

BRIDGING THE GAP – OPERATIONS MANAGEMENT SCIENCE, PATIENT SAFETY AND HEALTH CARE COST

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SYSTEMS APPROACHES FOR IMPROVING HEALTH INNOVATION COLLABORATIVE, IOM/NAE

December 14, 2012

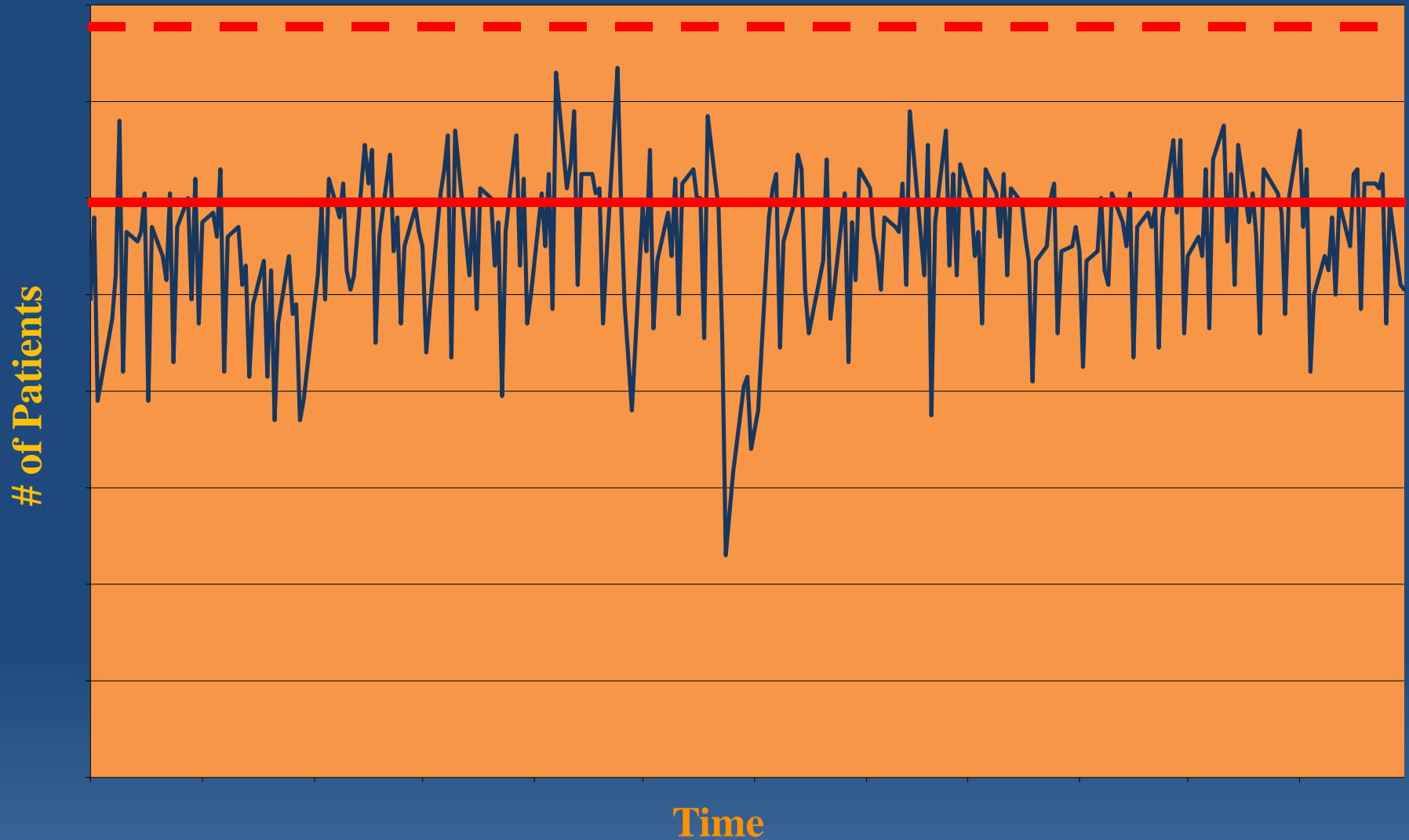
- ❑ Why are the words ***system*** and ***science*** frequently absent from the system redesign?
- ❑ Why is managing patient flow a critical **first step** for redesigning the health care delivery system in order to reduce Emergency Department/hospital overcrowding, medical errors, nurse stress, mortality, readmissions, and to improve access to care, quality of care, and bottom line ?

Major health care delivery problems:

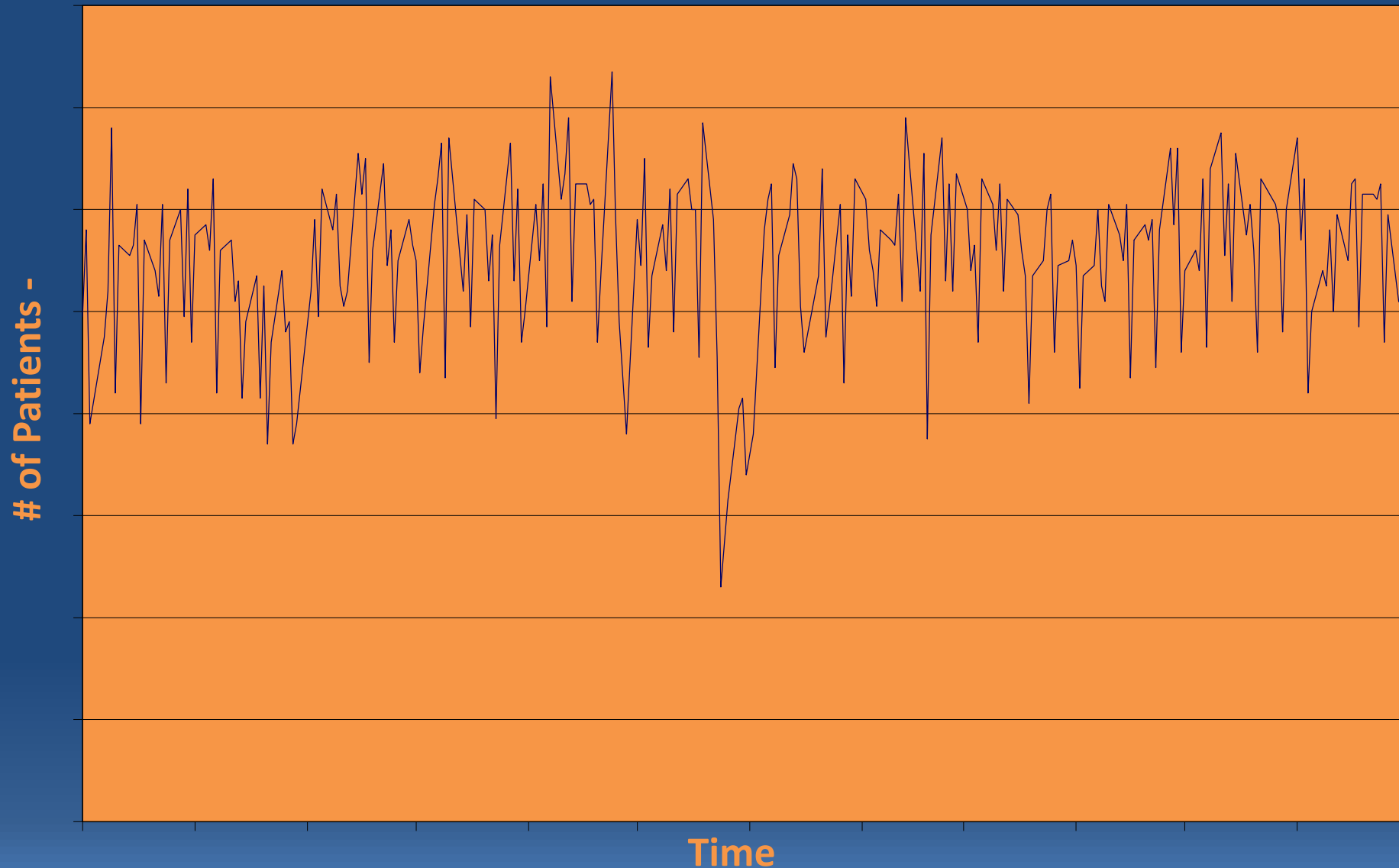
- Patient Safety
- Nurse understaffing/overloading
- Emergency Departments and hospital overcrowding/access to care
- High cost

Addressing variability in patient flow is necessary.
Although, of course, it is not sufficient to satisfactorily
resolve either of these problems.

Hospital bed occupancy: How did we staff, and how do we staff

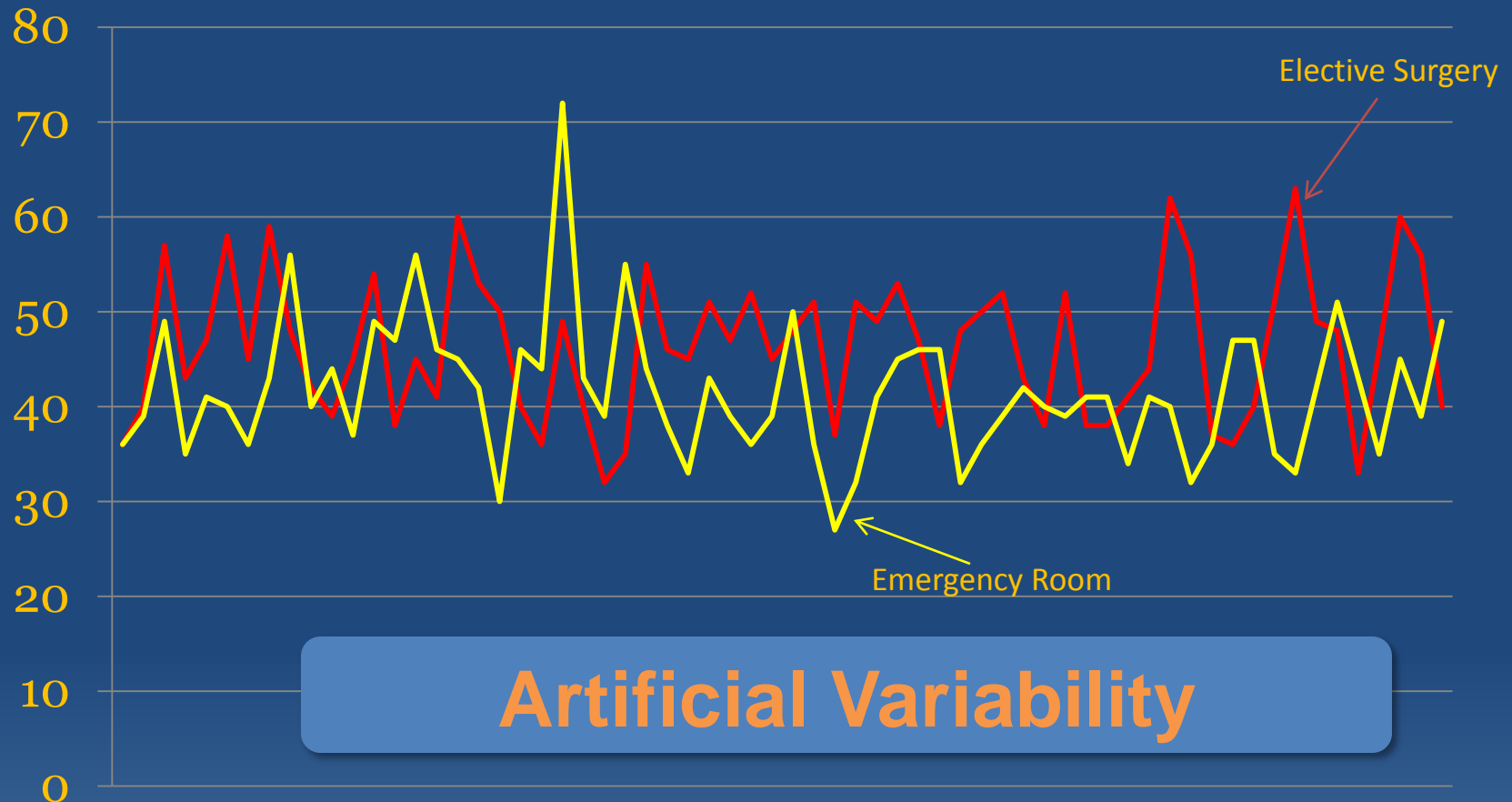


The question we do not ask: what makes hospital census variable?

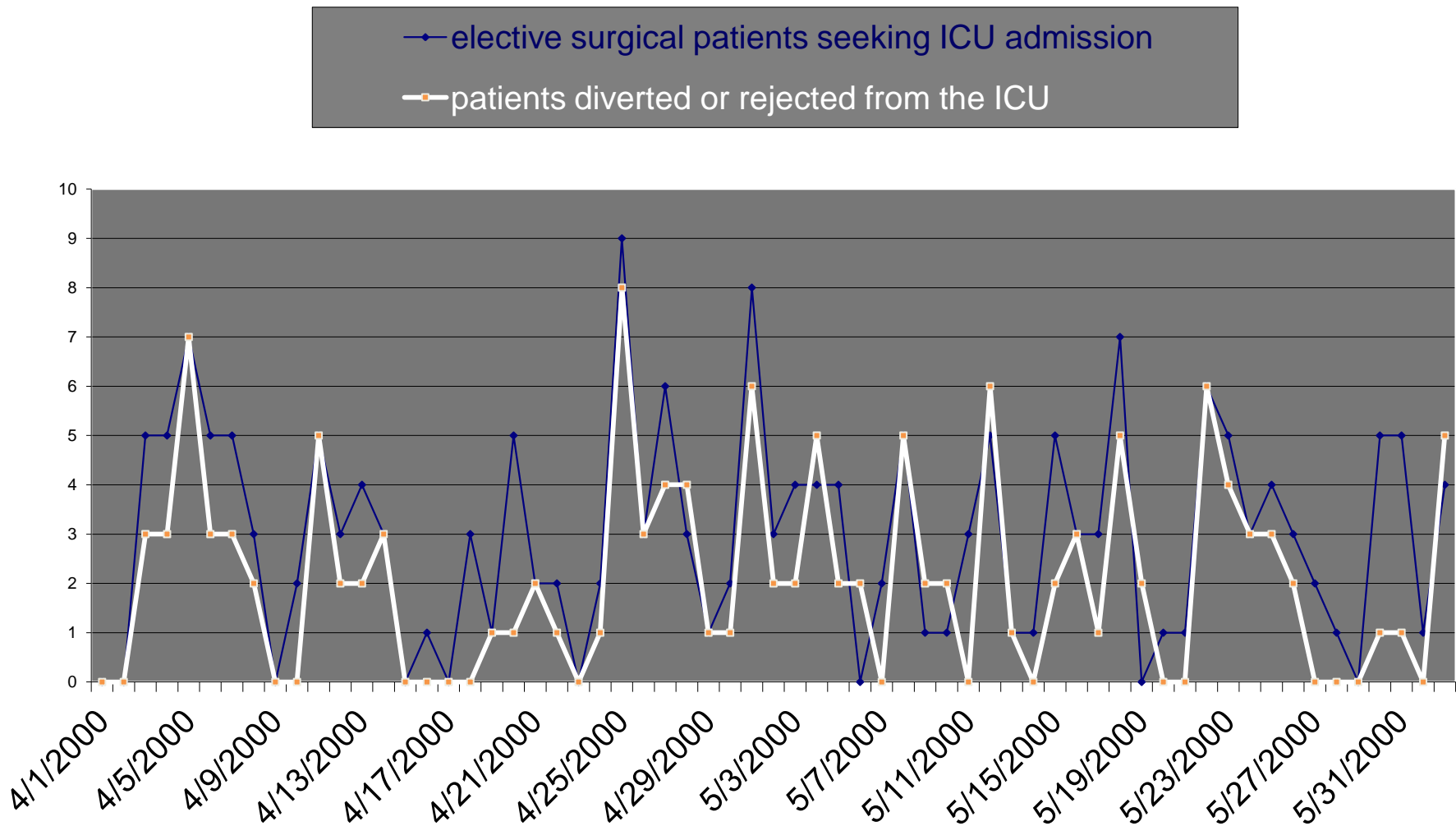


A key root cause of hospital bottlenecks and inefficiency

Daily Weekday Emergency and Elective Surgical
Admissions June - August 2008



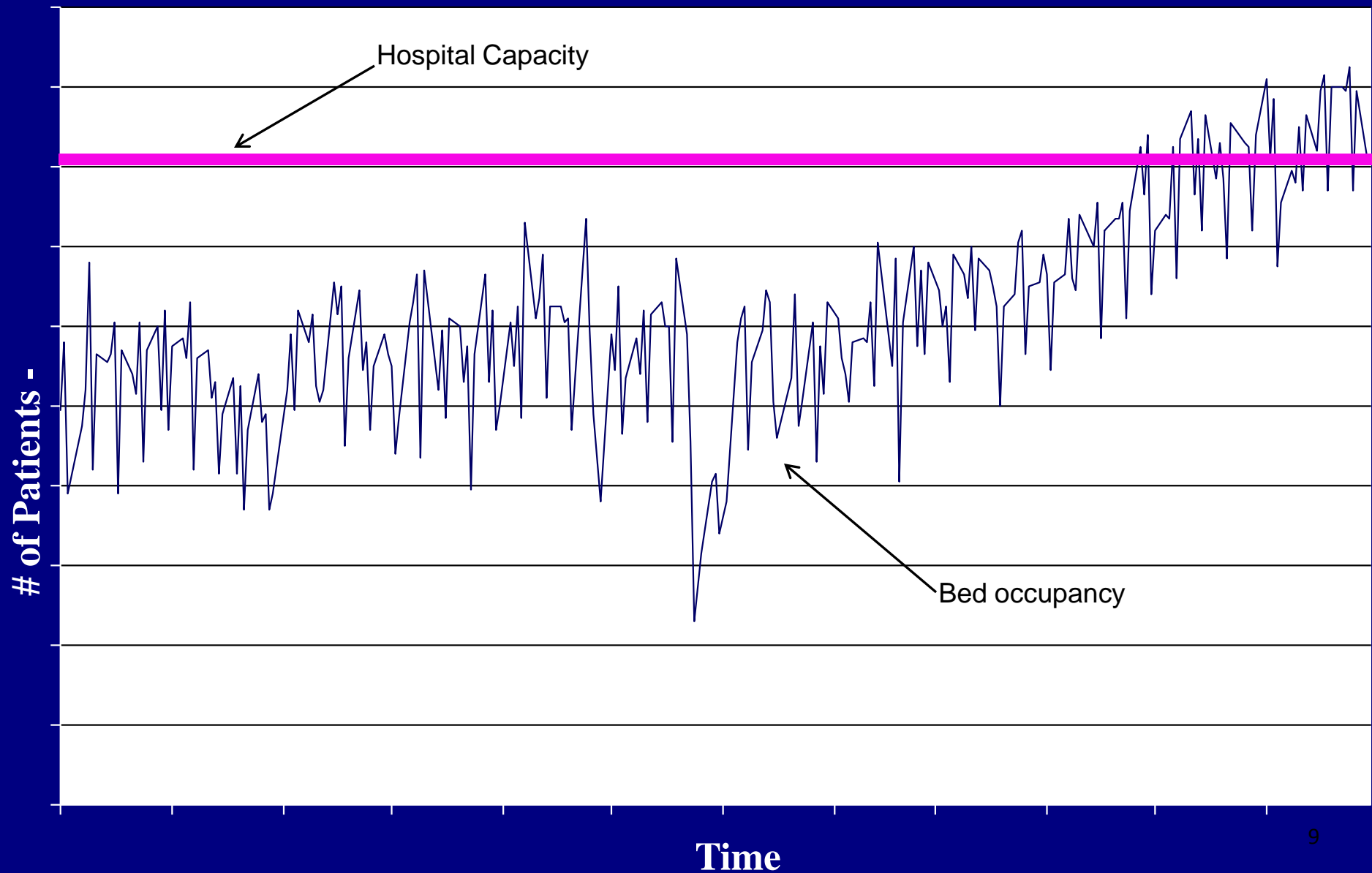
Elective Surgical Requests vs. Total Refusals



Michael L. McManus, M.D., M.P.H.; Michael C. Long, M.D.; Abbot Cooper; James Mandell, M.D.; Donald M. Berwick, MD; Marcello Pagano, Ph.D.; Eugene Litvak, Ph.D. Impact of Variability in Surgical Caseload on Access to Intensive Care Services, *Anesthesiology* 2003; 98: 1491-1496.

**Why is managing variability in
patient flow more important
now than ever?**

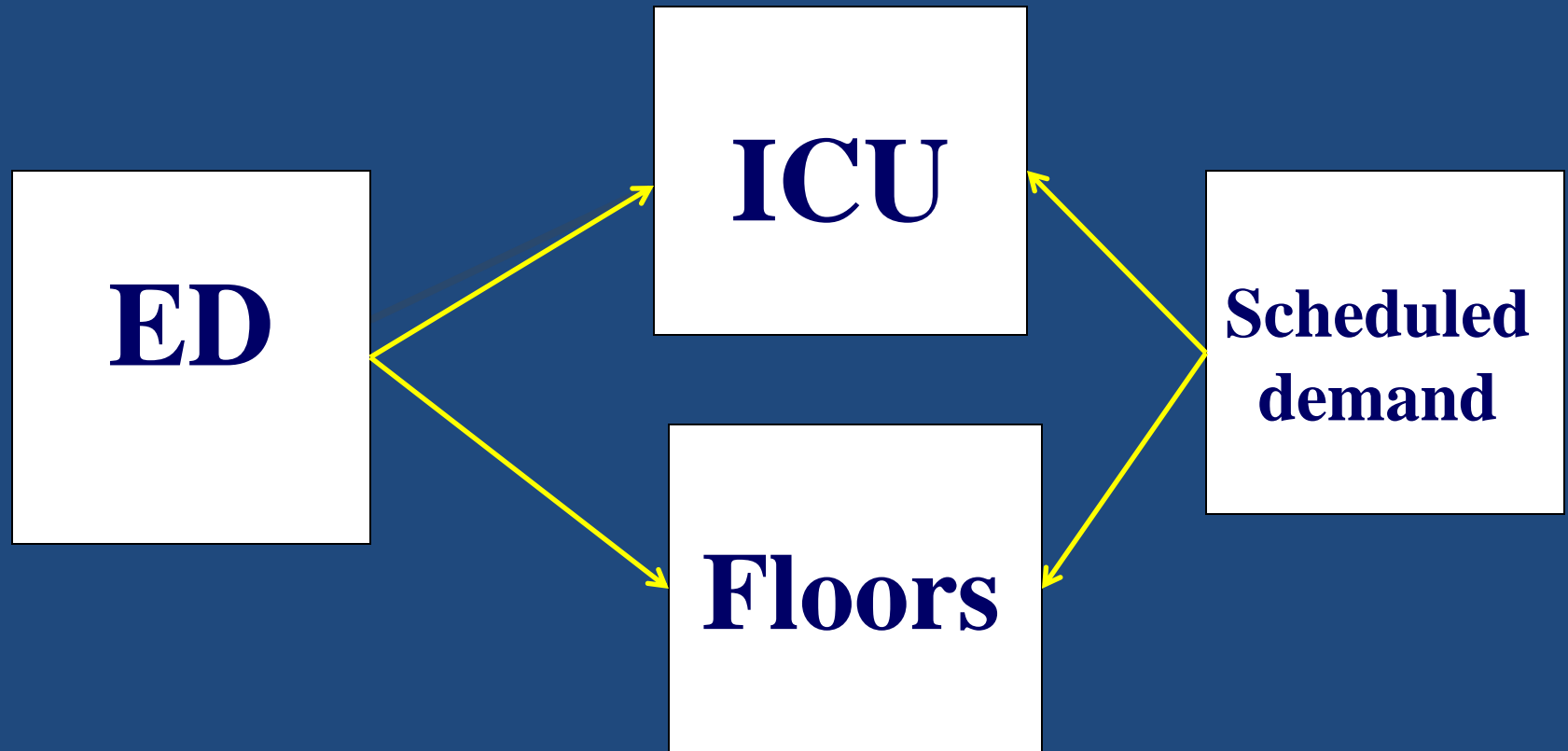
Does the healthcare system need more capacity?



At what cost?

- ❑ Typical cost of new capacity
 - Inpatient beds - \$1 M in capital and \$250K-800K annual operating expense
 - Operating rooms - \$2 – 7 Million, \$250K+ annual operating expense
 - Major imaging (CT, MRI, PET/CT, etc.) – approx. \$1M+
 - Cardiac Catheterization Lab – approx. \$2M
- ❑ Nursing and other provider shortages?

Variability and access to care



Variability and Quality of Care*

Inadequate numbers of nursing staff contribute to 24% of all sentinel events in hospitals. Inadequate orientation and in-service education of the nursing staff are additional contributing factors to over 70% of all sentinel events*)

*) Dennis S. O'Leary, - former President JCAHO (personal communication)

Adoption of National Quality Forum Safe Practices by Magnet Hospitals

Jayawardhana, Jayani PhD; Welton, John M. PhD, RN; Lindrooth, Richard PhD

Journal of Nursing Administration: September 2011 - Volume 41 - Issue 9, pp 350-356

Maintaining adequate and affordable nurse staffing levels is only possible by managing variability in patient flow

Variability and health care-associated infection

Jeannie P. Cimiotti DNS,RN, Linda H. Aiken PhD, Douglas M. Sloane PhD, Evan S. Wu, BS
American Journal of Infection Control: August 2012- Volume 40, pp 486-490

“There was a significant association between patient-to-nurse ratio and urinary tract infection (0.86; $P \leq .02$) and surgical site infection (0.93; $P \leq .04$). In a multivariate model controlling for patient severity and nurse and hospital characteristics, only nurse burnout remained significantly associated with urinary tract infection (0.82; $P \leq .03$) and surgical site infection (1.56; $P < .01$) infection. Hospitals in which burnout was reduced by 30% had a total of 6,239 fewer infections, for an annual cost saving of up to \$68 million.”

Variability and mortality

*“Each additional patient per nurse was associated with a 7% increase in the likelihood of dying within 30 days of admission and a 7% increase in the odds of failure-to-rescue” **

*) Linda H. Aiken, Sean P. Clarke, Douglas M. Sloane, Julie Sochalski, and Jeffrey H. Silber. Hospital Nurse Staffing and Patient Mortality, Nurse Burnout, and Job Dissatisfaction. *JAMA*, 2002; 288: 1987:1993

Variability and mortality

*“ For every 5% increase in census over the adequate staffing level, an additional 20% of surgical patients will be unnecessarily exposed to a 7% risk of increased mortality. Census increases up to 25% above an adequate staffing level subject all patients in the nursing unit in question to the 7% increase in risk; census increases over 25% result in the addition of new patients with a 14% increase in mortality rate; and so on.” **

***) Litvak E, Buerhaus PI, Davidoff F, Long MC, McManus ML, Berwick DM. “Managing Unnecessary Variability in Patient Demand to Reduce Nursing Stress and Improve Patient Safety,” *Joint Commission Journal on Quality and Patient safety*, 2005; 31(6): 330-338. <http://www.ihl.org/NR/rdonlyres/E18D05FD-F4E5-448D-8CBE-217CB5C03B7C/0/ManagingUnnecessaryVariabilityinPatientDemand.pdf>**

Patient Mortality and Variability in Patient Flow

Nurse Staffing and Inpatient Hospital Mortality, Needleman J., Buerhaus P., et al.

N Engl J Med 2011; 364:1037-1045, March 17, 2011

- ❑ *“There was a significant association between increased mortality and increased exposure to unit shifts during which staffing by RNs was 8 hours or more below the target level “*
- ❑ *“The association between increased mortality and high patient turnover was also significant “*
- ❑ *“In light of the potential importance of turnover on patient outcomes, research is needed to improve the management of turnover and institute workflows that mitigate the effect of this fluctuation”*

Legal consequences of staffing below peaks in patient demand:

<http://www.nhmedmallawyer.com/blog/post/show/hospital-staffing-and-its-effect-on-quality-care>

<http://www.healthleadersmedia.com/content/LED-269595/PDH-Understaffing-a-Possible-Factor-in-Deaths-at-CRMC##>

Does variability affect readmission rate?

- *“The main outcome variable is unplanned patient readmission to the neurosciences critical care unit within 72 hrs of discharge to a lower level of care. The odds of one or more discharges becoming an unplanned readmission within 72 hrs were nearly two and a half times higher on days when ≥ 9 patients were admitted to the neurosciences critical care unit ...” *)*
- *“The odds of readmission were nearly five times higher on days when ≥ 10 patients were admitted ...” *)*

*) Baker, David R. DrPH, MBA; Pronovost, Peter J. MD, PhD; Morlock, Laura L. PhD, *et al.* Patient flow variability and unplanned readmissions to an intensive care unit. *Critical Care Medicine*: November 2009 - Volume 37 - Issue 11 - pp 2882-2887

Rapid Response Team

“These peak time–based bed needs are well known in hospitals, but their occurrence appears to be largely unpredictable. During these times, everything goes wrong: ambulances are diverted, patients are boarded in emergency departments, patients are often prematurely discharged from the ICU to make room for more ill patients or elective surgical cases, nurses are overloaded and stressed, and patient discharges take place prematurely, resulting in patient readmissions. On days like these, hospital clinicians and managers face an unlikable dilemma: to admit a patient to a non-preferred unit or to board the patient in the emergency department or the post-anesthesia care unit until a bed in the preferred unit becomes available. During these times, proper patient placement is an exercise in wishful thinking and the definition of a preferred bed becomes “the one that is available.” Because of these artificial peaks in scheduled admissions, US hospitals ration ICU beds, monitored beds, and even regular-floor beds every day.”

*) Litvak E, Pronovost PJ. *Rethinking rapid response teams*. JAMA. 2010;304(12):1375–6.

http://jama.ama-assn.org/content/304/12/1375.full?ijkey=951c7c932f9a2618e8d538f136fdcc77748fab8b&keytype=tf_ipsecsha

Managing variability in patient flow: Success stories



Improving Health Care Quality and Safety

Managing Patient Flow: A Focus on Critical Processes, 2005

<http://www.jcrinc.com/fpdf/dep/Patient%20Flow%20postcard%20pdf.pdf>

Case Studies



- Weekend waiting time (for urgent / emergent surgeries) went down **34%**, despite **37%** volume increase. Weekday waiting time decreased **28%**, despite **24%** volume increase (results for the first three months after implementation)
- OR overtime was reduced by **57%** (approx. **\$559K** saved annually)
- Surgery volume has sustained **7%** growth per year for at least two years
- Initially, an equivalent of **1 OR** capacity freed up
- Inpatient occupancy increased from **76%** to **91%**, resulting in **\$137 million/year**, plus the avoided capital cost of **75 new beds** (over **\$100 million**)
- Substantially improved provider satisfaction

- “We have not had anywhere near the patient complaints or physician complaints. Physician and Family satisfaction has skyrocketed...” - *Orthopedic Surgeon, Division Director*
- “The family satisfaction with their experience is better than it used to be.” – *ENT Surgeon, Attending*
- “As a general observation, nursing staff ‘on call’ are not staying as late due to add-ons remaining at change of shift.” - *OR Nurse*
- “...We get our case done early, and patients don’t have to wait NPO until the evenings to have their surgery. This has made call much less stressful for my surgeons and myself...” - *Orthopedic Surgeon, Division Director*

- Surgical throughput increased by **8%**
- Bumped surgeries down **99.5%**
- Reduced nurse stress; **1/2 hour** reduction (**6%**) of nurse hours per patient day in one unit (**\$ 130.000** annual saving)
- ED waiting time went down by **33%**
- **2.8 hour** wait in one of state's busiest EDs vs. **4 to 5+ hours** for MGH, BWH, BIDMC

Source: John Chessare, MD, then Chief Medical Officer at Boston Medical Center

- **Waiting time for urgent/emergent surgical cases decreased 38%, while overall surgical volume grew about 3%**
- **Annual margin growth opportunity of \$8M per year, \$2M of which have been collected**
- **Results were achieved in less than 1 year**

Source: Ellis Knight, MD, MBA, then Chief Medical Officer at Palmetto Health Richland, now Sr. VP for Ambulatory Services for the Palmetto Health System

A few more examples

Multimillion savings, along with quality of care improvements have also been achieved in IHO collaboration with:

- The Mayo Clinic, FL (initiated by the hospital CEO – Dr. William Rupp); PI – Chair, Dept. of Surgery C. Daniel Smith, MD
- The Johns Hopkins Medical Center (initiated by Dr. Peter Pronovost); PI – Chair, Dept. of Surgery – Julie Freischlag, MD
- Projects in Canada and UK
- **In general, ROI from applying Variability Methodology ranges from \$17,000/bed/year to over \$300,000/bed/year**

State-wide collaborative to improve patient safety and quality of care while reducing its cost

Partnership for Patients - New Jersey



News

On January 30, **NJHA** in collaboration with The **Institute for Healthcare Optimization** kicked off *Partnership for Patients-NJ*, part of a national initiative from the U.S. Department of Health and Human Services to improve the quality, safety and affordability of healthcare, [Learn more»](#)

Patient Flow/Throughput

The New Jersey Hospital Association has provided IHO Variability Methodology™ to NJ hospitals to help them improve patient safety and flow/throughput . Some of these resources and the list of the NJ Patient Flow Collaborative Members have been publicly disseminated, [Learn more»](#)

What is here for me?

Patients:

- ☐ Reduced waiting time and improved access to care
- ☐ Reduced mortality and medical errors

Nurses:

- ☐ Reduced overtime
- ☐ Reduced workload

Physicians:

- ❑ Reduced waste of time
- ❑ Increased patient throughput
- ❑ Reduced overtime
- ❑ Optimal patient placement

Hospital:

- ❑ Better utilization of resources
- ❑ Reduced hours of ED overcrowding
- ❑ Staff and patient satisfaction
- ❑ More staffing resources: better tolerating peak loads
- ❑ Reduced mortality and medical errors
- ❑ Reduced length of stay
- ❑ Increased hospital throughput and revenue

IHO Variability Methodology®

has been endorsed by many , and yet...

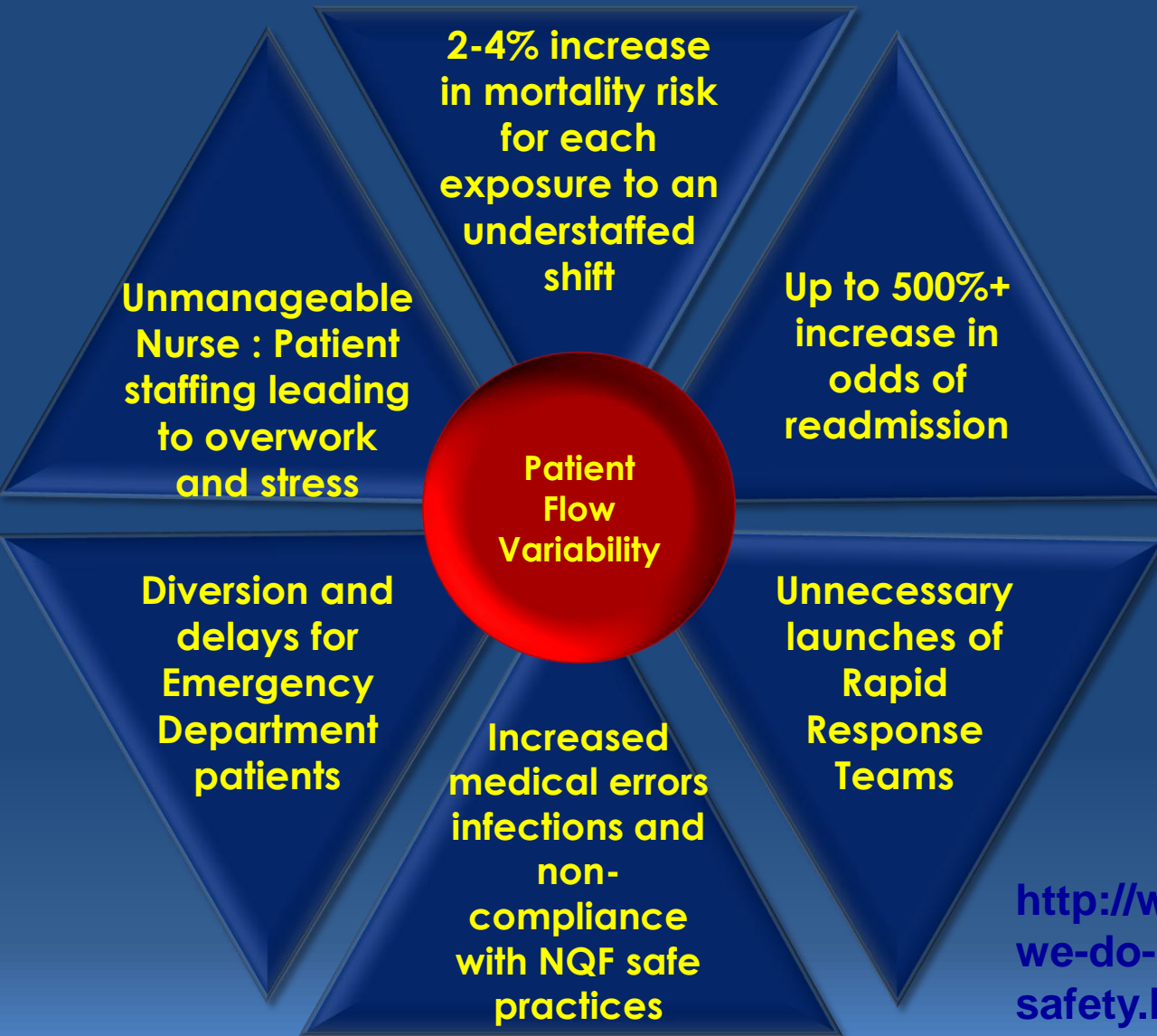
- **American Nursing Association Board:** IHO Variability Methodology has been endorsed by the ANA Board as one of the key measures to improve patient safety
- **American Hospital Association's Hospitals in Pursuit of Excellence:** The Institute for Healthcare Optimization's approach is recognized by the American Hospital Association as a key principle for achieving IOM's Six Aims for Improvement: care that is safe, timely, effective, efficient, equitable, and patient-centered.
- **Joint Commission Resources:** The Institute for Healthcare Optimization's approach to managing variability in healthcare delivery is the central theme of Joint Commission Resources' second edition of the book: *Managing Patient Flow in Hospitals: Strategies and Solutions*.
- **Government Accountability Office:** The Government Accountability Office recognizes variability in elective admissions as one of the key drivers of ED overcrowding .
- **American College of Emergency Physicians:** ACEP has recommended Variability Methodology as a key measure to reduce ED overcrowding
- **The Leapfrog Group** made reducing artificial variability in patient flow one of their Leaps for all US hospitals

What is next?

Three alternatives:

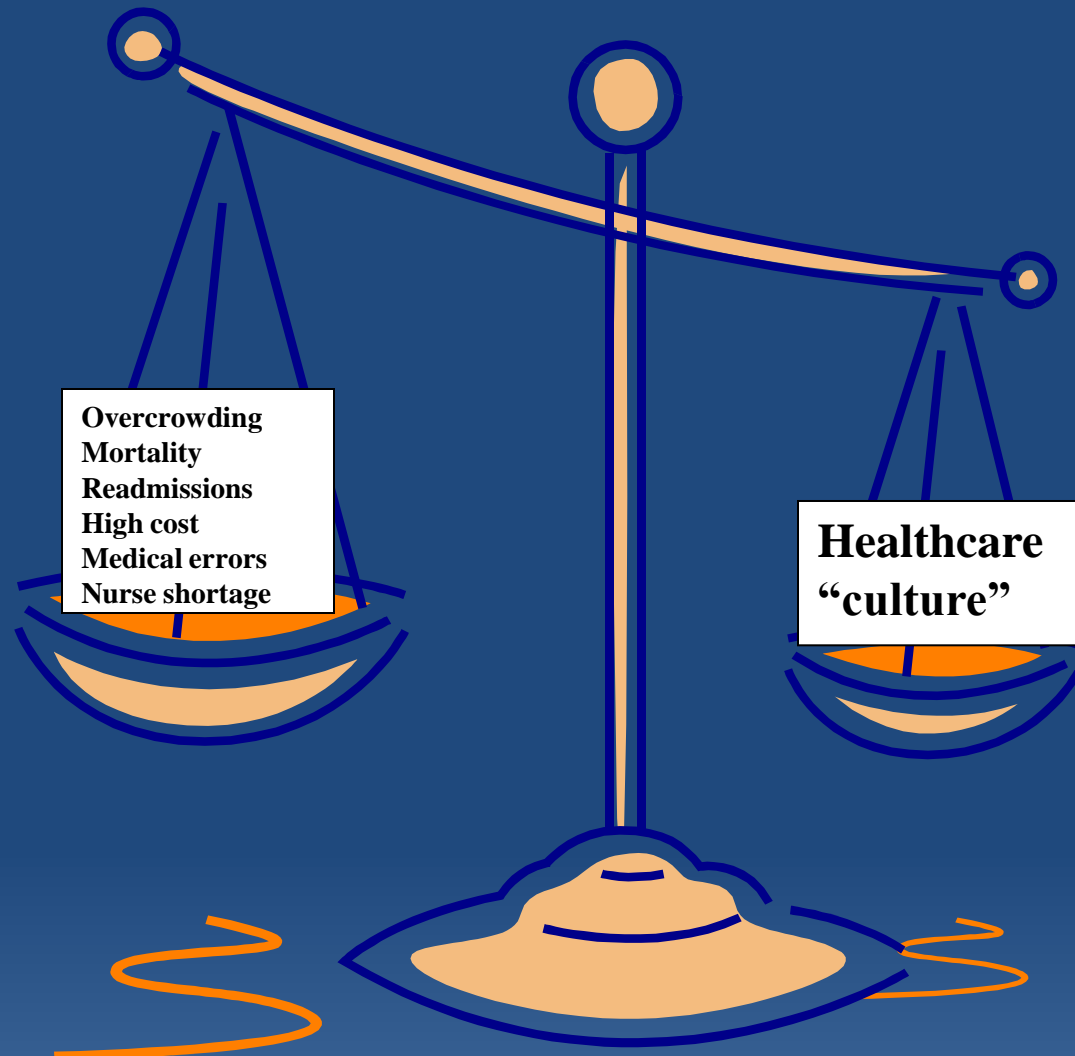
- ❑ Provide the resources (e.g., staffing) sufficient to meet current patient peaks in demand - historic scenario
- ❑ Staff below the peaks and tolerate ED diversions, readmissions, waste, nurse overloading and medical errors - current scenario
- ❑ **Smooth artificial variability and provide the resources to meet patient (vs. schedule) driven peaks in demand. Variability methodology can quantify and justify such additional resources**

Effects of Flow Variability on Quality of Care and Patient Safety



<http://www.ihoptimize.org/what-we-do-methodology-quality-and-safety.htm>

Mortality, Readmissions, Unemployment, High Cost vs. Health Care “Culture”: What Will Prevail?



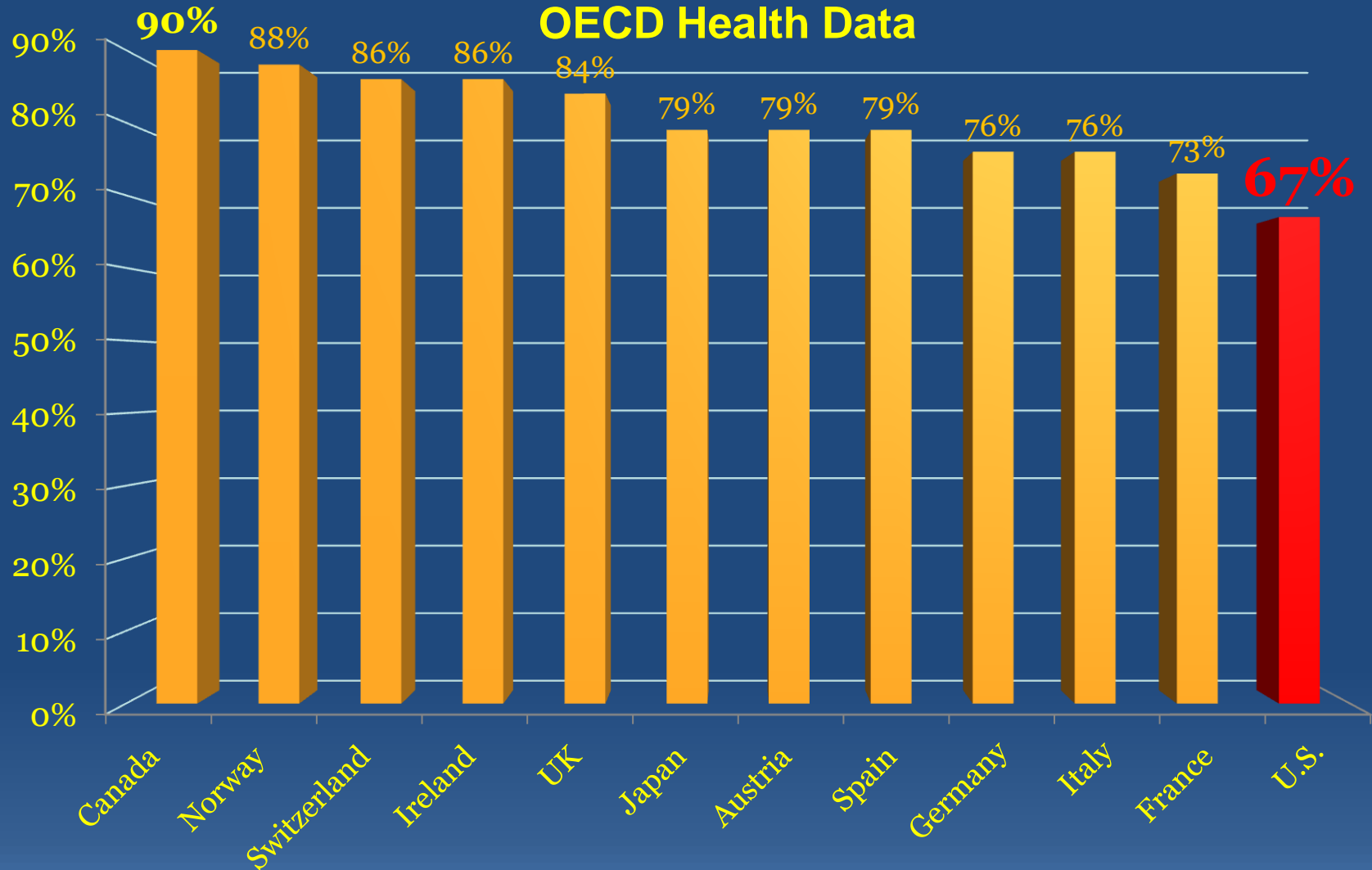
What would be national return on investment from applying these concepts?

Eugene Litvak (IHO), Maureen Bisognano (IHI).
More Patients, Less Payment: Increasing
Hospital Efficiency In The Aftermath Of Health
Reform.

Health Affairs, January 2011 (30):176-180

OECD Acute Care Bed Occupancy

Acute Care Bed Occupancy 2009 OECD Health Data



**On average, one third of
U.S. hospitals' bed
capacity is idle, and yet,
...hospitals are
overcrowded!!!**

National Opportunity

- Based on AHA 2010 data, overall nationwide hospital inpatient occupancy was about 66%
- 80% ÷ 90%+ occupancy is achievable with simultaneously improved access to and quality of care¹
- Potential savings are tens of billions of dollars annually²

¹ From Front Office to Front Line- Joint Commission Resources, chapter 4: Optimizing Patient Flow by Managing its Variability
<http://www.ihoptimize.org/Collateral/Documents/English-US/front%20lines%20chapter.pdf>

² IOM book: http://www.nap.edu/openbook.php?record_id=12750&page=294

National Opportunity – An Example

“Early hospital adopters such as Cincinnati Children’s Hospital (CCH) have been able to increase hospital throughput capability by more than 15%¹. If the experience of early hospital adopters proves generalizable, it will reduce U.S. hospital cost per admission by ~15 percent. Since hospitalizations, including outpatient procedures, consume over 30 percent of US health care spending, this single improvement would reduce the cost of U.S. health insurance by roughly 4-5 percent if hospitals pass savings through to insurers and insurers, in turn, to insurance buyers. It is also likely to reduce hospital mortality by sparing hospital nursing units preventable bulges in the number of new patients they must admit in a single day.”²

These 4%-5% mean over \$1 trillion in 10 years.

¹ http://www.ihl.org/ihl/files/WIHI/WIHI_20091202_Patient_Flow.mp3

² E. Litvak, A. Milstein, M. Smith. “**Engineering Science And Episode-Based Hospital Payment**” <http://healthaffairs.org/blog/2010/09/15/engineering-science-and-episode-based-hospital-payment/>

Controlling variability in patient flow requires four components:



Challenges to re-engineering health care delivery

- I. There is a significant gap between engineering methods and health care delivery, as well as reluctance on each side to acquire knowledge from the other – “knowledge and recognition gap”.
- II. Health care applications of proven re-engineering methodologies may not be sufficient to reduce health care cost and improve its quality. Legislative “intervention” may also be needed:
 1. **Health care provider-centered culture formed under cost plus reimbursement is an impediment to adoption of the even proven re-engineering methodologies:** *Solutions To Emergency Department Boarding’ And Crowding Are Underused And May Need To Be Legislated, Health Affairs, 31, NO. 8 (2012): 1757–1766, 2012*
 2. Currently, there is no legal mechanism for payers to capture financial benefits of re-engineering the health care delivery system.

- III. Unlike medicine, computer networks, transportation, military, etc., improvement methods in the health care delivery system are frequently not based on scientific principles, and are nothing else but trials and errors, or benchmarking one dysfunctional organization against another.
- IV. Operations management methodologies successfully used in other industries are not always applicable to health care delivery (e.g., overbooking), and there is a need for new health care oriented operations management methods.
- V. Often, there are no explicitly formulated goals for re-engineering the health care delivery system neither in terms its quality (e.g., mortality), nor in terms its cost.

VI. Optimizing one part of the health care delivery system (e.g., hospital department) could adversely affect the performance of others. Thus, “*improvement*” does not always mean system optimization.

VII. While there are many re-engineering methods that have demonstrated significant returns on investment, there are still many results that are either just theoretical or, for various reasons, have not shown significant quality and monetary results of implementation.

VIII. Reliable data needed for operations re-engineering is rarely available.

IX. There is a significant problem with changing physicians' behavior, especially when they are not employed by health care organizations.