The presentation will begin shortly.
Best Care at Lower Cost

The Path to Continuously Learning Health Care in America
Why now?

• Quality: persistent shortfalls

• Costs: unsustainable levels, waste

• Complexity: exponentially increasing
Committee Members

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INSTITUTE OF MEDICINE
OF THE NATIONAL ACADEMIES
Advising the nation/Improving health
Quality

• **Patient harm** – Studies have found that between one-fifth and one-third of hospital patients are harmed during their stay; much of that harm is preventable.

• **Evidence not applied to care** – Americans receive only about half of the preventive, acute, and chronic care recommended by current research and guidelines.

• **Variations in outcomes** – If all states could provide care of the quality provided in the highest-performing states, there would have been 75,000 fewer deaths across the country in 2005.
Costs

- **Absolute expenditures** – $2.6 trillion (2009), 18% GDP

- **Overwhelming wage gains**— 76% increase health costs in past 10 years, overwhelming the 30% gain in personal income

- **Compared to the economy** – For 31 of the last 40 years, health care has grown faster than the economy.

- **If prices of other products had grown as fast as health care since WWII**—
  - A dozen eggs: $55
  - Gallon of milk: $48
  - Dozen oranges: $134
Opportunity Costs

• Waste could pay the entire Department of Defense budget in 2009 and have $100 billion left.

• Waste could pay salaries of all first response personnel for 12 years

• Waste could pay the entire nation’s infrastructure costs for 1.5 years—roads, railroads, water, telecom, airlines…

• Waste could pay the health insurance premiums (employee and employer contributions) for 150 workers

• Waste could pay the tuition and fees for every 18-24 year old to get 2 years of college.
Waste

Wasted expenditures – $750 billion (2009)

- Missed Prevention Opportunities: $55 billion
- Fraud: $75 billion
- Unnecessary Services: $210 billion
- Excess Administrative Costs: $190 billion
- Inefficiently Delivered Services: $130 billion
- Prices That Are Too High: $105 billion
The Vision

Characteristics of a Learning Health Care System

• **Science and informatics**
  - Real-time access to knowledge
  - Digital capture of the care experience

• **Patient-clinician partnerships**
  - Engaged, empowered patients

• **Incentives**
  - Incentives aligned for value
  - Full transparency

• **Culture**
  - Leadership-instilled culture of learning
  - Supportive system competencies
Recommendations

• **Community links**
  Promote community-clinical partnerships and services aimed at managing and improving health at the community level.
  • Public payers should incorporate population health improvement in payment and contracting policies.

• **Care continuity**
  Improve coordination and communication within and across organizations.
  • Research funding agencies should support the development of measures for monitoring the effectiveness of care transitions.
  • Public payers should support effective care transitions through payment and contracting policies.

• **Optimized operations**
  Continuously improve health care operations to reduce waste, streamline care delivery, and focus on activities that improve patient health.
Managing Variability in Hospital Patient Flow:
A Necessary Foundation for Quality, Safety Improvement and Cost Reduction

Eugene Litvak, Ph.D.
Institute for Healthcare Optimization (IHO)
March 5, 2013
Major health care delivery problems:

- Patient Safety
- Nurse understaffing/overloading
- ED diversions/access to care
- High cost

Addressing variability is necessary, although not sufficient, to satisfactorily resolve these problems.
How did we staff, and how do we staff
A key root cause of hospital bottlenecks and inefficiency

Daily Weekday Emergency and Elective Surgical Admissions June - August 2008

Artificial Variability

Slide provided by Sandeep Green Vaswani, Institute for Healthcare Optimization

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Why managing variability today is more important than before?
Does the healthcare system need more capacity?

![Graph showing the number of patients over time](image)
At what cost?

- Typical cost of new capacity
  - Inpatient beds - $1M 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

ED

ICU

Floors

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

- “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 “
What is easier: to talk to your colleagues or to your lawyers?!


http://www.healthleadersmedia.com/content/LED-269595/PDH-Understaffing-a-Possible-Factor-in-Deaths-at-CRMC##
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 higher affordable nurse staffing levels is only possible by managing variability in patient flow**
“There was a significant association between patient-to-nurse ratio and urinary tract infection (0.86; P ¼ .02) and surgical site infection (0.93; P ¼ .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 ¼ .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.”
Impact of Attending Physician Workload on Patient Care: A Survey of Hospitalists
Michtalik H, Yeh HS, Peter J. Pronovost, MD, Ph.D.
JAMA Intern Med. 2013, Published online January 28, 2013

“Forty percent of hospitalists reported unsafe workloads at least monthly. Nearly one-quarter of hospitalists reported that excess workload adversely impacted patient outcomes by preventing full discussion of treatment options and worsening patient satisfaction. Twenty-two percent of physicians reported ordering potentially unnecessary tests, procedures, or consults because of not having adequate time to evaluate patients in person. Given the large number of patients cared for by hospitalists, the frequency with which workload exceeds safe levels, and the perceived impact of workload on patient outcomes, hospital administrators, researchers, and policymakers should focus attention on attending physician workload”.

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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
“Each additional patient per nurse in the average nurse’s workload was associated with a 7% higher odds of readmission for heart failure [odds ratio (OR)=1.07; confidence interval CI, 1.05–1.09], 6% for pneumonia patients (OR=1.06; CI, 1.03–1.09), and 9% for myocardial infarction patients (OR=1.09; CI, 1.05–1.13)”. 
Quality and Safety Corner at www.ihoptimize.org

The Institute for Healthcare Optimization’s approach to managing variability in healthcare delivery addresses some of the most intractable quality and safety issues such as readmissions, mortality, infections, ED boarding and others. Learn more »
Why do this project?

- Bumped or delayed elective surgery cases
- Delays in securing OR access for urgent and emergent cases (transplantations)
- Overburdened nurses, medical errors, high overtime, excessive nurse vacancies
- Lack of timely access to nursing units
- Prevent ED overcrowding and boarding
- Improve patient, provider and staff satisfaction

“By smoothing the inherent peaks and valleys in patient flow, and eliminating the artificial variabilities that unnecessarily impair patient flow, hospitals can improve patient safety and quality while simultaneously reducing hospital waste and cost.” Institute of Medicine, June 2006

JCAHO’s Patient Flow Leadership Standard - "LD.3.15 The leaders develop and implement plans to identify and mitigate impediments to efficient patient flow throughout the hospital.”
**Phase I**
**Separation of OR Flows**

**Goals**
- To assess the extent of artificial patient volume variability and patient flow bottlenecks in key areas of the hospital, and their ripple effects on quality and cost of care
- To separate flows of scheduled (elective) patients from that of unscheduled (emergent/urgent) and work-in patients through the OR

**Expected Benefits**
- Increase in surgical capacity/volume *(Note: there will be absolutely no decrease in any individual surgeon’s volume as a result of this project)*
- Decrease in patient wait times for emergent and urgent surgeries
- Decrease in OR overtime
- Increase in staff and patient satisfaction
## Expected Results

<table>
<thead>
<tr>
<th>Phase I</th>
<th>Phases II and IIb</th>
<th>Phase III</th>
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<tbody>
<tr>
<td>Separation of Scheduled v. Unscheduled OR Flow</td>
<td>OR and Cath Lab Smoothing</td>
<td>Determination of Bed and Staffing needs</td>
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### Expected Benefits

#### Phase I
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- Decrease in OR overtime
- Increase in staff and patient satisfaction

#### Phases II and IIb
- Further increases in capacity / throughput
- Enhanced patient placement in preferred beds
- Decrease in nursing stress
- Decrease in mortality and medical errors related to delays and patient misplacement
- Increase in transplantations volume
- Prevention of ED overcrowding

#### Phase III
- Further decreases in patient wait times where they exist
- Further enhancement of patient placement
- Decrease in staffing expense
- Enhanced utilization of existing resources
- Accurate determination of capacity growth need *(Additional Med/Surg bed requires \( \approx \$1 \) million in capital cost + over \( \$.25 \) million annual operational cost)*

© Institute for Healthcare Optimization 2013
Case Study: Boston Medical Center

- Surgical throughput up 10%
- Bumped surgeries down 99.5%
- Reduced nurse stress; 1/2 hour reduction (6%) in nurse hours per patient day in one unit ($130,000 annual saving)
- ED waiting time down 33%
- 2.8 hour wait in one of state’s busiest EDs vs. 4 to 5+ hours for most of the academic hospitals in Boston

Source: John Chessare, MD, then Chief Medical Officer at Boston Medical Center
Case Study – Cincinnati Children’s Survey

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

Partnership for Patients - New Jersey

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

U.S. Senator Robert Menendez (Senate Finance Committee) at the Partnership for Patients New Jersey kick-off on January 30, 2012
Three alternatives:

1. Provide the resources (e.g., staffing) sufficient to meet current patient peaks in demand - historical scenario (a dream about the old good times)

2. Staff below the peaks and tolerate ED diversions, nursing overloading and medical errors - current scenario (pretend that we did not discuss these issues as it is much easier to create a new patient centeredness committee than to make tough changes required to achieve patient safety)

3. Smooth artificial variability and provide the resources to meet patient (vs. provider) driven peaks in demand. Variability methodology can quantify and justify such additional resources
OECD Acute Care Bed Occupancy 2005
OECD Health Data

Slide provided by Sandeep Green Vaswani, Institute for Healthcare Optimization

© Institute for Healthcare Optimization 2013
We are 1/3 empty and overcrowded!!!
“Engineering applications likely represent the single largest group of discrete service innovation opportunities to improve the affordability of US hospital care. Pioneers such as Cincinnati Children’s Hospital increased their patient flow by approximately 15% without proportionately adding staff or physical plant. National diffusion could reduce total US per capita spending by an estimated 4% to 5% if hospitals pass savings through to consumers and health benefit plan funders” *

The financial ROI from IHO projects at the individual hospitals varies from $17,000/bed to over $300,000/bed annually depending on the hospital size and patient flow structure (e.g., proportion of surgical patients). It is accompanied by significant improvements in quality of care.
Endorsements

- **American Nursing Association**: IHO Variability Methodology has been endorsed by the ANA Board as one of the key measures to improve patient safety.


- **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.

- **American Organization of Nurse Executives**
Effects of Flow Variability on Quality of Care and Patient Safety

2-4% increase in mortality risk for each exposure to an understaffed shift

Unmanageable Nurse : Patient staffing leading to overwork and stress

Up to 500%+ increase in odds of readmission

Diversion and delays for Emergency Department patients

Unnecessary launches of Rapid Response Teams

Increased medical errors, infections and non-compliance with NQF safe practices


Slide provided by Sandeep Green Vaswani (Institute for Healthcare Optimization)
Resource Utilization

“Optimized use of personnel, physical space, and other resources Providing high-value care requires the efficient use of finite resources, yet much of health care today is suboptimal on both counts. Operations-management tools can help improve returns on fixed capital investments. Variability in the flow of patients into a hospital unit results in overcrowding, worse health outcomes due to fluctuations in staffing levels, increased staff stress, lower patient and staff satisfaction, reduced access to care, and higher costs. Strategies such as Queuing Theory and Variability Methodology can be used to eliminate sources of artificial variability, improving occupancy without increasing staffing or capacity or reducing lengths of stay. Furthermore, systematic process improvement efforts such as Lean can be used to make more efficient use of personnel and other resources. Structured analysis of daily work can eliminate inefficiencies, increase value-added time spent with patients, reduce staff stress, and optimize the use of supplies and other resources.”
“...rely on systems engineering and operations research to smooth the flow of patients through the health care system. Backups in emergency rooms, periodic crowding in hospitals, and the lack of specialty postoperative beds are often symptoms of uneven scheduling of admissions, suboptimal scheduling of operating rooms, and inadequate discharge planning. Hospitals that apply systems engineering to scheduling and resource use can save many millions of dollars individually and billions in the aggregate, reduce overcrowding, and improve staff satisfaction and performance. Organizations such as the Institute for Healthcare Optimization are showing the way.23” *)


6 Things Every Hospital Executive Needs to Know

1. Scientific operations management and systems re-engineering methods that have helped other industries have been effectively applied to simultaneously improve quality, efficiency and customer satisfaction

2. The ROI from the implementation of operations management and variability management approaches enable hospitals to survive and thrive even under Medicare margins

3. Adoption of scientific operations management is the only sustainable way to improve hospital efficiency – ignoring systems re-engineering can significantly diminish any benefit from process improvement efforts
4. A significant portion of the problems of overcrowding, ED diversions, waiting times and patient flow, are self-imposed rather than patient-driven.

5. Efficient capacity utilization and planning cannot be achieved without better understanding and effectively managing your operations.

6. Artificial variability in patient flow is a key driver of readmissions, unmanageable nurse-to-patient staffing levels, ED and other internal delays, patient rejection and diversion, misuse of rapid response teams, and other important healthcare problems.
Mortality, Readmissions, Medical Errors, High Cost

VS.

Health Care “Culture”: Which Will Prevail?

YOU decide!
Managing Patient Flow in Hospitals: Strategies and Solutions, Second Edition


Patient Safety and Quality of Care:
http://www.ihoptimize.org/knowledge-center-publications.htm
News & Events

Additional Resources

• www.ihooptimize.org

Upcoming Events

• IHO Symposium: How to Succeed at Achieving Hospital Efficiency (July, 2013)

  A 2.5 day professional symposium
Tackling Capacity Management

James M. Anderson

American Hospital Association Webinar
March 5, 2013
Why We Did It

• Inadequate capacity
• Very difficult and expensive to build
• Clearly dysfunctional flow
  • Patients, nurses, anesthesiologists, surgeons waiting
  • Operating rooms underutilized
  • Beds not available
  • Resources not available when and where needed
• Commitment to our vision: leadership
  • Best outcomes, experience, value
• Lessons from manufacturing; go visit
Why We Did It

Once the facts were clear, we couldn’t fail to address capacity management and regard ourselves as a well-managed institution.
Hospital-Wide Flow

Prediction and Decreasing Variability

Smoothing OR Schedule (Elective Cases)

Saturday surgery

Maximize Hospital Utilization

Smoothing OR schedule

Increase OR utilization

Prediction of ICU Inflow Smoothing Elective Cases

Demand: capacity matching

No OR cancellation due to ICU beds

Prediction of ICU Outflow

Optimal flow to inpatient units

Smoothing Outpatient Admissions

Heme Onc

Timely discharges

Discharge Predictions All Patients

Maximize Hospital Utilization

Optimal flow to inpatient units
Culture Changes: Ownership of Work

• Surgical scheduling
  – Changes in block management, call schedules
  – Prioritization of cases by urgency

• Optimization of capacity use
  – Prediction of D/C and transfer
  – Rounding and work flow

• Capacity prediction
  – Design unit level by simulation bed prediction

• Capacity management
  – Prediction of bed needs, “reservations”
OR Urgent Case Management

Operating Room Flow Improvement
Separating Scheduled and Unscheduled Cases to Improve Access, Safety, and Efficiency

Initial Model

Two Case Scheduling Types

Scheduled Cases: 85-90% of all Cases

Emergencies: 10-15% of all Cases

Daily Schedule

95% of all OR time allocated to Doctor Specific Blocks

Emergencies done at end of the day, or forced into slots between scheduled cases.

Result

Long Add-On List at the conclusion of the day

Long Waiting Times for parents and children with urgent needs

Often doing complex cases in evening or at night when resources were limited

Present Model

Two Case Scheduling Types

Scheduled Cases: 85-90% of all Cases

Unscheduled: 10-15% of all Cases

Divided into two subgroups

Add-On - 0-24 hours

Work-In - 1-7 days

Daily Schedule

90% of all OR time allocated to Doctor Specific Blocks

2 Add-On Rooms for Urgent and Emergent cases / day

1 Work-In Room for cases needing access in < 7 days

Result

Decreased time to access OR in urgent and emergent cases

Add-On's done during prime operating hours, maximum resources

More predictable end of day
Production Capacity, FY 2005

- Maximum inpatient capacity: 425 beds ("theoretical capacity")
- Barriers resulted in daily "practical capacity" reached at ~ 325 patients
  - System failures: cancel surgery, deny admission
- Practical operational capacity was 76% of theoretical maximum capacity
Flow and Patient Placement

Production Capacity, FY 2010

• Inpatient capacity: 510 beds ("theoretical capacity")
• Four years of work on:
  • Smoothing scheduling
  • Discharge planning
  • Patient flow
  • Physical layout in key bottleneck areas
  • Re-examining patient cohorting for greater utilization
• Expanded “practical capacity” to a daily peak of 450 inpatients (88% of theoretical capacity)
Room for Improvement

Average Midnight Census
July 1 – October 27, 2010

Are kids really sicker Tuesdays - Thursdays?

- Avg Per Day of Week
- Total Midnight Avg (all days)
What Has It Meant?

- Potential for **65** more inpatients/day within current bed capacity; previously unsustainable
- **$315,000/day** in potential additional net billing revenue from existing assets and staff ($115 million/year)
- FY 2010: Utilized about **30%** of the total additional untapped capacity (about $33 million)
- Avoided construction of about **75 additional beds** ($100+ million) that would have been required to meet today’s volume in our FY 2005 workflow system
- Still have a long way to go to grow into our capacity