Nursing Unit Design, Communication and Teamwork: An Ecological Approach to Integrated Healthscape Strategies

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“Knowledge tends to be local, sticky and contextual. It stays where it is.”

Laurence Prusak

The challenge is to create environments that help move all forms of information more effectively.
The Communication and Teamwork Challenge


• Poor communication contributing factors to 65% of sentinel events reported to Joint Commission 1995-2003

• Communication problems stated cause of 8% of medication errors reported to MedMarx system in 2003

• ED, OR and ICU at greatest risk for teamwork failures that cause medical errors.

• Contributing to problem are time pressures, rapidly evolving information, high degree of ambiguity, and turnover among team members

• Organizational culture, including the presence of hierarchy and intimidation, make it difficult for people to speak up and contribute to poor team functioning.

• In hospitals where collaborative nurse-doc relationships are common and encouraged, 30-day patient mortality was lower (Manojlovich & Antonakos, 2008).
Organizational Ecology and Knowledge Networks

Organizational Ecology
Space/ Time/ Culture/ Demographics/ Technology/ Work Processes

Knowledge Networks
Informal learning/on the job/continual/transparent

Performance
e.g.
• New hires up to speed faster
• Patient and staff safety
• Shared goals/values/expectations
• Teamwork/Collaboration
• More trust
SELECTED Cornell RESEARCH PROJECTS

Franklin Becker, Ph.D., Ronojoy Dutta and Anton Villacorte
Influence of Nursing Unit Layout on Staff Communication and Interaction Patterns

Franklin Becker, Ph.D., and Ketki Herale
The Role of Design in Communication and Teamwork: Phase 2

Franklin Becker, Ph.D., Sarah Hammer and Rosie Adams
The Role of Physical Design and Informal Communication and Learning in Reducing Stress and Gaining Competency Among New Nurse Graduates

Franklin Becker, Ph.D., Ying Hua, Ph.D., and Teri Wurmser, Ph.D.
The Organizational Ecology of the Nursing Unit: Design, Communication, and Teamwork
Intensive Cardiac Care Unit (ICCU) at Cayuga Medical Center

New ICCU ("Multi-Pod")

Old ICCU ("Dual Hub")
Cayuga Medical Center

- **Observe**
  - space use patterns
  - behavioral mapping
  - shadowing

- **Survey**
  - stress
  - job satisfaction
  - teamwork

- **Interview**
  - nurses
Systematic observations of communication frequencies and behaviors within the ICCU both before and after its relocation to a new space.

Data collected

- Professional Role
- Gender
- Duration of interaction
- Location of interaction

Sample Time Table

Sample Data Recording Sheet

Total Observations

<table>
<thead>
<tr>
<th></th>
<th>Pre-Move</th>
<th>Post-move</th>
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</thead>
<tbody>
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Results

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<th>Pre-Move Data</th>
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Total Hours of Observation: 23, 50

The Ecology of the Nursing Unit
Cayuga Medical Center
Q4: **The nursing personnel on my unit are more likely to pitch in and help one another when things are in a rush than they were prior to the move**

Staff comments to question:

“The isolation makes it difficult to know what is happening in other areas”

“Less likely because “pods”, walls are all barriers to unity. less ability to learn from each other, teach, know less about each others patients”

“It is difficult to help others because the unit is more spread out”

Q5: **Since relocating the ICU, physicians and staff work better together than they did prior to the move**

Staff comments to question:

“Less likely because “pods”, walls are all barriers to unity. less ability to learn from each other, teach, know less about each others patients”

“This is 100% related to a change in MD’s and change in companies” (strongly disagreed to question)
Cayuga Medical Center: Phase 2

PRE
1 month before

Phase 1
2 months post

Phase 2
2 years post
Results: Phase II

Percentage of Time by Roles

- NursingAide: 9.3%
- Patient: 8.6%
- WardClerk: 0.9%
- RegisteredNurse: 15.2%
- Intensivist: 0.9%
- AlliedHealth: 9.3%
- NurseDirector: 2.5%

“Overall Assessment”
- Staff work together to care for you
- Likelihood recommend hospital
- Overall rating of care given

40% 50% 60% 70% 80% 90% 100%


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New Nurse Graduate Study
Why Study New Nurse Graduates (GN)?

Nursing Shortage and New Models of Service Delivery

• Hospitals nationwide are experiencing nursing shortages
• Stress and burnout related to attraction and retention
• Service delivery emphasis on cross-disciplinary teamwork and collaboration

GN Transition

• High stress levels as GN transitions from school to the hospital environment
• Feel they have not learned enough; fear mistakes
• Transition complex psycho-social process; become member of group
• GN must gain competency with clinical skills AND understand unit’s unique history, identity, and style of doing work
Research Purpose

To explore the role that the physical design of a nursing unit plays during the new nurse “orienting” period in creating more or fewer opportunities for informal, on-the-job communication and learning that can help reduce stress and build competency and cross-disciplinary collaboration.
Data Collection

- Track NG’s patterns of work and communication
- Measure time/task

- Measure level of competency weekly
- Adapt pre-existing rating system

- Interviews to understand how design influences communication and learning
  - Further understand complexity of unit

- Survey NNG perceived stress, and learning opportunities
  - Understand culture of nursing unit

- Physiological measure of stress
  - Analyze change over time

The Ecology of the Nursing Unit
New Nurse Graduates
The units show very similar patterns.

The only notable difference between units is frequency of interactions & time spent with the Orientor.

The discrepancy is likely due to differing learning styles of the GNs and the Orientors’ ability to adapt to those styles.

Low frequency of interaction with doctors.
Sightlines and Teamwork

4S: Placement of two large columns obstructed visibility across the unit.

6N: East & West sides of the unit are composed of enclosed rooms which limited visibility across the unit.

Cornell University
Sightlines and Teamwork

- “Sometimes I don’t even know who’s working over there for half the day.”
- Teamwork suffers because the unit is a “box shape” and “whoever you’re next to is who you usually go to for help.”
- Both designs result in physically divided units, creating two separate teams of nurses.
SOME COMMON THREADS

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
  - Ask for help from whomever visible, not necessarily person with right expertise
  - Visual transparency increase chance encounters; on-demand assistance
- Most interaction social and informational; relatively little “consulting”

Informal Learning
- Learning/teaching w/nurses’ aides as important as from RNs
  - Teaching (NNG to aide) an excellent way to learn
  - “Reactive” or “opportunistic” learning occurs in the middle of action, when there is little time to think.
  - Teaching builds confidence in NNG
ONE KEY ISSUE:

IF the goal of the service delivery model is to strengthen informal learning, multi-disciplinary collaboration and teamwork (as research indicates needs to occur to improve patient safety and care quality), THEN we need to....
To address the influence of the social and professional hierarchy of the hospital on teamwork and collaboration, esp. between nurses and doctors we need to....

**THINK** more imaginatively and broadly about *all* the factors and sub-systems that contribute to effective communication and collaboration, the trust underlying it and the informal learning generated by it, including....
Backstage Areas and Neutral Zones: subsystems within the Healthscape.

They may provide an underestimated opportunity for making professional boundaries more permeable and building effective teamwork, collaboration and informal learning.
FUTURE RESEARCH DIRECTIONS

- Increased observation of Ancillary ‘backstage’ areas and neutral zones
- What is a healthcare team? From whose perspective?
- How design can contribute to collaborative culture (docs, nurses and allied health professionals)
- Observe planned and unplanned team interactions: space, status/hierarchy and nature of communication
- Understand relationships across settings and systems
- Understand role of electronic communication
- Develop more theoretical frameworks and ecological models
Ecological Frameworks

The Clinical Microsystem

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 and support staff, information and technology, the specific care processes, and the behaviors required to care for the patient in their immediate environmental setting (which could be in an hospital, for example, an operating theater, emergency room, nursing unit). (Mohr, Batalden and Barach, 2004)
Need to consider not just the micro-system, but the whole healthscape.
The HEALTHSCAPE

MACRO-System

MICRO-system
- nurse unit
- emergency
- operating
- doc lounge
- administration

MESO-system
- hospital (system of systems)

EXO-system
- professional schools
- professional associations
- home

MACRO-system
- USA values/politics

(Bronfenbrenner, 1979)
“The primary purpose of ecological experiments is not to test hypotheses, but discovery: explore systems properties and processes that affect and are affected by the behavior and development of human beings.”

(Bronfenbrenner, 1979)
**Discovery:** A focus on discovery reflects the concerns of field biologists (ecologists) that pioneering research on complex ecological systems too often explores the systems with insufficient knowledge to construct sound multi-parameter models.

A useful starting point is exploratory data analysis. For this, the best evidence may be qualitative and purely descriptive (Stephens et al., 2005), with the intent to know the who, what, and where of events (Sandelowski, 2000).
How Might INTEGRATED HEALTHSCAPE STRATEGIES Influence the Research Process?

- Identify key micro, meso, exo and macro systems

- Collect data related to each system level (e.g., care providers, patients, families, Board, donors, community groups)

- Collect data about system elements (e.g., technology, physical environment, management, pay and recognition, demographics, staffing levels, acuity levels, turnover, etc. (more diverse research teams)

- Collect data about relationships among different system levels

- Collect diverse data; e.g., quant and qual: Institutional data, surveys, interviews, observations, small scale quasi experimental interventions

INTENT: Understand properties of interlocking systems; how they influence each other to produce some outcomes more likely than others.
Organizational Ecology: The Basis of an Integrated Healthscape Strategy

**Design & Technology**
- Workstation design/layout
- Paths and circulation
- Storage [physical/electronic]
- EMR/Electronic communication
- Ambient Environment
- Furniture /Equipment

**Management/Change Processes**
- Formal/informal use policies
- Service delivery model
- Values
- Leadership
- Planning/Design Processes

**Physical settings**
- Office
- Nursing station
- Lounges/break areas
- Patient room
- Exam rooms
- Doctors practices

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INTEGRATED HEALTHSCAPE STRATEGY (IHS): Making a Difference

New EBD MINDSET = Ecological Framework + Research Evidence + Engaged Stakeholders
The State of Affairs:

“Few of the places where we do office work horrify us. Occasionally they energize us. Typically, they simply bore us to tears. We can do better than create workplaces that, as Florence Nightingale advocated for hospitals, do no harm.”

(Franklin Becker, *Offices At Work: Uncommon Workspace Strategies That Add Value and Improve Performance*)
Five Issues to Consider

1. Targeted Investment: Spend money on what generates valued outcomes.
2. Preferences vs. effectiveness: What really counts?
3. Workstyles: Choice and diversity
4. Synergy: Investments paying off on many levels
5. Small Matters Count: Micro-design features important
As **RESEARCHERS**, we believe that:

Systematic, structured research needed to make informed decisions
INFORMED DECISIONS: About What? For Whom? For What Purpose?

Research Purposes

- Innovation:
- Incremental Change
- Justification

EBD Focus
TYPES of RESEARCH: Research for INNOVATION

1) Data that designers, clients, administrators and other users not necessarily well-versed in research methods and statistical analysis can easily and immediately understand;

2) Negotiated interpretation of the data(evidence), rather than the implications for design and practice being exclusively the province of the researcher;
TYPES of RESEARCH: Research for **INCREMENTAL CHANGE**

1) Focus on the nature and extent of problems with existing solutions/systems; not on the dynamic and complex relationships among variables and systems

2) Analytical techniques describe, segment, and compare customer/user satisfaction/outcomes (e.g., POE)
TYPES OF RESEARCH: Research for JUSTIFICATION

1) More experimental and quasi-experimental research designs.

2) More sophisticated analytical techniques and more attention to mediating and moderating factors.

3) More consideration of critical outcome variables (e.g., Cost, safety).
GN Frequency of Communication By Location  4S and 6N (over 8 wks)
The Ecology of the Nursing Unit
New Nurse Graduates

Average time (8-hr) GN spent with each person 4S

Average time (8-hr) GN spent with each person 6N
Average time of a single interaction by location 4S

Average time of a single interaction by location 6N
6N Med Room: Design encouraged social interaction, including venting.
Why Focus on Knowledge Networks and Informal Learning?

A Model of the Transfer Process

Trainee Characteristics
- Ability
- Personality
- Motivation

Trainee Design
- Principles of Learning
- Sequencing
- Training Content

Learning & Retention

Generalization & Maintenance

Work Environment
- Social Support
- Opportunity to Use

Rethinking “Work Environment”: Why Consider Physical Settings

- Higher performing research scientists interact in a wider range of settings. (Chin, 1984)

- Higher performing engineering design teams interact with more people outside their own team. (Allen, 1976)

- Software engineers report stronger social bonds, greater trust, greater sense of teamwork, more tacit learning when working in small team-oriented open clusters. (Becker and Sims, 2002)

- Software developers almost twice as productive when working in shared “war room” than in individual workstations. (Teasley et.al., 2002)

- MBA students select different settings for different types of interaction/learning (Becker and Mardex, 2004)
Communication Research …con’t

• In study of errors in ICU of university hospital verbal miscommunication between nurses and physicians responsible for 37% of all errors (Donchin et. al., 2003)

• Hospitals characterized by good communication between nurses and physicians had lower than-expected mortality rates than those with poor nurse-doc communication (Knaus, Draper, Wagner & Zimmerman, 1986)

• In an ICU, higher patient satisfaction and better patient outcomes when collaboration and communication was rated as “good” by docs and nurses. (Knaus, Draper, Wagner & Zimmerman, 1986)

• Significantly lower mortality rates in ICU with better interaction among ICU staff; and higher job satisfaction for nurses when teamwork with physicians higher (Sengin, 2003).

• In hospitals where collaborative nurse-doc relationshipships are common and encouraged, 30-day patient mortality was lower (Manojlovich & Antonakos, 2008).
How does the change from a more centralized to more decentralized nursing unit design affect communication patterns, teamwork and collaboration, and job stress and job satisfaction?

**Hypothesis 1:**
The frequency of communication among nurses and other clinical staff will decrease in a more decentralized unit design.

**Hypothesis 2:**
Nurses will continue to walk constantly among pods and other work areas in a more decentralized unit design.

**Hypothesis 3:**
Teamwork and collaboration will decline in a more decentralized unit design.

**Hypothesis 4:**
Staff members job satisfaction will decrease and job stress will increase in a more decentralized unit design.
Results

Pre-Post Comparative Analysis by Duration

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<thead>
<tr>
<th>Duration of Interaction</th>
<th>Pre-Move Data</th>
<th>Post-Move Data</th>
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<tr>
<td>Short (&lt; 1 min)</td>
<td>34.74</td>
<td>15.94 (54.1%)</td>
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<tr>
<td>Medium (&gt;1 min &lt; 5 min)</td>
<td>7.61</td>
<td>1.86 (75.6%)</td>
</tr>
<tr>
<td>Long (&gt; 5 min &lt; 10 min)</td>
<td>0.74</td>
<td>0.18 (75.6%)</td>
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<td>Extra Long (&gt; 10 min)</td>
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Total Hours of Observation: 23 vs. 50

(Number of Interactions per Hour)

(% decrease from pre-move data value)
Results: Phase II

Percentage of Each Type of Interaction by Nurse
Percentage of Time spent by Location

- Nurse Pods: 64%
- Patient Room: 18%
- Conference Room: 3%
- Ward Clerk Desk: 2%
- Patient Care Hallway: 7%
- Med Room: 2%
- Fax/Copy Room: 1%
- Bed Board: 1%
- Computer Alcove: 1%
- Back Hallway: 1%
Results: Phase II

Percentage of Time Spent in Patient Rooms

- Average: 32%
- Observed: 18%
- Goal: 70%

Percentage of Time

Average  Observed  Goal
Comparison of Phase I and Phase II by Location

Percentage of Interactions

- **Nursing Pods**
  - Phase I: 74%
  - Phase II: 70%
- **Patient Room**
  - Phase I: 16%
  - Phase II: 11%
- **Conference Room**
  - Phase I: 5%
  - Phase II: 3%
- **Medication Room**
  - Phase I: 5%
  - Phase II: 4%
- **Back Hallway**
  - Phase I: 3%
  - Phase II: 2%
- **Other**
  - Phase I: 6%
  - Phase II: 4%
Results: Phase II - survey

Percentage of Survey Responses - Teamwork

- SD: 7
- D: 17
- N: 53
- A: 23

Percentage of Survey Responses - Job Satisfaction

- SD: 0
- D: 7
- N: 12
- A: 61
- SA: 20

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<tr>
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</tr>
<tr>
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</table>
Results: Phase II - survey

**Job Stress**
- Percentage of Responses

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**Value**
- Percentage of Responses

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**Percentage of Survey Responses - Job Stress**

**Percentage of Survey Responses - Valued**

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4S

- 661 SF adult medical Oncology/Gynecology/Surgical Unit
- 34 rooms (4 singles)
- 9.1 patient acuity
- 4:1 staffing matrix
6N
- 676 SF adult medical surgical unit
- 26 rooms (4 singles)
- 7.95 patient acuity
- 5:1 staffing matrix
Unit (safety) Culture

- Both units indicated a generally positive perception of their working environment
- Both units indicated a culture that embraces learning

Average RN and GN responses to culture section of survey (1-7 scale; 7=strongly agree) 6N
GN Frequency of Communication By Task 4S and 6N (over 8 weeks)

**Frequency (%)**

**4S**
- Discuss Patient Care: 33%
- Validation: 13%
- Social: 26%
- Admin: 5%
- Taught: 7%
- Seek Assist: 5%
- Provide Adv: 4%

**6N**
- Discussing Patient Care: 30%
- Seeking Advice: 7%
- Seeking Assistance: 8%
- Administrative: 5%
- Being Taught: 2%
- Validation: 1%
- Providing Assistance: 7%
- Other: 2%
Competency & Stress

4S

- Strong relationship between competency and stress
- More time with Orienter
- Week 6: competency increased, BP decreased
- Week 9 BP significantly lower than Week 2 BP

6N

- No relationship between competency and stress
- Competency increased steadily while BP varied
- Week 9 BP similar to Week 2 BP
- More clinical variety on 6N (gen. Med/Surge vs. Oncology)
- Higher patient-staff ratios
- Less time in direct patient care; skip meals and breaks
- Perform duties (nurses aid) below training and rank
**Complexity: Micro Design Interaction Zones 4S**

- **Med Non-Interactive**: Staff defined an invisible boundary
- **Med Interactive**: Site for social, validation, learning, and discussing patient care.
- **Doctor Interaction**: Occurred on the outside edge of the nurse’s station into the neutral zone.

**Backstage Spaces**: facilitated social support and unification of the unit
SOME COMMON THREADS…so far

General 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
- Most interaction in nursing pods..but **not** only in one assigned
- Relatively little time spent in patient rooms
- How space used in one location affected by nature of space available
- Little shared space; neutral zones important for communication across disciplines
TALKING POINTS

Outcomes
- Medical outcomes (unclear…data unreliable that we had access to)
- Staff satisfaction (unclear that significantly better than before new design; better than immediately after move)
- Patient satisfaction (improve ~10 percent, from low point. Still not high)

Value for Money
- Are scarce funds being invested wisely?

Research Issues/Approach/Direction
- Key issues?
- Useful theory?
- Appropriate Methods
Does anybody else feel that their needs aren’t being met?
Quality of Care, Communities of Practice and the Organizational Ecology of the Nursing Unit

Design

Community of Practice

- Technology
- Work Process
- On-the-Job Learning/Teaching
- Informal Communication
- Organizational Culture

Work Effectiveness

Quality of Care

Job Stress

Job Satisfaction

Attract/Retain

Cornell University
Why Study Nursing Unit Design?

- $30-40b annually on new construction
- Evidence-based design: Test working assumptions
- Decentralized design advocated as best practice; little evidence

Why Study Communication, Collaboration, Stress, and Job Satisfaction

- Importance of sharing information, informal learning; negotiating diagnosis and treatment plans: junior docs, new information, co-morbidity
- Service delivery model (team and collaboration)
- Communication and medical errors
- Stress, job satisfaction and nursing turnover (shortage)
“We know a few things, but not very much.” (Campbell, 1971)

- Feedback is a critical element in achieving learning; and timing and specificity of it are critical.

- “Employees look towards their supervisor for important information regarding how to work successfully within the social environment of the organization.”

- “Modeling has been shown to be a powerful force in affecting behavioral change….the extent to which the supervisor behaves in ways congruent with the training objectives will have a major impact on transfer of trained skills by subordinates.”

- HR practices help build social relations among employees by improving their opportunity, motivation, and ability to access and mobilize one another’s knowledge (Leana & Van Buren, 1999; Dyer & Nobeoka, 2000).

- The process of transferring and applying valuable knowledge distributed within and across organizational boundaries often takes place in the context of social interaction (Nahapiet & Ghoshal, 1998; Kale, Singh, & Perlmutter, 2000)
How does the organization’s ecology (how space is planned, design, used and managed) influence:

- Trust.
- Teamwork.
- Decision speed.
- Understanding of the culture.
- Transfer of tacit expertise and knowledge.
The Organizational Ecology of (any) Workplace

It is a SYSTEM: A tangled web of interdependencies
Hospitals Are Changing… Patient-Centered Care