteristics of Research for Incremental Change are: 1) Data collection methods that generate data about the nature and extent of customer/user satisfaction and dissatisfaction; 2) Analytic techniques that are likely to try to segment and compare customer/user satisfaction (e.g., Are registered nurses more or less satisfied than nurses’ aides or doctors? Are there differences in ratings by staff in the ICU compared to the med/surge units?); 3) the data generated focuses more on identifying problems than in understanding in depth what is causing them, or the underlying dynamic and complex relationships among variables.

RESEARCH FOR INNOVATION

The fundamental premise of EBD is that the design of hospitals needs to be re-examined, and innovative and better solutions grounded in credible research found so that the hospital facility not only does “no harm,” but also improves the patient experience, the staff work environment, and care quality; and does all this in a cost-effective manner. IDEO, widely recognized as one of the most innovative design firms in the world, invents groundbreaking products by starting from the premise that invention requires understanding a problem deeply, from multiple perspectives and without preconceptions (Kelley, 2002). When the goal is research intended to inspire, ethnographic methods based on careful observation in the field are often of more value than surveys and experimental or quasi-experimental research designs.

IDEO seeks evidence to inspire innovation in a “deep dive” that examines who, how, and where an existing product is used (Kelley, 2002). To rethink the design of a grocery shopping cart, for example, they start by spending lots of time in grocery stores closely observing and recording what people do. How do mothers with young children, older adults, and singles use their carts? Where do the kids sit? Where are there bottlenecks involving carts in narrow aisles? How is the food stacked in the cart? Anthropologists, psychologists, designers, and engineers watch and record what people actually do, not what we or they themselves think they do. Paco Underhill (1999) describes a very similar process for studying retail environments: Where do people go when they enter a store, what do they look at and touch, how long do they spend with different displays, and how does that relate to how much they spend.

Research for Innovation mirrors the distinction Bonnes and Secchiaroli (1995) noted that Barker (1987) made between “discovery research” and “verification research”. The former emphasizes the observation of what occurs naturally, rather than experimental research organized by the researcher. It also reflects Bronfenbrenner’s (1979) view that the primary “purpose of the ecological experiment is not to test hypotheses but discovery; that is, to explore systems
properties and processes that affect and are affected by the behavior and the development of the human being (Bronfenbrenner, 1979, p.518).

What characterizes this research approach is 1) ethnographic methods grounded in direct observation; 2) negotiated interpretation of the data (evidence), rather than the implications for design and practice being exclusively the province of the researcher; 3) the “outcomes” observed are simple and meaningful to those involved in the innovation process. An Integrated Healthscape Strategy recognizes the value of these different research purposes; and as a consequence, the “gold standard” in terms of research approach varies from one purpose to another.

CHANGING MINDSETS: ENGAGING THE PRACTITIONER

The evidence-based design process needs appropriate theory and research methods. These are necessary but insufficient if the goal is to use research to make a difference in practice. Designers, administrators, and frontline staff need to be engaged in the EBD process.

Researchers highly value and are easily engaged by the empirical studies and results. For practitioners more valuable may be a focus on the theory rather than its empirical underpinning. For example, there is a considerable body of research demonstrating the importance of control (and sense of control) on satisfaction and stress reduction (Evans & McCoy, 1998). While the empirical results that generated that relationship are important, for architects and planners knowing that whatever their specific design proposal, it should provide patients, staff and visitors with opportunities to make meaningful choices (theory) about such things as where they sit, what they can do while waiting, what they see from the bed, what they eat, what the temperature is, where they can interact with others and so on provides a clear direction both for the search for and evaluation of proposed solutions.

Theory, from this perspective, may feel less restrictive for the architect and designers, and yet because it is empirically tested, still be reflective of EBD principles. Framing research about a design feature conceptually, so that the question is not, for example, about the specific height or placement of a wall in a particular hospital, but whether the proposed design offers good “sightlines” within a centralized nursing station, offers greater potential for innovative thinking and for generalization to hospitals not with the identical design, but with the same design principal.

The pre-condition for using theory and evidence of any kind to inform decisions is getting the attention of key stakeholders and involving them in the interpretation of the results and the implications of research done in other institutions for their own situation. PowerPoint presentations and peer-reviewed journal articles by themselves rarely engage and motivate people. The National Science Foundation now regularly requires a “translational” component in research it funds, and “translational research” has become a field of study in its own right (Woolf, 2008). Translation implies, however, one individual or group interpreting and making sense of something for someone else. As a process, it is a handoff, not collaboration. EBD needs to go beyond translation to negotiated meanings and interpretations involving researchers, care providers, patients and families, and administrators as key stakeholders with a shared interest in how evidence is interpreted and applied.
As one example of this approach, Professor Rick Iedema and his colleagues at the Centre for Health Communication at the University of Technology Sydney have for several years been using video to record in detail the communication and interaction patterns of health care providers (Iedema et al., 2006; Carroll, Iedema, & Kerridge, 2008). Their detailed ethnographic data has revealed a number of the dysfunctional ways in which doctors and nurses communicate around “hand-offs.” Presentations at academic conferences and publishing in peer reviewed journals were not particularly effective in engaging hospital staff in considering how they could improve their work processes and practices. Iedema and his doctoral students started exploring how the video they had taken could be used to more effectively engage front-line staff as well as clinical managers and leaders (Carroll et al., 2008). They found that having a clinical team that was working together in an emergency department watch a short compilation of video showing how they actually worked and behaved not only fully engaged the doctors and nurses in reflecting on their work processes, but led them to voluntarily redesign their own work practices.

The importance of directly involving frontline staff in considering available research evidence of all types and using it to inform the nature of the interventions they consider worthwhile implementing takes a similar, but different form, in the work of Wandersman, Duffy, Flaspohler, Noonan, Lubell, Stillman, Blachman, Dunville, and Saul (2008). Their research focuses on evaluating health and human service social policies related to substance abuse prevention, underage drinking prevention, teen pregnancy prevention, children and family mental health services, emergency preparedness, and services for homeless veterans. Wandersman calls his approach “Getting to Outcomes” (GTO). It focuses on the role of citizen participation in interpreting and applying evidence to improve programs in community-based organizations. Evidence is a starting point, but the process for involving frontline staff in interpreting and applying it is every bit as important as the research evidence itself (Becker & Carthey, 2007).

THE MISSING EVIDENCE

The process of involving frontline staff in making sense of available evidence is critical because, although EBD implicitly assumes the evidence is available to make critical decisions, for the most part it is not; and what is available is not always consistent or has been collected in settings and organizations similar to the one wanting to apply the findings. For these reasons those translating the research into practice have to determine themselves whether the findings, for example, from a study, in a large, urban teaching hospital are applicable to their own small, rural community hospital. To do that, all the relevant stakeholders, including frontline staff, need to debate and discuss the available research and come to some agreement about what it means for their specific project. Thus, the processes for how research is interpreted and applied are critical to the overall impact the EBD process has on improving healthcare quality, and are an essential element of a comprehensive Integrated Healthscape Strategy.

IMPLICATIONS FOR FUTURE RESEARCH

Proposing conceptual frameworks and broad strategic approaches is relatively easy. Much harder is transforming concepts into research practice. How, for example, would the ecological systems approach and techniques for engaging key stakeholders and decision-makers described above change the nature of the Cornell research described earlier?

1) Current: Focus on a single microsystem: the individual nursing unit.
Future: Map different microsystems within the hospital and exosystems outside it, and examine how they influence each other. Starting from the point of a single microsystem (e.g., ICU nursing unit) what are other microsystems within the hospital with which care providers interact; for example, other nursing units, break rooms, doctor’s lounge, medical rounds; operating theater; administration. What are relevant exosystems that might influence and be related to hospital microsystems; e.g., doctors’ private practices.

2) Current: Collect data and focus primarily on one role within one microsystem: nurses.

Future: Collect data related to each system element (e.g., describe technology, physical environment, management, pay and recognition, demographics, staffing levels, acuity levels, turnover, activity patterns); and for all key users perspective on teamwork and collaboration (e.g., physicians, nurses, nurses’ aides, allied health professionals). Collect data about the relationships among different system levels from the perspective of users on target microsystem.

3) Current: Collect data on communication patterns, organizational culture, job satisfaction, job stress, and teamwork from nurses. Data collection methods diverse and highly descriptive, and both quantitative and qualitative: Institutional data, surveys, interviews, observations, small scale quasi experimental interventions

Future: Continue using diverse data collection methods. More emphasis on institutional quality performance indicators: e.g., ALOS, medical errors and incidents. Also, collect data from doctors, allied health care professionals, nurses’ aides, and administrators and managers to complement and supplement nurses’ data/perspective.

4) Current: Minimal feedback and discussion with frontline staff about the accuracy of the research results and implications for their own policy, practices, and design.

Future: Structured review sessions using photographic images and/or video with all persons involved in the systems were data was collected on the accuracy and implications for policy, practice and design.

INTEGRATED HEALTHSCAPE STRATEGIES (IHS)

In conclusion, as a multi-faceted process whose ultimate goal is to generate evidence appropriate for different research purposes that, in combination, contribute to improved care quality, a more rewarding patient and family experience, and more effective and less stressful working conditions for care providers (Hamilton, 2003; Hamilton and Watkins, 2008), EBD needs to develop theoretical frameworks that reflect the complexity of the ecological system that constitutes the “hospital.” For the evidence to make a difference in practice, key stakeholders must be actively engaged in interpreting and applying it to specific projects.

The concept of “Integrated Healthscape Strategies” (IHS) is proposed as term that encompasses the broader ecological context in which results are generated, interpreted, and applied. Like the term “landscape,” the term “healthscape” recognizes and embraces a consideration of how multi-faceted aspects of a system including physical, social, and technological factors work together to create an overall outcome and experience. It is about pattern not individual elements within a system. HIS recognize that 1) EBD research serves several complimentary but distinct research
purposes, and different methods and research designs are appropriate to each; 2) that theoretical frameworks that are used to structure the research and design process should explicitly reflect the complexity of the systems being examined; 3) that whatever the nature of the evidence brought to bear in planning and designing hospitals, it needs to be subjected to a negotiated process of interpretation and application involving the key stakeholders in planning, designing, administrating, and using the hospital.
REFERENCES

Becker, F., Bonaiuto, M., Bilotta, E., and M. Bonnes (in press). Integrated healthscape strategies: An ecological approach to evidence-Based design. *HERD (Health Environmental Research and Design)*.


COST AND PERFORMANCE COMPARISON OF PFI AND NON-PFI HEALTHCARE INFRASTRUCTURE IN ENGLAND

G. Ive¹, A. Murray², A. Edkins³ and K. Rintala⁴

ABSTRACT

The number of operational PFI hospitals has grown considerably in recent years. Despite benchmarking exercises on the cost side being required as part of most PFI contracts, few comparative performance studies of hospitals procured via alternative methods have been produced. This is in part due to lack of appropriately granular operational data. This stifles the debate around the hypothesis that procurement method can influence operational performance. Here, one cost of cleaning variable (input) and the two widely used (output) indicators of patient environment (Patient Environment Action Team ‘Patient environment’ rating) and cleanliness (NHS National Specifications of Cleanliness scores) at site level are compared by samples defined by procurement method over 4 years. Cost of catering and its performance, as well as cost of facility maintenance (Hard FM) and Backlog maintenance are also examined. Findings suggest PFI hospitals have significantly higher performance on some performance indicators, with no significant higher costs.

KEYWORDS

cleanliness, hospitals, patient environment, PFI, procurement

INTRODUCTION

Following over 12 years of a programme of new hospital construction, the Department of Health (DoH, 2009) suggest that from schemes approved in England since May 1997, there are now over £7 billion worth of operational Private Finance Initiative (PFI) healthcare infrastructure capital in operation, with a further £3.9 billion under construction. The corresponding value operational procured under public (non-PFI) capital investment totals approximately £1.1 billion, with a further £210 million under construction. In addition, to date over 200 NHS scheme have been delivered (since 2002) through Procure 21’s £3.7 billion programme (Procure 21 website, 2010).

Comparative studies of the operational performance of these facilities in either meeting their specified outputs or desired outcomes have not been forthcoming, despite the significant implications for future public service infrastructure. The relative effectiveness of facilities management (Soft FM) and facility maintenance (Hard FM) services as inputs provided in-house, or by outsourced and PFI contractors is possibly a key factor in outputs, such as observed levels of cleanliness, and outcomes, such as hospital acquired infections. In this paper our concern is to compare costs and performance of FM services when these are either integrated with procurement

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of design and build in a DBFO (PFI) contract with where FM is procured separately from design and build.

Among the defining characteristics of PFI contracts are; their long duration, their scope (to integrate design, construction, operation and finance within one contract), their incentives (linking payment to measured availability and performance relation to output specifications), and their ring-fencing of funds intended for maintenance and management of the facility (NAO, 2003). Whilst all PFI contracts include aspects of ‘operation’, not all PFI contracts necessarily include cleaning or catering within their scope.

While there has been some insightful quantitative based comparative analysis of PFI and alternative procurement mode performance (Wang, 2008), cost analysis has been restricted by lack of data, in part due to the relatively short period for which there has been sufficient numbers of operational PFI hospitals. The National Audit Office (NAO) have produced numerous case studies of PFI projects (NAO, 2005), as well as an analysis of the comparative performance of the construction phases of PFI and conventionally procured projects (NAO, 2009a). Yet only very recently has there been any objective metric based comparison of the performance of projects within the operation phase (NAO, 2010). The need for further analysis is clear in light of the NAO’s recent calls

“there is a pressing need for better quality evaluation of private finance and other forms of procurement……Government …need particularly to ensure that they can compare the benefits and costs of different procurement routes” (NAO, 2009b, page 4),

and

“the systems are not in place to collect comparable data from similar projects using different procurement routes………together with robust evaluation of the overall whole-life costs of alternative forms of procurement” (Ibid, page 8).

There are 600 operational PFI projects within the UK (HM Treasury, 2009), all but a handful of which are facilities that became operational post 1998. There are also an unknown number of public financed facilities built or rebuilt during the last 12 years. Over 100 of the aforementioned PFI projects were commissioned by the Department of Health in England, not including other healthcare projects procured through the devolved NHS organisations in Scotland, Wales and Northern Island. This high number of PFI healthcare facilities, as well as the availability of NHS hospital cost and performance data made this sector the ideal place to start such comparative analysis.

**METHOD**

**DATA SOURCES**

The main data source for the study was the online NHS Hospital Estates and Facilities Statistics (HEFS) site level reports. The website is hosted by the NHS Information Centre. Collected through the annual Estate Return and Information Collection (ERIC) the HEFS reports provide site specific measurements of various aspects of hospitals specification and operational performance over the fiscal year. They do not provide the procurement route applied for the construction and/or operation of the site. The cost, cleanliness and backlog maintenance data was
obtained from these reports. The remaining site level patient environment and food ratings are
publically available information provided by the National Patient Safety Agency’s (NPSA) Patient Environment Action Team (PEAT) assessments. These are reported for the calendar year.

SCOPE

The scope of this paper is limited by the availability of data on the operational performance of healthcare infrastructure. Cleaning and catering together comprise a considerable part of the soft FM range of services. Given the availability of data on these FM services, albeit limited, analysis of these services forms the basis of the paper. We also so consider Hard FM expenditure and Backlog Maintenance but there remains issues with the method as detailed later.

We concentrate on outputs rather than outcomes as the casual link between input (expenditures) and outputs (scores and ratings) is clearer. Outcomes are more likely to have more influential determinants than the procurement mode of FM services. For example, hospital acquired infections are more a function of patient mix and staff cleanliness regimes, both of which are not wholly within the scope of FM provision (Wurtz, 1995).

We do not include Energy expenditure analysis as the data quality in terms of reported figures remains an issue. Furthermore, it can not be established that normalising such expenditure by gross internal floor area is appropriate, given that energy use is more likely a function of the equipment used within the facility, such as the intensity of radiology services provided on site, rather than a simple function of the size of the facility.

UNITS OF ANALYSIS

Cost of cleaning: This was produced by dividing the HEFS site level ‘Cleaning services cost’ by ‘Occupied floor area’ to make an annual per square metre cost of cleaning variable. The cost of cleaning is the cost to the NHS trust as reported by that trust in its ERIC. For outsourced cleaning services this cost refers to the contract price. Cost for in-house cleaning provision refers to material, equipment and staff costs plus certain on-costs. The cost for cleaning in PFI hospitals is the part of the unitary charged apportioned to cost of cleaning under the PFI contract. Each year’s cost of cleaning at current prices was converted to constant prices of April 2008 (using Office of National Statistic RPIX indices) to make the years comparable with each other.

Patient environment and food ratings: The patient environment rating assesses non-clinical aspects of patient surroundings and takes into account the organisation’s policy, cleanliness in various areas, infection control, general environment and conditions in access/external areas. The food rating is published by the NPSA through a similar assessment of aspects of the quality of patient food provision in hospitals. For more effective Chi squared analysis, both the patient environment and food 1 to 5 ratings were reduced to instances of either 5, 4 or 3 and below, as consistent with guidance to deal with the problem of instances of less than 5 occurrences within categories in the contingency table (refer to referenced † link for example). In the range 1 to 5, 5 represents excellent, 4 good, 3 acceptable, 2 poor and 1 unacceptable.

Cleanliness: This is a percentage score assessment against the National Specification for Cleanliness of the NHS as reported for the site in the HEFS report. The score is produced by self-
assessment by NHS employees. The assessment is a pass or fail audit of 49 elements, such as cleanliness of fixtures and fittings and equipment, in the functional areas of the hospital.

Cost per patient meal day: This a direct read off of the statistic on the HEFS site level report ‘cost of feeding one patient per day (patient meal day) (£)’. No normalisation was required for this variable. This cost data was converted in the same way as cost of cleaning data to April 2008 prices.

Cost of Hard FM: This is the HEFS site level reported ‘Building and engineering maintenance cost’ normalised by dividing by the ‘Gross Internal Site Floor Area’ (GIFA). This cost data was not converted to April 2008 prices as comparability is hindered by other underlying data quality issues.

Backlog maintenance: This is the HEFS site level reported ‘Risk adjusted backlog maintenance’ normalised by dividing by the GIFA. Backlog maintenance is the estimated cost required to bring assets up to ‘condition B’ of the NHS estates definition. The risk adjusted measure is a weighted sum of four categories of backlog, each defined by level of risk resulting there from.

**SAMPLING PROCESS**

The site level HEFS reports formed the basis of the samples. Each year’s report was filtered using the following process to produce our study sample:

**Sampling attrition example – cost of cleaning 2007/08**

- The untouched 2007/08 HEFS site level report covers 1,965 sites
- Removing all forms of aggregated site and sites where patients are not both treated and accommodated (including GP properties, Support Facilities, Treatment Centres and Non-hospitals) and sites with no data provided for site type leaves 1,052 hospitals. These include Community hospitals, General acute hospitals, Long stay hospitals, Multi-service hospitals, Short term non-acute hospitals and Specialist hospitals.
- In attempting to control for age of the facility as this may affect cost/performance we removed all sites with any part of the age asset profile dated before 1995 (as well as sites without the data to confirm they have been wholly built after 1994). This reduced the sample down to 136 hospitals.
- Finally, the 4 sites which returned a zero results for cost of cleaning or ‘No Data Provided’ were removed, leaving us with 132 hospitals to allocate to either PFI or Non-PFI procurement subsets. This was also the stage at which the patient environment and food ratings samples were procured by cross matching the 136 hospitals from the previous stage with publically available results for hospitals.

The Hard FM costs and corresponding Backlog maintenance samples were taken from hospitals built since 2000 (data for 2004/05), or since 2005 (data for 2005/06 onwards) so as to minimise any bias in favour of PFI. The reporting of asset age profile change in 2005/06. Prior to this the date assets were reported as built (or not) from 1009 to 200 and since 2000. From 2005/06 onwards, they are reported separately as 1995 to 2005 and 2005 onwards’. A higher proportion of the PFI sample has the more recent construction dates (the average age of PFI sample is somewhat lower that that of the Non-PFI sample). This aspect was not considered so important in
the other cost and performance variables as all are essentially ‘new’ hospitals and any negative
effect from the deterioration of older non-PFI facilities may well be compensated for by a longer
operational phase allowing for improvements in standards over time. The 2004/05 Hard FM cost
and Backlog maintenance samples were for sites wholly constructed since 2000. The
Corresponding 2005/06 – 2007/08 samples were from sites wholly constructed since 2005. This
did have the impact of reducing sample sizes but is a necessary step for like for like comparison.

PROCUREMENT ROUTE

In this paper, by procurement route we mean the method by which FM services are procured. This
can be as part of an integrated PFI contract, a free standing outsourced contract or by in-house
service agreement. To establish comparative samples of PFI and non-PFI facilities, a
comprehensive list of presently operational PFI hospital was compiled. This was done through
augmenting a list helpfully provided by the NHS Information Centre of hospitals they were aware
to have been procured via PFI, with sites identified from the HM Treasury PFI signed project list,
as well as PFI sites identified through iterative research.
### Table 1. Units of analysis and samples

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<th>PFI n</th>
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### ANALYSIS RESULTS AND COMMENTARY

The results of the appropriate statistical tests (independent sample t tests for cost, cleanliness scores and backlog maintenance values and chi squared tests for patient environment and food ratings) are now presented with commentary. In reporting the independent sample t tests, we
present the ‘equal variances not assumed’ t-test results if Levene’s test for equality of variance was statistically significant.

In the tables, * indicates when the significance result meets the 95% confidence level applied.

**COST OF CLEANING**

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<th>Year</th>
<th>Group</th>
<th>N</th>
<th>Mean 1</th>
<th>Std. Dev. 1</th>
<th>Std. error mean 1</th>
<th>t</th>
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<td>37.5</td>
<td>16.1</td>
<td>2.89</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007/08†</td>
<td>Non-PFI</td>
<td>95</td>
<td>40.7</td>
<td>19.3</td>
<td>1.99</td>
<td>1.45</td>
<td>96.8</td>
<td>0.15</td>
<td>4.25</td>
<td>2.93</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>37</td>
<td>36.5</td>
<td>13.0</td>
<td>2.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

†: Levene’s test of equality of variance showed statistical significance at 0.021; *equal variances not assumed test results are presented.

No statistically significant differences between the costs of cleaning by procurement mode were witnessed throughout the study period. Interestingly we see consistent inverse trends between the indexed decreasing cost of PFI (reducing £4.76) and increasing cost of Non-PFI (increasing £6.04) over the period. The marked increase in Non-PFI cost of cleaning going into 2007/08 may reflect the impact of the implementation of the ‘Deep Clean’ initiative announced in September 2007. The corresponding PFI cost would not be expected to increase as the scope of the cleaning services is defined within the contract and not so variable.
PATIENT ENVIRONMENT RATINGS

Table 3. Patient environment ratings

<table>
<thead>
<tr>
<th>Year</th>
<th>Group</th>
<th>Ratings</th>
<th>Total</th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2 sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3 or below</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>Non-PFI</td>
<td>38 (45.8%)</td>
<td>23 (27.7%)</td>
<td>22 (26.5%)</td>
<td>83 (100%)</td>
<td>5.578</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>2 (13.3%)</td>
<td>7 (27.7%)</td>
<td>6 (40%)</td>
<td>15 (100%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>40 (40.8%)</td>
<td>30 (30.6%)</td>
<td>28 (28.6%)</td>
<td>98 (100%)</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Non-PFI</td>
<td>27 (29.0%)</td>
<td>44 (47.3%)</td>
<td>22 (23.7%)</td>
<td>93 (100%)</td>
<td>7.889</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>1 (5.0%)</td>
<td>9 (45.0%)</td>
<td>10 (50.0%)</td>
<td>20 (100%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>28 (24.8%)</td>
<td>53 (46.9%)</td>
<td>32 (28.3%)</td>
<td>113 (100%)</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Non-PFI</td>
<td>31 (32.6%)</td>
<td>47 (49.5%)</td>
<td>17 (17.9%)</td>
<td>95 (100%)</td>
<td>2.452</td>
</tr>
<tr>
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<td>PFI</td>
<td>7 (24.1%)</td>
<td>13 (44.8%)</td>
<td>9 (31.0%)</td>
<td>29 (100%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>38 (30.7%)</td>
<td>60 (48.4%)</td>
<td>26 (20.1%)</td>
<td>124 (100%)</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>Non-PFI</td>
<td>22 (25.9%)</td>
<td>44 (51.8%)</td>
<td>19 (22.4%)</td>
<td>85 (100%)</td>
<td>9.460</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>1 (2.7%)</td>
<td>23 (62.2%)</td>
<td>13 (35.1%)</td>
<td>37 (100%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>23 (18.9%)</td>
<td>67 (54.9%)</td>
<td>32 (26.2%)</td>
<td>122 (100%)</td>
<td></td>
</tr>
</tbody>
</table>

Chi squared results do not compare averages of continuous variables but rather the probability that the results for each subset of discrete variables are sampled from the same distribution. Based on the observation that PFI has higher proportions of each yearly sample in the best rating ‘5’ (excellent) and lower proportions in the worst rating of ‘3 or below’ (acceptable or worse), these results are interpreted such that if the chi squared result is significant, then PFI has statistically significant better patient environments. As can be seen, there are two strong results in 2006 and 2008 with a borderline result in 2005. A large proportion of the patient environment rating is based on assessments of cleanliness. However, some aspects involve assessments of resource availability, e.g. hands scrubs and wash basins in certain areas. If these aspects were covered within the scope of the PFI contract for the facility, the financial penalty for non-provision may have resulted in the higher occurrence of resources, and in turn may account for higher patient environment ratings.
CLEANLINESS

Table 4. Cleanliness

<table>
<thead>
<tr>
<th>Year</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Std. error mean</th>
<th>t</th>
<th>df</th>
<th>Sig. 2 tailed</th>
<th>Mean diff.</th>
<th>Std. error diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004/05</td>
<td>Non-PFI</td>
<td>68</td>
<td>89.68</td>
<td>8.01</td>
<td>0.97</td>
<td>-0.68</td>
<td>77</td>
<td>0.493</td>
<td>-1.82</td>
<td>2.65</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>11</td>
<td>91.50</td>
<td>8.95</td>
<td>2.69</td>
<td>0.000</td>
<td>11</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>2005/06</td>
<td>Non-PFI</td>
<td>96</td>
<td>89.80</td>
<td>8.85</td>
<td>0.90</td>
<td>-2.17</td>
<td>47</td>
<td>0.034*</td>
<td>-3.08</td>
<td>1.41</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>19</td>
<td>92.87</td>
<td>4.73</td>
<td>1.09</td>
<td>0.000</td>
<td>19</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>2006/07</td>
<td>Non-PFI</td>
<td>11</td>
<td>89.09</td>
<td>7.95</td>
<td>0.76</td>
<td>-1.99</td>
<td>140</td>
<td>0.048*</td>
<td>-3.01</td>
<td>1.51</td>
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<td></td>
<td>PFI</td>
<td>32</td>
<td>92.10</td>
<td>5.88</td>
<td>1.03</td>
<td>0.000</td>
<td>32</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>2007/08</td>
<td>Non-PFI</td>
<td>96</td>
<td>91.31</td>
<td>6.16</td>
<td>0.63</td>
<td>-1.95</td>
<td>133</td>
<td>0.54</td>
<td>-2.16</td>
<td>1.11</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>39</td>
<td>93.48</td>
<td>5.03</td>
<td>0.80</td>
<td>0.000</td>
<td>39</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
</tbody>
</table>

† Levene’s test of equality of variance showed statistical significance at 0.027; equal variances not assumed test results are presented.

The PFI subset average is higher in each year of the study period here with 2 years where the result is statistically significant. The lack of statistical significance in 2004/05 is in part down to a lower differential, PFI’s higher standard deviation, as well as smaller sample sizes.


COST PER PATIENT MEAL DAY

Table 5. Cost of per patient meal day

<table>
<thead>
<tr>
<th>Year</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Std. error mean</th>
<th>t</th>
<th>df</th>
<th>Sig. 2 tailed</th>
<th>Mea n diff.</th>
<th>Std. error diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004/05</td>
<td>Non-PFI</td>
<td>83</td>
<td>6.87</td>
<td>5.10</td>
<td>0.56</td>
<td>0.19</td>
<td>95</td>
<td>0.84</td>
<td>0.28</td>
<td>1.14</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>14</td>
<td>6.59</td>
<td>3.19</td>
<td>0.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005/06</td>
<td>Non-PFI</td>
<td>95</td>
<td>7.12</td>
<td>3.51</td>
<td>0.36</td>
<td>-0.00</td>
<td>113</td>
<td>0.99</td>
<td>-0.01</td>
<td>0.85</td>
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<tr>
<td></td>
<td>PFI</td>
<td>20</td>
<td>7.13</td>
<td>3.19</td>
<td>0.72</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006/07</td>
<td>Non-PFI</td>
<td>96</td>
<td>6.99</td>
<td>3.59</td>
<td>0.37</td>
<td>-1.63</td>
<td>124</td>
<td>0.10</td>
<td>-1.44</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>30</td>
<td>8.43</td>
<td>5.83</td>
<td>1.06</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007/08</td>
<td>Non-PFI</td>
<td>84</td>
<td>7.96</td>
<td>3.81</td>
<td>0.42</td>
<td>1.76</td>
<td>118</td>
<td>0.08</td>
<td>1.23</td>
<td>0.69</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>36</td>
<td>6.73</td>
<td>2.57</td>
<td>0.43</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

† Levene’s test for equality of variance was close to significance within this test at 0.55, with a corresponding equal variances not assumed p value of 0.043

No statistically significant differences are witnessed within the cost per patient meal day data. Only the final two years come close to statistical significance and the procurement subsets swap direction of difference between the years, so neither PFI nor Non-PFI look to cost consistently less.
FOOD RATINGS

<table>
<thead>
<tr>
<th>Year</th>
<th>Group</th>
<th>Ratings</th>
<th>Total</th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2 sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3 or below</td>
<td>4</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>Non-PFI</td>
<td>14 (15.7%)</td>
<td>46 (51.7%)</td>
<td>29 (35.6%)</td>
<td>89 (100%)</td>
<td>1.134</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>2 (13.3%)</td>
<td>6 (40.0%)</td>
<td>7 (46.7%)</td>
<td>15 (100%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>16 (15.4%)</td>
<td>52 (50.0%)</td>
<td>36 (34.6%)</td>
<td>104 (100%)</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>Non-PFI</td>
<td>11 (11.5%)</td>
<td>59 (61.5%)</td>
<td>26 (27.1%)</td>
<td>96 (100%)</td>
<td>7.101</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>0 (0.0%)</td>
<td>9 (45.0%)</td>
<td>11 (55.0%)</td>
<td>20 (100%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>11 (9.5%)</td>
<td>68 (58.6%)</td>
<td>37 (31.9%)</td>
<td>116 (100%)</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Non-PFI</td>
<td>9 (9.5%)</td>
<td>40 (42.1%)</td>
<td>46 (48.4%)</td>
<td>95 (100%)</td>
<td>7.574</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>0 (0.0%)</td>
<td>20 (69.9%)</td>
<td>9 (31.0%)</td>
<td>29 (100%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>9 (7.3%)</td>
<td>60 (48.4%)</td>
<td>55 (44.4%)</td>
<td>124 (100%)</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>Non-PFI</td>
<td>4 (4.8%)</td>
<td>33 (39.8%)</td>
<td>46 (55.4%)</td>
<td>83 (100%)</td>
<td>2.132</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>0 (0.0%)</td>
<td>13 (36.1%)</td>
<td>23 (63.9%)</td>
<td>36 (100%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>4 (3.4%)</td>
<td>46 (38.7%)</td>
<td>69 (57.9%)</td>
<td>119 (100%)</td>
<td></td>
</tr>
</tbody>
</table>

* - notable result as the only instance where Non-PFI has a higher proportion of the Non-PFI subset sample total in the excellent rating than the corresponding PFI result.

Again, we interpret these results in a similar way to patient environments ratings. As can be observed, PFI generally witnesses a more negatively skewed distribution towards the higher ratings, the exception being 2007 where Non-PFI has a higher proportion of facilities in the ‘excellent’ band, while PFI has a much higher proportion in the mid range with none in the lowest band of ‘3 or below’ (acceptable or worse). We see statistical significance in 2006 and 2007. The 2007 result is hard to interpret; the non-PFI sample has higher proportions in both the top (5 ‘excellent’) and bottom (3 and below ‘acceptable and worse’) categories. The 2006 result has a clear interpretation that in that year PFI hospitals have better food ratings than Non-PFI hospitals.
HARD FM COSTS AND BACKLOG MAINTENANCE

Table 7. Hard FM cost (£/m²)

<table>
<thead>
<tr>
<th>Year</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Std. error mean</th>
<th>t</th>
<th>df</th>
<th>Sig. 2 tailed</th>
<th>Mean diff</th>
<th>Std. error diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004/05</td>
<td>Non-PFI</td>
<td>37</td>
<td>12.59</td>
<td>10.00</td>
<td>1.64</td>
<td>-1.25</td>
<td>15.19</td>
<td>0.231</td>
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<td>PFI</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005/06</td>
<td>Non-PFI</td>
<td>8</td>
<td>16.88</td>
<td>17.95</td>
<td>6.35</td>
<td>0.34</td>
<td>9</td>
<td>0.744</td>
<td>3.78</td>
<td>11.22</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>3</td>
<td>13.10</td>
<td>10.37</td>
<td>5.99</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2006/07</td>
<td>Non-PFI</td>
<td>13</td>
<td>10.54</td>
<td>13.56</td>
<td>3.76</td>
<td>-0.32</td>
<td>19</td>
<td>0.755</td>
<td>-1.72</td>
<td>5.44</td>
</tr>
<tr>
<td></td>
<td>PFI</td>
<td>8</td>
<td>12.26</td>
<td>9.07</td>
<td>3.21</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007/08</td>
<td>Non-PFI</td>
<td>13</td>
<td>17.17</td>
<td>19.60</td>
<td>5.44</td>
<td>-0.68</td>
<td>24</td>
<td>0.502</td>
<td>-9.45</td>
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<td>13</td>
<td>26.62</td>
<td>45.99</td>
<td>12.76</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note on samples: 2004/05 (all hospitals constructed since 2000); 2005/06 onwards (all hospitals constructed since 2005)

Levene’s test of equality of variance showed statistical significance at 0.14 for 2004/05; equal variances not assumed test results are presented

Table 8. Backlog maintenance (£/m²)

<table>
<thead>
<tr>
<th>Year</th>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Std. error mean</th>
<th>t</th>
<th>df</th>
<th>Sig. 2 tailed</th>
<th>Mean diff</th>
<th>Std. error diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004/05</td>
<td>Non-PFI</td>
<td>35</td>
<td>1.10</td>
<td>3.67</td>
<td>0.62</td>
<td>1.57</td>
<td>34.88</td>
<td>0.127</td>
<td>0.98</td>
<td>0.62</td>
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<td></td>
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</tr>
<tr>
<td>2005/06</td>
<td>Non-PFI</td>
<td>8</td>
<td>0.11</td>
<td>0.24</td>
<td>0.08</td>
<td>0.78</td>
<td>9</td>
<td>0.453</td>
<td>0.11</td>
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<td>0.00</td>
<td>0.00</td>
<td></td>
<td></td>
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<tr>
<td>2006/07</td>
<td>Non-PFI</td>
<td>13</td>
<td>0.13</td>
<td>0.46</td>
<td>0.13</td>
<td>-0.94</td>
<td>7.05</td>
<td>0.379</td>
<td>-2.08</td>
<td>2.21</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2007/08</td>
<td>Non-PFI</td>
<td>13</td>
<td>132.8</td>
<td>474.8</td>
<td>131.7</td>
<td>1.01</td>
<td>12.00</td>
<td>0.335</td>
<td>132.74</td>
<td>13.70</td>
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<td></td>
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<td>0.06</td>
<td>0.21</td>
<td>0.06</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Levene’s test of equality of variance showed statistical significance at 0.035 for 2004/05, 0.011 for 2006/07 and 0.039 for 2007/08; equal variances not assumed test results are presented
It is plausible to predict that because PFI contracts provide both opportunity (by ring-fencing of funds) and incentives not to allow build-up of backlog maintenance, one would expect to find both higher levels of Hard FM expenditure and lower levels of Backlog maintenance in PFI compared to Non-PFI hospitals. In addition, it is possible that the long duration of responsibility under PFI contracts induces investment in construction designed to reduce cost of Hard FM required to keep assets at or above ‘condition B’ by increasing designed durability (Rintala, 2004). However, the findings here on cost of Hard FM and Backlog maintenance are inconclusive as the sample sizes are restricted by the requirements to control more finely for age of the facility. The data also contains influential outliers (see Backlog maintenance, Non-PFI, 2007/08). These issues need resolving before any analysis can produce meaningful findings. The Hard FM and Backlog maintenance analyses and results here are intended to demonstrate the data availability and methods of normalisation rather than to make any meaningful comparisons. More conclusive findings may be produced by future analysis using actual year construction was completed for each hospital.

DATA QUALITY

In researching what data was publically available for comparative analysis of procurement modes, it was surprising to find the amount of potentially useful data on the HEFS reports. However, the quality of some of this data is questionable with some of the following issues:

- Instances of similar costs reported for different sites under the same trust suggesting aggregated costs over estate.
- Wrongly returned variables, with some hospitals in one year returning the Patient environment ratings when asked for their cleanliness score against the NHS National Specification for Cleaning.
- Very low values in cost of cleaning and per patient meal provision.
- Very high value extreme outliers in cost of Hard FM and Backlog maintenance.

Aside from removing the instances of hospitals which were confirmed to have returned the patient environment rating instead of cleanliness score and the aforementioned edit to the discrete PEAT ratings, no changes were made to the raw samples. Confirmation of where assumed / obvious errors originate from will be sought before such adaptations are made. As such, these initial findings should be taken with some caution as the quality of data behind them is not known to be robust. An audit of the data will take place in the coming months.

DISCUSSION

The results tend to paint a favourable picture for PFI, suggesting higher performance for no higher costs. However, to make the leap to say PFI hospitals are better because they are PFI would be fool hardy based on this data. We must keep in mind that procurement mode is one of many potential determining factors. An obvious alternative hypothesis is that procurement mode is in part determined by other facility characteristics, which themselves influence performance. For example, are PFI facilities generally larger facilities allowing for greater economies of scale and cost savings? To provide an insight into this, the HEFS cost of cleaning sample for 2007/08 is broken down by facility type and average size by type below. As can be seen, PFI hospitals represent the majority of the typically larger General acute hospitals (despite the PFI subset representing less than one third of the year’s total sample in terms of number of hospitals). PFI
hospitals also tend to have higher average gross internal floor areas (GIFA) than Non-PFI hospitals. On this basis, we can not reject the possibility that the hospital size has as much, if not more of an influence on cost and performance than procurement mode. Future research will attempt to control for this and other characteristics.

Table 9. Sample breakdown by type of facility and size – Cost of cleaning 2007/08

<table>
<thead>
<tr>
<th>Type of hospital</th>
<th>PFI</th>
<th>Non-PFI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Numbe</td>
<td>Size</td>
</tr>
<tr>
<td></td>
<td>r</td>
<td>Average GIFA (m²)</td>
</tr>
<tr>
<td>Community</td>
<td>7</td>
<td>4,696</td>
</tr>
<tr>
<td>General acute</td>
<td>8</td>
<td>51,777</td>
</tr>
<tr>
<td>Long stay</td>
<td>6</td>
<td>8,018</td>
</tr>
<tr>
<td>Multi-service</td>
<td>3</td>
<td>26,081</td>
</tr>
<tr>
<td>Short term non-acute</td>
<td>11</td>
<td>6,600</td>
</tr>
<tr>
<td>Specialist</td>
<td>2</td>
<td>8,733</td>
</tr>
<tr>
<td>TOTAL</td>
<td>37</td>
<td>17,933</td>
</tr>
</tbody>
</table>

The larger facility sizes seen within the PFI subset help explain why the sample of PFI hospitals is smaller than that of Non-PFI despite the higher levels of overall investment applied through this procurement route over the past 12 years.

CONCLUSIONS

PFI hospitals tend to have higher performance in aspects of patient environment, cleanliness and to some extent catering, at seemingly no higher costs. However, the data used to arrive at these findings remains questionable and will require at least some form of audit before we can be certain of the significance of the performance differentials.

PFI hospital’s comparative cost and performance in aspects of Hard FM remains illusive as the quality (and quantity) of the data in this area remains poor. A more sophisticated method for increasing the samples while maintaining a fair, like for like method of comparing Hard FM cost and Backlog maintenance of hospitals by procurement route needs to be developed.
FURTHER RESEARCH

Sufficient data does exist to calculate some labour productivity measures based on ‘occupied floor area (m2)’ and ‘number of cleaning staff (WTE)’, controlling for cleaning score. There is also data on what proportion of occupied floor area is occupied by patients and so the hypothesis that patient occupied area is more expensive to clean and harder to maintain to higher standards can be explored.

Future research will also look to establish a three way procurement continuum dividing provision of cleaning service into in-house, outsourced and PFI distinctions. We know the necessary questions are asked in the PEAT assessments and access to this data is being sought.

This research may in future link to other research examining the determination of clinical outcomes such as hospital acquired infections.
REFERENCES


† See link for collapsing categories method for Chi² analysis (http://hsc.uwe.ac.uk/dataanalysis/quantInfDifChi.asp)
ACHIEVING FLEXIBLE AND ADAPTABLE HEALTHCARE FACILITIES – FINDINGS FROM A SYSTEMATIC LITERATURE REVIEW

J. Carthey¹, V. Chow², Y.-M. Jung³ and S. Mills⁴

ABSTRACT

Achieving flexible and adaptable health facilities has long been the goal of health facility designers and their clients yet appears rarely achieved. Demand for healthcare continues to grow, models of care are evolving, new medical technologies are being invented, and workforce shortages and organizational changes must be accommodated. Failure to meet these challenges often leads to early obsolescence, increased lifetime operational costs and the need for expensive facility reconstruction or early replacement. This research used a systematic literature review to identify a set of international healthcare case studies that demonstrate approaches to flexible and adaptable design. The scale of the study ranged from site level through to the building envelope. A matrix classification of flexibility and adaptability measures was developed and tested in terms of the findings from the case studies. Lessons for the development of flexible and adaptable hospitals plus areas of future research are proposed.

KEYWORDS

adaptability, flexibility, healthcare facilities, hospitals, literature review

BACKGROUND

Healthcare facilities must respond over their life cycles to changing demands imposed by shifting demographics, the availability and cost of increasingly sophisticated technologies, workforce capacity and capability issues, and ever more pressured public and private sector health budgets. The challenge to design flexible and adaptable healthcare facilities has been widely embraced by healthcare designers and their clients, and consequently this outcome is claimed for many projects.

However, there are still too many examples of healthcare facilities becoming obsolescent before their time and this is of major concern to Health Infrastructure NSW. New South Wales (NSW), the most populous of the Australian States, spends approximately AUD$600 million annually on building health service capital works (NSW Government, 2009), often replacing or upgrading existing hospitals that are no longer fit for purpose well before the end of the life of the buildings within which they deliver care. As one strategy to address this recurring problem, Health

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Infrastructure NSW commissioned this research to develop guiding principles for the cost-effective design and delivery of flexible and adaptable ‘future proof’ health buildings with a targeted useful life of at least 20 to 30 years, and ideally even longer.

INTRODUCTION

Drawing on extensive investigation by others of flexibility and adaptability in recently built hospital projects from around the world this research was intended to develop useful, cost-effective lessons that could be applied to the design and construction of contemporary Australian health facilities. It commenced as a systematic literature search which sought information and relevant case studies, especially international projects, that could be analysed and extrapolated to provide practical, design-related strategies that would future proof Australian health facilities for at least the next 20 to 30 years. A report on the research was completed for Health Infrastructure NSW. This discussed the findings and case studies, and developed a framework for classifying strategies for flexibility and adaptability.

First, the concepts of ‘flexibility’ and ‘adaptability’ were analysed, refined and defined. Terms such as flexibility and adaptability are used often loosely and interchangeably, causing a general vagueness and loss to their meaning (Worthington, 2008). For many projects such claims have neither been evaluated nor proved over time - quite often because insufficient time has elapsed since the project was built, commissioned and occupied. This research aims to initiate further discussion of issues such as these in order to develop a clearer focus to the creation and ongoing evaluation of health facilities that are better ‘future proofed’ than many of those designed today both within Australian and international settings.

FLEXIBILITY AND ADAPTABILITY OF HOSPITALS – A BRIEF OVERVIEW

Flexibility and adaptability are neither new concepts nor particularly original as measures of hospital building performance. In 1924 the US Goldwater Report of the Committee of Hospital Planning included the need for flexibility in its principles for hospital planning. This was intended to mean far more than facilitating simple, unanticipated alterations but rather the potential of a hospital building to adapt to a total change of function. Edward F. Stevens, the architect reporting to the committee, imagined ‘a plan so flexible that the medical department of today may be the surgical department of tomorrow’ as quoted by Adams (2008, p. 121). Indeed, most healthcare clients often express very similar requirements today.

At the end of the 20th Century, Verderber and Fine (2000) explored the concept of flexibility in planning hospitals in some detail while discussing the history of hospital development particularly from 1960 onwards. During this period, hospitals were forced to evolve to meet ever shifting needs including the rapidly changing needs of clinicians, patients and communities, different funding models, and especially the inexorable increases in the quality, cost and demand for sophisticated medical technologies – not so different to today. The solutions proposed ranged from prefabrication and modularization of hospitals through to interstitialism and then on to the final utopia of the infinitely renewable hospital. In discussing the concept of ‘interstitialism’ and other planning movements they make the point that “[b]ecause of the rapid changes in the medical field, the machine hospital, for all its architectural predictability, had become the most complex
and unpredictable of building types. The logical response to the dilemma was to create “infinitely” flexible space.’ (p. 118)

Bobrow and Thomas further reinforce this theme noting that ‘[b]ecause change is a constant force in design, today’s designs must acknowledge that what is built for today is not permanent and will at some point become a candidate for reuse, retrofit or removal’ (Bobrow & Thomas, 2000, p. 191). Finally, and from a European and British perspective, reflecting one of the major preoccupations of the early 21st Century, Glanville and Nedin consider flexibility requirements in terms of the responsibility being increasingly imposed on contemporary hospital developments to be (environmentally) ‘sustainable’. They believe that ‘For a sustainable approach, this flexibility is essential if we are to address the changing needs of providing healthcare, and to reduce the need for additional construction’ (Glanville & Nedin, 2009, p. 236).

METHODOLOGY

The research was conducted by means of a systematic literature review with the aim of discovering relevant literature that would enable evaluation of different approaches to the design of flexible and adaptable health facilities with particular reference to international exemplar case studies. The overall objective of the research was to consider ‘practical built form implications of implementing strategies aiding flexibility and adaptability…(and thus it was) generally limited to discussing flexible strategies that have an applicable design outcome.’ (Carthey, 2009b, p. 1)

The systematic review approach was chosen because it could assist the study to ‘find and evaluate the best available research on a specific question’ (Campbell Collaboration, 2009). The systematic review method is a scientific investigation with pre-planned methods. It uses strategies that include a comprehensive search of all potentially relevant articles and the use of explicit, reproducible criteria in the selection of articles for review (Cook, Mulrow, & Haynes, 1997). Systematic reviews enable efficient management of information, provide data for rational decision-making, ensure consistency and generalisation of the findings, and improve the reliability and accuracy of conclusions (Mulrow, 1994).

The initial research question was framed as:

*How can we design health facilities for flexibility and adaptability? Can we discover cost effective ways to do this, drawing on examples from a mainly international perspective from health systems similar to the Australian system (and NSW in particular)?*

A search frame was developed in conjunction with further refinement of the research question in order to ensure relevant and meaningful outcomes. Protocols for systematic review in healthcare research sometimes suggest four basic components (Counsell, 1997) whilst others recommend a five part strategy comprising of 1) problem, 2) intervention, 3) outcome, 4) comparison, and 5) target population (Bridge & Phibbs, 2003). As it was not concerned with specific clinical interventions to a patient population, this research adopted a simpler three part strategy or protocol covering 1) environment, 2) intervention, and 3) outcome (Carthey, 2009b).

A list of keywords and relevant synonyms were developed from preliminary study and trial searches through electronic databases. A comprehensive list of resources was then searched using these keywords and terms. First, a range of electronic databases was searched (including
MEDLINE, ICONDA Avery Index to Architectural Periodicals, RIBA Library, Scopus, Web of Science, and others) for scholarly literature including books, covering the topics areas of architecture, engineering, health, business and science disciplines. Next, web-based searches using Google and Google Scholar were conducted to gather a broader range of literature including ‘gray literature’ and technical reports from various sources.

Although a large amount of literature was found from these sources, it was recognised that potentially relevant articles in non-indexed journals, conference proceedings etc, may have been overlooked. So manual searching of journals, trade magazines, conference proceedings, books, reference lists from similar projects and studies held by the research centre library and associated research bodies was undertaken. Finally, unstructured conversations on the topic of investigation were initiated with Australian and international research and professional colleagues by telephone and email.

Criteria were then used to ensure that the results were relevant, leading to a number of articles being excluded for the following reasons:

- Focus not on healthcare assets;
- Discussions without design implications;
- Editorial or advertorial pamphlets, such as trade magazines;
- Written in a language other than English;
- Published pre 1990; and
- Study focus on countries with dissimilar practice or very different cultures to Australia, such as Eastern Europe, Asia or the Middle East.

During the process of review, further filters were developed and applied including the location of the research, and its focus. The filters applied were:

- nationality (origin of paper)
- facility type (primary care, ambulatory care or otherwise)
- project stage (funding/tendering, masterplanning, building design, construction, facilities management)
- context (model of care, ICT, patient safety, affordability / cost, policy, sustainability/ESD)
- research method (literature review, RCT, quasi-experimental, case, expert opinion, anecdotal).

A matrix spreadsheet was then developed using the selection criteria and filters to summarise and assess the literature objectively and methodically. An annotated bibliography was also produced (Carthey, 2009a).

RESULTS

OUTCOME OF LITERATURE SEARCH

The systematic review found 49 articles from 357 potentially relevant publications. Almost half (48%) of the publications included were based on healthcare facilities located in the USA or resulted from research conducted in that country, followed by the UK (18%) and Norway (7%).
From the articles reviewed, 19 distinct case studies were then noted as being significant in their use of flexibility principles and were further analysed (Carthey, 2009b).

**DEFINITION OF FLEXIBILITY AND RELATED TERMS**

Review of the relevant literature resulted in the discovery of varied, and sometimes conflicting, definitions of ‘flexibility’ and associated terms used to describe it such as ‘adaptability’, ‘elasticity’, ‘convertibility’, ‘generability’ and ‘expandability’. Barlow et al (2009, p. 11) define ‘adaptability’ as ‘the facility to accommodate changes of use or function, which result in the need to alter the building and its services physically or organisationally’. Worthington (2008) and Bjørberg (2009) define ‘flexibility’ as a subset or dimension of ‘adaptability’, whereas Pati et al (2008) identify ‘adaptability’, ‘convertibility’ and ‘expandability’ as one or more subsets of ‘flexibility’.

Westlake Jr (1995) used the term ‘flexibility’ in an acronym i.e. SAFE – ‘strategy’, ‘assessment’, ‘flexibility’ and ‘efficiency’. In this ‘strategy’ relates to architectural masterplanning, ‘assessment’ to the programming phase of architectural design, ‘flexibility’ to ongoing qualitative assessment and ‘efficiency’ to quantitative analysis.

**‘FLEXIBILITY AND ADAPTABILITY’ AND HEALTHCARE PROJECTS**

It quickly becomes clear that ‘flexibility and adaptability’ as an abstract, sometimes intangible, concept tends to elude succinct definition, and instead may be more meaningful when considered in terms of the results of its application to the design of actual, rather than theoretical, projects. From this perspective, designing for ‘flexibility and adaptability’ can be defined as the provision of options for the future use of healthcare buildings, without the obligation to necessarily exercise those options (Neufville, Lee, & Scholtes, 2008). Ultimately, the nature of the designed-in options can only be evaluated in terms of their practical, demonstrable implications if, or when, they are applied usually some years after the initial commissioning of a healthcare facility.

**GOALS AND OUTCOMES ASSOCIATED WITH DESIGNING FOR FLEXIBILITY AND ADAPTABILITY**

Expanding on the definition above, to design for ‘flexibility and adaptability’ is to plan and implement an organised system whereby a health facility can fulfil its long term potential by being able to respond to the necessity of future changes of purpose or use. Clearly, there is a range of scales at which such a system could apply to the design of a facility i.e. from detailed facility design (micro level) to site masterplanning (macro level). There is also a range of physical and organisational project implications expressed in terms of managerial, functional or building system-related issues across the micro-macro scales. The scale and the type(s) of issue addressed can be summarised by a matrix of potential practical goals and outcomes for flexible healthcare facility design and this is illustrated below.
Table 1. Definitions of flexibility and associated concepts

<table>
<thead>
<tr>
<th>Focus</th>
<th>Managerial considerations</th>
<th>Functional requirement</th>
<th>Building system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro</td>
<td>Operational: Easy to reconfigure, low impact on time and cost (e.g. furniture and interior spaces)</td>
<td>Adaptability: Ability to adapt existing space to operational changes e.g. workplace practices</td>
<td>Tertiary: 5-10 years lifespan, no structural implications e.g. furniture</td>
</tr>
<tr>
<td></td>
<td>Tactical: Involves commitment of capital expenditure; changes not easy to undo (e.g. design of operating theatres, provision of interstitial floors)</td>
<td>Convertibility: Ability to convert rooms to different functions</td>
<td>Secondary: 15-50 years lifespan, e.g. walls and ceilings, building services capacity</td>
</tr>
<tr>
<td>Strategic</td>
<td>Substantial increase in the lifetime of the infrastructure (e.g. long term expansion plans, future conversion to other functions)</td>
<td>Expandability: Ability to expand (or contract) the building envelope and increase/decrease capacity for specific hospital functions</td>
<td>Primary: 50-100 years lifespan, e.g. building shell</td>
</tr>
<tr>
<td>Macro</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source</td>
<td>(Neufville, Lee, &amp; Scholtes, 2008)</td>
<td>(Pati, et al., 2008)</td>
<td>(Kendall, 2005b)</td>
</tr>
</tbody>
</table>

OVERVIEW OF LITERATURE REVIEW FINDINGS

The literature review identified a high level of consensus that the rate of obsolescence of healthcare facilities is rapidly increasing. For example, Datta (2000) noted that the main drivers for change are the rapid rate of information and knowledge development so that a space that might have served a hundred years in the 18th century would now require renovations after a mere 5 years of use.

Avoiding the early obsolescence of healthcare facilities by allowing them to evolve over time as needed is by no means a contemporary idea, although the methods proposed for achieving this have changed over the past decades. For example, in the mid 20th Century, Llewellyn-Davis (1966, p. 1678) advocated “looser planning and horizontal contiguity” to combat the monolithic structures that by 1966 characterised primary care facilities. Completed in 1972 by Craig, Zeidler & Strong Architects, the McMaster Health Sciences Centre in Canada was one of the pioneers of the separation of a hospital into “permanent” and “non-permanent” elements able to operate independently from each other. Excess capacity was also designed into this facility, perhaps unfortunately, resulting in a giant, intimidating structure criticized for its “uniform, regimented appearance” according to Verderber and Fine (2000, p. 120). Weeks (1985) proposed the “nucleus system” for hospital planning that would echo the planning of an urban village in being able to facilitate future growth and changing use of various components.
More recently, and in response to contemporary approaches to hospital procurement in the UK, opinions were expressed that current UK Private Finance Initiative (PFI) structures are “not conducive to good design” nor do they allow for future proofing of facilities. This is because the rigid contract, attempting to mitigate risks for both parties, does not allow for changes in design at later stages (RIBA, 2005). Other authors (Barlow, et al., 2009; Lee, 2007; Neufville, et al., 2008) discuss procurement strategies for UK PFI projects in terms of the need to improve contractual and financial flexibility with a view to maximising the useful life of UK hospitals built using these strategies.

Finally, the literature review also identified discussions regarding scenario planning (Pressler, 2006), broadening cost planning to consider lifecycle analysis (Bjørberg & Verweij, 2009; Sadler, Hamilton, Parker, & Berry, 2006) and approaches to the categorisation of different components of the building in terms of functional service life periods (SLP) that could improve long term flexibility (Bjørberg & Verweij, 2009; Lee, 2007; Nitch, 2006; Rechel, Wright, Edwards, Dowdeswell, & McKee, 2009a, 2009b; Thiadens, Kriek, Afink, Burger, & Oosterom, 2009). This last approach reflects the strategies pursued in the development of the McMaster Health Sciences Campus as far back as 1972.

In terms of design solutions, there appeared to be two main approaches adopted. The first is epitomised by the term “modularity”. For example, a suitably sized uniform building grid is applied in conjunction with a core distribution system for various building services that allows subdivision and reconfiguration in response to emerging and changing purpose and needs. This results initially in spaces that are “fit for purpose” for one or more specific functions whilst also allowing these to morph through movement of walls, building expansion, etc, but with minimal overall structural impact, to suit different activities and service conditions in the future (Diamond, 2006). This can be combined with the functional service life approach advocated by the authors above and operational approaches such as acuity adaptable or universal rooms.

The second approach is the provision of an almost infinitely flexible and adaptable building from the beginning as in the “airport hanger” or warehouse approach advocated by Lawrence Nield (2008). This approach provides a stage on which a very varied range of activities can be conducted with minimal change to the building fabric as a result of changing use or emphasis. However this implies a constant need for the spatial area provided - it may be difficult to anticipate and incorporate requirements for additional capacity or space requirements without physically extending or adding to the building. Similarly it may be difficult to contract to meet less demand or to co-locate alternative uses within the overall fabric of the building.

CASE STUDIES

The 19 case studies chosen illustrate specific arguments or strategies for flexibility or adaptability used by designers across the world. The case studies chosen for review are listed in the following table with the primary strategies for achieving flexibility and adaptability shown and then classified in the right hand column with reference to the matrix above. For many of the cases more than one strategy would be identifiable hence the inclusion of major and minor strategies which may also cover both intent and building system implications.
Table 2. Case studies selected / flexibility strategies adopted

<table>
<thead>
<tr>
<th>No</th>
<th>Hospital / Facility</th>
<th>Strategies adopted for flexibility / adaptability</th>
<th>Year Complet-ed</th>
<th>Location</th>
<th>Classification of Strategy(ies) adopted</th>
<th>Major (/ minor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Addenbrooke’s Hospital, Cambridge (Neufville, et al., 2008)</td>
<td>The old hospital (1,100 beds) was relocated to cope with expanding functions</td>
<td>1984</td>
<td>UK</td>
<td>Expandability</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(strategic /primary)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Banner Estrella Medical Center, Phoenix (Eagle, 2006)</td>
<td>Designed to facilitate future expansion by adding two new towers in the future to cope with increased demand. (DPR Constructions, 2010)</td>
<td>2005</td>
<td>USA</td>
<td>Expandability</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(strategic /primary)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Celebration Health, Orlando (Gallant &amp; Lanning, 2001)</td>
<td>Universal room design - reduction in average lengths of stay and nursing hours per patient day.</td>
<td>Not specified</td>
<td>USA</td>
<td>Adaptability</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(operational / tertiary)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Clarian West Medical Center, Avon, Indianapolis (Eagle, 2007)</td>
<td>Universal patient rooms - size of the room and configuration can serve all the purposes from medical-surgical to labour / delivery to intensive care.</td>
<td>2004</td>
<td>USA</td>
<td>Adaptability</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(operational / tertiary)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Clinica Las Condes Medical Centre, Santiago (Pressler, 2006)</td>
<td>Standardised spaces, same-handed rooms, pod design, and shell spaces.</td>
<td>1982; renovat-ed - 2000s</td>
<td>Chile</td>
<td>Adaptability / convertibility</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(strategic)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Insel Hospital, Bern (Geiser, 2004; Kendall, 2005)</td>
<td>First medical facility in the world where ‘open building’ management principles were applied to the design of a large medical complex.</td>
<td>2009 (stage 2)</td>
<td>Switzerland</td>
<td>Convertibility</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(tactical / secondary)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>John H. Stroger Jr. Hospital, Chicago, (Doiel &amp; Loharikar, 2003)</td>
<td>First 5 floors in repeating pattern; modular design - modules connect at the intersection of a horizontal / vertical core; outpatient clinical clustering.</td>
<td>2002</td>
<td>USA</td>
<td>Convertibility</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(tactical / secondary)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Loma Linda University Hospital, California (Gallant &amp; Lanning, 2001)</td>
<td></td>
<td>Not specified</td>
<td>USA</td>
<td>Operational</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Adaptability</td>
<td></td>
</tr>
<tr>
<td>Patients stay within the boundaries of the cardio-vascular unit moving from ICU bed to acute care bed as they recover with same caregiver staff.</td>
<td>/tertiary</td>
<td>2007</td>
<td>Netherlands</td>
<td>Strategic (expandability / primary)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Martini Teaching Hospital, Groningen (Thiadens, et al., 2009)</td>
<td>Site masterplan – ‘empty chair’ model – as one part of site developed, a vacant area is left for the next project. Buildings designed for change of future use e.g. inpatient unit to offices to apartments / offices.</td>
<td>2007</td>
<td>Netherlands</td>
<td>Strategic (expandability / primary)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>McMaster Health Sciences Centre, Ontario (The American Institute of Architects, 2005)</td>
<td>Designed for maximum flexibility, including vertical and horizontal expansion; interstitial floors</td>
<td>1972 – latest refurb in 2002</td>
<td>Canada</td>
<td>Convertibility (tactical / secondary)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MedCath, Various (Gallant &amp; Lanning, 2001)</td>
<td>Universal room design</td>
<td>Not specified</td>
<td>USA</td>
<td>Adaptability (operational / tertiary)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methodist Hospital, Arcadia, California (Pressler, 2006)</td>
<td>Flexible staffing model floor plan incorporating satellite nursing stations to pods of single beds</td>
<td>Not specified</td>
<td>USA</td>
<td>Adaptability (operational / tertiary)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methodist Hospital, Indianapolis, Indiana (Gallant &amp; Lanning, 2001; Sadler, et al., 2006)</td>
<td>Acuity adaptable 56-bed cardiac critical care unit</td>
<td>1999</td>
<td>USA</td>
<td>Adaptability (operational / tertiary)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northwestern Memorial Hospital, Chicago (Briggs &amp; Barnard, 2000; Olson, 2008)</td>
<td>Adaptable building infrastructure, modular planning and functional adaptability, for patient safety and sustainability.</td>
<td>1999</td>
<td>USA</td>
<td>Convertibility (tactical / secondary)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Royal Victoria Infirmary, Newcastle-upon-Tyne, UK (Lee, 2007)</td>
<td>PFI project incorporating flexible design to address future needs</td>
<td>1996</td>
<td>UK</td>
<td>Strategic (expandability / primary)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>St Joseph’s Community Hospital, West Bend, Wisconsin (Reiling, et al., 2004)</td>
<td>Designed for patient safety – standardised room design</td>
<td>2005</td>
<td>USA</td>
<td>Adaptability (operational / tertiary)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>St Olav’s Hospital &amp; Trondheim University Hospital, Trondheim (Jenso &amp; Haugen, 2005; Rechel, et al., 2009a;</td>
<td></td>
<td>2014</td>
<td>Norway</td>
<td>Strategic (expandability / primary)</td>
<td></td>
<td></td>
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</table>
Concentration of functions on same levels of interconnected buildings e.g. clinics, ‘hot floors’. ‘Hot Spots’ such as operational theatres and intensive care units are as much as possible surrounded by ‘Soft Spaces such as waiting areas, administration and ancillary spaces. (Bjørberg & Verweij, 2009)

18  St Vincent’s Hospital, Darlinghurst, NSW (Farrelly, 2002)
    Developed for ‘growth and change’ – open-ended corridors to allow buildings to expand in one or more directions; interstitial floors.
    Late 1990s  Australia  Expandability
    (strategic / primary)

19  The Ohio State University Richard M. Ross Heart Hospital, Columbus, Ohio, (Bush, Reisman, Anstine, Gallaher, & Davis, 2005)
    Acuity adaptable rooms to minimise need for patient transfers.
    (Brown & Gallant, 2006)
    2004  USA  Adaptability
    (operational / tertiary)

DISCUSSION

This study identified and classified various practical design-related strategies to improve the flexibility and adaptability of healthcare buildings over their whole useful lifespan. Review of the table suggests that for the selected case studies (8 out of 19) the main driver for the strategy adopted was adaptability i.e. the ability to adapt existing space to operational changes e.g. workplace practices. This is reflected by the preponderance of case studies focused on the use of acuity adaptable or universal rooms. Convertibility and expandability were the next most common strategies (5 and 4 respectively). It would certainly be useful to test this in the future on a larger sample and compare the results.

An issue raised by review of the literature and case studies was the relevance of some of the lessons learnt for buildings in different health systems and countries. Another issue not yet addressed is how best to evaluate the performance of healthcare facilities claimed to have been designed for flexibility and adaptability. It may also be worthwhile to extend the study to older, still operational healthcare facilities in Australia (and perhaps other countries) for further valuable lessons.

Hospitals designed in different health systems and countries must respond to the needs of those systems, local culture and consumer attitudes towards healthcare provision, and at a very practical level to prevailing construction practices, building codes, standards, guidelines and legal requirements. One example of this is the impact of building codes on structural grids and hence, on the size of building modules. Another is the example of French hospitals where the requirements for access to daylight in all rooms where people work, has an effect on the layout and dimensions of buildings including size of courtyards (Building Design Partnership, 2004).
Pressler (2006, p. 53) noted that a “good design should provide an adequate amount of flexibility, but no more than that”. Providing an excessive level of future adaptability may be a waste of current resources without a justified return on investment (Latimer, 2008). Latimer suggests a building is over designed, when accommodating flexible design, if it uses unnecessary area, money, time and resources. Blanken (2008) developed a framework for measuring hospitals in terms of “value for money” which included the ability of the hospital to adapt to different scenarios. Both these authors highlight the importance of using quantitative criteria to measure the success of design innovations intended to achieve flexibility and adaptability – these could be extended to include analysis of how much flexibility should be provided and how to know when the correct amount has been achieved. Perhaps the simplest and most persuasive method for many clients is fiscal analysis that compares various indicators of efficiency between similar, yet differently designed projects, or for the same project, comparison of before and after scenarios related to project implementation. A further approach could be to use other data such as patient satisfaction ratings to draw conclusions regarding the impact of various design strategies. However, there was generally insufficient data available from the case studies to assess them in terms of such criteria.

**CONCLUSION**

As the search frame for the study was limited to literature from the period 1989 to 2009, it is difficult to foresee how many of the case study hospitals will actually perform in the next few decades. Evaluation of hospitals typically reveals valuable data only after a period of operation and so the search frame may have been too limited. Many of the case studies were recently completed and some of them, for example the St Olav’s Hospital in Trondheim, Norway, are yet to be completed. Looking further into the past than the last ten to twenty years may be worthy of greater consideration. This could allow an understanding of historical trends and approaches to flexible and adaptable design, especially those resulting from projects completed during the 1960’s and 70’s when design flexibility appears to have been explored more extensively. Noting that flexibility is only valuable if it is exercised effectively, “when the time is right”, and efficiently, “at acceptable cost and disruption” (Neufville, et al., 2008), much can be learnt from older hospitals in order to see how these have coped with change over their life spans. It is therefore suggested that any further research should widen the search frame to include earlier articles and research on the subject.

In terms of the relevance of the research to Australian hospitals, further investigation of Australian hospitals should also be considered given the impact of local regulations and other factors on projects in all countries and health systems. At the same time, research into the best method(s) for measuring the outcomes of designing hospitals for flexibility is also required. These methods should include but also move beyond the more usual explorations of initial capital cost and occasional considerations of patient safety and staff turnover (possibly) attributable to facility design.

To consider these issues, a second phase of this research is now being planned that will investigate case studies of four NSW hospitals completed between 1978 and 1999 in terms of how well they have been able to change and adapt to new imperatives over the period of their existence. In particular, Westmead Hospital, completed in 1978, was specifically designed to be flexible and expandable and was a copy of the Harness model from the United Kingdom
translated to the Australian setting. This hospital is still in operation today after several refurbishments and upgrades and the study will investigate the extent to which the initial design has assisted or hindered this process.

Finally it is recommended that agreement of standardised terminology and definitions of the concepts of ‘flexibility’ and ‘adaptability’ is needed to assist in creating a more unified body of knowledge for discussion and dissemination between academics, clients and design practitioners.

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REFERENCES


DEVELOPING AND IMPLEMENTING STRATEGY FOR BENEFITS REALISATION

J. A. Rooke¹, K. Hamblett², S. Sapountzis³, M. Kagioglou⁴ and J. B. Lima⁵

ABSTRACT

The failure of initiatives to adequately plan and deliver benefits is a perceived problem in the healthcare sector. Problems of strategy formation and successful innovation are widely discussed in the literature. The concept of benefits realisation offers a possible key to better planning, but before this can be achieved strategic innovation is necessary to integrate the benefits realisation process itself into the corporate planning process.

How can successful strategic innovation be introduced into NHS trusts?

A prescriptive model of strategy has been developed, employing a phenomenological analysis which draws on: [1] one of the authors' twelve years experience of working in strategy formation and implementation; [2] the results of three years action research, developing the BeReal benefits realisation model. The strategy model is evaluated in the light of existing literature on organizational strategy and planning. It is intended that the model will be subsequently tested in an action research case study.

Much of the literature stresses the emergent nature of strategy and the consequent difficulties that this presents for the development of formal planning models. The model seeks to integrate planning and implementation into an orderly learning process in which broad policy objectives are increasingly refined in the light of stakeholder and corporate needs. Three integrated planning 'levels' are identified: strategic; portfolio and project. Essential inputs are identified in each level, including: regulatory direction, community consultation and corporate planning; organizational capability, knowledge realisation and resource capacity; programme alignment, stakeholder alignment and structured project benefits.

The model identifies essential inputs to the planning process which, if not properly managed, can result in organizational disruption or stakeholder dissatisfaction. It offers a structured procedure for integrating these. Finally, it demonstrates how the notion of benefits realisation and the BeReal process itself, fit into a coherent strategy development and implementation process.

KEYWORDS

emergent strategy, benefits realisation, stakeholder management, organizational learning, unique adequacy

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INTRODUCTION

The failure of initiatives to adequately plan and deliver benefits is a perceived problem in the healthcare sector. Meanwhile, the Office of Government Commerce recognises that a benefits realisation plan “should be one of the main foundations” for planning transformational organisational change (OGC 2007:62). Arguably, then, the door is wide open for the introduction of advances in benefits management, such as the BeReal programme (Sapountzis, Yates, Kagioglou & Aouad 2009) to the NHS. The concept of benefits realisation offers a possible key to better planning, but before this can achieved strategic innovation is necessary to integrate the benefits realisation process itself into the corporate planning process. A model of strategy formation is proposed here, in order to facilitate that process.

The Problems of strategy formation and successful innovation are widely discussed in the literature. A key innovation has been the recognition of the informal features of organization and their corollary, the formation of strategy through emergence. The proposed model integrates these concerns.

The development of practitioner oriented models by academics is sometimes considered problematic. The model is based on a phenomenological approach which posits the understanding of managers' concerns and as the key criterion for academic management research. In this way, a resolution is suggested to the rigour/relevance debate.

The model is outlined below and its epistemological status suggested.

THE PROBLEM OF STRATEGY AND ORGANIZATIONAL CHANGE

Strategy has been defined as:

“the pattern or plan that integrates an organization's major goals, policies and action sequences into a cohesive whole” (Quinn 1998:5)

Robertson (2003) points out that early models of strategy treat the environment in which strategy is formed as an unchanging given. This approach, typified by a linear progression from SWOT analysis, though goals and means ends analysis to implementation and performance measurement, is perhaps best formulated by Porter (1980) and is still evident in Daft (1998). Strategy in this conception can be seen as a manifestation of the 'planning model' (Suchman 2007). The idea is simple, strategy makers formulate strategy and then implement it.

Bittner (1973/1965) was perhaps the first to point out that this kind of approach to the understanding of organisations depends upon a naive view of the relationship between formal organisational plans and the day to day reality of organizational life. Mintzberg (1979) offered an alternative conception, presenting strategy as 'a pattern in a stream of decisions', in which leaders mediate between environmental pressures and the organizations own bureaucratic momentum. From this perspective, different modes of strategy formation can be seen to exist on a continuum running from deliberate to emergent; the former embodying advanced planning, the latter, strategic learning. Mintzberg & Waters (1985) suggest that effective strategy makers combine both deliberate and emergent approaches in the light of prevailing environmental and organizational conditions.
A corollary of this more sophisticated approach is that strategy is a process of organizational change, involving considerations of culture and politics. Furthermore, as a consequence of the complex interactions that constitute cultural and political change in organizations, it may be considered as a learning process for all involved, whether they are primarily concerned with formulating or implementing strategy.

Strategic management theory and research has tended to confirm Mintzberg's original insight. White (2004) asserts that is is “impossible to deal with formulation and implementation of strategy as different and distinct stages in strategy making” (589) and advocates a balance between command and control on the one hand and communication and creative conflict on the other. In practice, Lowe & Jones (2004) found strategy in a case study organization to be best characterised as a process involving: different perspectives and disagreements; uncertainty and lack of knowledge; and emergent understanding. Whereas de Waal (2007) outlines a process for the more or less inflexible implementation of a detailed plan, this is accompanied by the proviso that both external stability and internal acceptance of the need for change are necessary prerequisites.

Notwithstanding these developments, the literature retains a strong emphasis on the design of strategy (Mintzberg 1998). Indeed, Warren (2008) gives little attention to the implementation dimension. Our intention in this paper is to outline an interactive strategy process which incorporates both design and implementation.

**ELEMENTS OF STRATEGY PROCESS IN THE NHS**

The strategy process in the NHS arguably differs from that usually described in the literature, which tends to emphasise competition. Notwithstanding attempts to introduce market mechanisms into the NHS, there may be little in the way of competition at the present time. Nonetheless, the common elements of commercial strategic thinking, including cost reduction, risk management, customer satisfaction, resource management and orientation to the organization's environment are clearly relevant to NHS organizations.

The established NHS process for managing organizational change is governed by the Managing Successful Programmes (MSP) guidelines and the Projects in Controlled Environments (PRINCE2) management system, which are standards for UK Government initiatives (OGC 2006). PRINCE2 emphasises the development of a sound business case for proposals and specifies a stage gate process for delivery (OGC 2005). While comparatively little recognition is given in PRINCE2 to the problems of strategy formation or organizational change, emergent strategy is arguably managed in this system as a problem of change control. Benefits management and a more explicit recognition of emergent strategy are introduced in MSP which provides a high level outline of the benefits realisation process (OGC 2007). In line with OGC guidance, the NHS strategy process is governed by the Integrated Service Improvement Programme (ISIP) which emphasises benefits led change in collaboration with other agencies and stakeholders. However, emergent strategy is currently only explicitly recognised at the programme level.
THE DEVELOPMENT OF THE STRATEGY MODEL

The SIDER model was developed in order to overcome a practical problem that became apparent in the course of the research. The BeReal model is intended to provide detailed guidance for the implementation of effective benefits realisation processes, including elicitation, management and evaluation. While considerable progress had been made in developing the BeReal process, the question arose as to how the process could best be introduced to new organizations.

Academic research is primarily directed towards the production of 'knowledge that', while management practice involves the employment of 'knowledge how' (Ryle 1963). Thus, academic models often assume the point of view of an objective independent observer of the organization and are evaluated as such. In contrast, models used by managers are valued for their practical utility within the organization. The danger of overlooking this key difference and assuming that management models and documents can be presented as objective representations of the organization has long been known (Bittner 1973). There has been a sustained critique of the notion of objectivity as it relates to representations of organization and an ongoing discussion of the consequential epistemological status of such representations (for example, Schutz 1972, Giddens 1984; Suchman 2007).

While there would be little question from any methodological perspective as to the dangers of treating managers' models as objective representations, a lively debate has ensued about how, or indeed if, academic models can be used by managers. Commonly referred to as the rigour relevance debate, it arises out of fears, on the one hand, that academic research is marginal to the production of management knowledge (Fincham & Clark 2009) and on the other, that attention to practitioners' problems can only undermine attempts to study organisations in a scientific manner (Kieser & Leiner 2009). While strong arguments are put forward for a science of production (Simon 1996; Hodgkinson 2001; Tzortopoulos, Codinhoto, Kagioglou & Koskela 2008), these have not addressed the Aristotelian distinction between production (\(technē\)) and moral or political action (\(phronēsis\)) (Rooke, Koskela & Kagioglou 2009). Such a distinction suggests that, while there is an important distinction to be made between descriptive science (\(epistēmē\)) and design science, there is an equally important distinction to be drawn between design and management.

The critique of engineering based management research is long standing in the construction management literature (see, for instance Seymour & Rooke 1995). Lately, the Unique Adequacy (UA) requirement of knowledge has been suggested as a criterion for management research, which supports intense academic rigour, while making managers' concerns the focus of research. UA comprises a set of criteria which require that research reports: [1] are based on an ordinary competence in the reported setting; and [2] that they are made with a strict agnosticism to theoretical suppositions (Rooke & Kagioglou 2007). In accordance with this principle, the model has been developed on the basis of: [1] the UA understanding of strategic change in organizations acquired by one of the authors through twelve years experience of working in strategy formation and implementation; [2] the results of three years action research, developing the BeReal benefits realisation model.

The model has been designed to be as simple as possible, in line with its intended use as a communication tool to introduce managers to the BeReal model. At the same time, it is designed to be sensitive to the complex phenomena of emergence and informality discussed above. In
addition, while the model encompasses a description of good practice in strategic decision making, it is also prescriptive, an exercise in *phronēsis*, rather than *epistēmē*. From a practical management perspective, the descriptive dimension is nonetheless important as a means of demonstrating how the necessary changes can be integrated with existing good management procedures while minimising disruption. If the prescription is to be successful in convincing managers and facilitating the proposed changes, its basis in a UA understanding of the managers’ situation will be critical.

**THE SIDER STRATEGY MODEL**

The purpose of the SIDER model is to locate the BeReal process in the overall strategy process of the organization. The SID columns of the model respectively stand for the shaping, influencing and definition of strategy and represent more or less conventional strategy processes.

In the horizontal dimension, the SIDER strategy model consists of three 'levels', each offering a different organizational view which corresponds to a phase in the strategy implementation process. Each level identifies major processes and strategic deliverables which input into the overall strategy formation process, giving explicit recognition to the way that strategy is continually shaped as it is communicated down the vertical axis of the organization. Each level also represents a strategy implementation process in which the strategy outputs feed into a cyclical implementation/learning process.
Vertically, the model can also be divided into three areas: shaping and influencing; defining; and enabling and realising. Broadly speaking, shaping and influencing cover inputs to policy definition, while enabling and realising are outputs of policy definition. However, many of the relationships between processes identified in the model are learning and improvement cycles. Thus, the direction of communication is two way and the processes are iterative.

**STRATEGIC LEVEL**

*Regulatory direction* consists in government policy and budget constraints, but also in the government's expressed intentions and aspirations. Regulatory direction feeds into *strategic intentions*, which represents an overview of the proposed changes. Strategic intentions include a vision, setting out the overall direction of the organization for the purposes of public communication and internal orientation and motivation. They also include the organizations objectives. Strategic intentions help to build support for change among stakeholders.

The other major inputs into strategic intentions are *stakeholder consultation* and corporate planning. The former consists in outward looking processes for capturing: health needs; supply chain information; patient perceptions; and engagement of strategic stakeholders, including local authorities and neighbouring trusts. *Corporate planning* consists in assessing the trust's capacity and capability to deliver change within its environment. Knowledge realization and analyses of organizational capability and resource capacity feed into this from the portfolio level.

The outputs from strategic intentions are the *integrated business plan* and the strategic Be-Real case. The former is a top-level specification of the changes needed, setting out the business scorecard measures and the benefits and dis-benefits of proposed changes, which is equivalent to a strategic business case as defined in PRINCE2 stage 1 (OGC 2005). The *strategic Be-Real case* forms part of this plan, cataloguing the planned strategic benefits and defining the processes necessary to realise these. This draws upon elicited strategic benefits from the portfolio level and informs the construction of a scorecard profile, providing a basis for the briefing process and a framework for selection criteria.

**PORTFOLIO LEVEL**
**Strategic direction**, comprises a characterisation of the organisational transformation to be achieved, including details of the corporate objectives. This involves a process in which values are aligned through discussion and objectives aligned with organisational values, providing a basis for leadership of the change initiative and appropriate redefinition of the organization's public image. Strategic direction is developed out of strategic intentions. These are shaped by a further more detailed consideration of *organisational capability* and *resource capacity*.

At this level, the refinement of policy is driven by *knowledge realisation*. This is a knowledge management process in which an assessment the organisation's accumulated knowledge and skill base is fed into the decision making process. When the process is fully established, an important element of this will be the feedback from the BeReal evaluation carried out at the project/programme level. Knowledge realisation informs the initial strategic intentions at the strategic level and continues to inform the emerging strategic direction at the portfolio level.

![Fig. 3. The portfolio level](image)

**Change realisation** involves the operationalisation of this strategic consensus, through the development of programmes, standards and controls. In this process, activities are aligned with objectives, while stakeholders and providers are engaged in the change process. A key output from this process is the outline business case (OGC 2005).

**Elicited strategic benefits** form a key element of the change realisation process. These are derived from a workshop process as carried out in the BeReal process. A picture of the overall collective benefits of the change is built up and aligned with strategy. Thus, the planned strategic benefits in the integrated business plan need to be checked against and strategically aligned with the elicited strategic benefits. While the benefit elicitation process is formal, there is necessarily a negotiation and stakeholder management process involved in the prioritisation of benefits.

As the strategy emerges, projects/programmes to realise the strategic benefits can be developed and ownership of these project/programmes identified. Thus, the elicited strategic benefits form a framework for the development of individual project/programme business cases.

**PROJECT/PROGRAMME LEVEL**

The BeReal benefits realisation management process is focused on identifying and delivering
benefits at the project/programme level (Sapountzis, Yates, Kagioglou & Aouad 2009). On this level, the process is an exercise in **stakeholder management** and **benefits realisation**, which balances management of the risks arising from competing stakeholder interests with a systematic approach to building up a profile of **structured project benefits**, the intended benefits which stakeholders stand to gain from the project/programme (Yates, Barreiro–Lima, Sapountzis, Tzortzopulos & Kagioglou 2009). The process promotes an understanding and ownership of the individual benefits. The process begins with the preparation of a **BeReal case** and proceeds with profiling and mapping, before moving into the realisation phase and the eventual **BeReal evaluation** (Yates, Sapountzis, Lou & Kagioglou 2009).

In addition, **programme alignment** must be established with other programmes in the portfolio.

**TOP DOWN COMMUNICATION**

Central to the model is the definition of policy. This begins with 'regulatory direction' and develops successively into: 'strategic intentions'; 'strategic direction'; 'programme alignment' and project 'BeReal Case'. Thus, policy definition is represented as a process of progressive shaping, implementation and refinement.

**SOME KEY LEARNING AND IMPROVEMENT CYCLES**

Ideally, the relationships within the SIDER model should consist of iterative cycles of learning and improvement. It is impossible to trace all of these in this short paper, so three key ones have been identified for illustrative purposes: the strategic direction learning cycle; the change management learning cycle; and the stakeholder and benefits management learning cycle.

**STRATEGIC DIRECTION LEARNING CYCLE**

Strategic intentions are a product of regulatory direction, the corporate planning process and the community consultation (are elicited strategic benefits an outcome of the community consultation?). In turn, they inform strategic direction. The knowledge realisation process helps define strategic intentions through its influence on corporate planning, but it also directly influences strategic direction in a more detailed way. Furthermore, strategic direction is also influenced by feedback from the change realisation process. Thus, strategy is further defined at
the portfolio level. Partly through a more profound knowledge realisation and partly through feedback from the programme/project level.

CHANGE MANAGEMENT LEARNING CYCLE

The change realisation process is the realisation of strategic direction and is governed by the integrated business plan. The change realisation process should produce a set of performance measures that are clear and implementable. Ordinarily, these measures are conventional key performance indicators, but here they are supplemented by strategic benefits. However, these measures are not at this stage, fully validated as desirable. As the benefits elicitation process proceeds, the emerging structured benefits inform the overall change realisation process and may contribute to changes in the anticipated strategic benefits.

STAKEHOLDER AND BENEFITS MANAGEMENT LEARNING CYCLE

Structured project benefits, derived from stakeholder workshops, are the core of the overall stakeholder management process that produces the BeReal case. The BeReal case aligns the programme/project with the overall change realisation project defines the benefits that are the planned outcomes of the benefits realisation process. Thus, the stakeholder management process, often depicted as entirely political (see for instance: Olander & Landin 2005; Newcombe 2008) is here supported by a structured process for the elicitation and management of benefits outcomes.

WHAT HAPPENS TO THE EVALUATION?

A question that remains to be answered is what happens to the evaluation that completes the BeReal process? The failure to retain and disseminate learning points from completed projects is a well known phenomenon. This may be attributed to both: the pressure to focus on new and upcoming projects, at the expense of winding down and completed ones; and the reluctance to dwell on perceived shortcomings and failures.

Evaluation is an explicit strategy for counteracting these tendencies, it is however fraught with difficulties. The danger is that an evaluation report is produced, read and filed without the consequent learning being disseminated or implemented. Thus, when the systematic evaluation is done, there must be a systematic procedure for feeding the findings back into the knowledge realisation process, making possible the utilisation of learning points in future work. The difficulties are compounded by the need for long term evaluation of major infrastructure projects and change programmes. These require that both the evaluation system and feedback procedures are maintained over a period of many years, with long periods of dormancy. Further research is needed on how this might best be achieved.

CONCLUSION

The SIDER model combines theoretical knowledge with experiential knowledge of good practice and action research findings from the development of BeReal into a formal system for change management in the NHS. In doing so, it offers an a further extension to the MSP methodology which goes beyond the detailed implementation guidelines offered by BeReal itself. MSP is currently being revised for a second edition and one of the authors is a contributor to this process.
The model has been presented from a number of related angles, in terms of: current thinking on emergent strategy and organisational learning; action research, UA and the demands for rigour and relevance in management studies; and as a strategic management system that functions as a practical tool for organisational change. As a product of theory and research on emergent strategy, the model can be viewed as a theoretical construct, which is testable in the field. As a practical tool, it is intended to add value to NHS organisations by facilitating the introduction of BeReal. Methodologically, it operationalises a possible solution to the problem of reconciling rigour and relevance by conducting action research to the UA requirement of methods. There is an overall methodological relationship between these three aspects. The validation of both the theoretical perspectives and the action research methods employed depend upon the practical utility of the tool.
REFERENCES


http://usir.salford.ac.uk/2142/
INFRASTRUCTURAL PLANNING FOR HOSPITALS IN RELATION TO A PRIMARY PORTFOLIO STRATEGY

K. Diez¹ and K. Lennerts²

ABSTRACT

As in most European nations, Germany has to face the challenges from demographic changes of society. Aging population has a great impact on the health care system, and especially on hospital care. For optimized use of resources hospitals have to develop a primary portfolio strategy. But how can we translate the consequences of changing primary portfolios to the infrastructure and its function specific services needed? Combining different sources of data this research is exemplarily showing the implementations of changing primary portfolios scenarios on the capacity use of one central functional unit in a hospital, the operation unit. Thus, not only changing time patterns – influencing possible need for doctors and nurses on primary personnel planning – become transparent, but also changing need for infrastructural resources. The model presented allows the development of a holistic planning strategy, combining strategic, tactical and operational levels.

KEYWORDS

strategy planning, hospitals, capacity use, infrastructural services

INTRODUCTION

As in most European nations, Germany has to face the challenges from demographic changes of society. Aging population has a great impact on the health care system, and especially on hospital care. While patient flows and treatment patterns are changing hospitals need to be aware of quality standards: For certain operative procedures, doctors have to fulfil minimum numbers of operations. Thus, not only in terms of quality but also in terms of costs for primary and secondary services – as for example special surgical instruments – an optimized treatment of patients shall be guaranteed.

As a consequence, hospitals have to develop a primary portfolio strategy. But how can we translate the consequences of changing primary portfolios to the infrastructure and its function specific services needed?

METHODOLOGY

For a holistic strategy planning in hospitals different levels of knowledge have to be linked. Demand for certain treatment profiles has to be translated to capacity use of space and need for

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infrastructural services. Using a process oriented model this research is combining the following sources of data:

**GERMAN DIAGNOSIS RELATED GROUPING SYSTEM - DATABASE**

In 2003, a Diagnosis Related Grouping (DRG) System for the payment of hospitals’ performance for in-house patients had been implemented in Germany. Thus, periodically data on different levels has become available. First level is the standardized documentation of every patient’s diagnoses and procedures in terms of medical treatment based on the International Code of Procedures in Medicine (ICPM) and the International Classification of Diseases and Related Health Problems (ICD).

On a second level, for every case demographic data is collected, i.e. gender and age.

The third level is costs: all primary and infrastructure costs have to be internally allocated according to a standard set by German Institute for the System of Proceeds (InEK) (InEK, 2007) and accounted to 11 direct cost entities, as can be seen in Figure 1. On the basis of these 11 cost entities’ patient related performance, all costs have to be allocated to the patients individually. The costs per patient are analyzed according to patient clusters, i.e. DRGs. Thus, for each of the 11 cost entities an average cost profile per DRG is available. This profile is used to calculate fixed amounts of money the hospital gets paid for the treatment of a patient.
The 11 cost entities can be interpreted in terms of hospital’s functional space units. The provision of a ready to function hospital’s space unit can be described as Facility Management (FM) core process. (Diez et al., 2009)

The described database is basis for analysis on strategic level: Considering the demographic structure of a hospital’s region and its future development, a prognosis for the number of cases for different Diagnosis related groups can be made and probable primary performance scenarios can be estimated. Considering other hospitals in the vicinity a market analysis can be done, and strategic decisions can be made. Also, average income (short term) can be estimated.

**EMPIRIC COST AND PERFORMANCE DATA FOR FUNCTIONAL UNITS**

For tactical and operational planning information on a more detailed level is needed. To know about capacity use primary processes have to be standardized not only on level of costs but also on operational level, for example using the idea of clinical pathways (Coffey, 1992). This method allows the statistical analysis of primary performance in relation to space units. Thus a linkage
between primary and FM processes can be obtained. Figure 2 shows the path of a patient through the hospital.

![Diagram showing the path of a patient through different functional space units in a hospital, with labels for OR, Catering, Laundry, Bed sterilization, Radiology, Diagnosis, Ward, Maintenance, Delivery room, and DRG.]

Along a therapeutic pathway a patient is travelling through the hospital using different functional space units. In these space units the patient is receiving primary and secondary services. Thus, costs may be allocated in a process oriented way.

The provision of a functional space unit can be described as Facility Management core process. Depending on its specific function, different FM services have priorities. Whereas Catering for example is a key FM service for the provision and operation of a ward, priority in the operation unit will be set to Sterilization services and Cleaning. Besides, considering the character of the variety of FM processes a distinction between variable and fixed services and costs is necessary.

**WHOLISTIC PLANNING SCENARIOS FOR THE FUNCTIONAL UNIT OPERATION**

**RESULTS OF AN EMPIRIC RESEARCH ON PRIMARY PERFORMANCE DATA AND INFRASTRUCTURE PERFORMANCE AND COSTS OF 4 GERMAN HOSPITALS**

In an empiric research the primary and infrastructure performance and costs of the functional unit operation of four German hospitals had been analyzed (Diez, 2009). For about 100 most common operation procedures average process times had been collected. The functional units had been analyzed in terms of spatial layout. Also, a performance and cost allocation for all infrastructural services had been done. Excluding the cost for primary investment (in the German system, these costs are covered by the state) result of the analysis was that only 5 infrastructural services
accounted for about 85% of the total infrastructural costs. Using a product oriented scheme (Abel, 2008) the average distribution of costs is shown in figure 3.

The products Sterile goods supply, Cleaning, Maintenance of biomedical equipment, Building and technical maintenance and Laundry services had been analyzed in detail and cost drivers in relation to the patient for each product were determined. Also an average cost value based on the data of the four hospitals could be estimated – as can be seen in table 1.

Table 1. Relevant FM products and cost drivers

<table>
<thead>
<tr>
<th>FM Product</th>
<th>Cost driver</th>
<th>Average cost value (reference year 2006)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sterile goods supply</td>
<td>Number of sterile entities per procedure (ICPM)</td>
<td>23,41€/sterile entity; average number of sterile entities per operation: 2,25</td>
</tr>
<tr>
<td>Cleaning</td>
<td>Operation time; number of operations</td>
<td>0,09€/minute; 13,38€/operation</td>
</tr>
<tr>
<td>Maintenance of biomedical equipment</td>
<td>Fixed cost</td>
<td>Fixed cost</td>
</tr>
<tr>
<td>Building and technical maintenance</td>
<td>Operation time</td>
<td>0,07€/minute</td>
</tr>
<tr>
<td>Laundry services</td>
<td>Operation time; number of operations</td>
<td>0,03€/minute; 4,01€/operation</td>
</tr>
</tbody>
</table>
Using these findings, a variable FM function in relation to number of operations and operation time, but also in relation to the procedure that is performed can be determined.

STRATEGIC SCENARIOS

A hospital’s primary performance portfolio can be estimated on basis of prognoses on a certain region’s future age structure and population density (German Statistical Data 2005, Hessen 2006). According to a study commissioned by the state of Baden-Württemberg (German Statistical Data 2005) there will be distinct shifts between in patient treatment numbers in the year 2030 in comparison to 2002 because of demographic change. Table 2 shows expected case numbers in Baden-Württemberg divided by department. Especially for the departments of ophthalmology, heart surgery and internal medicine high growth rates of more than 40% are being expected, whereas for children’s surgery for example shrinking case numbers have been predicted.

Table 2. Changes of in patient cases due to demographic reasons in Baden-Württemberg for the year 2030 clustered by medical department (German Statistical Data 2005, table 3, p. 44)

<table>
<thead>
<tr>
<th>Department</th>
<th>2002</th>
<th>2010</th>
<th>2020</th>
<th>2030</th>
<th>Changes in comparison to 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
<td>2020</td>
<td>2030</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Case numbers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ophthalmology</td>
<td>48 671</td>
<td>56 669</td>
<td>64 967</td>
<td>72 145</td>
<td>+ 16,4 + 33,5 + 48,2</td>
</tr>
<tr>
<td>Surgery</td>
<td>441 790</td>
<td>486 501</td>
<td>525 170</td>
<td>553 454</td>
<td>+ 10,1 + 18,9 + 25,3</td>
</tr>
<tr>
<td>Obstetrics</td>
<td>244 438</td>
<td>245 472</td>
<td>249 037</td>
<td>238 921</td>
<td>+ 0,4 + 1,9 - 2,3</td>
</tr>
<tr>
<td>Ear, nose and throat diseases</td>
<td>79 498</td>
<td>81 511</td>
<td>82 557</td>
<td>80 892</td>
<td>+ 2,5 + 3,8 + 1,8</td>
</tr>
<tr>
<td>Venereal and skin diseases</td>
<td>17 455</td>
<td>19 411</td>
<td>21 262</td>
<td>22 564</td>
<td>+ 11,2 + 21,8 + 29,3</td>
</tr>
<tr>
<td>Heart surgery</td>
<td>3 016</td>
<td>3 515</td>
<td>3 916</td>
<td>4 433</td>
<td>+ 16,5 + 29,8 + 47,0</td>
</tr>
<tr>
<td>Internal medicine</td>
<td>600 616</td>
<td>692 811</td>
<td>786 056</td>
<td>862 010</td>
<td>+ 15,4 + 30,9 + 43,5</td>
</tr>
<tr>
<td>Children’s surgery</td>
<td>11 390</td>
<td>10 299</td>
<td>9 815</td>
<td>9 508</td>
<td>- 9,6 - 13,8 - 16,5</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>94 620</td>
<td>85 362</td>
<td>84 233</td>
<td>82 404</td>
<td>- 9,8 - 11,0 - 12,9</td>
</tr>
<tr>
<td>Children’s psychiatry and therapy</td>
<td>3 183</td>
<td>3 166</td>
<td>2 746</td>
<td>2 697</td>
<td>- 0,5 - 13,7 - 15,3</td>
</tr>
<tr>
<td>Oral and maxillofacial surgery</td>
<td>11 106</td>
<td>11 953</td>
<td>12 425</td>
<td>12 543</td>
<td>+ 7,6 + 11,9 + 12,9</td>
</tr>
<tr>
<td>Neurosurgery</td>
<td>16 936</td>
<td>18 570</td>
<td>19 651</td>
<td>20 242</td>
<td>+ 9,6 + 16,0 + 19,5</td>
</tr>
<tr>
<td>Neurology</td>
<td>56 860</td>
<td>63 164</td>
<td>68 047</td>
<td>71 635</td>
<td>+ 11,1 + 19,7 + 26,0</td>
</tr>
<tr>
<td>Nuclear medicine</td>
<td>5 956</td>
<td>6 640</td>
<td>7 156</td>
<td>7 668</td>
<td>+ 11,5 + 20,2 + 28,8</td>
</tr>
<tr>
<td>Orthopädie</td>
<td>60 545</td>
<td>65 912</td>
<td>70 555</td>
<td>73 435</td>
<td>+ 8,9 + 16,5 + 21,3</td>
</tr>
<tr>
<td>Plastische Chirurgie</td>
<td>7 156</td>
<td>7 539</td>
<td>7 752</td>
<td>7 635</td>
<td>+ 5,4 + 8,3 + 6,7</td>
</tr>
<tr>
<td>Psychiatry and psychotherapy</td>
<td>66 323</td>
<td>70 505</td>
<td>71 486</td>
<td>70 901</td>
<td>+ 6,3 + 7,8 + 6,9</td>
</tr>
<tr>
<td>Psychotherapeutic medicine</td>
<td>4 453</td>
<td>4 771</td>
<td>4 791</td>
<td>4 524</td>
<td>+ 7,1 + 7,6 + 1,6</td>
</tr>
<tr>
<td>Radiotherapy</td>
<td>10 814</td>
<td>12 214</td>
<td>13 656</td>
<td>14 749</td>
<td>+ 12,9 + 26,3 + 36,4</td>
</tr>
<tr>
<td>Urology</td>
<td>73 245</td>
<td>83 632</td>
<td>93 145</td>
<td>102 025</td>
<td>+ 14,2 + 27,2 + 39,3</td>
</tr>
</tbody>
</table>
Regional, demographically based patient case data in combination with a market analysis on a region’s healthcare providers is the basis for the prediction of probable hospital performance scenarios. Using the process oriented FM function described earlier, consequences of shifting primary performance scenarios on FM performance and costs in the operation unit can be simulated. Thus, strategic decision making considering infrastructural issues may be supported. In the following, three possible performance scenarios for an exemplary hospital are being discussed.

**PRIMARY PORTFOLIO SCENARIOS IN THE OPERATION UNIT – EXAMPLE HOSPITAL 1**

In regards to the prognosis of case numbers in Baden-Württemberg and considering hospital 1’s specific performance data for the reference year, the following scenarios for the operation unit of hospital 1 are discussed:

Scenario 1: “Obstetrics”
Scenario 2: “Ophthalmology“
Scenario 3: “Hip-joint implants”

In the present situation a distinct part of the procedure portfolio of hospital 1 is in the area of obstetrics. In the reference year, 358 operations are performed distributed to 11 different procedures (ICPM). The average overall operation time is 79 minutes. Thus, the operation unit is occupied for 28,282 minutes (471,4 hours) in total by obstetrical operations. This first scenario represents the basic situation.

Besides obstetrics, 634 operations in the area of eye surgery and 388 hip-joint implants are performed by hospital 1 in the reference year. It is obvious that this hospital is already somewhat specialised in both of these areas of surgery. For demographic reasons the number of cases in the area of obstetrics may diminish around 2,3 %. (German Statistical Data 2005) At the same time growth of case numbers around 48,2 % in the area of eye surgery is expected. Thus, scenario 2 shall describe a shift of the primary procedure portfolio towards ophthalmology:

As alternative scenario a shift towards further specialisation towards hip-joint implants shall be described. For these procedures an especially high growth rate is expected due to observed correlation between rising age, osteoporosis and higher risk of tumbling. (Robert Koch-Institute 2006)

**SIMULATION OF FM PERFORMANCE AND COSTS - OPERATIONAL LEVEL**

Background for the simulation of FM performance and costs for the different scenarios is the assumption that the overall capacity use of the operation unit is not changing. Table 3 gives an overview of the relevant process figures for the three scenarios.
Table 3. Scenarios and relevant process figures

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Procedure (ICPM)</th>
<th>Number of operations</th>
<th>Σ OR-time [min]</th>
<th>Φ OR-time per operation [min]</th>
<th>Σ number of STE</th>
<th>Φ number of STE per operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Obstetrics</td>
<td>11 ICPM</td>
<td>358</td>
<td>28.282</td>
<td>79</td>
<td>716</td>
<td>2</td>
</tr>
<tr>
<td>2: Ophthalmology</td>
<td>5-144</td>
<td>912</td>
<td>28.282</td>
<td>31</td>
<td>684</td>
<td>0.75</td>
</tr>
<tr>
<td>3: Hip-joint implant</td>
<td>5-820</td>
<td>181</td>
<td>28.236</td>
<td>156</td>
<td>996</td>
<td>5.5</td>
</tr>
</tbody>
</table>

The maximal value of OR-time (28.282 minutes) is given by the present scenario 1, obstetrics. Due to differing average procedure times in both of the alternative scenarios, the number of operations performed are changing. In scenario 2 the number of operations is about 2.5. At the same time the need for sterile entities (STE) is diminishing from 2 to 0.75 STE per operation.

Scenario 3 is different: the number of operations in the given time span is only half. The need for sterile entities per operation is nearly tripling from 2 to 5.5.

Using these figures in hospital 1’s individual FM cost function for the three scenarios, different need for FM services and changing FM costs become transparent (see figure 4). The costs for Maintenance of biomedical equipment are excluded of the analysis, as they are deemed to be mainly not dependent on capacity use. The cost value for the calculation of cost for sterile entities was set to the individual value of 15,51 €/STE of the reference year, not taking into account that there might be shifts in price due to possibly changing capacity use of the sterile goods department. Laundry service is calculated with a fixed cost value of 3,60 €/operation and a time dependent value of 3 Cent/minute. The fixed value for Cleaning per operation is 12,30 € and combined with a time dependent figure of 10 Cent/minute. Building and technical maintenance (Maintenance) is calculated with a time dependent figure of 2 Cent/minute operation time.

Costs for Maintenance are – considering constant total capacity use – the same for all the three primary process scenarios. Regarding cost for sterile goods, there is nearly no difference between
scenario 1 and 2. The significantly lower need for sterile entities per operation in ophthalmology is evened by the high number of short operations. Scenario 3 though gives a different picture: the need for 5,5 STE per hip-joint implant operation leads to about 40 % higher costs for this infrastructural service in total. Changing numbers of operations have high impact on the FM products Laundry service and Cleaning. In scenario 2 costs are about doubled compared to scenario 1. The rather few number of long operations in scenario 3 leads to relatively low costs there.

CONCLUSIONS

Based on the German background for hospital care, a model allowing a holistic analysis of primary and infrastructural core processes in hospitals in relation to functional space units has been developed. Thus, exemplary, for the functional unit operation, consequences of strategic primary planning issues down to operational factors, i.e. capacity use and need for infrastructural services can be estimated. Process oriented simulation of FM costs for different primary performance scenarios for a given time span in the operation unit shows, that time is an important cost driver. But for FM planning for this specific functional space unit even more important is which special kind of procedure is performed. Strategy, costs and the provision of infrastructure have to be linked. Looking at decisions made on the strategic level of department specialisation – which may be shifting from a focus of obstetrics to ophthalmology or hip-joint transplanting – transparency and tools are needed that allow for optimized provision of space including function specific infrastructural services.
REFERENCES


SHAPING FUTURE HEALTHCARE INFRASTRUCTURE: AN ACCESS AND CARBON STUDY

G.R. Mills¹, S.S Mahadkar ², A.D.F Price³ and P. Astley⁴

ABSTRACT

Population increase, the economy and global warming are creating a sharp focus on how we make better use of our resources to achieve both short and long term goals. Within the UK National Health Service (NHS), “taking care closer to home” and “saving carbon, improving health” are two of a number of Department of Health (DH) initiatives aimed at improving healthcare and responding to the need for sustainable, accessible, efficient and effective services. This paper discusses the implementation of a new approach to open transport scenario planning on a retrospective case study within a regional planning context to deliver a distributed and networked primary and community healthcare service from a range of settings. This work will help to underpin existing rigid strategic asset management and master planning approaches with a more dynamic approach that starts with future care model design and responds to advancing technology, integrated care pathways and extended workforce roles.

This case study showed that around 86 per cent of healthcare activity (not including home and social care activity) is performed in GP practices. The results demonstrated that shifting only a few care specialities closer to home can have a significant transport carbon saving (5,011,104 kgCO₂ or approximately 500 annual person carbon clouds). This could be even greater as more radical care pathway changes are adopted or if patients are more frequently treated in their homes using remote technologies. As an indicator of the ratio of transport carbon expended by scale, 60 per cent of patient and carer carbon was expended in a specialist setting (also accounting for higher car use to this setting). Furthermore, travel to community scales accounted for only four per cent, a much smaller proportion than travel to both specialist and general care; however, shifting services to these settings could make significant carbon savings. This work found (through a case study application) that existing healthcare planning tools may be inadequate and inflexible to model transport carbon, however could be easily and quickly adapted. This paper makes a number of recommendations for research and the ongoing development of the healthcare planning tools and particularly the NHS Strategic Health Asset Planning and Evaluation (SHAPE) tool.

KEYWORDS

access, carbon, care model, estates, scenario, SHAPE, transport, planning

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INTRODUCTION

Some Clinicians such as those involved with the Health and Sustainability Network and Climate and Health Council (2010) are starting to see a stronger interrelationship between healthcare and climate change. In addition increasing demand and the cost of energy is threatening the fundamental principle of healthcare free at the point of access. Legal and regulatory carbon targets are cutting further into healthcare budgets and people's choice of carbon and energy intensive transport mode is leading to increased incidence of obesity, cardiovascular disease, diabetes and cancer. As such there is a huge relationship and opportunity to tackle both the healthcare and climate crisis together. Improving the sustainability of a health service could contribute to improved health outcomes and patient experience while at the same time improving running efficiency, effectiveness and cost savings. According to the Health and Sustainability Network and Climate and Health Council (2010) there is a number of principles in sustainable care service design, these include: 1) prevention; 2) supported self-care; 3) lean pathways; 4) choice of low carbon treatment alternatives; 5) distributed scales of care, estates and transport to meet supply; and 6) innovative technologies that support remote and distributed care. This paper is addressing the principle of understanding the scale and distribution of transport infrastructure and its impact on carbon. However the authors are also pursuing an understanding of innovation and lean patient pathway design.

This paper draws on research conducted with the Prince’s Foundation for the Built Environment (PFBE), Department of Health, HaCIRIC (The Health & Care Infrastructure Research and Innovation Centre), MARU (Medical Architecture Research Unit) and HUDU (NHS London Health Urban Development Unit) to develop a strategy for integrating the principles of infrastructure healthcare planning. It also refers to work carried out to develop a broad framework for infrastructure planning (Mills et al., 2010c, Mills et al., 2010d), which discusses the importance of taking an integrated and multi-stakeholder approach to care, estates and transport issues. This paper however only describes work done in understanding transport carbon and why this must be understood along with care model design and estates planning.

This paper does not make a clinical case for moving care closer to home but details the sustainability arguments that must be made alongside the discussion of care quality. The goal is to understand the carbon consequences of delivering ‘care closer to home’ as expressed by Lord Darzi (Darzi, 2007, Darzi, 2008b, Darzi, 2008a) in the NHS Next Stage Review, and to transfer outpatient services into more accessible settings and new networks of care, thus contributing to the NHS commitment to reduce carbon. In this broad context, many questions have been raised as to whether this vision is to be achieved through the integration or co-location of services, with the implications on what setting is appropriate for which type of care and how accessible those services are. This work also relates to work carried out by the authors on open scenario planning an approach that is being proposed to respond to new thinking in service delivery and for a flexible, optimised, use of facilities in healthcare and across the spectrum of care (Astley, 2009). In recent years, a number of DH policies and initiatives have strongly emphasised the need to shift healthcare towards local community settings, closer to patients’ homes (Darzi, 2007, Darzi, 2008b, Darzi, 2008a, DH, 2006) and priorities specific care pathways. In 2006, a series of 30 demonstration sites were selected in six specialties: Dermatology, Ear Nose and Throat (ENT), General Surgery, Gynaecology, Orthopaedics and Urology (Leese et al., 2007). Care models for these six are being further explored in the UK (DH, 2010) across diverse delivery locations (Mills et al., 2010a). The implication of this is that accessibility and transport planners must understand
the implications of these on travel and carbon as more remote technologies will almost certainly have an impact on reducing travel carbon.

This work aims to develop frameworks and tools that ensure that schemes do not gain momentum and develop, be designed or constructed at scales that are outmoded and inappropriate, when judged against existing healthcare demand, innovation and distribution.

**LEVELS OF PLANNING INFRASTRUCTURE**

It is important to consider healthcare planning as a number of layers that are associated and dependent (See Figure 1). This idea of layers in building first originated in adaptable and open building (Brand, 1995). These infrastructure layers each have their own value and speed of change. Figure 1. describes the importance of considering care model design nested or dependent on estates infrastructure and estates infrastructure similarly nested or dependent on the broader access and transport network. This work starts to explore the implications of this within the healthcare sector. According to Brand (1995) within the estates layer are six components of differing time span: stuff, the space plan, services, skin, structure and the site. The component layers in health care model design and transport planning are being developed by the authors and its importance is growing given the complex and dynamic nature of today’s kaleidoscope of care (Mills et al., 2010a) as shifting structures, funding, changing markets and re-organisation are contributing to changes in the NHS from centralised to de-centralised and back.

For some the way that the NHS is set up can sometimes require disproportionate input of resources for the clinical benefits received. From a care service design perspective there are wasted clinical visits for tests results not yet back, operation deferral, missed appointments, overlapping treatments, incorrect referral or inappropriate system entry and step down. From an estates perspective: there may be treatments in acute settings that could be performed in a
community or home setting; there are dedicated GP, clinical outreach or theatre spaces that could be shared by different healthcare providers; there are specialist spaces that have been built but are not being operated, and spaces not operated out of hours; and there is duplication in space between acute and community settings. From the third and final perspective, i.e. transport, there are wasted journeys and missed opportunities to use more carbon and energy efficient modes of transport. For all of these, distribution and scale is critical.

ACCESSIBLE HEALTHCARE CLOSER TO HOME

Healthcare and access planners must work together to resolve carbon issues in infrastructure planning. To do this they must find new ways to collaborate and develop new innovative and whole system savings.

Care models are starting to move closer to home. In a review of community care and closer to home delivery Leese et al., (2007) showed examples of how trusts have extended General Practitioner, nurse and pharmacist roles to carry out some general and specialist procedures (such as: Hull and East Yorkshire, Leicester and Leicestershire dermatology services, Newcastle flexible sigmoidoscopy service, Cornwall minor & intermediate injury unit, Nottingham urology specialist nurses and Newcastle outreach community urology centre). Some have explicitly investigated the importance of integrated working (For example: Hull and East Yorkshire dermatology service is a joint service where GPwSI and consultants work alongside each other with pharmacists and nurses in clinics in both primary and secondary care settings). These case studies have also described outreach and remote working, whereby consultants travel to community settings, or nurses and pharmacists travel to community and home settings. Some have also described the use of telephone follow-up or home follow-up, as methods to improve self-care and reduce follow-up appointments and inpatient stays (for example: Ipswich ENT, the audiologist telephones patients with their results, while in Hartlepool a follow-up procedure has been put in place whereby a secondary care nurse telephones mastectomy patients that have returned home after 23 hours).

These exemplars of care service change are showing the importance of understanding how improvements in care service and estates planning can have an impact on transport carbon reduction. Those trusts that will be most successful at reducing whole system carbon will do so by integrating care service model, estates planning and access and transport planning. However in doing so they must also understand how carbon is expended by different stakeholders in the system, as travel saving made by patients may lead to increased travel and carbon emissions expended by outreach staff traveling to community and home settings.

This paper will now investigate the carbon implications in moving care closer to home using a case study example. Finally it will make recommendations on how this kind of study can be improved and can contribute to the development of SHAPE an NHS healthcare planning tool.

METHOD

This method draws on Defra guidance (DEFRA, June 2009, DEFRA, October 2009) and shows the indirect carbon cost of patient travel to and from in-patient, out-patient and day case community hospital and acute appointments. It shows only part of the system of transport
infrastructure structure, and does not include travel to other primary care settings, nor does it include staff travel – only patient and carer travel.

Health Episode Data was analysed over a 12 month period (between Feb 08 and Jan 09) to understand transport activity. This activity data was then used to calculate the inline distance between a patients’ home postcode and a destination healthcare setting. Once the activity and distance was known, this was then converted into GHG emissions by multiplying activity and distance data by DECC / Defra’s emissions factors (Equation 1.). Emissions for all six GHGs were calculated. This work uses a common approach to calculate GHG emissions by applying documented emission factors to known activity data from the organisation. An estimation of the in-line distance between an origin (patients home) and destination (healthcare setting) for existing services and future distribution and setting scenarios was calculated. Further to this, realistic care model changes and transfer ratios/shifting from an acute setting into community settings were incorporated to develop care service change scenarios, which in this case was for Dermatology, ENT, General Surgery, Gynaecology, Orthopaedics and Urology.

Equation 1. Calculation for GHG Emissions

\[
\text{Activity Data} \times \text{Emission Factor} = \text{GHG emissions}
\]

\[
\text{Activity Data (Estimated in Miles)} \times \text{Emission Factors} = \text{GHG emissions}
\]

Estimated car miles were imported into the Defra / DECC's GHG Conversion Factors excel spreadsheet (DEFRA, 2009). Finally in order to account for the modal shift, a survey of patients to understand transport mode change was undertaken. 17,000 patient survey’s were printed and distributed to patients through batched and self-selecting sampling. Further interviews were also carried out with patients structured around the questionnaire at 4 healthcare settings. This understanding of modal shift was used as a ratio to adjust the total distance travelled (calculated from HES data) and a comparison between scenarios was made between the acute care setting and distributed community settings.

This transport and access work is a part of ongoing research into healthcare open scenario planning, strategic asset management and master planning. Work was established as a collaborative initiative and programme of workshops with numerous participants were also conducted. These included the Department of Health, The Prince’s Foundation, HaCIRIC, MARU, HUDU and a number of other institutions. As part of this work a case study review of SHAPE was carried out with a midlands based PCT. Some findings from the transport and carbon analysis are further described here.

CASE STUDY REVIEW OF THE SHAPE PLANNING TOOL

A Midlands based PCT granted access to SHAPE to retrospectively evaluate how it could have been used in service, estates and transport planning. SHAPE allows providers and commissioners to compare costs and activity by condition and to look at length of stay, day surgery and outpatient rates. The software can be used to identify future services and asset requirements. The system is also linked to a geographical information system, allowing comparison between
performance and local demographic trends (Mahadkar et al., 2009). This application showed that other local means of data gathering and capture were often favoured. Locally led time travel analysis was conducted to multiple sites with an accurate local description of facility types.

Organisational and regional boundary limits in SHAPE meant that patients travelling from outside a regional PCT boundary to access care were not captured; however local activity data was able to provide this information. Geographical maps of where patients access clinical specialisms from could be calculated from local data, as could multi-site travel catchments be overlaid to show the lack of spatial distribution. In application the SHAPE tool was often limited to one commissioner or provider (due to reasons of contestability); which may not facilitate a multi-stakeholder and multi-organisational perspective, and may constrain integration and collaboration. Care, estates and transport data often lacked integration and there was no common framework or decision making process to support user decision making. What is needed is the development of a user framework and process that sits alongside SHAPE to allow Trusts and other stakeholders to work collaboratively to quickly define and test scenarios for regional distribution and scale. This paper provides some research and development recommendations and provides a method of transport carbon analysis that could be quickly adopted.

Transport data was available locally and was managed by the Local Authority rather than healthcare Trusts. Existing data on modal shift across healthcare settings was inadequate, which is why the authors of this report carried out their own research with 629 questionnaire responses on the mode of healthcare travel across settings. This understanding of the modal shift was then used to determine the greenhouse gases exhausted in travelling to different settings. SHAPE provides information on geographical catchments and demographics, however actual patient travel distances and specialty specific access was not available. Transport mode data could be included into SHAPE, also a capacity and decision making framework could be incorporated to facilitate the discussion of distribution and scale. Somewhat unrelated to the topic of this paper SHAPE also contained clinical and estates information, from Estates Return Information Collections (ERIC) and Hospital Episodes Statistics (HES) data and benchmarks against national practice.

**FINDINGS FROM A SCENARIO-BASED TRANSPORT CARBON ANALYSIS**

This paper details part of a case study implementation of a new approach to understanding the transport carbon implications of planning changing healthcare infrastructure. This involved understanding the interaction of three very different types of infrastructure.

The case study used data captured from a diverse county in the centre of England. This county is predominantly rural, but has a number of towns and suburban communities, nine of the largest population centres ranging from 8,000 to 58,000. The county population is a little over 660,000 and the county covers an area of about 2,000 square kilometres, with a density of 317 people/km² and 349,873 dwellings/km² and 1.68 dwellings/ha. The county has 10 community hospitals - which provide inpatient care, outpatient clinics and services, diagnostic services and day case operations. Furthermore there are 118 GP practices, 54 practices in the North and East and 64 practices in the South and West.
Carbon modelling data showed that shifting a relatively small number of care specialities closer to home had a significant transport carbon saving (5,011,104 kgCO₂ or approximately 500 annual person carbon clouds). This could be even greater if more radical care pathway changes were adopted or if patients were more frequently treated in their homes using remote technologies. Conversely, shifting smaller local GP practices into a larger amalgamated hub can increase carbon (by some 990,000 kgCO₂ or approximately 100 annual person carbon clouds). As an indicator of the ratio of carbon expended to access buildings at various scales we found that 60 per cent of patient and carer carbon across the whole system (not including staff or home or social care settings) was expended in specialist settings (where the average distance travelled was 40 km and accounting for modal shift). Furthermore, travel to community scales accounted for only four per cent (where the average distance travelled as 14 km), a much smaller proportion than travel to either secondary care as mentioned previously, or primary care (where the figure was close to 36% of carbon expended against the whole system and the average distance travelled was 4 km).

This case study explored the carbon implications of moving care closer to home through the definition of a number of realistic clinical shift scenarios. Anonymous activity data (n = 187,912) was used to calculate actual patient travel distance (in-line rather than against transport networks) to care services at various geographical positions (through the changing of destination postcodes). This incorporated the shift in transport mode towards more sustainable modes for closer service settings. Activity and distance was translated into Defra 2009 guidelines to calculate carbon and Green House Gas (DEFRA, 2009, DEFRA, June 2009, DEFRA, October 2009). There were five scenarios that were tested using this approach; these are included in Figure 2. Alongside the results for all six specialist care services is an example of one of these specialties (Dermatology), which provides some explanation of how the scale and distribution of service scenarios were realistically agreed.

Figure 2. shows that there could be a significant impact with a 72 per cent transport carbon reduction on a hypothetical present centralised scenario (as some services have already moved to a community setting) for the six specialist care services that have been recommended by DH to move closer to home (i.e. Dermatology, ENT, General Surgery, Gynaecology, Orthopaedics and Urology). These community service attendances make up 23 per cent of the total secondary attendance in this case study region. This could be much higher if further services were delivered closer to home or if new technology modalities such as tele-care could deliver care to patients in their homes. Further work is underway to calculate the carbon implications of built infrastructure and its impact on investment decision making.
Fig. 2. Travel distances and CO₂ in a rural midlands healthcare region
DISCUSSION – FUTURE RECONFIGURATION AND CARBON ANALYSIS

Healthcare infrastructure planning is by its very nature a complex interaction of factors that determine the distribution of resources. These factors in the planning process are interrelated and interdependent and as such the delivery of an efficient and effective proposal is often dependent on an iterative and multi-stakeholder information and coordination decision making process that emerges at the correct level of granularity.

There are a number of healthcare planning tools that are used throughout the data gathering, analysis and evaluation process. These are detailed elsewhere by the authors (Mahadkar et al., 2009, Mills et al., 2010b), however, what is important is that many of these tools often take a single perspective and do not incorporate all aspects (care, estates and transport) of a structural infrastructure change (HUDU, Scenario Generator, CIAMS, EstatesCODE, and Estates Capacity Planning). SHAPE provides an excellent opportunity for integrated service, estates and geographical planning (demographics and transport). However it does not facilitate a broader strategic and open discussion on the integration of data using scenario modelling. As a result those healthcare planners with experience and expertise will use an organisations own data sets to develop bespoke models that can be used to play what-if scenarios in a more flexible manner.

There are a number of potential carbon savings that can be made by shifting care and making the whole system more efficient with regards to the correct care, estates and transport scales that meet an ideally distributed supply. This research showed that shifting GP practices into integrated health and social care centres or polyclinics could lead to an increase in car use, but this could be traded off against more efficient buildings and travel savings from patients being in the right place and receiving the correct diagnostics rather than being referred. Within the midlands case study a large scale questionnaire helped to determine mode shift for transport at each scale.

Further work is needed to understand in detail the optimum building scales and the optimum distribution of these within a regional care model. Unfortunately no data were available on the travel savings from patients being in the right place and receiving the correct diagnostics rather than being referred. This would require understanding the number of in-appropriate or wasted journeys as a result of incorrect referral, step up/down between settings. Shifting clinical speciality services closer to home could lead to transport carbon savings from shorter patient and family/carer trips. Data on transport carbon savings achieved from shorter patient and family/carer trips was collected and modelled for a single case. This involved building scenarios of care closer to home and total and average travel distances, carbon and overall savings between the worst and best case.

This work is demonstrating the need to define a new language and framework to help integrate a multi-disciplinary healthcare planning and estates and transport design team. These disciplines will work together through a process of gathering baseline information, developing innovative and future looking scenarios and then finally evaluating and selecting the best scenario(s).
RECOMMENDATIONS

Further research could combine primary and secondary activity, estates and transport data to develop a whole system perspective of access and carbon. The following recommendations for ongoing research are made:

1) SHA’s and Trusts must work together to build a unified whole system approach to healthcare access and transport planning using an open infrastructure scenario planning approach;

2) Healthcare planners need to have a clear definition of scales and type of care, estates and travel response if they are to define clear distribution scenarios and a whole system carbon strategy. This thinking should be incorporated into healthcare planning tools;

3) Care pathway design and clinical engagement must drive the definition of infrastructural change. Without this non-commitment and non-adoption could lead to waste, inappropriate use and failure. Healthcare planning tools should incorporate a layered approach and develop an emerging framework of priorities;

4) Research evidence on the healthcare impact of scale and distribution of infrastructure re-organisation on healthcare quality is desperate with no common integrated framework. Funding should be sort to consolidate this evidence in a single place that is accessible to healthcare planners;

5) There is a lack of whole healthcare system data availability, integration and transparency. Existing tools have some limitations and a broader decision making framework and social process needs to be defined. Case study research could be used to understand and model existing intuitive healthcare planning processes;

6) Further empirical research is needed to validate this work and to develop it into a more robust multi-parameter and multi-stakeholder approach.

7) SHAPE should incorporate a method of carbon transport analysis at a specialty and grouped specialty level that simply calculates in-lines distances and carbon expended by patients travelling to and from healthcare facilities (in line with the method described in this paper).

ACKNOWLEDGEMENTS

We are grateful to the Department of Health for their support in funding this research. We also acknowledge the contribution of the EPSRC for funding the researchers and part of Prof. Andrew Price’s time via the Health and Care Infrastructure Research and Innovation Centre (HaCIRIC). Grant ref no. EP/D039614/1
REFERENCES


DEFRA (June 2009) Draft guidance on how to measure and report your greenhouse gas emissions, Crown.


Leese, B., Bohan, M., Gemmell, I., Hinder, S., Mead, N., Pickard, S., Reeves, D., Roland, M., Sibbald, B., Coast, J. & McLeod, H (2007) Evaluation of Closer to Home Demonstration Sites: Final Report, Manchester, National Primary Care Research and Development Centre (University of Manchester);

Health Economics Facility (University of Birmingham).


International Conference of the CIB W104 Open Building Implementation on “Open and Sustainable Building”, 17-19 May, Bilbao.
INFECTION CONTROL AND THE BUILT ENVIRONMENT OF ACUTE HOSPITAL WARDS

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ABSTRACT

It is recognised that hospital acquired infection is a multi faceted problem and control of infection can only be achieved by a combination of design and management factors, not by a single identifiable factor. This paper is based on a research project which aimed to identify what physical interventions are being made to improve the ward environment in acute NHS Trusts and if these changes improve infection control. A combination of research methods were used to achieve the aim of the project including literature review, questionnaire survey of acute NHS Trusts and focus group discussions. The outcome was the identification and detailed analysis of 10 areas of intervention. A Design and Management Decision Making Tool has been developed from the findings and includes information relating to curtains, flooring, sensor taps, single bedrooms, sluice rooms and ward storage. The anticipated users of this decision-making tool are hospital managers, designers and estates and facilities staff.

KEYWORDS

control of infection, curtains, design, facilities management, single bedrooms

INTRODUCTION

This paper details a research study carried out over an 18 month period to review the physical interventions being made by acute NHS Trusts in ward areas to assist with the control of infection (CoI). Hospital acquired infections (HAIs) have been a recognized problem in the NHS for a long time. Progress in reducing infection rates has been significant and this is predominantly due to changes in clinical practice. It is also recognised that the ward environment can provide many reservoirs and opportunities for transfer of infection (National Audit Office, 2009).

Hospital Acquired Infection (HAI) is a complex problem but existing research suggests that it is not being approached in holistic, coordinated and coherent way. The importance of design is crucial in infection control and there is a need for a better understanding of the interaction between design factors to tackle infection control. The research study focused on some key infection control design issues in acute ward areas. It sought to understand the complexity of
infection control and design by exploring the impact of diverse factors in the hospital
environment.

AIM, OBJECTIVES AND METHODOLOGY

The aim of the research study was to develop design guidelines to identify and implement control
of infection measures in briefing, design development and construction stages and in managing
the operation of hospital facilities. The specific objectives were:

- To identify areas with the greatest risk of infection, and the patterns and sources of
  infection in hospital environments.
- To explore the role of different stakeholders in facilities planning and their impact on
  design decisions.
- To examine the impact of organisational drivers on key design and management factors
  and its influence on the transmission of infection and control measures.
- To evaluate the impact of design on clinical, facilities management and behavioural
  practices and to develop an audit tool to formulate control measures.

During the study it became clear that it would be better to focus on specific areas in hospital
environments. The research was then limited to acute hospital ward settings as this is where the
greatest focus is in relation to HAI and its control. It was also decided to exclude areas of interest
with a lot of guidance and legislation such as Legionella, Aspergillus, theatres, intensive care
areas, decontamination of theatre instruments and endoscopes. This is because it was unlikely
that the research would have added anything new to the existing body of knowledge.

The methodology for the research project is outlined in figure 1 and consisted of various research
approaches to address the study aim and objectives. This included:

Stage 1 - a literature review to identify key themes relating to design and management factors
affecting infection control.

Stage 2 - a questionnaire survey on control of infection interventions, based on the £300,000
received by most NHS Trusts from Capital Challenge monies in 2006/07, using the Freedom of
Information (FoI) route as a research tool.

Stage 3 - focus groups to bring together experts from a wide range of fields to share expertise and
debate current issues to bring a fresh and synergistic approach to tackling this difficult issue.

Research team meetings were held at least monthly throughout the study and steering group
reviews were held at the end of each stage.
LITERATURE REVIEW

The Meta analyses by Ulrich et al (2004) and Phiri (2006), of the literature on evidence based design, were used as the baseline for the literature review. The research team, guided by the steering group, carried out a targeted literature search, which initially focused on the general literature relating to the design of wards and CoI in hospitals. The search was then expanded, based on the investigation of CoI, towards the design and management of the environment associated with:

- Location, planning and design of bed spaces and arrangement of beds
  - Bed spacing
  - Single bedrooms
- Clinical practice drivers
- Engineering services in acute hospital buildings
  - Heating and ventilation
  - Clinical hand wash basins and taps
- Facilities management
  - Hard FM (fixtures and fittings)
  - Soft FM (furniture, curtains and cleaning methods)
  - Storage
  - Centralised decontamination of ward furniture ★
  - Staff changing facilities ★
  ★ These were added to the review following the FoI request responses as they appeared to be issues for NHS Trusts.

LOCATION, PLANNING AND DESIGN OF BED SPACES AND ARRANGEMENT OF BEDS

Bed spacing and the possibility for cross infection is recognised as a variable in the incidence and control of HAI and have been subject to considerable debate (for example, Hawkes, 2004; NHS
Estates, 2002; Scher, 2003). The assumption that bed spacing and separation is likely to influence cross-infection is widely held, but it is not universally supported within the thinking and practice of bed-space planning and design (NHS Estates, 2005). The limited research evidence about patient separation and HAI was found to be inconclusive.

Single bedrooms may be effective in the control and management of HAI, but actual performance is also highly dependent on the associated staff behaviour and hygiene control methods (Moore, 2009). This demonstrates the symbiosis between design and practical operation of hospital buildings.

CLINICAL PRACTICE DRIVERS

The clinical practice drivers surrounding the CoI are well known. These have been subject to some considerable research and documentation (Bissett, 2007; Coia et al, 2006; Department of Health 2003, 2006, 2007a, 2007b, 2008a, 2008b; Fairclough, 2006; Gould, 2005; Healthcare Commission, 2008; Pratt et al, 2007; et al). The Department of Health guidelines have been developed from the principles of CoI and relate to the appropriate management of clinical equipment, instruments, hand hygiene and practices involving patient intervention (Department of Health, 2007b, 2008a, 2008b). The key interventions for practice are detailed in the 'Saving lives' document (Department of Health 2006) which requires the auditing of practice to ensure minimum standards are met. These relate to a range of activities including: antibiotic prescribing; cannula insertion and rate of change; insertion of catheters, peripheral and central lines; and clinical hand hygiene.

Hand hygiene plays a central part in the CoI (Department of Health, 2006, 2008b). Much of the literature on hand hygiene focuses on behaviour, culture, education and hand hygiene practice amongst clinicians and nursing staff (Bisset, 2007; Chen and Chiang, 2007; Collins and Hampton, 2005; Cooper, Wisenor and Roberts, 2005; Fairclough, 2005; Lam, Lee and Lau, 2004; Nazarko, 2007; Preston, 2005; et al). In all of these articles only two make any reference to the physical environment. Preston (2005) in her article on aseptic technique comments on the requirement of elbow or foot operated taps to negate the recontamination of hands by touching taps to turn them on and off and to adjust temperature. Lam, Lee and Lau (2004) state that proper design and convenient location of clinical hand wash basins can improve compliance with hand hygiene protocols. Their work was related to a neonatal intensive care unit in Hong Kong but is still relevant to all clinical settings.

ENGINEERING SERVICES IN ACUTE HOSPITAL BUILDINGS

Engineering services are a crucial feature in the functioning of buildings. The principles and practices of CoI rely to a considerable extent on the installation, control and management of water supplies and treatment of wastes, heating and ventilation, air pressure control in various forms of isolation rooms (Department of Health, 2002).

One of the few research based articles on architecture and engineering in CoI is a Brazilian study, by de Castro Bicalho (2006). He investigates the physical barriers, air-flow control, the organisation of workflows, and the choice of finishes and materials relating to CoI. In the specification of materials, it is recommended that careful consideration should be given to their performance in CoI and, in particular, the water retention and impermeable properties of materials.
in walls, floors, ceilings and counters to reduce the transmission of micro-organisms (de Castro Bicalho, 2006).

**FACILITIES MANAGEMENT**

The performance and maintenance of surfaces is an important consideration in design, construction and in the maintenance and management of buildings.

NHS guidance, specifications, cleaning manuals and audit tools exist (Department of Health, 2008b, National Patient Safety Agency 2007, 2009) and detail expected cleaning regimes and some methods including, the use of micro-fibre cleaning systems. Neither of the National Patient Safety Agency documents comment on the expectation, or ability, of the built environment in supporting cleaning processes.

American research highlighted the issue of persisting bacteria on hospitals walls, flooring and upholstery. One of the conclusions drawn was that the specification and selection of materials to be used in surfaces should consider both the performance of the application in use and its performance in disinfection (Lankford, 2006).

The properties of flooring in relation to CoI are considered in HFN 30 (NHS Estates, 2002) and HAI-SCRIBE (Health Facilities Scotland, 2007b). Both detail the requirement for smooth impermeable surfaces for floors and appropriate skirting. HAI-SCRIBE states the right angle joints between walls, floors and ceilings should have coving for ease of cleaning and that surface joints should be kept to a minimum; where they do exist, that they should be sealed effectively.

Behaviour and cleanliness are a focus for the National Audit Office’s (NAO) investigation into HAI (NAO, 2009). The report found that lack of clutter and tidiness improves compliance with hand hygiene practice. The report also points to the need for design and building management to pay more attention to adequate storage space for equipment, instruments and materials. The study by Whitehead et al (2007) argues that the perception of cleanliness is influential on the behaviour of staff and patients and, consequently, on the CoI regime. This particular study points to the possibility that the ‘appearance’ of cleanliness should be a design criterion integrated into the design approach to CoI.

The literature on bed spacing and CoI shows little or no connection with considerations concerning the planning, design, installation and management of curtains and partitions. The NPSA cleaning manual (2009) details how frequently curtains should be changed, the HAI-SCRIBE document asks if curtain track are dust traps and if curtains can tolerate the required laundering temperatures.

The only research found regarding staff changing facilities was from China. The study looked at why severe acute respiratory syndrome (SARS) spread on some wards and not others. One of the key conclusions was that the provision of staff changing facilities at ward level helped to reduce the risk of hospital acquired outbreaks of SARS (Yu et al, 2007).

The relationship between the performance of the built environment in relation to CoI is underdeveloped in the mass of literature relating to infection control. The literature that was found
was predominantly government guidance and ‘grey literature’. There is very little academic research on the elements reviewed. This is possibly due to the fact that the majority of research is carried out by doctors, nurses and academics who tend to focus on the infections, transmission routes, treatments and preventative measures in clinical practice. This relative lack of strength of published evidence led the research team to believe that the research study was worth pursuing as it could develop knowledge in this field and enhance the published evidence base.

RESEARCH FINDINGS

RESPONSES FROM QUESTIONNAIRE TO ACUTE NHS TRUSTS

The literature search was followed by a Freedom of Information (FoI) request to all acute NHS Trusts relating to how they spent the £300,000 capital money made available to most NHS Trusts to make improvements relating to infection control in 2006/07. There were some challenges in using FoI as a research tool to collect data. These included:

- It was slow work finding the FoI addresses as there is no central database.
- Some addresses were wrong which impacted on the response rate.
- There was some confusion over funding in question (capital or revenue) as more money was issued in the next financial year - so some responses had to be rejected.
- Questions needed to be objective to ensure reply.
- Responses came back in various formats which made collation very slow.
- Some responses were very generalised, others very specific which made analysis difficult.

The FoI route yielded a 77% response rate. The questions asked are detailed in table 1.

<table>
<thead>
<tr>
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<th>Freedom of information questions</th>
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<tr>
<td>1</td>
<td>Did the Trust bid for the HAI capital monies available?</td>
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<tr>
<td>2</td>
<td>How was it spent – were there any deviations from their original plans?</td>
</tr>
<tr>
<td>3</td>
<td>Who was involved in the decision making?</td>
</tr>
<tr>
<td>4</td>
<td>With more time would the Trust have done anything differently?</td>
</tr>
<tr>
<td>5</td>
<td>Has the Trust undertaken any infection control related facilities improvements subsequent to the initial money?</td>
</tr>
</tbody>
</table>

Using the FoI route as a research tool was very rewarding. Useful and insightful data was obtained which provide the basis for the next stage of the project.

From the data collected it was apparent that the reasons for the CoI work being carried out fell into the broad categories of backlog maintenance, changes in guidance, changes in thinking, new technologies, behaviour and design issues. The results showed that NHS Trusts were making different choices and some were doing the complete opposite to other NHS Trusts. Though the numbers in these areas were very small, it was of interest to the steering group, all of whom had experienced issues in these areas. The areas of divergence are summarised in table 2.

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The Director for Infection Prevention and Control (DIPC), estates manager, housekeeping manager, matrons and capital projects team members were all represented in responses to the question “who was involved in the decision making?”. Only a few NHS Trusts mentioned that they had used the services of architects or designers. This was probably because most of the
works were small changes, in many places, such as elbow taps being changed for sensor taps in specific areas. All the responses indicated that they had continued to improve facilities in relation to infection control through their capital projects or refurbishment schemes. The interventions that were mentioned are similar to the list of original interventions in response to question 2 (see table 1). This demonstrated that the initial interventions were not one off's and are being repeated. In addition very few NHS Trusts reported that they would have done anything differently with the £300,000 if more time had been available. It was clear from the activity in the NHS Trusts and the literature review that there is not always published evidence underpinning actions. One example of this was a number of NHS Trusts putting clinical hand wash basins in sluice rooms the activity was not included in the Department of Health guidance for sluice rooms (Department of Health, 2008c).

<table>
<thead>
<tr>
<th>CoI Activities</th>
<th>Activities</th>
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<tbody>
<tr>
<td>A Curtains</td>
<td>Replacement curtains with anti-microbial properties</td>
</tr>
<tr>
<td></td>
<td>Replacement of curtains with disposable curtains</td>
</tr>
<tr>
<td></td>
<td>Replacement of curtains with screens</td>
</tr>
<tr>
<td>B Sluice</td>
<td>Replacement of old macerators with new</td>
</tr>
<tr>
<td></td>
<td>Replacement of old bedpan washers with new</td>
</tr>
<tr>
<td></td>
<td>Replacement of old bedpan washers with new macerators</td>
</tr>
<tr>
<td>C Cleaning methods</td>
<td>Micro fibre</td>
</tr>
<tr>
<td></td>
<td>Dry air systems</td>
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<tr>
<td></td>
<td>Vapour technology</td>
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<td></td>
<td>Hydrogen peroxide</td>
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RESPONSES FROM THE FOCUS GROUPS

Stage three of the study consisted of a series of facilitated focus groups. Focus group methodology brings together an informal group of people who share common characteristics, to discuss or share their experiences about a specific topic or problem. They are a useful research tool to identify a wide range of experiences around specific topics and to collect data to address the research aim and objective. The focus groups chosen were microbiologists, control of infection nurses, facilities managers, estates and capital planning managers and architects and designers as all of these groups have been involved in the decision making and planning of the capital spending for control of infection interventions in stage 2. A patient representation group was also used as the research team felt it was important to discover the patents' views on the chosen topics/issues. It was decided to hold uni-disciplinary focus groups as previous experience in the team had shown that this allowed individuals to speak more frankly and openly about the issues they faced than would be elicited in a multi-disciplinary group.

At each focus group the discussions were based on the key themes from the findings of the stage 2 of the research and the literature search, as detailed in table 3. The key themes were presented and members invited to discuss the issues and give their professional and personal views based on their own experiences and knowledge.
The research team felt that the areas of activity with little or no evidence in the literature should be explored further. The key topics chosen for further debate at the focus groups are detailed in table 3. Areas excluded from further investigations were endoscopy and surgical instrumentation tracking as the actions taken were in response to recent well documented guidance. Also excluded were actions which were not directly related to design. These included IT software, replacement commodes, furniture and teaching aids.

Single bedrooms were added as a subject for discussion at the first focus group. All groups were keen to discuss the issues highlighted by the responses to the FoI requests to acute NHS Trusts and no other topics were requested to be discussed. Single bedrooms were highlighted in the FoI responses but were initially excluded as there is a reasonable evidence base for the provision and their use. To keep the discussion points to ten in total the sluice room became one topic – where the merits of having a clinical hand wash basin in the sluice and the divergence of macerators or bed pan washers were discussed.

A recent National Audit Office report (2009) reiterated the Health Act 2006 (Department of Health) that “infection control must be everyone’s responsibility, from clinicians, cleaners and ancillary workers to patients and relatives” but it is difficult to judge if this approach is being adopted. Design solutions are responding to this statement. With clinical hand wash basins at ward entrances, in sluices and no touch taps all visitors and staff are encouraged to wash their hands and minimise cross infection.

Table 3. Original focus group discussion list

<table>
<thead>
<tr>
<th>Subject for discussion</th>
<th>Reason for choice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical hand wash basins at ward entrances</td>
<td>Activity – no evidence in the literature</td>
</tr>
<tr>
<td>Clinical hand wash basins in Sluice/ dirty utility</td>
<td>Activity – no evidence in the literature</td>
</tr>
<tr>
<td>Macerators vs. bedpan washers</td>
<td>Mixed evidence and mixed activity</td>
</tr>
<tr>
<td>Sensor taps</td>
<td>Activity – no evidence in the literature</td>
</tr>
<tr>
<td>Changing facilities for ward staff</td>
<td>Mixed activity – limited evidence</td>
</tr>
<tr>
<td>Centralised ward equipment decontamination areas</td>
<td>Activity – no evidence in the literature</td>
</tr>
<tr>
<td>Flooring (vinyl in all clinical areas and coving instead of skirting)</td>
<td>Activity – little evidence</td>
</tr>
<tr>
<td>Ward storage (quantity and method)</td>
<td>Mixed activity - little evidence</td>
</tr>
<tr>
<td>Choice of cleaning method</td>
<td>Mixed activity – little evidence</td>
</tr>
</tbody>
</table>

FOCUS GROUP SUMMARY

There was consensus across the groups that the topics for discussion were all relevant and important issues for NHS Trusts, which was unexpected.

The methods of cleaning, curtain choice, flooring and skirting choice are open to interpretation. As long as cleaning is thorough, curtains are changed regularly, flooring is smooth and impervious, the risk of cross infection from these items are low. The patients’ focus group said this is the topic that they have the most calls about, usually relating to general cleaning and its frequency.
Some design issues came out of the discussions. The microbiologists felt strongly that wards need to be designed for easy cleaning and to look clean. The facilities and housekeeping management group expressed the need for local separate storage areas for top up supplies e.g. paper towels, soap, toilet tissue, detergent and disposable curtains if used.

Certain cleaning methods require design input. Micro fibre reusable systems need laundry services with strict clean and dirty separation. Hydrogen peroxide vapour requires that areas to be cleaned are physically sealed off to contain the process. Not all hospitals have the required space or design to implement the range of cleaning methods available.

The method of cleaning needs to be matched to the floor surface and finishes chosen or visa versa, to ensure that cleaning methods and regimes will be suitable for the finished product. The number of facets, corners and seals in floors should be kept to a minimum to maximise the integrity of the flooring surface.

All groups were in agreement that the provision of hand wash basins in strategic places increases the opportunities for hand washing at ward entrances, in sluice rooms and in clinical areas. This is in line with the literature (Bissett, 2007; Lam, Lee and Lau, 2004).

The provision of staff changing facilities seems to be of questionable value particularly if the NHS Trust is not laundering uniforms for staff. However infection control teams would welcome in house laundering of uniforms as this would ensure that they are washed at the right temperature and promote changing on entering and leaving the premises. The general design recommendations from the groups to support this process was that pleasant changing rooms should be provided either centrally to the hospital or locally to the wards to encourage use.

Ward storage and management of supplies are key infection control design and management issues. Keeping ward areas free from clutter reduces contamination and allows thorough cleaning. The way storage is designed and what is stored needs much consideration and must incorporate the principles of infection control. The patient focus group were very vocal about wards being clutter free.

The decontamination of ward equipment and furniture (including mattresses) is a requirement but is logistically difficult in large numbers of existing hospitals. The space and specification of such cleaning areas (drains in floors, adequate ventilation, bed washer, etc) make them difficult to retrofit. The required additional staff, stock of furniture and equipment to run a service is an additional financial burden. Consideration should be given to creating these areas in refurbishments and new builds.

The extent and use of single bedrooms is still a cause of much debate. NHS Scotland has a requirement that all new hospitals will now be 100% single bedrooms. New builds are in progress in England with 90 to 100% single bedrooms. There is evidence that placing infectious patients in single bedrooms is an effective measure to combat spread of infection. There are additional drivers for the single bedroom approach which include improved sleep and rest, greater privacy and dignity, and flexibility of accommodation. With single bedrooms there are not the gender restrictions which occur with multi-bed bays.
Key infection control principles of cleanliness, tidiness, no dust traps, clinical hand washing between patients and procedures, together with the containment of known infections must be incorporated into the designs of ward areas.

It is evident that some decisions have been made under the auspices of infection control but really meet different needs; curtains are a specific example of this.

There were comments from the housekeeping focus group that they were not always invited to the design meetings and when they were it was usually too late in the design process to influence anything. They felt that this could be improved.

The general feeling from the focus groups was that CoI is often an after thought in the design process or a box that must be ticked. This does not foster good working relationships, stakeholder engagement or good practice.

**STEERING GROUP INPUT**

Discussion with the steering group on the identified CoI interventions yielded a set of additional issues that add to the complexity of the decision making process. These “design dilemmas” as they became known are detailed in table 4.

CoI is a complex issue on its own. When combined with the complexities of hospital buildings it becomes even more complex. Figure 2 shows the interaction of many of the dimensions of building projects and their relationship with CoI in the design and construction phases. Figure 2 clearly shows how tensions can arise due to the multiple areas of input and areas for consideration. This helps to explain the dilemmas identified by the steering group.

From the overall discussions it is evident that infection control issues are not always a key feature of design, that the cleaning and onward management of the facility is not always considered and designed for accordingly. There are also occasions when infection control is thought about but through the iterative process of the design and not having the key stakeholders present at the table the ideas can get lost, overlooked or designed out due to competing priorities.
Table 4. Design dilemmas for infection control

<table>
<thead>
<tr>
<th>Dilemma</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>New build vs. refurbishment</td>
<td>There are different issues posed by the type of building project. Refurbishments tend to be more restrictive in relation to what is possible to change to achieve infection control design requirements</td>
</tr>
<tr>
<td>Variable age of the estates and size of sites</td>
<td>Different aged buildings require different solutions to infection control issues and this is the same for different sized sites</td>
</tr>
<tr>
<td>Choice without substantiating research evidence</td>
<td>There are numerous products on the market purporting to be antimicrobial resistant but there is little research evidence directly relating to the realities of hospital environments</td>
</tr>
<tr>
<td>Differing views of infection control teams</td>
<td>There appears to be some subjectivity in decisions made by infection control teams – probably due to ‘choice with out substantiating evidence’</td>
</tr>
<tr>
<td>Affordability vs. risk</td>
<td>Some solutions are more expensive than others, NHS Trusts have to keep within budgets and have to ‘cut their cloth’ accordingly</td>
</tr>
<tr>
<td>Preventing problems for the future</td>
<td>Trying to predict what will be problematic in the future is difficult.</td>
</tr>
<tr>
<td>Incorporating new technology</td>
<td>Developments are so fast that designs can be out of date before construction is complete. How is the design brief kept flexible to accommodate late changes?</td>
</tr>
</tbody>
</table>

Fig. 2. The relationship of CoI design decisions with other dimensions of hospital build projects
DESIGN AND MANAGEMENT DECISION MAKING TOOL

The key elements and choices discovered in this study have been collated to form a Design and Management Decision Making Tool to assist anyone involved in hospital building projects.

The study found that there are infection control principles to follow that are relevant to all Trusts, but that these must be interpreted locally because of constraints within the layout and age of the estate. The prioritisation of actions should be agreed with representation by all stakeholders, although the study found from the focus groups that this was not always the case. Infection control is multifaceted and requires many things to be effective. It is clear from the research study that it is not possible or desirable to have a “one size fits all” approach. NHS Trusts will always have restrictions and limitations due to various factors influencing their decision making, from site constraints to affordability. However, there is no doubt that investment in informed design can enhance infection control in ward areas. The CoI Design and Management Decision Making Tool (Table 5) can be used to guide Trusts, stakeholder representatives and designers when involved in Hospital construction projects.

The tool sets out the main themes of the study to provide support for key management and design recommendations appropriate to a Trust’s local environment when planning improvements to the ward for the control of infection. Within the CoI Design and Management Guidance Tool, decision making considerations are set out with the aim to overcome barriers to implementation and the highlight choices available. The Tool themes are listed alphabetically for ease of use and the tool is detailed in table 5.
### Table 5. Control of infection design and management guidance tool

<table>
<thead>
<tr>
<th>Themes</th>
<th>Outcome of research</th>
<th>Infection control considerations</th>
<th>Other positive considerations</th>
<th>Negative considerations</th>
<th>General observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Centralised ward equipment decontamination areas</td>
<td>A number of Trusts have put in “bed washers” and/or created centralised equipment decontamination areas. A few have also developed non-medical equipment libraries to facilitate cleaning and reduce storage and clutter at ward level.</td>
<td>Ward furniture and equipment should be regularly, thoroughly cleaned and this should be audited.</td>
<td>Gives the opportunity to mend and replace furniture regularly, can be linked with a library type system so wards call for equipment as it is needed, this reduces clutter and storage space required on wards.</td>
<td>Few Trusts have the space to put in a centralised cleaning area, there also need s to be an increase in furniture stock to ensure availability on the wards.</td>
<td>There are logistical problems associated with this model but the outcome is worth navigating these.</td>
</tr>
<tr>
<td>2 Changing facilities for ward staff</td>
<td>Preference is for localised changing areas with hospital laundering the uniforms.</td>
<td>Clothing is low risk but all risks should be minimised.</td>
<td>Ensures uniforms are washed at the correct temperature.</td>
<td>May require staff to have more uniforms to ensure a clean one on every shift – this could be more costly.</td>
<td></td>
</tr>
<tr>
<td>3 Choice of cleaning method</td>
<td>Various methods in use — microfibre appears to be a popular choice at the moment.</td>
<td>Method needs to leave ward areas visibly clean and should reduce microbial load without dispersing it in the air.</td>
<td>Reduces the amount of chemical products being used, reduces cost and risk of allergies.</td>
<td>Not all systems are suitable for use in every design of hospital.</td>
<td></td>
</tr>
<tr>
<td>4 Curtains</td>
<td>No clear preference. Mixture of actions.</td>
<td>Curtains considered low risk. Fabric needs to be washed at high temperature, antimicrobial coatings are acceptable, as are disposables.</td>
<td>Manual handling, some Trusts feel that disposables are easier to change. However quick change systems are available for fabric curtains.</td>
<td>Sustainability – there is a large waste issue associated with disposable curtains. Designers don't like them as they are boring and bland, with fabric you can add interest and enhance interior design.</td>
<td>Any choice requires careful consideration, including risks, benefits, life cycle and financial costs.</td>
</tr>
<tr>
<td>Themes</td>
<td>Outcome of research</td>
<td>Infection control considerations</td>
<td>Other positive considerations</td>
<td>Negative considerations</td>
<td>General observations</td>
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<td></td>
</tr>
<tr>
<td>5 Flooring</td>
<td>Preference is for vinyl, Linoleum or Marmoleum and non-slip vinyl for wet areas.</td>
<td>Clinical areas require floors with smooth impervious finish that is easy to clean and maintain, with minimal corners. Edge finishing needs to be durable and cleanable.</td>
<td>‘Smart’ flooring developments are including messages and instructions inset into the flooring. Future technological developments might include for colour indicators of cleanliness.</td>
<td>Standard vinyl is slippery when wet. This need to be managed locally.</td>
<td>The life expectancy of flooring needs to be factored in.</td>
</tr>
<tr>
<td>6 Hand wash basins (Clinical) at ward entrances</td>
<td>Agreement that they are a good idea to promote hand hygiene. There is a feeling that they need to be at the ward exits too, to help stop travel of infection out of the ward.</td>
<td>This is a general requirement, needs to be clearly visible but not at risk of being struck by passing beds etc.</td>
<td>Building Control may approve one basin at part M height of 740mm.</td>
<td>Ward entrances can be congested, there are often no accessible water and drainage points making it difficult to retrofit clinical hand wash basins.</td>
<td>If there were two basins, then one would be at 740mm (DDA compliant), the second at 860mm (standing height).</td>
</tr>
<tr>
<td>7 Sensor taps</td>
<td>Infection control teams keen to have as much as possible on sensors to minimise contact transfer of pathogens; doors, toilet flushed, lights as well as taps.</td>
<td>Infection control enhanced with this style of tap as no possibility of recontamination of hands during the hand washing process.</td>
<td>Can reduce water consumption and wastage.</td>
<td>Can be difficult to get the temperature set correctly on some designs.</td>
<td>High visibility jackets can cause the sensors to activate – this can cause water wastage during the final stages of construction and commissioning of new and refurbished areas.</td>
</tr>
<tr>
<td>Themes</td>
<td>Outcome of research</td>
<td>Control of infection considerations</td>
<td>Positive considerations</td>
<td>Negative considerations</td>
<td>General observations</td>
</tr>
<tr>
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</tr>
<tr>
<td>8</td>
<td>Sluice rooms – clinical hand wash basins and macerators vs. bedpan washers</td>
<td>HBN 04 should be amended to reflect requirement of hand wash basins in sluice rooms. Macerators are the preferred option as there is no risk of residual contamination.</td>
<td>There should be a clinical hand wash basin in the sluice.</td>
<td></td>
<td>Space in existing sluice rooms may preclude the addition of a clinical hand wash basin.</td>
</tr>
<tr>
<td>9</td>
<td>Single bedrooms/patient isolation</td>
<td>Generally felt that higher proportions of single side bedrooms are required. Increased side single rooms might be created to give an element of containment. If not room for side rooms then doors to bays will give element of containment.</td>
<td>There should be adequate numbers of single/isolation rooms to provide segregation of infected and non-infected patients. Consider doors on bays with sensor activated sliding doors. Consider en-suites in larger bays.</td>
<td>Patients do not have to leave bays to use the bathroom, facilities for staff to wash hands close to bays. Patients get more sleep and rest, the issue of privacy and dignity is addressed.</td>
<td>Sometimes doors to isolation rooms left open, the use of sensor activated doors to side rooms could over come this.</td>
</tr>
<tr>
<td>10</td>
<td>Ward storage</td>
<td>Ward storage solutions have been addressed in a number of Trusts. Some providing clear fronted storage to help staff locate items. Cupboards need shelving that can be cleaned.</td>
<td>There needs to be enough storage to put everything away. Nothing should be stored on the floor. There should be no dust traps.</td>
<td>Reduces clutter on the ward.</td>
<td>Can mean staff have to travel further to get items they need.</td>
</tr>
</tbody>
</table>
RECOMMENDATIONS AND CONCLUSIONS

Through literature searching, examination of capital spending on infection control improvement measures, steering group and focus group meetings a range of evidenced and non-evidenced based interventions have been identified. The research team make 7 recommendations to improve the CoI and the built environment of acute hospital wards. These are:

1. To ensure CoI is embedded in the design the relevant CoI principles need to be clearly stated at the commencement of each project.
2. Consideration must be given to how the CoI principles impact on each element and area of the design (the Design and Management decision Making Tool can be used to assist). Once identified the CoI principles, areas of impact and management issues should be documented to prevent them being lost in the design process.
3. The tracking of any changes and rationale for any should be documented through the iterative process of the design.
4. Infection rates should form part of the pre and post project evaluation as a value for money measure.
5. Patients should be involved in the design process.
6. All stakeholders, in-house and external, are involved in the design process and construction process from the beginning and at regular intervals throughout the process.
7. The requirement for a clinical hand wash basin in the sluice room should be added to HBN 04-01 (Department of Health, 2008c).

Valuable data gathered from NHS Trusts, using the Freedom of Information route, was analysed. There were 10 key issues identified and explored with uni-disciplinary focus groups. This gleaned further insights into the issues, practices and rationales for choices. This work has resulted in the creation of a Design and Management Decision Making Tool. It is anticipated that the Design and Management Decision Making Tool will assist anyone involved in the design and construction of hospital projects.

It is clear from the study that CoI is linked with design and can be successfully integrated into the design process. However it is also closely linked with managerial practice and individual behavioural issues. CoI knowledge is rapidly developing and emerging new practice will need to be integrated into both operational and design frameworks. There is also new technology developing in the facilities management arena which will influence both design and operational practice. From the work with uni-disciplinary groups a key factor is getting a balance of stakeholder opinions to enable sensible local responses and decision making.

The study found that there is a general lack of, and in some cases, no evidence in the literature relating to CoI issues and design. This could be due to the pace at which things are changing, improving and developing. This study goes some way in filling the evidence gap.
REFERENCES


THE SIMULATION MODEL AS AN OBJECT BETWEEN BOUNDARIES

M.Kapsali¹, T.Bolt², S.Bayer³ and S.Brailsford⁴

ABSTRACT

The successful planning of healthcare services depends on the process of forming common understandings of systems with complex interdependencies among diverse stakeholders. In this paper we are interested in understanding the role of simulation modelling as a boundary object: how is it used to facilitate communication and transfer meaning and learning amongst diverse stakeholders?

Evidence was gathered in in-depth studies of two simulation modelling projects. The data collection was based on observation of planning group meetings and individual semi-structured follow up interviews with a variety of healthcare professionals. The analysis reveals the relationship between the variety of perspectives among stakeholders and their group dynamics, the social roles of the models and the outcomes of the modelling process.

The findings can be used to plan and manage modelling processes more successfully and develop simulation models with higher levels of usability.

KEYWORDS

boundary object, group model building, modelling, planning, simulation

INTRODUCTION - STAKEHOLDER INTERACTION THROUGH SIMULATION AS A BOUNDARY OBJECT

STAKEHOLDER INTERACTION THROUGH BOUNDARY OBJECTS

A variety of modelling approaches have been used in health care planning ranging from behavioural to mathematical modelling. Simulation models in healthcare are being developed since the mid 1960s and since then the amount of work in the area has increased substantially (Brailsford, 2008; Pitt et al., 2008) because technological advances have helped to access and spread the use of simulation modelling to non-specialist users.

Among the range of modelling approaches, the extent to which individual entities are aggregated in the relevant stock pools varies greatly and it may find objection from professionals who are used to focus on the level of the individual patient. Among the key factors in service planning influencing the use of modelling are the types of uncertainty, complexity, appropriate aggregation, abstraction and the range of stakeholders. Typical of this is the uncertainty in population responses to interventions at the strategic level or the responsiveness to treatment of individual patients or their access to services, as well as the variation in queuing times or event outcomes. The level of abstraction is a key factor in the selection and use of different modelling approaches. Since different models operate on different levels (strategic vs. operational), different types of information are required.

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To collect this information one needs to include different types of sources – experts who belong to different professional communities. The uncertainty and sources of randomness in their information are critical in the construction of a planning tool. This is why communication between diverse stakeholders has to be explicit and clear and should be facilitated by objects that bridge professional boundaries.

Delivering effective care services to patients frequently requires the coordination of activities of several stakeholders: GPs, other primary care services such as rehabilitation, acute hospital and potentially palliative, specialist and social care providers who might all need to come together to provide services for an individual patient. Planning such services is difficult: communication as well as the coordination of the flow of resources between many stakeholders across organisational boundaries needs to be managed. Planning requires the differing needs of stakeholders to be understood and addressed. Local political needs, complex and sometimes perverse financial incentives, differing values between professional groups from different parts of the system (such as social services and acute care) can lead to open or hidden conflicts and misunderstandings. The decision process itself is the key to reveal the factual accuracy of the assumptions and rationality of stakeholder communications. A process which gives some degree of structure, by highlighting uncertainties, encouraging stakeholder dialogue, supporting and documenting the decision, is therefore desirable.

As described very diverse stakeholders are involved in health care planning. The differences in experience, knowledge and incentives among clinicians, managers, policy makers and patients make modelling challenging. First, the dual hierarchy in healthcare institutions (clinical vs. managerial) can hinder communication. Second, because of the complexity of the system, the cognitive distance between professionals can be so that they might be unaware of each other’s roles. Third, the emotive nature of many healthcare decisions can lead to open or hidden conflicts and misunderstandings. The decision process itself is the key to reveal the factual accuracy of the assumptions and rationality of stakeholder communications. A process which gives some degree of structure, by highlighting uncertainties, encouraging stakeholder dialogue, supporting and documenting the decision, is therefore desirable.

Diversity and distance play a role in communication between stakeholders and their group cohesion. When diversity and distance are high, they can be described as communities of interest, with looser connections and different ways of relating than communities of practice. Communities of interest and communities of practice can be distinguished by the coherence of their interests and goals, their close coupling, understanding and expectations (Koskinen and Makinen, 2009). Communities of interest are typically under more time pressure, are more diverse in knowledge, skills and background stimuli. The higher levels of cognitive distance between stakeholders makes it more difficult for them to communicate. Individuals are likely to belong to more than one stakeholder group and occupy several roles. In addition, stakeholder links are not usually obvious – stakeholder salience may be a matter of multiple perceptions, power and sensitivity to influence; their dynamics are based on their status and reciprocity (Fassin, 2008).

Warmington et al. (2004) argued that the kind of collaboration of “looser” communities is “knotworking”, which is a rapidly changing, partially improvised collaboration between otherwise loosely connected professionals. Loose collaboration needs to extend its capacity to re-interpret, learn and expand the definition of the object of communication and literature suggests the use of boundary objects for such a function. In this paper we are interested in understanding the role of simulation modelling as a boundary object: how is it used to facilitate communication and transfer meaning and learning amongst diverse stakeholders?

THE BOUNDARY ROLES OF MODELS

Simulation models can be such an artefact facilitating communication, and examples of such artefacts in other situations might be sketches and engineering drawings or physical models. Such artefacts are created, live and are used in the boundaries between communities of interest.
Bechky (2003; Dodgson et al., 2007) found that jurisdictions manage their conflicts through knowledge authority and legitimacy claims, in which boundary objects stand as flexible artefacts that inhabit several intersecting social worlds and satisfy their information requirements. Rixon and Burn (2008) argue that artefacts enable stakeholders to explore perceptions and attitudes since they can be communication and translation devices, convey meaning and create understanding; however they can also be used to manipulate meaning or assert status. The role of the artefacts is ambiguous since they are used subjectively between different types of conceptual boundaries that exist (Carlisle, 2004). The level of abstraction of artefacts is also serendipitous. Scientific artefacts are of a multi-dimensional nature (Rheinberger, 1997; Cetina, 1997) and can perform different functions for different audiences.

However, while boundary objects can be the basis of negotiation and knowledge exchange, they can also be ineffectual, precisely because their role is at the margins of communities, and their use depends on the frequency of interaction and level of understanding within groups (Sapsed and Salter, 2004). Some artefacts seem more used and preferred than others. Bechky (2003) warns of the misuse of artefacts used to mediate social relations between professions, used to maintain and justify occupational jurisdictions, in an environment where professional groups are involved in occupational competition. This is because different groups support different elements or types of artefacts which have their own specific informational codes (Star and Griesemer, 1989; Carlile, 2002; Sapsed and Salter, 2004) which they consider as adequate representations of what really happens, or they claim to while in reality they use these objects to establish information asymmetry which they use to control their status and that of others.

In the literature different “faces” of artefacts are distinguished including roles as epistemic, technical and boundary objects (Ewenstein and Whyte, 2009). Epistemic objects help to create knowledge and are fluid, while technical objects are static and seen as unproblematic tools to make knowledge available (Ewenstein and Whyte, 2009; see Table 1). Epistemic objects can be used as tools to reinforce knowledge claims, and sometimes are deliberately created to be intentionally subject to interpretations and to dispute. The process of the creation of the artefacts mirrors the status and attitude of the groups towards each other.

Boundary infrastructures are part of social infrastructures which hold particular meanings to communities (Gal, Yoo and Boland, 2004); therefore the creation of the boundary objects becomes a social practice. For that matter it might at some point incorporate agency (Kling and Gerson, 1978: 25). As parts of this dynamic process, boundary objects are outcomes of convergence representing abstract concepts through their visual representations, a process of mutual constitution, and are possible, not necessary outcomes of these processes (Fleischmann, 2006).

Table 1. Objects in experimental systems (Ewenstein & Whyte, 2009)

<table>
<thead>
<tr>
<th>Epistemic objects</th>
<th>Technical objects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract and evolutionary in-flux artefacts used in expert work to negotiate meaning – usually political</td>
<td>Unproblematic, static, technocratic instruments used in expert work between the boundaries</td>
</tr>
</tbody>
</table>

In this paper we are particularly interested in understanding the role of simulation modelling as a boundary object: how is it used to facilitate communication and transfer meaning and learning amongst diverse stakeholders?
UNDERSTANDING SIMULATION MODELS AS BOUNDARY OBJECTS

In a variety of domains, modelling was shown to be able to support disparate stakeholders to create new knowledge. In complex transdisciplinary areas, models can become the facilitators of interdisciplinarity, integrating different knowledge bases (Mattila, 2005; Star 1989). Simulation modelling was shown to act as a boundary object in engineering (Dodgson et al. 2007a) helping to bridge disparate communities involved in innovation and in particular allowing disparate groups to engage with innovation projects and contribute potential solutions to engineering problems (Dodgson et al. 2007b).

Models can be used to make predictions about the real world and allow decision-makers to experiment in a safe, quick and low-cost way with different courses of action. However, as was shown in the case of engineering, (Dodgson et al., 2007b) simulation modelling can also help to shape the conversation between stakeholders in problem solving and foster collaboration. Zagonel (2002) identified a tension between conceptualising modelling as representing reality and as negotiating a social order. He contrasted simulation models as boundary objects or as micro-worlds (see Table 2, summarized from Zagonel 2002).

Modifying Zagonel’s (2002) terminology slightly we can distinguish between models as boundary and as representative objects (replacing his term of “micro-world”). This classification of models can be further refined if we draw on the distinction between epistemic and technical objects (Table 1).

Table 2. Zagonel’s (2002) conceptualization of group model building

<table>
<thead>
<tr>
<th>Models as “micro-worlds”</th>
<th>Models as “boundary-objects”</th>
</tr>
</thead>
<tbody>
<tr>
<td>• problems are pre-existent in the system</td>
<td>• problems emerge from debate and discussion</td>
</tr>
<tr>
<td>• create a realistic representation</td>
<td>• come upon a shared understanding</td>
</tr>
<tr>
<td>• accurately address the content of the issue</td>
<td>• understand our complementary and competing views,</td>
</tr>
<tr>
<td>• strive to find the “correct” solution</td>
<td>• build a joined picture reconciling our different views</td>
</tr>
<tr>
<td>• focused upon the results and outcomes</td>
<td>The process we use to “negotiate” this model is as important, if not more important, than the accuracy of the model as a representation of our reality.</td>
</tr>
<tr>
<td>Therefore, our group process needs to be effective at getting at the answers we need.</td>
<td></td>
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</tbody>
</table>

Boundary and representative objects can both also be epistemic and technical objects. This combination allows a classification of four types of model roles (Table 3). Models which as boundary objects facilitate communication between stakeholders with different knowledge bases can be used to create new knowledge (as epistemic objects) by the stakeholder group or can be used to make knowledge available across the group (as technical objects). In the first type of use of a model as a boundary object the emphasis would be on learning as a group while in the second it would be on expression of the knowledge in a form accessible to others and on experimenting with that knowledge within the group, i.e. showing what would happen under different scenarios. Models which are primarily used to represent a reality which is seen as principally unproblematic can again be used in two different ways: to be explored as a micro-world or management flight simulator in order to allow the user to learn or as a predictive tool thereby allowing the user to draw on the knowledge embodied in the model without necessarily requiring an understanding of the relationships within the system.

These four types are ideal types – in practice the social roles of models might not always clearly fit into any one of these types, but instead be a mixture of them. Different stakeholders might have
different views of the role of the model: a client might for example have at the outset a predictive tool in mind, while the modelling process might show that what is required (or maybe in some cases achievable) would be group learning. Over time the role of a model might change: group learning might be followed by expression of knowledge and experimentation, followed by the development of a predictive tool for other users or a micro-world as a learning environment for students to explore.

Table 3. A framework to classify the social roles of simulation models

<table>
<thead>
<tr>
<th></th>
<th>Epistemic Object</th>
<th>Technical Object</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(create knowledge)</td>
<td>(make knowledge available)</td>
</tr>
<tr>
<td>Boundary Object</td>
<td>Learn as group</td>
<td>Experiment and express</td>
</tr>
<tr>
<td>(facilitate communication across boundaries)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Representative Object</td>
<td>Explore</td>
<td>Predict</td>
</tr>
<tr>
<td>(represent reality)</td>
<td></td>
<td></td>
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</tbody>
</table>

This paper introduces this framework; the remainder of the paper gives some initial directions and indications on how this framework might be used in research about model use.

CASE STUDIES OF TWO MODELLING PROJECTS

METHOD

We are currently conducting case studies of consultancy engagements using simulation modelling in healthcare planning. In this work we have observed a series of modelling workshops (typically 4-6 sessions) and interviewed clients, modelling consultants, expert group members and other stakeholders (typically 8-10 interviews per case). We have chosen a case study approach (Eisenhardt, 1989; Yin, 1994) in order to be able to examine in detail the roles models take through the modelling process and analyse the influencing factors upon these roles through case comparison.

In this paper, the two case studies are based on two System Dynamics (SD) projects tackling the same problem (Alcohol Hospital Admissions), one from a local perspective and the other from a national perspective. The local project aimed to inform commissioning of healthcare services for that particular local jurisdiction, while the national project aimed to develop tool for local commissioners nationwide. In both projects a similar group model building approach was used. Both projects were carried out interactively with expert groups led by modelling consultants with experience in healthcare modelling. However, the composition of the two expert groups involved in the process was different. This sampling of case studies allows us to control the project influencing factors to some extent and use their differences to observe the group composition and project purpose have on the role models play.

RESULTS

Table 4 compares the two case studies and includes some illustrative quotes highlighting how the differences in goals and group composition influenced the roles of the models in both cases.
### Table 4. Comparison of two case studies

<table>
<thead>
<tr>
<th>Case 1: producing a tool for others – national project</th>
<th>Case 2: learning as a group – local project</th>
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<tbody>
<tr>
<td><strong>Goal:</strong> &quot;influence policy&quot; and &quot;make a difference&quot;, &quot;reflect the work we had done in this&quot;, &quot;Provide a tool for local authorities to make a robust business case.&quot;</td>
<td><strong>Data clashed with perception of participants – learning about wider system, finding about the performance of the solutions, attention directed by modeller towards solutions</strong></td>
</tr>
<tr>
<td><strong>Group composition:</strong> &quot;it is a reasonably small field&quot; and so &quot;we all knew each other&quot; &quot;already had a high level of understanding&quot;</td>
<td><strong>Iterative process where the boundaries of the model are negotiated with participants depending on changing perceptions of the system</strong></td>
</tr>
<tr>
<td>Some said the model building was different and made them &quot;look at everything&quot;, while others don’t see a difference from other policy discussion events</td>
<td>&quot;Three key points to help the participants use the model constructively: a well defined issue, people who have the power to make changes to take part in the process and the simplest model to address the issue.&quot;</td>
</tr>
<tr>
<td>Welcome broad participation in group (different disciplines)</td>
<td>&quot;...... it is a group learning process – if you present it cold through a model without the learning process it is very difficult to own the results ......&quot;</td>
</tr>
<tr>
<td>Model is &quot;looking at full spectrum of interventions&quot;, with the model you “can communicate this to others”</td>
<td>&quot;the model works best with those (participants) who have a whole systems view and can articulate what they see .....&quot;</td>
</tr>
<tr>
<td><strong>Goal:</strong> &quot;influence policy&quot; and &quot;make a difference&quot;, &quot;reflect the work we had done in this&quot;, &quot;Provide a tool for local authorities to make a robust business case.&quot;</td>
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</tr>
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<td>While case 1 (the national project) aimed at producing a predictive tool, case 2 (the local project) emphasized on the learning of the stakeholder group. This was correlated directly to the differences of the group composition. In case 1 the participants were nationally recognised experts, who knew each other well from meeting at conferences and other events. Even though they came from different disciplines, they had an understanding of the others’ knowledge and had developed a shared language. Case 2 was a group of local professionals involved in implementing the policy on a local level in different parts of the healthcare system. Maybe unsurprisingly, the cognitive ties between these stakeholders were looser and more work had to be done to create a shared understanding and a shared language. In case 2 the modelling workshops aimed at creating the shared understanding of the problem, while in case 1 the focus was more on codifying the shared understanding which was already there.</td>
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<td>Welcome broad participation in group (different disciplines)</td>
<td>The goal of the modelling approach, to develop a Systems Dynamics model, was the same for both case studies. The differences in goal agreement however reflected the differences in the composition of the stakeholder groups, which determined the social roles of the model in both cases. In case 1, the model was conceptualized as a predictive tool. The common understanding combined with the tool building focus resulted in limited use of the model as a boundary object. In case 2 the model was observed to be serving somewhat more of a boundary object and an epistemic object role than in case 1: it had some role in bridging the difference of the knowledge bases of the stakeholders and supporting the collaborative production of new knowledge.</td>
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ANALYSIS

Initial analysis considered the occurrence of the four object roles through the observed building processes. These confirmed that the models can to some extent function as epistemic objects to facilitate participants’ understanding of both the whole system, their own place in the system and their relation with other parts of the system. Initial results indicated that the extent to which this takes place depends on group composition. In case 1, the group was primarily composed of established experts who already had a strong overview of the system and simulation as a tool. Furthermore, the selected experts were already generally quite familiar with one another and one another’s priorities and positions, such that the model was not needed to play as much of a boundary object role.

In case 2, although it was expected that the model would be used as a boundary object to communicate and set up a vocabulary amongst the diverse group with large cognitive distance, the ability of the model to serve as a boundary object was limited by the perceived complexity of its visual representation. How it appeared seemed to be the most important criterion for the model to perform other social roles.

In addition, the role taken by the model at various points seemed to be linked to the project process, in particular the combination of objectives and the management of their perception. Unsurprisingly, the early use of the model tended towards the boundary and epistemic roles as the groups explored their understanding of the system and the tool and their various roles. In later meetings, the emphasis shifted to the model serving more a technical object role as it was used for supporting scenario-testing or exploring technical options as the project briefs originally intended; and as a representative object as it solidifies into a fixed structure to reflect the system as there was a higher need for learning. The model as an epistemic object succeeded in developing a general impression but not deep understanding of the system and its relations. In the follow-up interviews concerns identified by the subjects included the perceived rapid pace of the meetings; how the model was introduced to them; and the way they did or did not engage with it.

In case 1 the stakeholders seemed comfortable with the simulation technology. The more clinical experts did also understand and appreciate the approach, but they didn’t feel comfortable with the high level of aggregation of individual pathways. In case 2, stakeholders who were closer to the clinical pathway or had experience in pathways found it easier to understand the model than others who hesitated to engage in the discussion of what they perceived to be complicated and difficult to understand.

While the participants were expects deemed to have a strong understanding of the system, particularly in the national case study, there was use of the model for exploring and creating new knowledge (serving as an epistemic object) in both case studies.

In both cases, the expert participants were not the end users of the model. This did impact on the objects’ use as the meetings tended not to be structured for thorough training with learning objectives. The priority in both cases was to provide an accurate technical tool that describes the system and allowed for experimentation of policy options. The learning was basic enough as such that participants could feed the appropriate data into the processes, rather than learning about the system.

A factor recognised by all the stakeholders in both case studies was the inability to be present in all the meetings. It was readily recognised that consistent participation at meetings working with experts on the model building would have enabled it serve the boundary object and epistemic object roles more. (Certainly feedback indicates confidence from many of the participants in case 1
for the model’s ability to serve these roles.) However, we do not know whether this limited the models’ ability to take a representational or ultimately a technical role.

CONCLUSIONS AND RECOMMENDATIONS

The conclusion from the above analysis is that there seems to be a relationship between the different social roles of the model. That means that it is not only that an artefact such as a model can be used as either an epistemic, boundary, technical or representation object separately or even at the same time, but there is dependence between these roles. It seems that the representation function is the key to initiate the successful function of the object as boundary or/and epistemic that eventually will lead to a reified technical object. The evidence from the case studies is that the representative role is a catalyst for an object’s success in the other social roles.

The success of the representational function on the other hand is depended upon the level of previous knowledge and understanding of system the model is referring to and the technical model as a systemic tool. Prior understanding then is crucial for the model to perform its social roles - either that or some kind of understanding of the healthcare system where the model is applied on combined with learning objectives embedded in the process.

This on the other hand depends on the cognitive coupling of the stakeholder group. Large cognitive distances and high diversity are linked to poor knowledge and understanding of the healthcare system and the model as a tool – unless all are from a similar quantitative background. The levels of professionalization – operational vs strategic, being a staff or a decision maker, affects the level of systemic understanding for certain, and also the ability of the stakeholder to comprehend the abstraction of the data needed and represented in the model. Therefore the individual position in the system and their function will ultimately affect the group composition and the way the individuals will be receptive to the messages that the model carries while it is constructed.

A further conclusion is the function of the four key roles that a model can play within a diverse expert group. By definition a model has a representative role, though the overall purpose of its use or development can be more reflected by the other roles identified. This study also considered the role in facilitating communication and understanding across groups, as a boundary object. Additionally the use of the model as an object to create knowledge or explore ideas, an epistemic object, seemed particularly relevant for System Dynamics models which explicitly are used for exploring scenarios on the system and observe the changes to it. Only then would the model be used as a technical object.

The results demonstrate the key role that group composition and established knowledge had on the extent to which the model served in each role. Furthermore the extent to which participants could understand and work with the model determined how well it served in all four roles.

There might be a relationship between the group dynamics and role the model takes. In addition it would be interesting to identify if different types of modelling (Discrete Event Simulation) affect the social use of the models and the process of their construction. These are the planned further research steps that will follow and the results will shed light to the use of planning tools not only as predictive technical objects but also as social entities.

We are currently undertaking further data collection on Discrete Event Simulation projects, which will help us enrich our results as described in the previous paragraph. We expect that the results will enable project leaders, simulation developers and policy makers to run more successful projects and use simulation models in better ways. The practical outcome would be better simulations since they are going to be constructed more successfully. We expect that our results
will encourage clients and professionals managing modelling projects to incorporate more learning in the project process. In addition our work will enrich the literature on boundary objects with new perspectives and ideas infused by the groups dynamics literature.
REFERENCES


Lane D.C. 2000. “You just don't understand me: Modes of failure and success in the discourse between system dynamics and discrete event simulation”. LSE OR Dept Working Paper LSEOR 00-34, London School of Economics.


WHERE HAVE ALL THE PLANNERS GONE?
CHALLENGES OF INTEGRATED APPROACH TO PLANNING OF MAJOR INFRASTRUCTURE RECONSTRUCTION AND NEW WAYS OF SERVICES DELIVERY IN UNIVERSITY HOSPITALS IN SERBIA

G. Boulton¹, IM Jekić², A. Katrava³ and N. Koumpis⁴

ABSTRACT

Health infrastructure, like health financing, is ‘a means to an end; not an end in itself’. Infrastructure solutions need clear health policy direction and needs-based, evidence-based service planning. This study describes efforts to engineer a radical reconfiguration of the tertiary level of the Serbian health system, particularly four clinical centres, which stand at the apex of the system, in readiness for a major investment programme. The planning process described involved the Ministry of Health, the clinical centres and a technical assistance team financed by the European Agency for Reconstruction. The outcomes included a tertiary health care policy, site development, business plans and design briefs for the four centres, which provide the basis for a major investment programme financed by the Serbian Government with loan support from European Investment Bank. A number of key challenges faced and priorities and planning principles adopted to underpin the reconfiguration of the tertiary level of a previously under-invested health care system are described.

KEYWORDS

tertiary health care, teaching hospital, reconfiguration, sustainability

BACKGROUND AND CONTEXT

HEALTH AND HEALTH CARE SYSTEM

Serbia has a declining population (7,379 million 2008 est.), life expectancy of 73.9 years and a median age of 39.3 years. Population over 65 is 16.8% (2009 estimate). The burden of disease (heavily influenced by non-communicable disease) mirrors the established European pattern (Table 1), providing important clues about service needs.

Serbia is emerging from a difficult period in its history during the 1990s, characterised by political and economic isolation, a period of drift and underinvestment in health infrastructures and technologies. Serbian infrastructure legacy is typical of the central and eastern European region and the Semasko model, dominated by large institutions – polyclinic and hospital. Serbia currently lacks contemporary economic, management and planning capacities to provide the vision and planning framework to engineer a transformation in the health care delivery system.

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⁴ Technical Assistance-TA Project Team – DEC/EIB Technical Assistance to the Serbian Ministry of Health - Sofreco Project Office, koumpis@sofreco-tcs.com
Table 1. Burden of disease by deaths from non-communicable disease in the WHO European region. By Cause (2005)

<table>
<thead>
<tr>
<th>Groups of Causes (Selected non-communicable diseases)</th>
<th>Disease Burden</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DALYs (1000s)</td>
<td>% All Causes</td>
</tr>
<tr>
<td>Cardiovascular diseases</td>
<td>34,421</td>
<td>23</td>
</tr>
<tr>
<td>Neuropsychiatric conditions</td>
<td>29,370</td>
<td>20</td>
</tr>
<tr>
<td>Cancer (malignant neoplasms)</td>
<td>17,025</td>
<td>11</td>
</tr>
<tr>
<td>Digestive diseases</td>
<td>7,117</td>
<td>5</td>
</tr>
<tr>
<td>Respiratory diseases</td>
<td>6,835</td>
<td>5</td>
</tr>
<tr>
<td>Sense organ diseases</td>
<td>6,339</td>
<td>4</td>
</tr>
<tr>
<td>Musculoskeletal diseases</td>
<td>5,745</td>
<td>4</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>2,319</td>
<td>2</td>
</tr>
<tr>
<td>Oral conditions</td>
<td>1,018</td>
<td>1</td>
</tr>
</tbody>
</table>


Tertiary level health care in Serbia has historically been institutionally defined and planned using a range of rigid, detailed, population-based, normative measurements incorporated in a detailed master plan or network of facilities, which identifies the number of public inpatient provider institutions and a quota of beds. Until recently little attention was paid to system outputs, efficiency, productivity and outcomes and alternative care delivery approaches that are transforming the role, function and organisation of hospitals world-wide. Table 2 contains the institutional model as of 2008. The apparent increase in institutions in Table 2 results from a policy to separate, by the end of 2010, previously integrated hospital/primary care in health centres, into independent primary care and hospital entities. This presents a challenge in planning terms, as many countries are striving to integrate service planning and delivery, through the use of integrated service frameworks, clinical pathways, patient pathways approaches or variations thereof (e.g. UK1, Belgium2 and Sweden3).

This study concerned only with the tertiary level hospital component of the health provider network, the full extent of which is included in Table 2. It is acknowledged that in the fast moving health system environment, it is impossible to entirely divorce the planning of the primary, community and social dimensions of the delivery model from secondary and tertiary level planning.
Table 2. Health care institutions in Serbia 2005 - 2007

<table>
<thead>
<tr>
<th>Health Care Institutions</th>
<th>2005</th>
<th>2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Health Care Centre</td>
<td>86</td>
<td>116</td>
</tr>
<tr>
<td>Clinical Centre</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Clinical Hospital Centre</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Health Centre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- General Hospital</td>
<td>36</td>
<td>22</td>
</tr>
<tr>
<td>- PHC Centre</td>
<td>(39)</td>
<td>(24)</td>
</tr>
<tr>
<td>General Hospital</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>Special Hospital</td>
<td>16</td>
<td>37</td>
</tr>
<tr>
<td>Clinic</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Institute</td>
<td>33</td>
<td>22</td>
</tr>
<tr>
<td>Institute (Zavod)</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Institute of public health</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Pharmaceutical Institute</td>
<td>28</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td>246</td>
<td>301</td>
</tr>
</tbody>
</table>

Source: Ministry of Health 2008

THE FOCUS OF THIS STUDY

Tertiary health is defined in Serbia in institutional terms. There are 30 institutions currently providing some aspect of tertiary level health care providers, many of which are centralised the capital city, Belgrade:

- 4 Clinical Centres
- 4 Clinical Hospital Centres
- 6 Clinics
- 16 Institutes
- Certain general hospitals with tertiary level specialties e.g. neurosurgery, burns care, nuclear medicine

Tertiary level institutions provide more than tertiary care services, including varying contributions of basic secondary level care. In definitional terms the extent of tertiary level activity vis a vis secondary level activity is not important - the tertiary classification is applied to the whole institution.

The major providers of tertiary care are the four main Clinical Centres of Belgrade, Nis, Novi Sad and Kragujevac. The Ministry of Health plans to update and modernise these facilities. The four centres sit at the pinnacle of the Serbian health care system, consuming about 20% of recurrent hospital expenditure. Clinical Centre of Serbia, Belgrade acts additionally as a main National Referral Centre, providing quaternary level care.

HEALTH SYSTEM PLANNING - BACKGROUND

The Serbian traditional health planning approach, common in several central and eastern European countries in transition, is input-based, bureaucratic and marginal. Planning is based on the institution and infrastructure, rather than service. The law specifies the scope and scale of the hospital network. The network provides for a public component of 37,500 beds (approximately 5 beds per 1000 population) of which 30,000 are classified as acute, of which 6,000 are classified as tertiary level. Each institution has an annual plan, largely based on history, and rolled forward each year. The plans’ origins are lost in the mists of time, having, as their foundation, the prescribed normative base, which has much to do with a notion of population equity, but little to do with population need or anticipated capacities and levels of performance necessary to meet demand. The basic planning currency for hospitals is ‘the bed’ with little account taken of the increasing range of medical and surgical care that can now be delivered through alternative ambulatory, day and
Community-based models. Business planning has yet to enter the Serbian health care planning lexicon.

Basic units of the hospital are the department, the ward and the bed, the ‘normatives’ for which are usually expressions of physical, human resource and technology inputs. This has produced, and continues to produce, fragmented and territorial approaches to hospital development and custody of high cost technologies. Switching from an input-based planning (and financing) approach to one of needs-based, demand-lead, outputs and outcome-based and performance driven approach is a major challenge for many countries in transition, not least because of fundamental weaknesses in basic information/measurement systems.

Master planning is supported. This is a normative ‘one off’ top down approach with master plans fossilised and incorporated in law and not regarded as ‘organic’ and dynamic vehicles of health system planning, regularly updated to reflect the fast changing scientific and medical practice environment, within which a modern health care delivery system operates.

The hospital institutional legacy includes many large hospitals. The four clinical centres in this study have relatively high bed numbers – Clinical Centre, of Serbia, Belgrade 3,316 (spread over a 48 hectare site), Clinical Centre Nis 1,465, Clinical Centre Novi Sad 1,366, Clinical Centre Kragujevac 1,183. A total of 7,330 beds in four hospitals and accounting for almost 25% of the planned acute secondary and tertiary bed capacity of Serbia. Each centre and a number of basic regional hospitals exceed the optimum size range (300 - 600 beds) above and below which hospital efficiency begins to decay (Aletras et al 1997)\(^5\).

At the outset of the planning process, none of the four Clinical Centres had comprehensive site development control plans. Piecemeal and fragmented departmental hospitals over large sites, failed to produce cohesive and efficient whole hospital development. Three of the four clinical centres had a significant legacy of ‘sunk’ investment in incomplete developments. In particular, a substantial 100,000 m\(^2\) tower and podium development at Clinical Centre of Serbia, Belgrade, started in the 1980’s, of which only about one third was completed and used for outpatient and ambulatory services; a partially completed and occupied development on the periphery of the site of the Clinical Centre of Nis and a large structural steel and concrete ‘shell’ development at the Clinical Centre of Novi Sad.

EUROPEAN SUPPORTED PROJECTS

The European Community has been a major donor to the health sector in Serbia over the past decade, initially focussing on emergency assistance, following the Kosovo war in 2000, and more recently in the provision of technical assistance to support key aspects of health policy implementation, including tertiary care modernisation. European Investment Bank based in Luxembourg has provided loan support to the Serbian Government for aspects of health policy implementation requiring infrastructure and technology investment. The planning process described here is the prelude to a new €200 million loan, between the Bank and the Government of Serbia, supported by counterpart financing from Government, to ‘pump prime’ a radical upgrading and modernisation of the four Clinical Centres. This programme is now in the detailed design stage in preparation for the procurement of building and equipping contracts. There are already some signs that final design parameters are being influenced by previous approaches particularly relating to the dominance of departmental solutions and of the hospital bed as the main factor.
APPROACH AND METHODOLOGY - KEY PLANNING ISSUES

WHAT IS TERTIARY CARE?

There is a paucity of literature on tertiary health care policy, despite its impact on health system investment and recurrent resource consumption internationally. There is reported literature on some common tertiary level specialties such as cardiac surgery, neurosurgery, thoracic surgery, genetic reference services etc. Much American literature uses the term tertiary to denote a higher level of skill and capacity than competing institutions and services, almost as a marketing tool. Tertiary care in one country is not necessarily tertiary care in another. Much depends on factors such as the historical development of medicine, preferences in medical custom and practice, the state of art development of medical practice and economics. For example, in a number of European countries aortic aneurism repair has evolved as part of the vascular surgery service at the secondary, district general hospital level. This remains a tertiary level procedure in Serbia, undertaken almost exclusively in tertiary level institutions. Also tertiary level care, by its very nature, is not static. Tertiary care is at the forefront of applied medical innovation and practice. A provider’s role may be to absorb innovation and then diffuse it, in some cases, to lower level providers, to improve equity and citizen access. Cardiac pace-making services, for example, have in many countries been decentralised to a secondary care level. In Serbia, this evolutionary process is underway, but the umbilical chord has not yet been universally and completely cut with the main tertiary level provider. Some tertiary care procedures may, therefore be innovative and ‘transient’ aspects of the clinical centre/teaching hospital service portfolio. This makes tertiary care planning exercise a particularly tricky task.

THE TEACHING HOSPITAL ROLE

The tertiary level teaching hospital/clinical centre is a feature of most health care systems. It presents a more complex planning problem, not simply because of service complexity and the concentration of high cost services and technologies. The teaching hospital has a number of important roles to play aside from a service role, each of which has potential implications for the modernising planner. These functions were identified following an analysis of the Serbian and other teaching hospital/clinical centre models as:

- Hosting tertiary level activities for a regional catchment
- Provider of secondary care services for a local catchment
- Acting as a referral centre for more complex cases (complex case-mix)
- Provider of facilities and experience for undergraduate professional education in partnership conjunction with medical schools
- Providing a centre post-graduate and continuing professional education and training
- Contributing to a National applied medical research and development strategy
- Leading and promoting innovation in models of health care delivery
- Acting as a centre of professional excellence and leadership
- Collaborating with technical and engineering universities in seeking innovation in new materials and technologies (the ‘Science Park’ component).

FROM ‘INSTITUTION’ TO ‘SERVICE PROVIDER’

A fundamental and progressive shift is happening in the hospital role and function. Hospitals are operating less as institutions and more as service providers. They are operating beyond their institutional boundaries, to take service delivery closer to patients. For example, new information and communication technologies allow ‘virtual’ medical services to be established where geography and service access are important issues. Many complex major diagnostic and treatment technologies can now be ‘mobile’. The Insurance Fund in Hungary introduced a mobile lithotripter
service to improve patient access and aid the motivation and retention of renal physicians and urologists at local hospitals. Telemedicine services are increasingly cheap and reliable and enable remote consultation services. Such developments have significant implications for future infrastructure needs at host hospitals.

THE ‘CLINICAL GOVERNANCE’ INFLUENCE

A counter development is the centralisation of certain complex clinical functions in fewer institutions. Clinical governance influences are leading to the concentration of high volumes of high skilled and high cost procedures in fewer locations in order to improve service quality and safety. The critical mass of work undertaken by clinical teams is important in the planning of a number of services including, for example, some complex surgical procedures, paediatric cardiac services, major trauma care etc. These developments have significant implications for tertiary care strategy and consequently for service and infrastructure planning.

ASSET ‘CONSCIOUSNESS’

Capital assets in Serbia, in common with many other countries in transition, are still regarded as a ‘free good’, not taken into account when setting health care tariffs or costing of health care services. This lack of accounting for capital utilisation and the full life costs of capital investments, fails to incentivise an efficient approach to infrastructure and organisation and represents an important obstacle to the acceptance of issues of ‘modernisation’ of health care delivery models in plans.

CONCERN FOR SUSTAINABILITY

Sustainability is a key issue for Serbia. A snapshot comparison of CCS Serbia and two centres of tertiary health care and teaching excellence in Europe illustrates the resource gap between Serbia and other European countries. Manpower and finance levels are significantly lower in the Serbian Centre, but workload is broadly comparable.

<table>
<thead>
<tr>
<th>Table 3. Snapshot comparison centres of excellence, Europe</th>
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<tbody>
<tr>
<td><strong>No. Employees</strong></td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>No. Beds</strong></td>
</tr>
<tr>
<td><strong>Inpatients/year</strong></td>
</tr>
<tr>
<td><strong>ALOS</strong></td>
</tr>
<tr>
<td><strong>Outpatients/year</strong></td>
</tr>
<tr>
<td><strong>Surgeries/year</strong></td>
</tr>
<tr>
<td><strong>Annual budget €</strong></td>
</tr>
<tr>
<td><strong>GDP/capita (2005)</strong></td>
</tr>
<tr>
<td><strong>Health Expenditure as % of GDP (2005)</strong></td>
</tr>
<tr>
<td><strong>No. Employees</strong></td>
</tr>
<tr>
<td><strong>No. of Beds</strong></td>
</tr>
</tbody>
</table>

Source: Hospital data and WHO

Allowing for significantly lower pay levels in Serbia (pay represents 70% of recurrent expenditure), the remaining 30% ‘other’ expenditure for infrastructure maintenance, new technologies, leading edge pharmaceuticals, much of which has to be procured on international markets, is inadequate to achieve and maintain parity with other National centres undertaking similar roles. The technical assistance support project helped the four clinical centres to undertake a zero-based planning and financing exercise, to support sustainable service solutions. Realistic business plans were developed within current resource envelopes. In particular, issues of alternative
service delivery approaches and bed requirements, increased efficiency and productivity together with qualitative features such as the patient experience, patient privacy, dignity etc. were all addressed. Also, universal issues of energy efficiency, efficiency of manpower utilisation, environmental impact featured in the planning and financing assessments. Resulting business plans were designed to guide future investment choices. Tensions emerged as planning strategies signalled the introduction of multi-user departments for day, ambulatory and programmed medical care, centralised diagnostics, shared support functions, challenging deep-rooted departmental models of organisation and practice.

**PRINCIPLES AND UNDERLYING AIMS**

**GENERAL**

A number of guiding principles were identified to reflect what were perceived as the main changes of direction needed to support a modernised and sustainable tertiary level hospital system. In terms of hospital internal organisational structures, an objective set was to move from a departmental/unit basis to a whole institution approach and in terms of organisational processes to move to a patient/staff/material flows-based organisation; from an institutional model to a service model and in terms of underlying culture from a professional-centred organisation to a patient-focused clinical centre.

**CENTRALISATION OF KEY FACILITIES AND SERVICE**

Historical departmental development had produced significant overlap and duplication of diagnostic and therapeutic support services or had resulted in the denial or difficulty in access for geographically remoter clinical functions to diagnostic or therapeutic support services. The most extreme example of this is at the Clinical Centre of Serbia, Belgrade where diagnostic or therapeutic technologies are distributed amongst departments, separated from each other over the 48 hectare site, resulting in the operation 15 laboratory units and 11 x-ray departments.

**SITE CONTRACTION AND CLOSER INTEGRATION OF SPECIALTIES**

Over past decades medicine has become increasingly specialised and sub-specialised whereas patient needs are becoming more and more comprehensive and interlinked. A John Hopkins designed case-mix management system for primary care acknowledges that almost 25% of patients treated for diabetes in primary care have four or more co-morbidities, a pattern replicated for the other common chronic diseases. Co-morbidity is becoming the norm demanding the closer integration of specialties and services, to provide patient-focussed care regimes.

**THE CENTRAL, LOGISTICAL IMPORTANCE OF DIAGNOSTICS IN MODERN MEDICINE**

Not much happens in modern hospital medicine nowadays without diagnostics. Diagnostics are the essential tool of modern medicine. All streams of patients need interaction with diagnostic services, including the increasing range of diagnostic and therapeutic ‘oscopies’. In terms of internal organisation, centralised diagnostics sits schematically at the centre of the modern hospital. This is relatively easy to ensure in a ‘new build’ solution but must also be ‘engineered’ in upgrading and reconfiguration schemes.

**MULTI-USER EFFICIENCY AND PATIENT ACCESS**

The creation of multi user departments to replace traditional departmental mixtures and the separation, for efficient management purposes, of emergency patients, inpatients, day and ambulatory patient streams, has economic and quality advantages. Cost and quality advantages of
day surgery, for example, are not fully realised when mixed with main ward activities. There is some justification for a degree of specialisation within multi-user departments e.g. for ophthalmic surgery which needs dedicated equipment and environment. The same multi-user approach applies equally to the medical equivalent of day surgery, the programmed investigation unit, which concentrates elective and urgent patients into a single process, providing efficient rapid and integrated pre-planned care pathways.

SEPARATION OF PATIENT FLOWS

Traditionally hospitals have taken account of three main patient flows – the outpatient, the inpatient and the accident and emergency patient. Since the 1980s there have been significant developments in surgical technique and practice which has enabled the growth of day surgery. This has been matched by innovative developments in medical diagnosis and treatment. Current planning now provides for the four main patient streams – outpatient, inpatient, day patient and accident and emergency patient, patients from which have different needs and require different forms management and support in their progression through the hospital episode.

In 2003 the International Association of Day Surgery suggested:

“Ambulatory surgery is expanding throughout the World and it is considered that 75% if not more, of all operations will be carried out in ambulatory surgery centres/units”

Equally IAAS and European Observatory’s 2007 “Policy Brief: Day Surgery Making it Happen”12 highlights the wide variations throughout Europe in the assimilation of this safe, effective and cost effective organisational approach. Table 4 shows the variation in uptake of day surgery, for example, for hernia repair. Similar variations exist for most other common surgical procedures. Given current resource pressures it is difficult to ignore this common care delivery model.

Table 4. Percentage of hernia repairs performed as day cases (2002 – 2004)

<table>
<thead>
<tr>
<th>Country</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>90.5</td>
</tr>
<tr>
<td>Denmark</td>
<td>83.4</td>
</tr>
<tr>
<td>Canada</td>
<td>77.6</td>
</tr>
<tr>
<td>Sweden</td>
<td>71.7</td>
</tr>
<tr>
<td>Norway</td>
<td>67.6</td>
</tr>
<tr>
<td>Finland</td>
<td>65.4</td>
</tr>
<tr>
<td>England</td>
<td>60.5</td>
</tr>
<tr>
<td>Netherlands</td>
<td>54.3</td>
</tr>
<tr>
<td>Italy</td>
<td>52.1</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>48.2</td>
</tr>
<tr>
<td>Australia</td>
<td>41.2</td>
</tr>
<tr>
<td>Belgium</td>
<td>39.7</td>
</tr>
<tr>
<td>Portugal</td>
<td>37.3</td>
</tr>
<tr>
<td>France</td>
<td>36.1</td>
</tr>
<tr>
<td>Scotland</td>
<td>31.1</td>
</tr>
<tr>
<td>Germany</td>
<td>25.4</td>
</tr>
</tbody>
</table>

Source: Toftgaard (2003)13
PROVIDING FOR CONTINUING DEVELOPMENT

Serbian clinical centre sites are all relatively large. Planning solutions, particularly in the case of the Clinical Centre of Serbia, which occupies a 48 hectare site in the capital city, have aimed not only to provide more integrated and coherent hospital solutions, but also to free surplus city centre real estate for disposal, to fuel further phased infrastructure and technological investment and innovation. The first phase of its modernisation development should release over 10 hectares of land in Belgrade, which could be used to finance a process of continuing dynamic development.

INCORPORATING EFFICIENCY AND PRODUCTIVITY

Tertiary level health care like all other aspects of health care can achieve higher productivity and efficiency. Revised achievable operating parameters were incorporated into the reconfiguration exercise. These basic parameters, to which managers and professionals will have time to adapt and adjust during the design and construction period, were:

- 20-25% reduction of average length of stay
- 10% reduction in inpatient admissions
- 3-5% annual increase in inpatient cases dealt with on a day and ambulatory basis
- Average bed occupancy rate of 75-80%

OTHER FACTORS OF INNOVATION AND MODERNISATION

EVIDENCE-BASED INNOVATION

Sections 2.4 and 2.5 allude to changing approaches in care delivery. Evidence-based health care and HTA is continuously identifying innovation in clinical approach and practice, which impact on the planning and organisation of hospital provision, which, in turn, demands flexibility in both planning and design. Most new hospitals have built-in obsolescence by the time they are commissioned. The escalating pace of change in medical science and practice is likely to increase this potential planning hazard. Some examples of contemporary evidence-based developments which influenced this planning study include:

- The development of the multi-disciplinary ‘stroke’ unit for treating this major cause of emergency hospital admission;
- Best practice treatment pathways which require early cardiac catheterisation and angioplasty in the treatment of heart attack victims, another common source of emergency hospital admission;
- The more effective regional trauma centre model of accident and emergency service;
- The multi-disciplinary, multi level ‘cancer network’ model, integrating professional activities and levels of care in order to deliver safer and more effective cancer services to populations;
- The incorporation of acute assessment capacities for mentally ill patients within the acute hospital environment;
- Integrated client-group planning in diabetic care – the multi-disciplinary ‘one stop shop’ approach;
- The continuing growth and substitution of minimally invasive surgery for many surgical conditions;
- The growth in the use of the ‘oscopies’ for many forms of medical diagnosis and treatment;
- The impact, particularly on diagnostic service capacities, of systemic and systematic primary prevention screening programmes;
- The impact of systemic and systematic secondary prevention and health maintenance regimes in chronic disease management;
The above list is by no means exhaustive and is constantly evolving.

THE CONTINUOUSLY SHIFTING LOCUS OF HEALTH DELIVERY

Innovation in medical science and practice is ever-present. The pace of scientific development is escalating. New innovations are just over the horizon, which may radically affect the way patients are treated and where they are treated. The locus at which many aspects of health provision can be delivered is constantly evolving. This dynamic is summarised in the schematic in Box 1:

Box 1. The Health Care Locus Dynamic

- Inpatient
- Day Patient
- Outpatient
- Office
- Home Care
- Self Care

What used to an inpatient case is now treated as a day case; what used a day case can now be treated on an ambulatory basis; ambulatory care can now be delivered in the ‘office’ or the home.... and so on. This dynamic demands highly adaptable and flexible infrastructure solutions particularly in the major ‘growth’ area of day and ambulatory care. An important consequence of the increasing age and complexity of patients who continue to be admitted as inpatients to secondary and tertiary care hospitals, is the need for increased levels of intensive care facilities, the lack of which can be an important obstacle to hospital performance.

TERTIARY HEALTH CARE POLICY

A reconfiguration of the tertiary level health care system needed to be circumscribed within an overall tertiary care policy. Literature searches by librarians at Royal Society of Medicine produced little international perspective and guidance on international tertiary health care policy. Individual aspects of tertiary care such as cardiac surgery, oncology etc. were supported by extensive professional and organisational literature. But overall tertiary health care policy is a relatively neglected area. There are some useful examples. The Department of Health in England has a well-defined set of guidance on ‘Specialised Services’. Denmark takes this approach further by estimating anticipated incidence various tertiary level procedures, which can then be translated into caseload and capacity requirements.

As part of tertiary care policy development a definition of tertiary level health care was agreed as follows:
“Tertiary health care is highly specialised consultation, diagnosis, treatment and after care, not routinely provided at the primary and secondary care levels of the health care system. It is usually initiated by referral from a primary and/or secondary level medical practitioner* and is provided by appropriately qualified specialists working in and from centres with the requisite skills, capacities, facilities, equipment and associated resources for special investigation and treatment in their field, which meet the appropriate legal and regulatory requirements of Serbia.”

The definition includes three sub-categories of activity within the main definition:

- Specialised services involving rare conditions producing a small National caseload requiring special clinical expertise and investment and usually carried out at one National centre;
- Specialised tertiary health care services provided by a small number of providers for regional catchment populations of approximately 1.5 million or greater;
- Groups of patients with relatively routine conditions but with co-morbidities or complex variants of routine conditions (“complex case-mix”).

Three tertiary catchment populations were proposed (Table 5) reflecting natural communication routes, historical patterns of referral and existing bases of provision, together with a schedule of 10 National specialties to be provided on a quaternary basis and 39 specialties to be provided as tertiary level care.

<table>
<thead>
<tr>
<th>Clinical Centre</th>
<th>Geographical Coverage</th>
<th>Population Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical Centre of Serbia</td>
<td>Central Serbia</td>
<td>3.2 million</td>
</tr>
<tr>
<td>Clinical centre of Novi Sad</td>
<td>North Serbia (Vojvodina)</td>
<td>1.7 million</td>
</tr>
<tr>
<td>Clinical centre of Nis</td>
<td>Southern Serbia</td>
<td>2.6 million</td>
</tr>
<tr>
<td>Clinical Hospital centre, Kragujevac</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>7.5 million</strong></td>
</tr>
</tbody>
</table>

**WORK IN PROGRESS AND MAJOR RISK FACTORS**

Few countries have the opportunity to radically reconfigure and modernise virtually a complete level of their health care delivery system at the same time. Serbia has an opportunity to make a substantial start on that process. It is too early to judge whether the thought and research invested in the planning process will emerge in design solutions. The main areas of risk of divergence, are:

- The continuing preference for the security of higher bed numbers and uncertainty about the ability to change professional preferences and practices and organisational requirements to operate new models of care. The planning brief including the business plan provided for significant reductions in beds and the use of alternative more cost-effective delivery models, which in turn ensured future sustainability and affordability. Higher bed numbers will seriously and adversely impact on future sustainability and affordability of the tertiary care model;
- The lack of capital asset accounting in the hospital planning, management and financing processes provides little incentive for managers and professionals to ‘think’ efficiently and economically in setting functional space requirements;
- Resistance to the acceptance of multi-user facilities and perceived loss of ‘sovereignty’ provided by the traditional departmental and ward structures could perpetuate departmental approaches;
- Resistance to centralisation and integration of key major diagnostic departments, services and systems could perpetuate issues of access and efficiency in the utilisation of major new diagnostic and therapeutic technologies;
- The proposals represent major change in organisational, management and financing terms as well as clinical organisation and practice. Significant development is needed in planning and management capacities in order to exploit the ‘new order’. There are also a number of major professional development activities necessary to prepare professional staff for a number of clinical innovations. For example the adoption of day and ambulatory regimes of care requires professional re-education and training for a number of staff and new associated management capacities and competencies;
- The foreshadowed introduction of payment by results for hospital care may perversely affect the willingness of hospital providers to diffuse innovation to lower levels of care, as this may adversely affect hospital income streams;
- Information systems need significant development and strengthening in order to provide policy-makers, planners, professionals and managers with the necessary capacities to maintain the needs-based, service-based, patient-focused planning approach and to effectively performance-manage tertiary health care services in a radically different way. Serbia has still to adopt a data definition of an acute day case;
- Communities and patients have a strong adherence to current systems and approaches to care delivery and will require extensive communication and information if they are to be persuaded to play their part in the success of the radically different approach to the delivery of tertiary health care services incorporated in future policy and in future planning and design solutions.

As 2010/2011 progresses much of the detailed design work will have been concluded and a more contemporary assessment of how these planning issues have been reflected in detailed design solutions. The sequel is waiting to be written.

A postscript. In the modern health system context, tertiary health care planning is a most complex and sophisticated task. The universal trend towards decentralisation of accountability and increased levels of autonomy for hospital services, means that professionals and managers are rarely engaged, other than perhaps once, in the complete project cycle of a major development and investment programme. Previously centralised or regionally-based capital planning mechanisms, for example in England, were able to field teams of specialised generalist, medical nursing and other professional planners with experience of a number of major planning and infrastructure developments under their belts. The Clinical Centres modernisation project in Serbia has been a ‘learning curve’ for almost all of the managers and professionals involved. At a time when health system planning is becoming even more challenging - where have all the planners gone? Replaced perhaps by accountants, standard templates and the mathematics of private finance partnerships and initiatives?

1 Department of Health UK; http://www.dh.gov.uk/en/Healthcare/index.htm
2 Corens D, Health Systems in Transition Vol. 9 No.2; Belgium Health Systems Review. WHO Regional Office for Europe on behalf of European Observatory on Health Systems and Policies, 2007.
CREATING SUSTAINABLE FRAMEWORKS FOR SERVICE REDESIGN AT PRACTICE LEVEL IN THE NHS

V. Carr¹, D. Sangiorgi², R. Cooper³, M. Buscher⁴ and S. Junginger⁵

ABSTRACT

The National Health Service (NHS) in England is pursuing a programme of transformation through innovation, aiming to ‘provide High Quality Care for All in an NHS fit for 21st century and beyond’. Practice Based Commissioning (PBC) is one key strategy, devolving responsibility for commissioning of health services from Primary Care Trusts (PCTs) to front-line clinicians in General Practice (GPs). Focusing on developments in the North West Strategic Health Authority (NW SHA), this paper discusses the means by which varying structures of PBC governance afford scope and support for sustainable innovation at practice level.

Preliminary results from a project with one large GP practice in NW SHA investigating the application of design methods to issues of patient engagement and the redesign of care pathways are discussed, as is the necessity of reinterpreting and adapting these tools to ensure that clinicians and practice managers can appropriate and apply them in daily practice.

KEYWORDS

innovation, NHS, primary care, service design, sustainability

BACKGROUND

DEVELOPMENTS IN THE NHS

The NHS was established in the UK in 1948 as a means of providing universal access to medical services based on clinical need, not ability to pay. This social healthcare system is widely utilised and supported in the UK and less than 8% of the population choose supplementary private healthcare provision. Buildings and infrastructure development are perceived to have been the main focus of the NHS for the first 40 years of its existence ((Bradbeer, 1954; Guillebaud, 1956; The Bristol Royal Infirmary Inquiry 2001) with the NHS Plan (Department of Health (DoH) 2000) and later reports changing the focus to placing primary care at the heart of health promotion initiatives (Wanless, 2004), reducing the reliance on secondary and acute care, and ‘bringing care closer to home’ (DoH 2006, 2008).

Changing demographics have shaped these policy changes, with an ageing population portending a diminishing tax-paying workforce, supporting an increasing number of chronically ill older people, forcing the NHS to ‘do more with less’ (HayGroup 2008; Audit Commission 2009). Attempts to balance issues of economic efficiency (such as limited capacity and restricted budgets) with social concerns for equity have led to questions about the effectiveness of current mechanisms for the delivery of healthcare services. An integrated health and social care system which will provide a framework for supporting people in managing their own health is seen as a key component in achieving both the economic and ethical imperatives (DoH 2009; HM Treasury 2010) and is the basis of the World Class Commissioning strategy for improving health outcomes (DoH 2007).

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The Department of Health has recognised that patient involvement is not solely based on consumerist approaches to the healthcare market, a perspective introduced in the 1980s (Klein 2006), but that the public has articulated an increased willingness and capacity to be involved in decisions about their healthcare (DoH 2007). This parallels developments in other public services which emphasise a ‘duty to involve’ the public in decisions regarding service redevelopment (HM Government 2007). One of the main objectives of current health services reform, according to Lord Darzi is:

‘An NHS that gives patients and the public more information and choice, works in partnership and has quality of care at its heart’ (DoH 2008).’

In England, increasing public expectations have driven a focus on the quality of healthcare services which has lead to the tightening of regulations and standards through the Care Quality Commission and Quality Framework initiatives such as Indicators for Quality Improvement, the National Quality Board and the Commissioning for Quality and Innovation (CQUIN) and Patient Reported Outcomes Measures (PROMS) payment frameworks. Staff have, likewise, been subject to quality based contracts (Quality and Outcomes Framework, QOF), in primary care.

The next few sections will examine the concept, definitions and applications of sustainability in four domains with relation to the NHS. Subsequent sections will examine how organisational change and primary care initiatives such as PBC contribute to the sustainability of current healthcare frameworks. Finally, a discussion of the Design in Practice project will consider how design tools might contribute to innovation in healthcare service redesign.

**SUSTAINABILITY IN THE CONTEXT OF NHS**

Sustainability is a concept which is generally defined in four domains: human, social, economic and environmental. It is suggested that sustainability involves working within the regenerative, assimilative and adaptive capacities of a system (Goodland 2002; Folke et al 2002), managing consequences of excessive consumption of non-renewable resources, while safeguarding the capacity of renewable resources. In terms of the NHS it is recognized that there are finite budgets for healthcare, that the assimilative capacity of the system faces pressure from increased demands associated with the ageing population and obesity-related health problems, and that the regenerative capability and resilience of the service has been severely depleted as decades of restructuring have left a disillusioned workforce suffering from low morale and lack of motivation (Sullivan 1993; Laschinger and Havens 1997; Avallone and Gibbon 1998; Woodward et al 1999; Shannon et al 2001; Kluska et al 2004).

In the next section we examine how the NHS in England is addressing the issue of sustainability across the four domains outlined above.

**Human**

Human capital refers to preservation of individual health and wellbeing – the very essence and purpose of the National Health Service, a philosophy which has been rediscovered in the last decade. Antonovsky (1996) rejected the emphasis of the pathogenic model, focusing on sickness and disease and suggested a revised salutogenic model, highlighting the importance of maintaining health and wellbeing. Wanless, in his report of 2004, agrees, suggesting that the NHS ‘will need to shift its focus from a national sickness service, which treats disease, to a national health service which focuses on preventing it’. Further, in attempting to predict future demands on the NHS, he produced three scenarios of ‘fully engaged’, ‘solid progress’ and ‘slow uptake’, each related to how individuals might take responsibility for maintaining their own health.
Social

Goodland (2002) suggests that social capital is comprised of ‘investments and services that create the basic framework for society. It lowers the cost of working together and facilitates cooperation… only systematic community participation and strong civil society, including government, can achieve this.’ (p.2)

He continues by suggesting that western-style capitalism, with its focus on competition and individualism, can undermine social capital diminishing the shared value of community. Reich (2002) posits that the ‘marketization’, promoted in the 1980s as a solution to the inefficiency of centralized public services, reflected this shift away from a public interest perspective, esteeming the value of choice over cooperation. Wilkinson (1996) and Coburn (2000) found that neo-liberal, market oriented forms of government, where the welfare state is undermined, lead to higher income inequality, social fragmentation and lower average health status and life expectancy.

Since the Black report of 1980, and, more recently, with the focus on equitable access to healthcare in Lord Darzi’s report (DoH 2008), government initiatives have focused on the social determinants of health, with specific programmes addressing health inequalities (Wanless 2004; DoH 2008c; Royal College of General Practitioners 2008; European Union 2008; Marmot 2010).

Economic

Economic sustainability is a function of the efficiency and effectiveness of business management (Found et al 2006). Hicks (1940) and Kuznets (1948), in examining the concept of social income as an index of welfare, defined economic sustainability as a balance of current levels of economic consumption with the viability of remaining economic resources.

It is generally accepted that funding for the NHS cannot be sustained at historic levels. Under the current Labour government spending on healthcare has more than doubled (DoH 2009c). A review of developments in health promotion efforts, focusing on patient engagement in their own healthcare has led Wanless, Appleby, Harrison and Patel (2007) to conclude that current progress lies somewhere between solid progress and slow uptake, suggesting a continuing increase in demand on the health services.

Addressing the lack of balance between demand and supply capacity in public services, a new model ‘Open Welfare’ has been proposed by Cottam and Leadbeater (2004). In addition to providing the opportunity to stretch the productivity of existing organisations, this model relies on mass participation in the design and delivery of services, reconfiguring the system and introducing new innovation actors.

Given a freeze, or, at the least, restricted increases in funding, and simultaneous increase in demand as a result of changing demographics, Appleby, Crawford and Emerson (2009) have predicted a shortfall of between £20-30 billion in NHS funding by 2017. Wood (2009) and Haygroup (2008), both suggest productivity gains as the only acceptable answer to funding problems in NHS, but warn that staff engagement will be the main hurdle in implementing any efficiency drives.

Two potential areas which may lead to productivity gains in the NHS have been identified as shifting more care from acute to community settings, and better integration of health and social care services. Practice Based Commissioning (PBC) has been proposed as a suitable channel for the introduction of these changes (DoH 2007).
Environmental sustainability focuses on the protection of natural capital, and maintenance of ecosystems. Energy efficiency in healthcare facilities has been the main focus of Department of Health guidance in recent years, with the need for energy and carbon management policies being emphasised at all levels (DoH Estates and Facilities Division 2006; DoH 2005). The Building Research Establishment's Environmental Assessment Method (BREEAM) assessment tool for measuring the environmental impact of buildings has been adopted as the standard for refurbishment and new builds. The renewed focus on localised and community care, reducing travel, has also been supported with the development of ‘hub and spoke’ models of polyclinics, again retaining the majority of health services within local community settings (Johnson 2007).

Concluding this section on sustainability in relation to the NHS an illustration by Hancock (1993), drawing from Barbier (1987), explains that human health, the first domain of sustainability, is a product of the dynamic functioning of the interrelation of the three other domains as indicated below.

![Fig. 1. A model of health and the community ecosystem (from Hancock, 1993)](image)

**ORGANISATIONAL CHANGE IN NHS**

How can the NHS improve productivity, increasing efficiency and effectiveness, whilst maintaining its focus on equitable access to and ethical delivery of healthcare services?

As the largest organisations in the UK, and one of the largest employers in the world, the NHS has been accused of promulgating vicious circles of bureaucracy (Crozier 1964; Masuch 1985; telegraph.co.uk 2010; BBC News Channel 2009) with too many changes layered one upon the other, often with seemingly conflicting targets. This continuous ‘top-down’ change in the NHS has led to the disengagement, cynicism and even hostility of staff in the service - what Oxman, Sackett...
et al (2005) have described as the cumulative negative effect of ‘redisorganization’ at all levels. The complexity of the organisation with its nested structures and processes, functional and disciplinary boundaries and hierarchies which are compartmentalised, yet highly interdependent and strongly coupled, makes any efforts at organisational change challenging (Van De Ven and Poole 1995; Litaker et al 2006). Organisational Development (OD) experts have distinguished between first-order change, representing incremental changes within an organisation without fundamental system change, and second-order change, where the core values and schemata of an organisation are challenged and redeveloped (Watzlawick et al 1974; Bartunek and Moch 1987). Within the NHS the drive towards rewarding quality instead of volume, as detailed below, is seen as an attempt at second order change (DoH 2000; Johnson 2007; The King’s Fund 2010).

Since the government introduced the purchaser/provider split in the health service in 1991 the issue of purchasing or ‘commissioning’ healthcare services has continued to provoke debate and controversy, with a recent report suggesting that the transaction and management costs associated with this approach are now approaching 14% of the total health budget for England - around £14 billion (Health Committee 2010). While Scotland and Wales have now reverted to an integrated health service, England has, so far, continued to try to balance power and responsibility between Hospital/Foundation Trusts and Primary Care Trusts (Smith, Curry, Mays and Dixon 2010). Recognising the relative weakness of the commissioning skills in the PCTs, World Class Commissioning (WCC) was introduced in 2007, providing an accountability and development framework, outlining core competencies to be developed in PCTs, and identifying 11 strategic outcomes on which the PCTs would be assessed (Woodin and Wade 2007). As a means of counteracting the activity based payment system associated with Payment by Results (PbR), CQUIN, PROMS, and Quality Accounts have all been developed to allow PCTs leverage in terms of a quality focus in commissioning. Responsibility for commissioning streamlined and innovative care pathways to achieve the 18 week target for patient referral (DoH 2006b), shifting the emphasis from diagnosis and treatment to prevention and promotion of wellbeing through a multi-sectoral approach, developing open and innovative partnerships with the public, other public service agencies and the voluntary sector are some of the key themes related to achievement of WCC status (DoH 2007a).

At practice level, the Quality and Outcomes Framework (QOF), developed in conjunction with the Royal College of GPs, has four domains of measurement based on clinical standards, organisational standards, additional services and patient experience, against which practices are assessed and reimbursed. These have generally been accepted well by GPs although the associated burden of bureaucracy has placed heavy demands, especially on smaller practices (McDonald, Checkland and Harrison 2009).

A focus on ‘innovation’ as a key route to improvement is evident in many of the Department of Health publications, and is the remit of the NHS Institute for Innovation and Improvement (NHSi), who have promoted the application of ‘design thinking’ and ‘design science’ as methods of enabling creative approaches to both defining and solving Organisational Development problems in NHS (Bevan, Robert, Bate and Maher 2007). Swan, Newell, Scarbrough and Hislop (1999), in examining the constituents of an innovative environment, have identified the importance of the social and organisational context in facilitating or hindering innovation. Fragmentation and fixed departmental and disciplinary boundaries create barriers to innovation, while communities of practice and boundary spanning activities, - what Swan and colleagues call ‘heedful interrelating’ are key to knowledge exchange. The federated models of GP practice, advocated by the Royal College of General Practitioners (2007), and, indeed, the consortia and federated models of Practice Based Commissioning, both have the potential to act as creative networks in the environment they provide for cross-functional, inter-organisational, and interdisciplinary interactions.
The following sections present findings from an 18 months research project called “Design in Practice: Change and Flexibility with Healthcare Providers”. The project, funded through the HaCIRIC network, involves a research team from Lancaster University, in collaboration with Salford University, in exploring the modes through which PBC has been implemented in England, while questioning if and how design and other creative methods and skills might support clinicians in service redesign activities, both at practice and PBC level. The team has carried out extensive desk research into NHS reform and the PBC framework with in-depth case studies on three PBC groups in the North West Strategic Health Area (NW SHA), and specific design workshop interventions with one large GP practice.

**PRACTICE-BASED COMMISSIONING IN NW SHA**

**BACKGROUND TO PBC**

Practice Based Commissioning (PBC) is one of the strategic frameworks responsible for implementing key elements of the NHS Plan (2000), devolving responsibility for the commissioning of healthcare services to frontline clinicians. The rationale behind this development is that clinicians in general practice have the closest contact with the public and will be able to commission appropriate, tailored, locally based services, improving effectiveness, efficiency and equity. Community based services are also seen as more sustainable in terms of building social capital, and limiting use of environmental resources. Economic sustainability will also be improved as commissioners review services, specify improvements and hold service providers to account for the services they deliver (The King’s Fund 2010). The Audit Commission (2007, p.2) suggest that,

“by devolving indicative budgets to practices that treat and refer patients, GPs and other primary care professionals are being encouraged to manage referrals and to commission and redesign services in a way that is more cost-effective and convenient for patients.”

PCTs are expected to provide both business and financial support to enable GPs to form PBC networks, within which they can examine patient care pathways, using their knowledge of specific local health problems, and produce proposals for the redesign of healthcare services in line with PCT strategic health plans. The PBC networks, at the present time, hold only ‘virtual’ budgets with the PCT approving business plans, but, as an incentive, the consortia are allowed to ‘keep’ or reinvest up to 70% of ‘Freed Up Resources’ (FUR) of efficiency gains from improved service pathways. The rationale behind this framework is that clinicians can challenge entrenched approaches to the provision of healthcare services, and reshape the boundaries between primary and secondary care, with an emphasis on bringing care closer to home and reducing overheads. Introducing the concept of PBC, Department of Health guidance (2004, 2006c) suggested that, ‘the freedoms and flexibility of Practice Based Commissioning give front line professionals and managers the information, levers and incentives to improve services in response to the needs of their patients and local populations. It will facilitate clinical engagement, improve access and extend choice for patients and help restore and maintain financial balance.’

In reality, although PBC has been functioning since 2004, in many areas it has progressed slowly, with problems associated with lack of trust and suspicion between primary care clinicians, hospital consultants and managers, and PCTs; uncertainty over the particular responsibilities of PCTs and PBC groups; and lack of (and conflicting) data from secondary care and PCTs delaying effective functioning of PBC and preparation of service redesign proposals (Audit Commission 2007; Department of Health 2009a; Health Committee 2010). These problems are intensified by clinicians’ lack of service design skills and time and capacity to develop these. In some areas PBC networks are beginning to adopt federated models of practice, with a significant minority forming social enterprises, some also developing separate ‘provider’ enterprises, allowing them to take
control of both the commissioning and provision of healthcare services in their area. While these more structured models have resulted in the faster implementation of new service models of care, there is concern that they may suffer from a lack of local focus, negating the intention to bring care decisions closer to the local community.

The following section outlines some insights into PBC frameworks as they have developed in North West of England, illustrating the diversity of models of governance, support and collaboration. These insights have been developed through the case studies in each area, involving a series of interviews and mapping exercises with each consortia.

**PBC CONSORTIUM A**

Consortium A is often presented as a ‘best practice’ example of how early uptake of PBC has led to innovation in both commissioning and the provision of improved services. Consortium A has been driven by two visionary people, a clinician and an executive director of the PCT, who together encouraged all of the 53 GP practices in the local PCT area to form one large commissioning group, giving greater influence and reducing the governance structures which might have proliferated with smaller PBC groups. Engagement exercises were facilitated by the PCT, which adopted a ‘top down’ approach to PBC implementation. Once formed, the PBC group elected to become an Industrial Provident Society, managing the whole PBC framework, and Charitable Company A (CCA), was formed in April 2007 with up to 45 staff from the PCT being seconded to CCA as business support. As such CCA have direct responsibility for almost all of the commissioning of health services within the PCT, managing a budget of £299 million for GPs with a patient base of 295,000 annually. Members of the society have developed a wide range of incentives and support structures for GP practices in the group, such as enhanced pension schemes, risk management and insurance, and even IT contracts. Membership of the Society is based on proportional representation from GP practices. An additional Community Health Enterprise is a GP owned subsidiary company of CCA, acting as the provider arm, managing the provision of estates. They are a national demonstrator site for the government Community Hospital initiative and will act as project managers for a new purpose built diagnostic and treatment centre in the area. One of the lead GPs clearly believes that PBC has improved patient care in the area, stating that,

“[PBC is about] making health and social care for patients safer, faster, and more accessible, whilst making it more evidence based and cost effective for PCTs”

The strong structure of this large PBC group has allowed it to employ the expertise of dedicated business, finance and data managers. Effective data interrogation, in particular, has allowed CCA to identify care and spending anomalies, and redesign and re-specify some clinical care pathways to bring them into line with the best of national comparators. However, in a recent national survey of PBC leads, one of the representatives from Consortium A indicated that the PCT still had to increase the resources available to clinicians in General Practice to recognize problems of workload associated with involvement in PBC, and allow practices to re-shape to commit additional effort to PBC work-streams (DoH 2009a).

**PBC CONSORTIA B**

Consortia B PCT has six PBC groups with a patient list of around 50-65,000 for each group. The consortium self-formed around historical relationships and geographical boundaries. Activity of the PBC groups had been limited to some very small scale, local service changes with limited impact. In 2008 the PCT appointed an external consultant, procured through the DoH Framework for External Support for Commissioners (FESC) programme, who acted as a catalyst for revitalising the PBC process. According to the PBC business manager and one of the GP leads, the FESC partner ‘brought an enormous amount of energy’ to the PBC process, along with knowledge about
what PBC was meant to do and deliver, and understanding of relevant structures and systems, policies and processes, areas of expertise lacking in both the PCT and clinicians (personal interview, March 2010). With the appointment of a FESC consultant to each PBC consortia, the PCT also provided a network group comprising a defined commissioning manager, commissioning assistant director of support (relationship manager), public health support, finance, data and medicines management support. These are fully funded by the PCT as part of their support package for PBC. Each of the PBC groups was given targets by the PCT beginning with developing the structure of the group, addressing health inequalities in their localities, examining demand and medicines management and taking responsibility for proactive management of the PBC budget, followed by the development of two service redesign proposals based on the PCT’s strategic priorities.

A detailed Service Design Methodology, produced by the FESC partner, outlined a series of steps to bring focus to clinical panel meetings attempting to develop service redesign proposals, allowing the consortia to progress some large scale service redesign proposals (such as redesign of the stroke care pathway) to the Commissioning Advisory Board (CAB). A process mapping exercise with one of the business managers and GP leads, identified some issues related to poor data and concurrent PCT re-structuring as having created some obstacles in the redesign process, but also highlighted the strengths of this particular clinical panel (stroke care) in involving a wide group of stakeholders from patients and carers, through hospital staff and managers to local council and social services, in the service redesign process.

The GP lead for this consortium, explained that going through the service redesign process has opened GPs’ eyes to how poorly services had previously been specified, with consultants being left to determine how services were provided, with little influence from the PCT as commissioners responsible for paying for the services. He suggested that, now that clinicians in primary care have gained understanding of the processes involved in commissioning, they will no longer be willing to accept whatever the acute sector chooses to provide (personal interview March 2010).

**PBC CONSORTIA C**

There are three PBC groups within Consortia C, each covering distinct geographical areas. The largest group operates a system where each practice is given one seat on the consortia board, however this is not allocated proportionally so, for example, a practice with a patient population of 32,000 has one seat, the same as small single-handed practices with populations of less than 5,000. This necessitates diplomatic negotiation between practice representatives to identify priority areas, common to the group, to focus their efforts for service improvement. The other PBC group interviewed involves 22 smaller practices, representing 158,000 patients. Both of these PBC groups have employed business managers independent of the PCT, using their own funds, and do not have the services of any dedicated staff within the PCT. However, in line with PCT strategic priorities (developed jointly with the PBC groups), and recognised areas of service inadequacy and inefficiency, the consortia has set up steering groups with lead GPs investigating particular areas, and developing service options.

The business managers of both PBC consortia have indicated that lack of information from the PCT to enable the formation of accurate business plans, lack of a realistic budget and up-to-date reports on PBC activity and savings generated, have constituted major hindrances to further development of the PBC Consortia Activities, as have conflicting data from secondary care providers. A process mapping exercise with the second PBC group indicated the range of difficulties and frustrations the group had encountered in attempting to redesign dermatology services for their area, with business proposals disappearing into the PCT, without feedback, for months at a time. Given a large sheet of paper with post-it notes to record actions and star shapes to record hazards and problems, this group
had more stars than actions. Recent changes in senior staff within the PCT have seen improvements in the relationships, with PBC representatives now being invited to key PCT meetings.

Working largely independently, the larger of the PBC groups has managed to develop an impressive number of service redesign proposals. Those which have already been implemented include practice based physiotherapists, community matrons, an A&E Integrated Urgent Care Service/Primary Care Assessment Centre, an Improving Access to Psychological Therapies programme and a study investigating options for Atrial Fibrillation.

Fig. 2. Models of the different PBC structures

PBC SUMMARY

These three very different models of PBC illustrate the ongoing grassroots evolution of structures and processes and the important influence of relationships of trust between the PCT and clinicians in primary care. PBC offers the potential for systemic or second order change in relation to the design of patient care pathways, but there are many barriers to be overcome. Those specifically identified in the literature and through the case studies include:

1. Data – lack of a coherent framework for recording and sharing data from primary care, hospital records, and social and economic data, mean that data is often contradictory and cannot be assembled in such a way that an accurate local assessment of healthcare services can be formed.

2. Roles and responsibilities – lack of clarity between PCT appointed WCC managers and PBC groups in some cases prevents collaborative working.

3. Lack of specific skills - both lack of clinical knowledge within PCTs and lack of business skills within PBC groups, and, in some cases, asking the wrong people to do the wrong job (PCTs to set strategy and PBC groups to implement this), rather than exploiting the relative strengths of each group.

4. Lack of levers to influence the providers – the recent introduction of CQUIN, PROMS has not yet been effectively used by PCTs or PBC groups.

5. The adversarial relationship promoted by conflicting incentives and structures in PCTs and Foundation Trusts, and lack of a framework allowing hospital based consultants to work with clinicians in primary care.

6. Limited engagement from the majority of GPs, with responsibility focused on a minority of enthusiastic GPs.

7. Failure, in most, cases to engage meaningfully with patients and public in healthcare service assessment and redesign.
8. Lack of understanding as to the most appropriate scale for PBC commissioning, balancing local knowledge and involvement with resources required for effective functioning.

It is recognised that through the introduction of PBC, GPs are more aware of the financial implication of their referral decisions, and that collaboration and cluster working offer stimulating environments for innovative solutions to healthcare service design. However, conflicting demands and capacity issues related to involvement in daily clinical practice, while attempting to fit in major service restructuring discussions mean that the potential of these cross-disciplinary, inter-organisational communities of practice has not been fully realised, as illustrated in the following comment:

“Our single greatest difficulty is squaring our day job with the time needed to give [to] PBC to make it work. In no other area of public work would something this important be staffed by people with full time jobs scrabbling to afford a half day here or there” (Department of Health 2009a).

It is clear that PBC is not yet functioning in its intended capacity as a sustainable framework for service redesign. In more developed consortia, such as Consortium A, it appears that PBC is becoming embedded in the PCT’s commissioning structure, also serving an important function as a community enterprise, involving local people and clinicians in the development of sustainable local health estates strategies. In Consortia B strategic partnerships have been developed with the local authority and voluntary sector, whose involvement in service redesign panels ought to ensure context-appropriate, sustainable pathways for patient care. Consortia C has the advantage of a reasonable base of local involvement by GPs, and frustration with lack of support from the PCT should hopefully be overcome by the new management approach. There is clearly no ‘one size fits all’ model for PBC, with advantages and disadvantages associated with scale and structures of governance. With latest government guidance suggesting that GPs may soon be given ‘real’ budgets for commissioning (Nuffield Trust 2010), clinicians in primary care are being offered the chance to take the lead in developing local clinical partnerships, with a focus on integrated care (Smith, Wood and Elias 2009). The potential of integrated care in a community setting to offer human, social, economic, and environmental benefits, currently offer the most hope of addressing issues related to the regenerative, assimilative and adaptive capacities of the NHS as a publicly funded system of healthcare. As those with the daily experience of working in the community, primary care clinicians, if they are fully supported by the PCTs, and manage to overcome the difficulties outlined above, may be best placed to assess local needs (in partnership with their patients), and produce proposals for strategic, holistic approaches to health care and promotion.

The following section will discuss details of an in-depth study with one large GP practice in the NW, which aimed to understand how clinicians use their daily experience of working with patients to inform the redesign of services at practice level.

DESIGN IN PRACTICE

Previous sections have indicated that innovation has been identified as an important conduit through which productivity gains, improved services and transformation of healthcare delivery might be created and delivered. This will investigate how sustainable frameworks for innovation in primary care might be enabled through the use of design tools and methods. ‘Indigenous’ healthcare service design skills and capacity are discussed, and some exercises involving cross fertilization from professional design are presented.

PRACTICE D

Practice D was formed in April 2005 through the merger of four general practices in a North West Seaside town, producing a large multi-site practice with a patient list of thirty two thousand
patients, involving twenty one partners, one of the ten largest GP practices within England. Many of the patients come from areas of high deprivation and there are a high proportion of patients with complex health needs and addiction problems. The Design in Practice team has been using an action research approach with Practice D to investigate the appropriateness of bringing design tools and methods to daily processes and issues of concern to the practice, with a view to ascertaining their effectiveness in stimulating and supporting innovation.

Two specific areas of interest were identified through dialogue with practice staff. These were improving patient engagement, and service redesign processes.

**Patient Engagement**

Following significant time spent in participant observation at each practice site and interviews with practice staff, it emerged that the practice staff were interested in improving their understanding of, and interaction with, patients, over and above the existing small Patient User Group. The Design in Practice team were asked if they might take part in the Staff Development Workshop in September 2009 and conduct a workshop exploring staff perceptions of their patient needs, as a first step to considering how to improve patient engagement – one of the key principles of the practice.

After some discussion, the Design in Practice team decided to explore the use of personas as a means of probing staff perceptions of patients. Personas are commonly used by software development companies and interaction designers as a means of influencing design decisions (Grudin and Pruitt 2002; Blomquist and Arvola, 2002). Originally advocated by Cooper in 1999, personas have been proposed as a means of involving ‘virtual’ clients in the design process. Traditionally the process of persona creation involves gathering data about different clients or ‘users’ of a service, which is then used to construct a ‘type’ or ‘persona’ of a typical user of the product or service (Pruitt and Adlin, 2006). Blomquist and Arvola (2002) suggest that,

> “The persona must come to life for the design team in order to reach its full potential, so that the team members are engaged in the persona and his or her goals. The personas are concrete embodiments of the needs and goals that the team designs for and they are easier to talk about, remember and get a shared view of than a list of features and an abstract description of “the user”.

A persona creation exercise with 60-70 staff in nine groups, produced a range of personas focused mainly on socially marginalised groups with low socio-economic status, and concomitant health problems. One of the doctors explained that black humour is often used by clinicians as a coping strategy, and that, given the social demographic of the area, staff do encounter a higher than average number of very demanding patients, and it is usually the worst cases that imprint on staff memory. A visualisation was produced from the results of this workshop which illustrated the characteristics of different ‘types’ of patients, with the intention that this could be used to inform decisions about future redesign of services.

**Exploring service redesign processes**

Subsequent to a staff development session where many of the reception staff asked questions regarding how to interpret patient demands for same day care, one of the partners in the practice, and the practice manager, set up a group to explore the options for redesign of the ‘same day care’ service. This group was titled the ‘Unscheduled Care’ group as, in initial discussions, it became clear that demands for same day care were not necessarily based on cases that the practice would deem ‘urgent’.
Two members of the Design in Practice team sat in on weekly meetings of the Unscheduled Care team over a period of three months from October to December 2009 - observing decision making processes and negotiations in the meetings, and the development of service ‘design’ proposals. The group generated a protocol for referral, and the new Unscheduled Care system went live on 1st December.

As a means of evaluating how the system was functioning, the team were asked to participate in another Staff Development afternoon on 20th January 2010, and to explore further the possibility of using design tools in designing ‘Unscheduled care’ – that is appropriate referral of patients based on information given over the phone.

A ‘design game’ was developed, drawing on professional service design practice, to allow staff to investigate their differing interpretations of patient’s demands for care. This provided a forum for knowledge exchange in the groups. In one group, the session functioned as a peer-to-peer learning opportunity, while the other group was more loosely structured and explored the dilemmas raised in receptionists trying to ‘diagnose’ a patient’s problem before passing it through the system. A later session, using the same design game with a similar intent of exploring concepts of urgent care, with the practice Patient-user group, was very successful, with patients expressing satisfaction that they had been able to contribute meaningfully to the discussions regarding service redesign.

The application of design tools in practice

Although the design tools used in the project were perceived as interesting and engaging, most staff did not see the value or relevance of the exercises to their daily practice. Although this can be attributed to the limited time available to conduct the workshops, this must also be recognised as an inherent feature of primary care practice, and means of communicating the purpose and intent of similar exercises is being explored in further dialogue with the practice.

The attempts to bring design tools into primary care have, so far, acted as ‘breaching experiments’, revealing differences in language, orientation and self-understanding of practice. While from a designer’s point of view, reconsidering patient care pathways seems very much like a service design process, from the medical staff’s perspective it is about ‘engineering’ a better service – a subtle but important difference. The staff do not conceive of themselves as ‘designers’ and are focused on finding ‘solutions’. Design methods, in contrast, look for in-depth understanding of the existing situation and visions for (systemic) change. It became apparent in the activities with staff that the medical emphasis on core competencies, protocols and processes may contribute to a prescriptive and potentially rigid approach to problem solving which clashed with the concept of divergent and emergent approaches proposed by the design team. DiMaggio and Powell (1983) and Carley and Harrald (1997) explain that protocol and process driven specialisms can lock an organisation into fixed methods of thinking, perceiving and responding to situations, which lead to smoother functioning on a daily basis, and thus to short term organisational gains, but may act as barriers to transformation and innovation in the long run.

Another perspective is provided by Bartunek and colleagues (2006) and Swan and co-authors (1999) both of whom highlight the importance of ‘shared systems of meaning’ and ‘sense-making’ to the success of cross-boundary collaborations. In attempting to explore the application of design tools as a means of fostering innovation in healthcare service design with healthcare professionals, it became apparent that exploring fundamental assumptions regarding the interpretation of words and concepts, requires the time and space for continual and evolving dialogue. The fact that the patients responded much more positively and engaged more readily with the design tools, and that staff observed this enthusiasm, may provide a lever for further discussion about the utility of design methods as a means of facilitating communication between clinicians and patients in considering
service redesign. In this respect the design tools will contribute as an innovative means of promoting boundary spanning activities, and may help promote sustainable, cooperative frameworks for service redesign.

CONCLUSION

This paper has explored issues of sustainability in the NHS in terms of the assimilative and regenerative capacity of primary care structures to deal with predicted increasing demands and reduced resources.

Practice Based Commissioning affords an opportunity to create ‘communities of practice’ (Hildreth and Kimble 2004), but some frameworks must be developed to allow clinicians to allocate sufficient time to developing relationships and critically examining evidence related to care pathways, to ensure that innovative local solutions emerge, and to envision and design change rather than copy-cat reproductions of publicised models of best practice. For the sustainability of PBC as a framework, it is vital that structures and processes for engaging all stakeholders in a deliberative and meaningful way are developed to validate the mandate given to PBC to bring commissioning decisions closer to the public (Mathur, Price and Austin 2008). The potential for personal healthcare budgets held by patients, replicating those already implemented in social care (Leadbeater, Bartlett and Gallagher 2008), to replace many of the functions of PBC, may depend on evaluations of the relevance and effectiveness of redesigned care pathways achieved through PBC.

In line with Lewin’s unfreeze-change-refreeze model of organisational change (1958), considerable unfreezing and deconstruction of currently rigid and embedded structures, both within PCTs and at practice level, may first be necessary to provide an environment within which clinicians are empowered to envisage and consider new and innovative approaches to the design of healthcare services. Lewin’s model actually functions in a continuous cycle of organisational change, where the refreeze stage consists of embedding changed attitudes, behaviours and ways of working in the organisational psyche, while continuing to challenge structures and processes in other areas. With this in mind, means of engaging a broader base of clinical support and involvement in PBC must also be investigated to ensure the relevance of PBC initiatives and their sustainability and embeddedness in general practice. As Levasseur (2001) has indicated, ‘a fundamental principle of effective change management is that people support what they help to create’.

The NHSi has advocated a ‘design’ approach as an alternative model, more capable of producing transformational change, than traditional OD diagnostic tools (Bevan 2007). The utility of design methods and tools as enablers of innovation in general practice have been explored to a limited extent in the Design in Practice project to date, highlighting conflicting ontologies and practices. Further dialogue and open discussion between designers and clinicians is proposed as a means of creating a shared system of meaning as the basis for further collaboration in the redesign of healthcare services.

The sustainability of current structures and frameworks for service delivery in primary care in the NHS will depend on a significant and pervasive cultural shift towards a salutogenic model, embracing shared individual, political and institutional responsibility for maintaining health and wellbeing. This will require staff and patients to work together in creating a quality centred health service, engaging in the co-design of efficient, effective and equitable models of healthcare service delivery. Control and vision are needed at all levels. Design tools and methods can make a significant contribution to this process, but require careful support for appropriation.
REFERENCES


Woodin, J. and E. Wade (2007). Towards World Class Commissioning Competency. Birmingham, Health Services Management Centre, School of Public Policy, University of Birmingham.

**AUTHOR INDEX**

Alalouch, Chaham  57  
Astley, Phil  141, 153  
Barlow, James  55  
Barreiro Lima, Jose  119  
Bayer, Steffen  171  
Becker, Franklin  75  
Bolt, Timothy  171  
Bonaiuto, Marino  19  
Bonnes, Mirilia  19  
Boulton, George  182  
Brailsford, Sally  171  
Buscher, Monika  195  
Carr, Valerie  195  
Carthey, Jane  104  
Chow, Vivien  104  
Chrysanthaki, Theopisti  55  
Cooper, Rachel  195  
Diez, Karin  131  
Edkins, Andrew  88  
Fornara, Ferdinando  19  
Fröst, Peter  6  
Glanville, Rosemary  153  
Hamblett, Keith  119  
Hatzaras, Kyriakos  42  
Hendy, Jane  55  
Ive, Graham  88  
Jekić, Ivan  182  
Jung, Yong-Moon  104  
Junginger, Sabine  195  
Kagioglou, Michail  119  
Kaka, Ammar  57  
Kapsali, Maria  171  
Katrava, Annette  182  
Koumpis, Nicholas  182  
Lennerts, Kunibert  131  
Lindhal, Göran  6  
Mahadkar, Sameedha  28, 141  
McDonald, Jacqui  153  
Mills, Grant  6, 28, 141  
Mills, Susan  104  
Montgomery, Robert  153  
Murray, Alex  88  
Page, Mark  153  
Phiri, Michael  6  
Price, Andrew  6, 28, 141  
Pronk, Andrew  57  
Rintala, Kai  89  
Robinson, Herbert  153  
Rooke, John  119  
Sangiorgi, Daniela  195  
Sapountzis, Stylianos  119  
Sorensen, Karen  153  
Strid, Marie  6  
Thomson, Derek  57
### KEY WORD INDEX

<table>
<thead>
<tr>
<th>Word</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>access</td>
<td>141</td>
</tr>
<tr>
<td>adaptability</td>
<td>104</td>
</tr>
<tr>
<td>benefits</td>
<td>57</td>
</tr>
<tr>
<td>benefits realisation</td>
<td>119</td>
</tr>
<tr>
<td>boundary object</td>
<td>171</td>
</tr>
<tr>
<td>capacity use</td>
<td>131</td>
</tr>
<tr>
<td>carbon</td>
<td>141</td>
</tr>
<tr>
<td>care model</td>
<td>141</td>
</tr>
<tr>
<td>cleanliness</td>
<td>88</td>
</tr>
<tr>
<td>communication</td>
<td>75</td>
</tr>
<tr>
<td>community engagement</td>
<td>28</td>
</tr>
<tr>
<td>consultation</td>
<td>28</td>
</tr>
<tr>
<td>control of infection</td>
<td>153</td>
</tr>
<tr>
<td>curtains</td>
<td>153</td>
</tr>
<tr>
<td>design</td>
<td>6, 75, 153</td>
</tr>
<tr>
<td>emergent strategy</td>
<td>119</td>
</tr>
<tr>
<td>environmental satisfaction</td>
<td>19</td>
</tr>
<tr>
<td>estates</td>
<td>141</td>
</tr>
<tr>
<td>evidence</td>
<td>6</td>
</tr>
<tr>
<td>facilities management</td>
<td>153</td>
</tr>
<tr>
<td>financing</td>
<td>42</td>
</tr>
<tr>
<td>flexibility</td>
<td>104</td>
</tr>
<tr>
<td>Greece</td>
<td>42</td>
</tr>
<tr>
<td>group model building</td>
<td>171</td>
</tr>
<tr>
<td>healthcare</td>
<td>75</td>
</tr>
<tr>
<td>healthcare design</td>
<td>19</td>
</tr>
<tr>
<td>healthcare facilities</td>
<td>104</td>
</tr>
<tr>
<td>hospital users</td>
<td>19</td>
</tr>
<tr>
<td>hospital</td>
<td>75</td>
</tr>
<tr>
<td>hospitals</td>
<td>88, 104, 131</td>
</tr>
<tr>
<td>infrastructural services</td>
<td>131</td>
</tr>
<tr>
<td>innovation</td>
<td>6, 195</td>
</tr>
<tr>
<td>integration</td>
<td>56</td>
</tr>
<tr>
<td>investment</td>
<td>57</td>
</tr>
<tr>
<td>judgement</td>
<td>57</td>
</tr>
<tr>
<td>literature review</td>
<td>104</td>
</tr>
<tr>
<td>mental care</td>
<td>42</td>
</tr>
<tr>
<td>modelling</td>
<td>171</td>
</tr>
<tr>
<td>NHS</td>
<td>195</td>
</tr>
<tr>
<td>organisational communication</td>
<td>56</td>
</tr>
<tr>
<td>organizational learning</td>
<td>119</td>
</tr>
<tr>
<td>patient environment</td>
<td>88</td>
</tr>
<tr>
<td>PFI</td>
<td>88</td>
</tr>
<tr>
<td>planning</td>
<td>141, 171</td>
</tr>
<tr>
<td>primary care</td>
<td>195</td>
</tr>
<tr>
<td>procurement</td>
<td>88</td>
</tr>
<tr>
<td>psychological responses</td>
<td>19</td>
</tr>
<tr>
<td>quality</td>
<td>6</td>
</tr>
<tr>
<td>QUIPP</td>
<td>6</td>
</tr>
<tr>
<td>reconfiguration</td>
<td>182</td>
</tr>
<tr>
<td>reform</td>
<td>42</td>
</tr>
<tr>
<td>remote care delivery</td>
<td>56</td>
</tr>
<tr>
<td>scenario</td>
<td>141</td>
</tr>
<tr>
<td>service design</td>
<td>195</td>
</tr>
<tr>
<td>SHAPE</td>
<td>141</td>
</tr>
<tr>
<td>simulation</td>
<td>171</td>
</tr>
<tr>
<td>single bedrooms</td>
<td>153</td>
</tr>
<tr>
<td>spatial-physical humanization</td>
<td>19</td>
</tr>
<tr>
<td>stakeholder management</td>
<td>119</td>
</tr>
<tr>
<td>stakeholders</td>
<td>28, 42, 57</td>
</tr>
<tr>
<td>standards</td>
<td>6</td>
</tr>
<tr>
<td>strategy planning</td>
<td>131</td>
</tr>
<tr>
<td>sustainability</td>
<td>182, 195</td>
</tr>
<tr>
<td>systems</td>
<td>75</td>
</tr>
<tr>
<td>teaching hospital</td>
<td>182</td>
</tr>
<tr>
<td>tertiary health care</td>
<td>182</td>
</tr>
<tr>
<td>Term</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------</td>
<td>------</td>
</tr>
<tr>
<td>transport</td>
<td>141</td>
</tr>
<tr>
<td>unique adequacy</td>
<td>119</td>
</tr>
<tr>
<td>utility</td>
<td>57</td>
</tr>
<tr>
<td>whole system change</td>
<td>56</td>
</tr>
</tbody>
</table>