Effects of Single Versus Multi-Bed Rooms on Outcomes

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Objectives

Review research relevant to comparing single vs. multi-bed rooms

- Safety (infection rates, medical errors, falls)
- Stress, other medical outcomes
- Satisfaction
- Economic outcomes
Healthcare Associated Infections (HCAI)

- Increase hospital costs per patient by $40,000 in U.S.

More that 145 studies were identified pertaining to infection and the hospital built environment

(Ulrich & Zimring, 2004)
Single-Bed Rooms Help to Reduce Infection Rates

- Enable proactive isolation of patients at admission
- Are far easier to decontaminate after patient is discharged
- Single-bed rooms are vastly superior to multi-bed rooms for managing air changes, pressure and maintaining clean air
Surfaces commonly contaminated by MRSA (Methicillin-resistant *staphylococcus aureus*)
STUDY  [by Cepeda,...Wilson et al. 2005]

- **Patients:** MRSA-positive patients in multi-bed rooms in two London hospitals
- **Interventions:** After diagnosis, patients were either (1) moved to a single room or cohort nursed or (2) not moved – that is, they remained in multi-bed rooms
- **Findings:** Isolating patients in single rooms or cohorts did not reduce MRSA acquisition rates
**STUDY** [by Ben-Abraham, Keller, Szold et al., 2002]

- **Patients:** children in pediatric intensive care unit

- **Environmental intervention:** Move from open ward to private rooms

- **Findings:** 50% decrease in infections (respiratory tract, urinary tract, catheter-associated)
Effect of Single versus Two-Bed Rooms on HCAI
Bronson Methodist Hospital, USA

Richard A. Van Enk, Ph.D.
Themba L. Nyirenda, MS

Pebble Project

The Center for Health Design
Categories of Infections in Study
(Van Enk and Nyirenda, 2003)

- Urinary
- Urinary, catheter-associated
- Pneumonia
- Lower respiratory
- Reproductive
- Surgical site
- Skin
- Bloodstream, primary
- Central nervous system
- Gastrointestinal
- Cardiovascular
- Ear/nose/throat
- Bone/joint
- Systemic
Infection Rates for Cardiac Surgery Unit
(Van Enk and Nyirenda, 2003)

The impact of the move on the CSU: $t = -2.83$, $p = 0.005$
The impact of the move on the Mothers in Mother/Baby unit: $t = -2.76$, $p = 0.006$

Infection Rates of Mothers in Mother/Baby Unit (Van Enk and Nyirenda, 2003)

Move to New Building with Single Rooms
Do roommates provide stress reducing social support?

- Studies show that 85%-90% of the time roommates are source of stress not positive social support
  - Stress examples: roommate who is unfriendly or seriously ill
  - Roommates generate much noise
American Women in Labor & Delivery Units Rate Room Noise

From Gesell and Malone (2002)
Press Ganey Associates

Based on data from 152,399 female patients in 566 hospitals across 46 states
January through December, 2002
Satisfaction with Room Environment Aspects
(from Gesell and Malone, 2002)

Satisfaction with Room Environment Aspects

![Bar chart showing satisfaction levels for different room environment aspects.]

- **Pleasantness of room decor**
  - Had roommate: 70
  - Single room: 80

- **Room cleanliness**
  - Had roommate: 85
  - Single room: 80

- **Noise level in and around room**
  - Had roommate: 65
  - Single room: 75

The chart indicates that single rooms generally have higher satisfaction levels in terms of pleasantness of room decor and cleanliness compared to rooms with a roommate. However, noise levels in single rooms are slightly lower than in rooms with a roommate.
Approximately 15%-20% of all room transfers in U.S. hospitals are caused by incompatibility and stress among roommates.
Transfers Worsen Patient and Staff Safety

- Transfers cause sharp peaks in medical errors
- Increase infections
- Major cause of staff injuries
- Each transfer requires hours of staff time and paperwork
- Each transfers adds .5 day to LOS
Transfers reduced 90% compared to unit with multi-bed rooms
Saves $5 million per year
Medication errors reduced 70%
Annual Medication Error Index
(errors/patient days) coronary critical care

Problem: Falls

- Most falls occur when patients get out of bed unassisted. Design for increasing assistance for patients and thereby reducing falls includes:
  - Decentralized nurse stations
  - Single-bed rooms designed to support family presence
Acuity-Adaptable, Single Coronary Critical Care
Methodist Hospital, Indianapolis

Family Zone
Family-centered single rooms + decentralized nurse stations improve observation and assistance for patients, thereby reducing falls.
Methodist Hospital Study: Patient Fall Index (falls per 100 patient days)

- Move to new unit with single family-centered rooms and decentralized nurse stations
- More Falls

Myth:

Single-bed rooms require much higher nurse staffing and therefore greatly increase costs
Study: Staffing Impact
Hendrich, Fay & Sorrells, 2004

- From two-bed to single-bed rooms
- From centralized to decentralized nurse stations
- From acuity-based care model (dependent on transfers) to acuity-adaptable without transfers
- From limited visiting times to family-centered care model
Figure 11  No. of nurses employed before and after implementation of the new design. (Two half-time nurses would count as 1 full-time equivalent.)

Figure 13  Retention of nurses after implementation of the acuity-adaptable model. (Two half-time nurses would count as 1 full-time equivalent.)

source: Hendrich, Fay & Sorrells, 2004
Another myth:

Single-bed rooms prevent observation of patients and therefore worsen safety.
Visual monitoring window in a Canadian hospital built more than 20 years ago
Hexham Hospital
Northumbria NHS
Design: Jonathan Bailey
Decentralized Nurse Charting & Observation Stations

- Well-designed decentralized nursing stations improve visual observation of patients, thereby enhancing safety and outcomes.
Pendleton Memorial, New Orleans
design: Blitch/Knevel

Decentralized charting/observation
Golden Jubilee National Hospital (NHS) Glasgow
Single vs Multi-bed Rooms:
Social Support from Family, Friends

- Much research shows that contact with caring, emotionally supportive family/friends reduces patient stress and improves medical outcomes.
Single rooms are better for being with family, increasing social support.
Major stressor:

**Poor staff communication with patients**

- Elevates patient and family anxiety and stress
- Considered by patients one of the worst stressors
- Worsens outcomes

**STRESS:** Single vs Multi-Bed Rooms
Single vs Multi-bed Rooms: Staff Communication

- Patients in single rooms, compared to those with roommates, think staff communicate much better with them.
Single rooms improve communication between clinical staff and patients
Evidence-Based Design to Improve Financial Performance
Single Rooms and Satisfaction

Source: Press Ganey US national data, 1999-2002 (approximately 4.5 million patients)

- U.S. patients are more satisfied with care when they are in single rooms rather than multi-bed rooms.
- Vast majority of British patients likewise prefer single-bed rooms, especially if they have experience with such rooms (Lawson and Phiri, 2003).
# Single-bed vs. Multi-bed Rooms

(ULRICH, 2004)

<table>
<thead>
<tr>
<th></th>
<th>Single</th>
<th>Multi-bed</th>
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<tbody>
<tr>
<td>HCAI</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Medical errors</td>
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<td>Falls</td>
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<td>Staff observation of patients</td>
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<td>Staff/patient communication</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Patient confidentiality, privacy</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Presence of family</td>
<td>✔</td>
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<tr>
<td>Death with dignity</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Noise</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Sleep quality</td>
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<td>Patient satisfaction</td>
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<tr>
<td>Patient stress, pain</td>
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<td>✔</td>
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<tr>
<td>Room transfers: costs</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Managing bed availability</td>
<td>✔</td>
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<tr>
<td>Adaptability to accommodate change</td>
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<tr>
<td>Initial construction costs</td>
<td>✔</td>
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<tr>
<td>Whole life costs</td>
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Example:
Karmanos Cancer Institute
Detroit, Michigan, USA

Previous facility:
- Multi-bed rooms
- Centralized nurse stations
- Poor acoustics

$15 million renovation
- 54 single-bed rooms
- Breast center
- Outpatient cancer center
Karmanos Cancer Institute
Detroit, Michigan, USA

Selected Data

• 30% reduction in errors
• 17% higher satisfaction
• Lower nurse attrition
• 16% decrease in patient use of narcotic pain drugs
• Average costs decreased >$1,000 per patient
Policy Changes Affecting Financial Outcomes of Trusts in England

• **Choice**
  - Patients can choose where to go for care. *Revenues flow with patients.*
  - Two sources of competition: NHS and private providers

• **Payment by results**
  - Costs of infections, falls, errors, longer stays paid to greater extent by trusts
Study:

*Choice in the Birmingham and Black Country SHA*

MORI Social Research Institute, 2005
How much do you think the private sector is better than the NHS in these areas of activity?

source: 1,201 residents, MORI Birmingham SHA study, 2005
Comparing persons ‘easy to persuade’ vs ‘hard to persuade’ to choose private sector

- *Private room* is important:
  - 79% of easy to persuade (EtP)
  - 47% of hard to persuade (HtP)

- *Flexibility about visiting* important:
  - 91% of EtP
  - 77% of HtP
Based on the survey findings, the independent sector could make £35 million in revenues this year from choice in the Birmingham and Black Country area

(source: Independent Healthcare Forum)
Kidderminster Hospital
Design: MAAP Architects
Build it cheap and quick!

Greater risk for stakeholders

Healthcare Operations COSTS

Negative long term financial consequences

Healthcare Operations REVENUES (from choice and performance)

After: Evans et al. 1998, Royal Academy of Engineering

Building Design and Construction 1

Maintenance 4.2

Healthcare (Business) Operations 50

75-100
Build it based on evidence and spend slightly more.

Reduced risk for NHS, taxpayer

Positive long term financial consequences

Healthcare Operations COSTS

Healthcare Operations REVENUES (from choice and performance)

Healthcare (Business) Operations [Revenues Minus Costs]
Forecast (2010)

- Evidence-based design will become critical for improving patient safety, outcomes and trust performance
- *Single-bed rooms* will play pivotal role
Reference


available online at www.healthdesign.org