The Economics of Hospital Nursing

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Outline

- **Context of discussions of economics of nursing**
- **Nursing matters – Nursing as a service line**
- **The business case for nursing**
  - Currently published analyses
  - Considerations that might change the business case analysis
- **The need for nursing to own the quality and efficiency agenda**

Context for presentation

- **Bending the cost curve/searching for value**
  - About to enter new period of cost containment in health care
  - 1980s-1990s: Hunterization of cost containment
  - Nursing as cost center, rather than service line
- **New era perhaps more sophisticated**
  - Ambulatory: Accountable care organizations, medical homes
  - Inpatient: Pay for performance, nonpayment for never events
    - Nursing sensitive conditions as never events
    - Readmissions
- **Implications**
  - Need for nursing to establish
    - Service line
    - Contribution to value for organization (business case)
    - Need to change policy/payment to value what patients value

Context

- **Quality improvement & process/efficiency improvement linked**
    - National agenda of bending the cost curve
    - National agenda of crossing the quality chasm
- **Demands on nursing increasing in all settings**
    - Sicker patients in hospitals
    - Sicker patients in nursing homes, rehab, and at home
- **After recession, nursing shortage will return**
- **Pay for performance/nonpayment for poor performance**

- **Implications:**
    - Need to make case for nursing
    - Need to build the business case
    - Nurses work needs to be redesigned to assure quality and efficiency

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Nursing matters

- **Staffing, education and work environment all influence patient care**

Nursing matters: Nurses Impacts on Patient Outcomes

- **Nurses' work is core function of hospital care**
  - Have outpatient surgery, imaging, labs, therapy
  - Only reason patient is hospitalized is they need nursing care
- **Range of outcomes influenced by nurse staffing reflect range of nurses' work**
  - Delivering ordered care
  - Assessment and monitoring
  - Timely and appropriate intervention
  - Coordination and patient management
  - Patient education
- **Because nurses involved in all aspects of care, interacting with other care givers, identifying the contribution of nursing to care, safety, quality, efficiency is difficult to parse out**
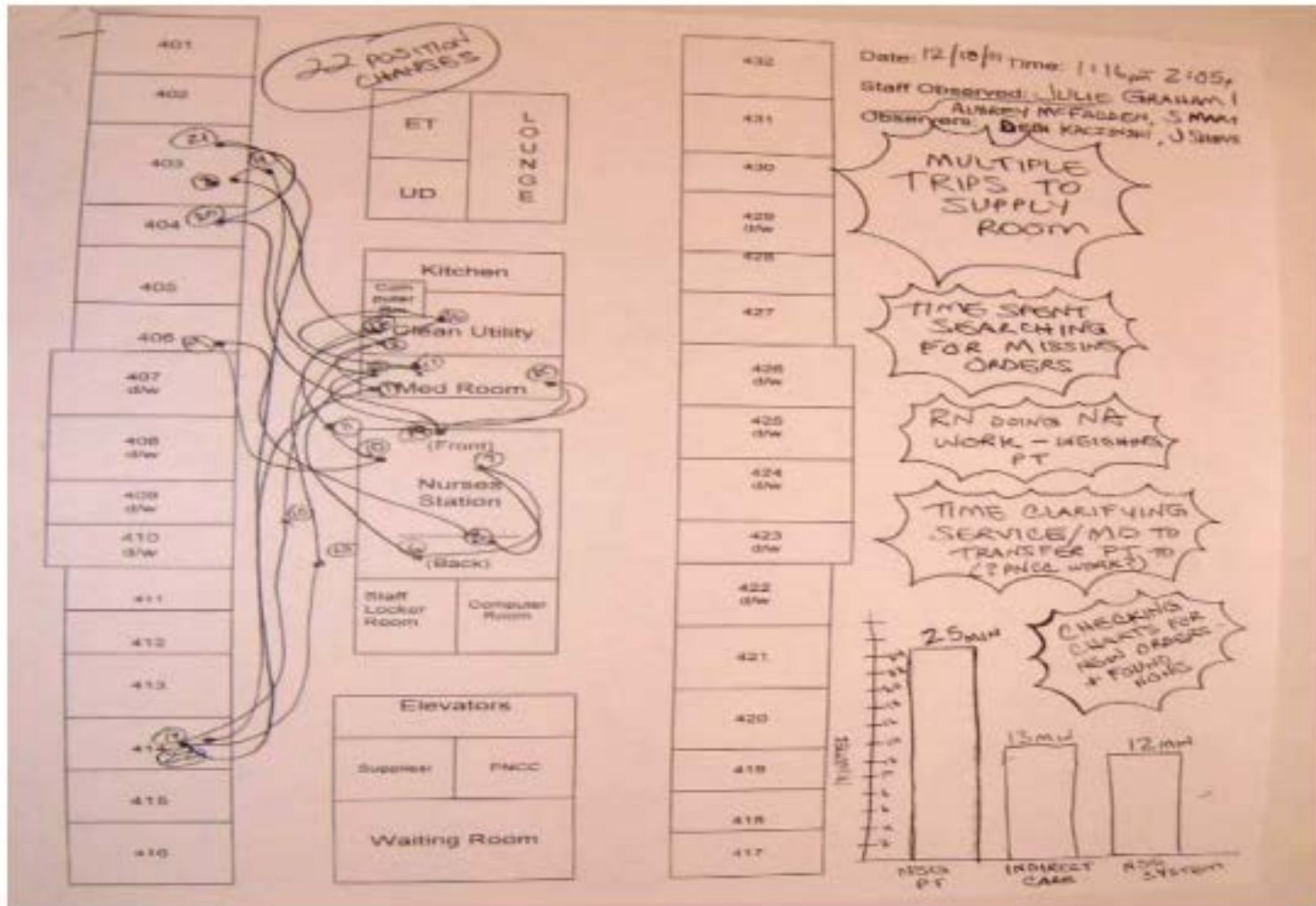
Source, Institute for Healthcare Improvement, TCAB How-to Manual on Nurse Time in Direct Patient Care, 2008

Review of research on staffing and quality

- **1996 IOM report**
  - "Serious paucity of recent research" on nurse staffing and quality
  - Call for rigorous research
- **In decade following, substantial research**
  - Needleman, Buerhaus; Aiken et al.; Mark et al; Kovner; Blegen and others
  - Most research based on comparing high staffed to low staffed hospitals
    - Variety of data sources for staffing
      - Typically, single estimate for year or from single survey
    - Variety of outcomes, with mortality and failure to rescue particularly compelling

Meta-Analysis of Nurse Staffing Studies

TABLE 1. Pooled Odds Ratios of Patient Outcomes Corresponding to an Increase of 1 Registered Nurse Full Time Equivalent per Patient Day*

Outcome	Studies	Odds Ratio (95% CI)	Attributable to Nurse Staffing Fraction of Events (%)	No. Avoided Events/1000 Hospitalized (95% CI)
All patients				
Mortality, hospital level analysis, all patients	5	0.96 (0.94; 0.98)	4.2	3 (2; 4)
Mortality, intensive care units	5	0.91 (0.86; 0.96)	9.2	5 (2; 8)
Mortality, surgical patients	8	0.84 (0.8; 0.89)	16	6 (4; 8)
Mortality, medical patients	6	0.94 (0.94; 0.95)	5.6	5 (4; 5)
Hospital-acquired pneumonia	4	0.81 (0.67; 0.98)	19.1	1 (0; 2)
Pulmonary failure	5	0.94 (0.94; 0.94)	6	1 (1; 1)
Cardiopulmonary resuscitation	5	0.72 (0.62; 0.84)	27.6	2 (1; 2)
Intensive care units				
Hospital-acquired pneumonia	3	0.7 (0.56; 0.88)	30.2	7 (3; 10)
Pulmonary failure	4	0.4 (0.27; 0.59)	60.3	7 (5; 9)
Unplanned extubation	5	0.49 (0.36; 0.67)	50.9	6 (4; 8)
Cardiopulmonary resuscitation	3	0.72 (0.62; 0.84)	27.6	2 (1; 2)
Relative change in length of stay	4	0.76 (0.62; 0.94)	24	7 (2; 11)
Surgical patients				
Failure to rescue	5	0.84 (0.79; 0.9)	16	26 (17; 35)
Surgical wound infection	1	0.15 (0.03; 0.82)	84.5	7 (1; 8)
Cardiopulmonary resuscitation	1	0.72 (0.62; 0.84)	27.6	1 (1; 2)
Nosocomial bloodstream infection	5	0.64 (0.46; 0.89)	36	4 (2;5)
Relative change in length of stay	3	0.69 (0.55; 0.86)	31	14 (6; 21)

*An increase of 1 registered nurse full time equivalent per patient day would result in 8 additional registered nurse hours per patient day and an increased cost of $24.57/h × 8 h or $196.56/patient day.[122] Attributable to nurse staffing fraction of events and number of avoided events per 1000 hospitalized patients were estimated assuming causality in the association.

Source: Kane et al, Medical Care, 2007

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Mortality, medical patients	6	0.94
Hospital-acquired pneumonia	4	0.81
Cardiopulmonary resuscitation	5	0.72
Surgical patients failure to rescue	5	0.84
Surgical wound infection	1	0.15
Nosocomial bloodstream infection (Surgical)	5	0.64
Relative change in length of stay (Surgical)	3	0.69

All ORs significant at 0.05 level

OR below 1.0 positive effect of nursing on outcome

Source: Kane, 2007

Avoided Days and Adverse Outcomes Associated with Raising Nurse Staffing to 75th Percentile in US hospitals

Estimates from Needleman/Buerhaus, Health Affairs, 2006

	Raise RN Proportion	Raise Licensed Hours	Do Both
Avoided Days	1,507,493	2,598,339	4,106,315
Avoided Adverse Outcomes Cardiac arrest and shock, pneumonia, upper gastrointestinal bleeding, deep vein thrombosis, urinary tract infection	59,938	10,813	70,416
Avoided Deaths	4,997	1,801	6,754

Since Kane, 2007

- **Replication of results for outcomes observed**
- **Addition of other outcomes, notably readmissions**

On Causality, from Kane Meta-Analysis

- **The arguments for a causal relationship are mixed**
  - Several lines of evidence suggest that overall hospital commitment to a high quality of care in combination with effective nurse retention strategies leads to better patient outcomes, patient satisfaction with overall and nursing care, and RN satisfaction with their job and the care they provide
  - Effects varied with measure of staffing (CA strongest)
  - Longitudinal studies would control better
  - Other factors besides staffing

The limits of comparing high staffed to low staffed hospitals

- **Most studies compare low staffed to high staffed hospitals**
- **Leads to questioning relationship of staffing and patient outcomes, including mortality:**
  - Cross-sectional studies comparing high and low staffed hospitals
    - Open to alternative explanation of association with other factors correlated with staffing but not staffing
    - Imprecise nurse staffing measurement
    - Lack of adjustments for patient acuity
    - Do not reflect intuitive sense of what "short staffing" is

SPECIAL ARTICLE

Nurse Staffing and Inpatient Hospital Mortality

Jack Needleman, Ph.D., Peter Buerhaus, Ph.D., R.N., V. Shane Pankratz, Ph.D.,
Cynthia L. Leibson, Ph.D., Susanna R. Stevens, M.S.,
and Marcelline Harris, Ph.D., R.N.

ABSTRACT

BACKGROUND

Cross-sectional studies of hospital-level administrative data have shown an association between lower levels of staffing of registered nurses (RNs) and increased patient mortality. However, such studies have been criticized because they have not shown a direct link between the level of staffing and individual patient experiences and have not included sufficient statistical controls.

METHODS

We used data from a large tertiary academic medical center involving 197,961 admissions and 176,696 nursing shifts of 8 hours each in 43 hospital units to examine the association between mortality and patient exposure to nursing shifts during which staffing by RNs was 8 hours or more below the staffing target. We also examined the association between mortality and high patient turnover owing to admissions, transfers, and discharges. We used Cox proportional-hazards models in

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16

Alternative conceptualization of low staffing: Gap between actual and target staffing

- **Compare actual staffing to *target staffing***
- **Hospital established staffing targets:**
  - Unit specific
  - Nursing care model
  - Driven by census and patients' need for nursing
  - Other factors influencing nursing work load, such as patient turnover on unit
- **Allows each organization to accommodate organizational nuances rather than fixed staffing targets applied to all organizations**

We address these concerns by

- **Constructing _individual patient experience_ of "low" staffing based on day-to-day, shift-to-shift variations in staffing at the <u>unit</u> level**
  - Not institutional or unit annual or monthly average
  - Same units, staff, technology, physicians

Increased risk associated with each shift with RN staffing below-target or high turnover, 30 day cumulative exposure

Shifts with RN staffing 8 or more hours below target	2%/shift
Shifts with high patient turnover	4%/shift

Increased risk associated with each shift with RN staffing below-target or high turnover, first 5 days cumulative exposure

Shifts with RN staffing 8 or more hours below target	3%/shift
Shifts with high patient turnover	7%/shift

19

Key findings – Patient Mortality

- **Even in a high quality hospital that generally meets its' staffing targets and manages patient turnover, and extensive controls for the influence of other factors, we still could detect the effects of staffing and high patient turnover**
  - Effects are comparable to those observed in comparisons of high to low staffed hospitals

- **Causality issue essentially resolved**

Implications for Hospital Management

- **Causal issue is resolved**
- **No free passes for hospitals with high average staffing**
  - Need to strive to hit targets every shift
- **Findings should also apply to hospitals less successful in routinely meeting nursing needs of patients**
  - Patients at higher average risk
- **Operational implications**
  - Nursing service line, not just cost center
  - Need systems for:
    - Identifying target staffing
    - Managing staffing against target
    - Staffing for anticipated turnover
    - Smoothing turnover

Nurse education and patient safety and quality

- **Significant body of research from US and Canada comparing outcomes in hospitals with high proportion of baccalaureate prepared nurses to those with small proportion**
  - General conclusion is care substantially better where higher proportion of baccalaureate prepared nurses

Mortality Rates in Hospitals with Differing Workloads and Percentages of BSNs
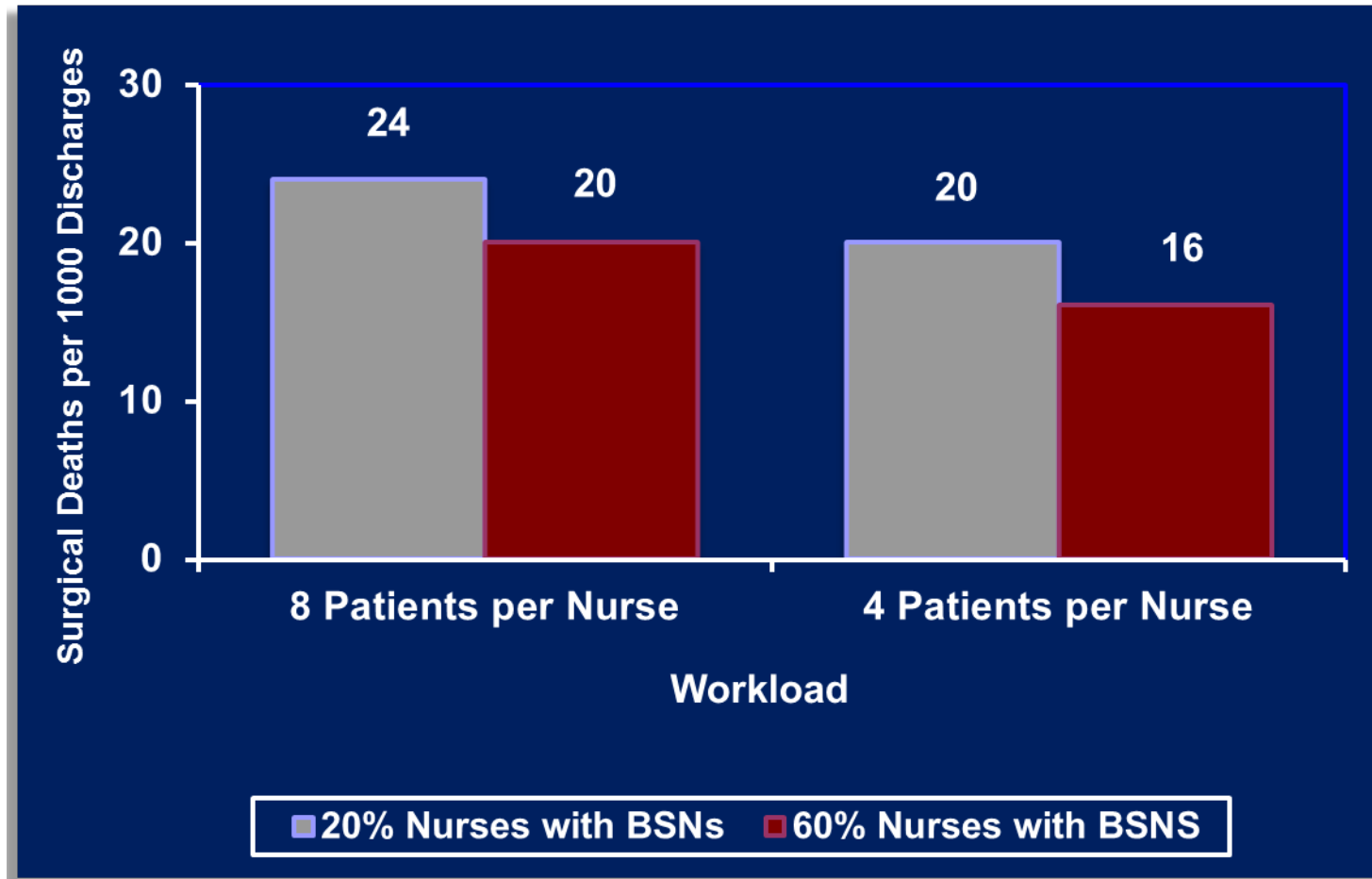

Aiken L. H., Clarke S. P., Cheung R. B., Sloane D. M. & Silber J. H. (2003). Educational levels of hospital nurses and surgical patient mortality. *JAMA, 290*(12), 1617-23.

Work environment also associated with patient outcomes

- **Work environment includes multiple dimensions**
  - Practice Environment Scale of Nurse Work Index identifies 5 dimensions:
    - Nurse Participation in Hospital Affairs
    - Nursing Foundations for Quality of Care
    - Nurse Manager Ability, Leadership and Support of Nurses
    - Staffing and Resource Adequacy
    - Collegial Nurse-Physician Relations
- **Other measures of environment or its impact include Kalisch Missed Nursing Care Scale, Patient Safety Culture Scale**
- **Magnet hospital status an effort to summarize nurse working environment across many dimensions**

Interacting Effects of Nurse Staffing and Work Environment on Surgical Patient Mortality

Aiken et al., 2011, *Medical Care*
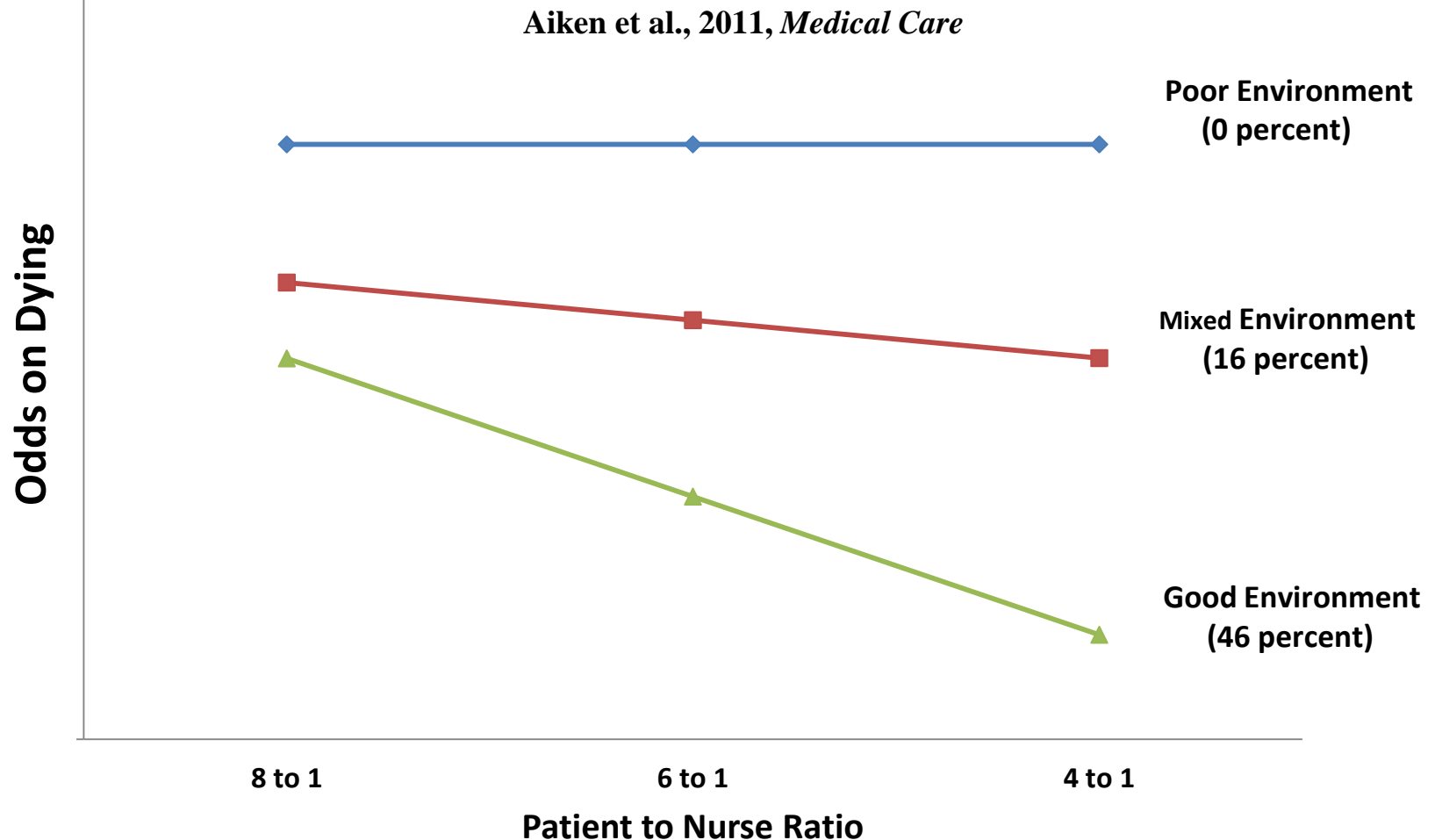
The difference in the odds on dying in hospitals with 8:1 and 4:1 patient/nurse ratios is -
0 percent in hospitals with poor environments;
16 percent in hospitals with mixed environments;
46 percent in hospitals with good environments.

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Economics of nursing: Social vs Business Case

- **Research shows having adequate nurse staffing can reduce lengths of stay, complications and mortality -- social case ignoring costs**
- **Hospital managers at low staffed hospitals might ask:**
  - How much would it cost to increase nurse staffing?
  - Would these costs be offset by cost savings?
  - Would the hospital realize these cost savings or, because of how the hospital is paid, would these savings be captured by payers?
  - Can the hospital attract additional profitable patients on the basis of its nurse staffing?
  - Are there other cost savings than those via better patient care that might also be realized if nurse staffing is increased?
- **Several partial models address these questions, using some but not all outcomes influenced by nursing**

Needleman, Buerhaus, Business Case for Nursing

- **Needleman, Buerhaus, NEJM, 2002 examined two dimensions of staffing**
  - Hours/patient day
  - RN/LPN mix
- **Wide variation across hospitals**
- **Robust association of staffing variables and outcomes for:**
  - Medical patients: length of stay, urinary tract infection, pneumonia, upper GI bleeding
  - Surgical patients: failure to rescue
- **Incorporated results into business case analysis in Health Affairs, 2006 by estimating impact of moving lower staffed hospitals up**
- **Updated in Needleman, PPNP, 2008, "Is What's Good For The Patient Good For The Hospital? Aligning Incentives And The Business Case For Nursing"**

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A note on cost offsets

- **Would hospitals save full (average) costs of reduced length of stay and complications?**
  - If not, save only marginal or variable costs, estimated at 40%
- **Over long term, might expect hospitals to recover or redirect fixed costs to:**
  - Scaling back to reflect change in volume
  - Increasing volume in other or replacement services
- **Therefore look at net savings two ways, assuming**
  - Only variable costs saved
  - Fixed costs also saved

SOCIAL AND BUSINESS CASE FOR NURSING

	Raise RN Proportion	Raise Licensed Hours	Both
Cost of higher nursing	$ 811 Million	$ 7.5 Billion	$ 8.5 Billion
Avoided costs (full cost)	$ 2.6 Billion	$ 4.3 Billion	$ 6.9 Billion
Long term cost increase	($ 1.8 Billion)	$ 3.2 Billion	$ 1.6 Billion
As % of hospital costs	-0.5%	0.8%	0.4%
Short term cost increase (save 40% of average)	($ 2.4 Billion)	$ 5.8 Billion	$ 5.7 Billion
As % of hospital costs	-0.1%	1.5%	1.4%

Conclusions from this analysis

- **Principal source of avoided costs is avoided days**
  - LOS reduction across all patients, but complications rare
  - LOS change approximately ¼ day of a 5 day admission
  - Some due to reduced complications, both measured and unmeasured
  - Also likely associated with improved ability of nurses to deliver care efficiently
    - Complete admission/discharge process & reduce delays
- **Given relative magnitude of savings, it is unlikely that increasing complications included in analysis would substantially add to cost savings**
  - Dall, et al., Medical Care adds more adverse events, alternative modeling, similar conclusion

Conclusions from this analysis

- **Level of net cost or savings is sensitive to judgment of how to deal with fixed costs**

  - Considering only variable costs, moving hospitals to 75th percentile of both staffing measures adds net of 1.5%

  - Considering fixed costs, adds net 0.4%

- **Estimate also based on current nursing models**

Conclusions from this analysis

- **Increasing proportion of RNs without increasing hours recovers its costs, even considering only variable costs**
    - Economic case
    - Whether business case depends on whether hospital retains savings
- **For other two options, net costs are not recovered via direct patient care savings**
    - But cost increases are relatively small, 1.5% if only variable costs recovered, 0.4-0.8% if fixed costs recovered
    - Context: MedPAC suggested 1-2% of Medicare payments be set aside for performance incentives

Turnover as an avoided cost

- **Analysis above focuses on cost offsets associated with direct patient care savings**
- **Most significant other offset discussed is avoided turnover due to better working conditions**
- **Using Aiken, 2002 as basis for estimates, for HA sample, reduced turnover of 17,500 nurses**
- **Cost savings of reduced turnover**
  - Cost of turnover 50%-100% of annual salary
  - At $60,000/avoided loss, $1 billion avoided costs
  - Do not fully offset cost increases, but lower net cost of patient benefits and enhance social and economic case

Conclusions from this analysis

- **From social value perspective, increased costs of this magnitude may be justified**
- **If one simply divides costs by avoided deaths:**
  - Recovering only variable costs:
    - $846,000 – 3.2 million
  - Recovering fixed costs
    - $231,000 – 1.8 million
- **Within guidelines federal agencies use in rulemaking for value of statistical death avoided**

Hospital payment systems and the business case

- **How much hospitals realize of cost offsets associated with improved patient care depends on payment systems**

- **Three broad systems of payment:**

  - Charges or percent of charges

  - Per diem, average or by type of bed

  - Per admission

- **Cost savings associated with reduced LOS would be retained by hospitals paid per admission, given back to payer under other systems**

Will "pay for performance" align incentives for improvements in nursing care?

- **Still evolving, with issue open on whether to be based on process or outcomes**
- **Current P4Reporting systems do poor job of targeting improvements in core work of nursing**
- **CMS "never event" payment policy better but small impact**
  - Narrow basis for nonpayment
  - Hospitals fail to recognize currently not being paid for many never events
- **Payment based on HCAHPS offers some additional incentive**
- **Bigger potential incentive from reduced readmissions**

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Nursing needs to own the quality and efficiency agenda to change the business case assessment

- **Nurses work will be redesigned to address sicker patients, changing technology, RN shortage and demand for cost savings**

- **Make more use of data to demonstrate nursing contribution to care**
  - Efficiency as well as safety/reliability
    - E.g., Readmissions as complement to LOS

- **Actively press for performance-related payment associated with nurses work**
  - Revenue stream has to match and support how we want the delivery system to behave

- **Nurses must engage in process improvement and work redesign**
  - Increasing efficiency as well as or offsetting staffing increases in face of cost control and nursing shortage
  - Need to integrate changes in care, not just add on
  - Will require institutions to commit time & attention
  - Will require nurses to build tool kit, especially re design and use of measurement
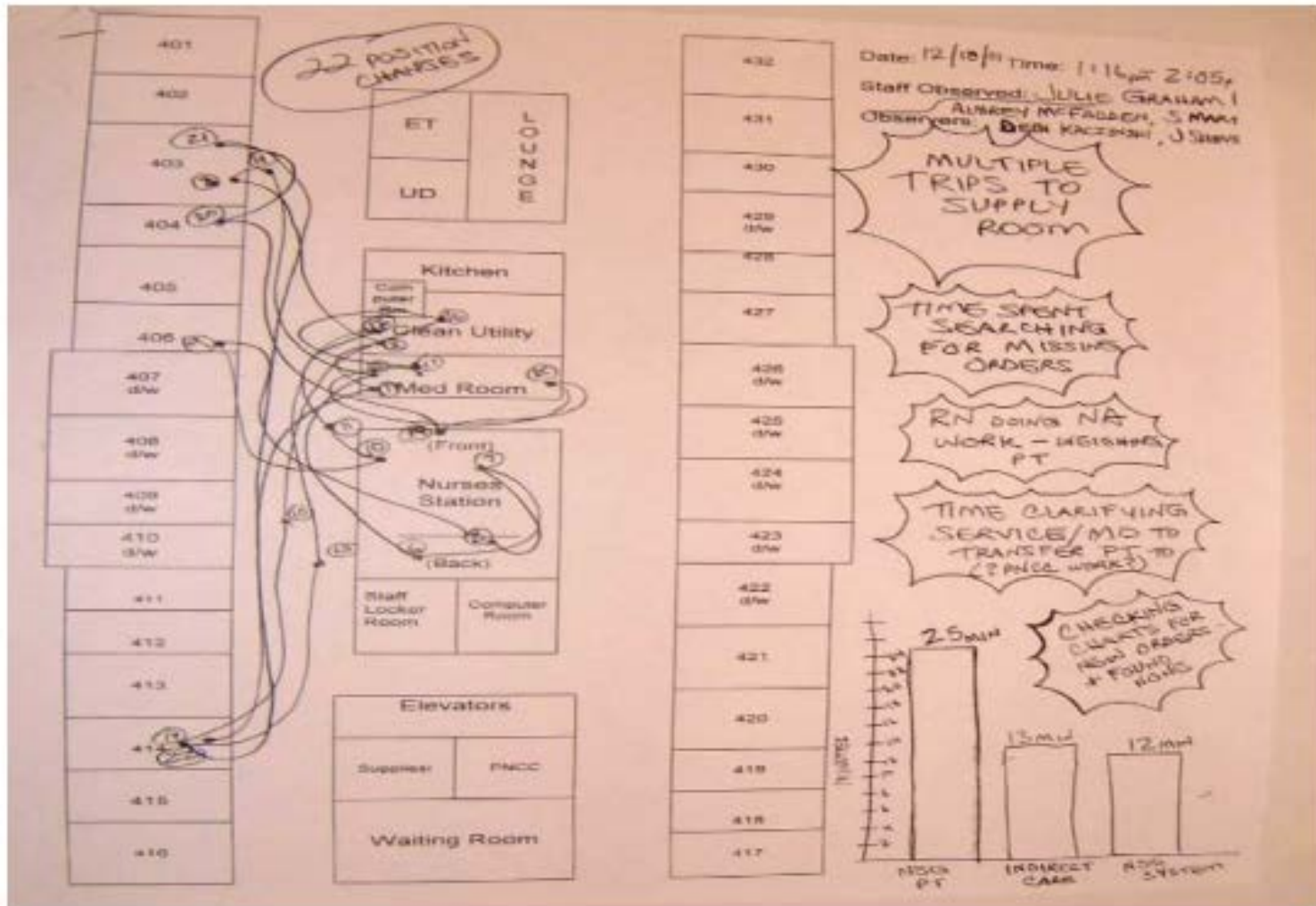
Source, Institute for Healthcare Improvement, TCAB How-to Manual on Nurse Time in Direct Patient Care, 2008

Challenges to redesigning work and sustaining change require nurses involvment

- **Nonlinearity of work**
  - Ebright "managing the stack"
  - Time? Completion and missed work? Accuracy/errors?
- **Improving care requires integration of practices, not simply adopting "best" practices**
  - Need to sustain effective practices
    - Not automatic
- **Key roles in coordination invisible to patient and often other staff**
  - Gerri Lamb INQRI grant
  - UCLA LOS and multi-disciplinary rounding
- **Burden**
  - Time, resources, training
  - Will look like added cost before it looks like improvement

We understand how to build a culture of improvement that engages the front line

- **Leadership engagement and commitment**
- **Organizational commitment to safety and reliability**
  - Alignment of improvement goals and institutional goals
- **Engagement, orientation and training of front line and clinical staff**
  - All above subject of "pre-work" in Michigan Keystone
  - Weakening hierarchical relationships and empowering staff
    - *"Respect the local wisdom of frontline providers."*
    - Engaging front line staff requires addressing their concerns
- **Adoption of methods for designing, testing and adapting innovations**
  - Plan-Do-Study-Act popular tool for rapid cycle testing
  - Complements longer and more formal methods of analysis and designing innovation
- **Commitment and capacity to collect and use data**
- **Not just "culture" but institutionalization of improvement work into work week and expectations**

Aravind Eye Hospital
How operational excellence is achieved

- **Work is designed as a series of ongoing experiments**
- **People are taught to be experimentalists**
- **Problems are addressed immediately through rapid experimentation**
  - Implication of the changes with the knowledge of concerned staff
- **Solutions are disseminated adaptively through collaborative experimentation.**
  - Results (Successful Methods) are shared across the system.