

## Bridging the gap between healthcare delivery and management science



### Challenges in Healthcare

The inability to routinely align hospital capacity with patient demand for services results in both system stress and widespread waste and inefficiency. Overcrowding in the emergency department (ED) and other service areas, nursing stress, medical errors, delays, cancellations, and underutilization of existing resources can be attributed to how hospitals schedule procedures and admissions and to poor management of patient flow. Scheduled/elective admissions and procedures (e.g., Operating Room (OR), Cath. Lab.) are often at the center of the problems experienced by hospitals in managing patient flow due to competition for hospital resources (e.g., beds) among many departments. Multiple studies have documented that suboptimal scheduling practices are frequently the cause of hospital overcrowding, nurse burnout, readmissions, medical errors, hospital-acquired infections, mortality, delays, lack of preferred beds, cancellations, underutilization of existing resources, and inflated cost.

The traditional solutions of adding more physical capacity or increasing staffing are no longer feasible (or advisable) in today's healthcare environment. The recent focus on consumer-driven healthcare and information transparency, while important, does not address the cause of these problems and, therefore, will not solve these operational challenges. Rather, it will exacerbate them as a result of more demanding consumers and increased patient volume at high-quality, cost-efficient hospitals.

### The Solution

The solution to these operational issues is the effective management of variability in patient need and demand for services through applying variability methodology and other operations management techniques. The experience, expertise, methodologies, and tools that the Institute for Healthcare Optimization (IHO) offers have been successfully adopted in a wide range of hospitals in the US (e.g., teaching, community, pediatric) and internationally (e.g., Canada and the UK). By applying these techniques, hospitals can substantially reduce variability in patient flow and thereby significantly reduce cost and increase quality. Financial returns on investment at hospitals that have implemented this methodology range between \$17,000 and \$300,000/bed/year coupled with improvement in quality of care.

*"...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."*

**- Harvey V. Fineberg, MD, PH.D**  
**President, Institute of**  
**Medicine, National Academies**

*IHO approach is "the best near-term play for changing healthcare delivery in a way that would meaningfully reduce spending and improve quality. As a country, we are at this point really starving for improvements in care delivery that not only improve quality, but equally important, make health insurance more affordable."*

**- Arnold Milstein, MD**  
**Medical Director, Pacific**  
**Business Group on Health;**  
**National Health Care Thought**  
**Leader, Mercer Health and**  
**Benefits**

# IHO Approach - IHO Variability Methodology<sup>®</sup>

The IHO brings together the science of operations management, clinical knowledge, analytic skills, and an understanding of organizational behavior. Each of these elements is potent in itself, but it is the combination that drives substantive and lasting improvements in healthcare delivery. IHO Variability Methodology<sup>®</sup> services are based on our unique three-phase approach for patient-flow redesign for hospitals and other healthcare delivery organizations:

## Phase I: Reengineering the OR

OR redesign aimed at determining appropriate OR resources needed for scheduled and unscheduled surgical flows. Phase I benefits include:

- Shorter waiting times for surgery for unscheduled patients
- Reduced bumping of elective surgeries
- Reduced OR overtime
- Higher OR prime-time utilization
- Greater surgical throughput (increase in overall surgical volume) or reduced cost/surgical case
- Improved patient safety
- Improved patient and provider satisfaction

## Phase II: Redesigning Surgical Inpatient Flow

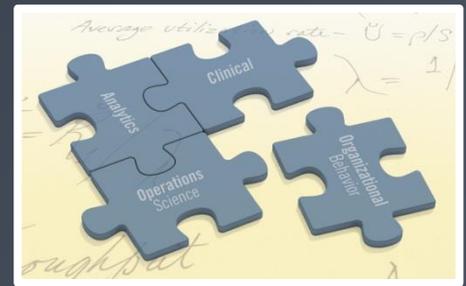
Redesign of the elective surgical schedule so as to smooth flow to downstream inpatient units. Phase II benefits include:

- Decrease in waiting times for placement in an inpatient bed for surgical patients thereby reducing overall hospital length of stay
- Increase in percentage of patients placed in the preferred unit based on their condition
- Additional increases in surgical throughput beyond what is achieved in Phase I
- Additional decreases in nursing overtime beyond what is achieved in Phase I
- Improvements in inpatient quality and patient safety

## Phase III: Reengineering Medical Inpatient Flow

Determination of specific bed and staffing needs for major hospital units. Phase III benefits include:

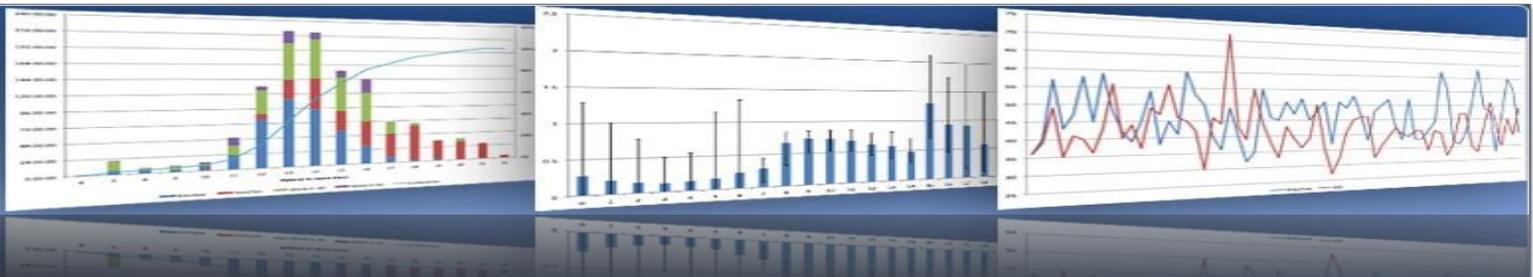
- Proper allocation of bed capacity to maximize the availability of the right bed for medical and surgical patients, thereby reducing waiting times, ED boarding, patient misplacement, and the likelihood of medical errors
- Proper allocation of bed capacity and nursing resources, thereby decreasing nursing stress and improving the quality of patient care
- Proper allocation of bed capacity to reduce inpatient length of stay, thereby reducing the number of disallowed hospital days and increasing patient throughput
- Improvements in patient safety



## Benefits

The expected benefits following implementation of the IHO Variability Methodology<sup>®</sup> include:

- ❖ Reduced waiting times, delays, ED overcrowding, and overall hospital length of stay
- ❖ Reduced mortality, medical errors, hospital acquired infections, and readmissions
- ❖ Reduced bumping/cancellation of elective surgeries
- ❖ Reduced OR overtime and higher OR prime time utilization
- ❖ Greater surgical throughput (increase in overall surgical volume) or reduced cost/surgical case
- ❖ Proper allocation of resources (i.e. bed capacity, nurse staffing) to maximize patient throughput
- ❖ Improvements in patient safety
- ❖ Improved patient and provider satisfaction



## Results from Organizations That Have Worked with IHO

IHO approaches are scientifically grounded and have been successfully applied with dramatic financial and quality of care improvement results at numerous leading hospitals including: Mayo Clinic Florida, the Johns Hopkins Hospital, Cincinnati Children's Hospital Medical Center, Boston Medical Center, and Palmetto Health of Richland, South Carolina.

### Mayo Clinic, Jacksonville, Florida (Phase I)

- Surgical case volume increased by 4%
- Surgical minutes and OR utilization increased 5% each
- Average OR overtime staffing decreased 27%
- 84% compliance with waiting time limits for emergent and urgent care
- No reported incidences of not being able to access OR in a timely manner
- Annual staff turnover cost reduced by \$1.07 million
- OR annual net revenue increased by \$5 million

### Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio (Phases I - III)

- Weekday OR waiting time for emergent/urgent surgical cases reduced by 28% (despite an increase in case volume of 24%) (Phase I)
- Weekend OR waiting time decreased by 34% despite an increase in volume of 37% (Phase I)
- OR overtime reduced by 57% (Phase I)
- Surgical throughput increased by 5% (an equivalent of an additional OR) (Phase I)
- Multi-year 7% increase in annual surgical throughput without adding new ORs (Phase II & III)
- \$115 million increase in annual revenue/cost savings (Phase II & III)
- Over \$100 million in avoided capital cost (Phase II & III)

### The Johns Hopkins Hospital, Baltimore, Maryland (Phase I)

- Waiting time for emergent/urgent surgical cases decreased by 39%
- Throughput increased by 5 cases per day in the main ORs and by 4 cases per day in their outpatient facility
- Overtime decreased by 6.6%
- Relative increase in surgical volume resulting in annual \$4 million increase in incremental margin

### Boston Medical Center, Boston, MA (Phase I and Phase II in one unit)

- Surgical throughput increased by 10%
- Emergency Department ambulance diversions reduced by 20%
- 2.8 hour wait in one of the state's busiest EDs compared to 4-5+ hours for most academic hospitals in Boston
- Annual number of postponed or cancelled elective surgeries reduced by 99.5%
- Reduction in nursing stress levels: 30 minute reduction (6%) in nurse hours per patient day in the step-down unit, resulting in \$130,000 annualized reduction in nursing costs

### The Ottawa Hospital, Ottawa, Ontario (Phase I)

- Improved access for patients needing emergency surgery within 24 hours from 60% to 90%
- Reduced mortality rate for patients requiring urgent surgery from 3.9% to 3%, resulting in 40 lives saved
- Achieved efficiency gain equivalent to \$9million by decreasing length of stay and better use of beds
- Reduced surgery cancellations due to bed shortages from more than 600 per year to zero
- Reduced Neurosurgery inpatient census from 46 to 33, resulting in a savings of 13 beds

### Palmetto Richland Memorial Hospital, Columbia, South Carolina (Phase I)

- 3% increase in surgical volume
- 38% decrease in weekday waiting time for non-elective cases
- Opportunity to further increase surgery volume with \$8m projected annual margin increase with \$2 million achieved in the first year



## Results from Partnership for Patients Initiative in New Jersey

Fourteen hospitals participated in a IHO 15-month patient-flow collaborative organized by the New Jersey Hospital Association (NJHA) as part of the Center for Medicare and Medicaid Innovation hospital engagement program. Participating hospitals have demonstrated significant quality improvements, reduced ED overcrowding, shortened wait times, and provided more access to patients while reducing costs. Overall program outcomes include:

- 11,800 to 17,300 additional patients that could be treated without adding inpatient beds or operating rooms
- Roughly 20,000 additional patients that could be accommodated in hospital emergency departments
- 21 percent to 85 percent decrease in wait times for emergency department patients to be admitted to a hospital bed
- Reductions in the length of hospital stays ranging from 3 percent to 47 percent for certain groups of patients

This initiative demonstrated that with strong leadership, will, and commitment, large-scale adoption of scientific operations management is within reach. Results include:

### CentraState Healthcare System, Freehold, NJ (Phase III)

- Telemetry beds required decreased from 54 to 42 while providing adequate clinically appropriate access
- Inappropriate telemetry admissions decreased from 18% to 1%
- Average waiting times for incoming patients (i.e. ED boarding) decreased from 18.2 hours to about 9 hours
- Telemetry length of stay decreased 31% from 4.4 days to just under 3 days
- Delays in discharging patients out of telemetry decreased from 8.3 hours to 3.5 hours on average
- Patient satisfaction increased from 56% to 73%

### Ocean Medical Center, Brick, NJ (Phase III)

- Telemetry ALOS decreased by 6%
- Patient waiting time (i.e., average ED boarding time) decreased 56%
- \$1.07 million cost reduction

### Newark Beth Israel Medical Center, Newark, NJ (Phase III)

- Eliminated 26 telemetry beds, resulting in a savings of over \$10 million per annum while reducing cost of care and improving quality of care
- Decreased ALOS of telemetry patients by one full day leading to fewer hospital-acquired infections

### Monmouth Medical Center, Long Branch, NJ (Phase II)

- Increased patient satisfaction score from the 88<sup>th</sup> to the 99<sup>th</sup> percentile of comparable hospitals
- Decreased variability in nurse workload (number of admissions, transfers, and discharges) by over 40%
- Significantly decreased PACU boarding
- Increased throughput resulting in an annual margin improvement of \$411K

### Overlook Medical Center, Summit, NJ (Phase III)

- ED boarding time for ICU admissions decreased by 21%
- ICU ALOS decreased by over 14% from 3.5 to 3 days
- 40% reduction in mortality
- Waiting time of discharge- and transfer-ready patients in the ICU decreased by 34% and 84% respectively

### HackensackUMC Mountainside, Montclair, NJ (Phase I)

- Improved elective OR block utilization resulting in increased capacity for 1,000 cases annually without additional resources
- More than 95% of emergent/urgent patients can access the OR in a timely manner, thereby projected decreasing their ALOS by almost 40%

**New Jersey hospitals that completed the NJHA-IHO collaborative:** CentraState Medical Center, Cooper University Hospital, HackensackUMC Mountainside, Inspira Health Network Woodbury, Jersey Shore University Medical Center, Monmouth Medical Center, Morristown Medical Center, Newark Beth Israel Medical Center, Ocean Medical Center, Overlook Medical Center, Robert Wood Johnson University Hospital, St. Joseph's Regional Medical Center, University Hospital and The Valley Hospital.



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## About IHO

The Institute for Healthcare Optimization (IHO) is an independent not-for-profit research, education and service organization focused on bringing the science and practice of Operations Management (OM) to solve health care's compelling issues of access, quality, and cost of care.

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