

How One Hospital Adopted Litvak's Methods and Saved \$100 Million

In 2006 the president and CEO of Cincinnati Children's Hospital, Jim Anderson, realized his hospital faced a daunting crisis. At the time, few outsiders would suspect anything amiss. The prestigious institution, routinely ranked among the best pediatric hospitals in America, seemed healthy. Admissions – from US patients, but also from around the world – were rising and revenue was growing. But several times each week the hospital mysteriously became packed beyond capacity.

Anderson grew concerned when he heard from transplant surgeon Fred Ryckman, MD. During overcrowding episodes, the hospital's care sometimes plummeted to an "inadequate and inefficient" level, Ryckman told him.¹ This was an alarming development from an institution that considered itself world class. The Cincinnati Children's Hospital has been caring for children since 1883.² But in 2006 when the 425-bed hospital (700 beds today) contracted with Eugene Litvak and the not-for-profit Institute for Healthcare Optimization (IHO), it was facing routine overcrowding issues, a problem vexing hospitals throughout the United States.

Anderson realized that the hospital could not keep up with the growing patient volume and maintain its high standards. When a surge of new patient arrivals swamped the facility, overstressed clinicians – doctors and nurses – were more likely to make mistakes.

Anderson foresaw an escalating cycle of higher costs and more expansion. Plans were already underway to build a 75-bed unit for around \$102 million. He knew from years spent in healthcare that the new wing wouldn't permanently fix the problem and overcrowding would return and pressure his staff, potentially leading to deteriorating quality of care.³ Eventually, something could go disastrously wrong.

"I was tired of seeing children coming in sick and having trouble getting into our operating rooms," surgeon Ryckman said. "If you delay a patient's treatment by more than six hours, their mortality rate goes up. If you delay entry to a hospital room, risk and mortality also go up. There is much data to support that it's a bad idea to make people wait."⁴

Anderson, a business lawyer who worked for manufacturing powerhouse Emerson Electric Company before joining the hospital, wanted to reverse what he feared could become a severe problem. When he hired Litvak, a Harvard professor and the president and co-founder of the Boston-based IHO, he hoped to see a plan for improving patient flow – the journey from hospital admission through discharge. He knew that creating a better, more streamlined patient flow process could reduce overcrowding and decrease the risk of bad outcomes. What Anderson got was much more: a roadmap to improving performance at the medical center, but one that could be deployed across the entire American healthcare system, saving many lives and billions of dollars in unnecessary spending.

Litvak said that the Cincinnati Children's Hospital, like most American hospitals, recorded a daily patient census that, on paper, resembled an electrocardiogram exam, with bed occupancies that could vary as much as 80% from one day to the next, typified by huge peaks and deep valleys. As an applied mathematician who studied queuing, reliability, and graph theories in his native Ukraine

during the Soviet era, Litvak knew that variability meant trouble. Canceled surgeries. Crowded hospital emergency rooms. A lack of hospital beds to admit new patients. That variability causes stress on nurses and physicians due to unpredictable schedules and long hours, leading to burnout, early retirements, and nursing shortages. It meant diverting ambulances transporting sick and dying patients to other ERs, putting the patients' lives at risk, and costing the intended hospitals millions in lost revenue. It meant "boarding" ER patients in hallways for hours, sometimes days, aggravating patient conditions, and even costing lives. It meant medical errors, malpractice lawsuits, and sinking reputations.⁵

The United States ranks near the bottom of industrialized nations in average hospital bed occupancy, hovering between 64% and 68%, according to the Organization for Economic Cooperation and Development (OECD), an inter-governmental economic organization comprised of 36 developed nations. Out of 28 nations, the United States ranked 27th, only ahead of Greece. Ireland, Israel, and Canada topped the list in 2017, with occupancy rates that ranged between 95% (Ireland) to 91.6% (Canada).⁶

"Yet we're still overcrowded. Why?" Litvak asked. "Because of the artificial peaks in patient demand. If we could manage patient flow more effectively, our average daily census could be around 80% nationally. The number of Americans who are uninsured is around 10% to 12%. If we could solve this, we could cover hospital care for the uninsured with the savings from hospital spending."⁷

Litvak said Cincinnati Children's Hospital initially hired him for a small assignment – an assessment of its status quo. "In a sense, it was cheating. I don't remember what they paid me, but it was a waste of money for them," he said. "Because I already knew the outcome and could have told them what I'd find."⁸ He said IHO performed the assessment – taking an operational temperature of the hospital,

then meeting with top hospital administrators and physician leaders in Cincinnati. More than 20 attended the morning meeting and listened as Litvak presented his findings.

Litvak said skepticism enveloped the room. “They were suspicious, and I was suspicious, too. Finally, Jim Anderson asked, ‘Would you help us walk this road?’ I told him no. That was a little shocking to him. He asked, ‘Why not?’ I said because the very people now smiling at me will create roadblocks later. I knew they would resist any change in their culture. So Jim looked around the room and said, ‘If you experience any pushback, call me immediately in my office.’ He looked at me again and requested, ‘Now, will you do it?’ I remember I was smiling when I answered, ‘Absolutely.’”⁹

Anderson told the surgeons, “Don’t tell me 100 reasons why we can’t do this. There are no end-arounds. If this doesn’t work, we’ll stop and go back to the old system.”¹⁰

Anderson gave a three-to-four-month window to test the program. “But once it was up and running, nobody wanted to go back. We didn’t entertain it at all,” Ryckman said.¹¹

Once the contract was signed, Ryckman flew to Boston on business and Litvak took him to lunch at the Cheesecake Factory. True to his loathing for variability, Litvak is unfailingly predictable in his dining out diet. “I always order the same thing: a salad and chicken.”¹²

Litvak said he needed someone within the hospital who was well-respected by the surgical staff to champion the process. The hospital appointed Ryckman. “He took responsibility for his leadership role. I asked him, ‘Why did they choose you?’ ‘Very simple,’ Ryckman replied. ‘Because I am the most difficult surgeon to deal with.’ They knew Fred would deliver. He understands the substance and culture and is very smart, the top surgeon there.”¹³

Litvak and his team of IHO analysts gathered hospital data and crunched numbers, applying complex algorithms and mind-numbing mathematical theories to analyze what was happening with the

hospital's patients. The IHO team's main goal was to understand and document how Cincinnati Children's Hospital handled its patient flow. How do managers schedule surgeries, both elective (planned) and emergency (unscheduled)? What causes all those patient surges, the peaks and valleys? Are they predictable, and how should the hospital respond to ease the burden on its doctors, nurses, and patients?

More than a decade earlier Litvak made the connection between patient demand and hospital capacity using his stealth, but not-so-secret weapon: math. After helping several other hospitals improve their patient outcomes and save millions of dollars, he sought to apply those same tools to Cincinnati Children's Hospital. Only this time, it wouldn't be applied in just one department as other hospital clients did; it would be integrated throughout the entire hospital.

Hospitals are complicated organizations that often employ thousands throughout multiple departments. They are dependent upon costly information technology, use the latest sophisticated and expensive medical equipment – some costing millions of dollars – and require the collaboration and continuity of a symphony orchestra. For decades, individual hospital departments – surgery, oncology, cardiology, to name a few – operated like individual fiefdoms or silos, jealously guarding their territory, revenue streams, and staffing. As long as the hospital prospered, that system worked. But recent changes in hospital reimbursement by insurers, both public (Medicare, Medicaid) and private (Aetna, United Healthcare, for example), are compelling hospitals to deliver higher-quality patient care at lower costs.¹⁴

These financial pressures have driven medical centers like Cincinnati Children's Hospital to make dramatic changes in how they plan to treat patients. In the past two decades many hospitals have sought out process improvement through programs like General Electric's Six Sigma and Toyota's Lean. These programs are common in the manufacturing world, but somehow escaped adoption

by the healthcare industry until recently. Anderson was puzzled by the scarcity of programs to improve patient flow. But IHO's trial run impressed him. He said the results were astonishing.

Litvak remembers telling Anderson and Scott Hamlin, the hospital's chief financial and administrative officer, that the surgeons would meet and vote yes or no on the full project implementation. "I talked individually with each chief of every surgical subspecialty and to each I spoke with, there was a trick," Litvak recalled. "I told them that their unit would benefit more than anyone else. It was not true that one would benefit more than anyone else, but all would benefit. For some people, however, it is important to come out ahead of everyone else."¹⁵

Ryckman said that back then, few understood the link between poor patient flow and patient safety. He said the greatest risks to hospitals occur when the care they deliver produces bad outcomes and inadequate care to patients.¹⁶ "And in the early days, before we changed, we were offering inadequate and inefficient care. The financial risk is also substantially higher when delivering bad care."

Ryckman pointed out another big risk: headlining the front page of your local newspaper because a patient sat for six hours in the ER and suffered a bad outcome. He felt that one of the most unappreciated and most important resources any hospital can offer is quality nursing care. "Within our hospital Litvak's program has been a driver for nurse retention. Our nurses don't have to routinely work overtime. It doesn't make OT go away but makes it less of a problem. It really changed the way we thought and planned," Ryckman said.¹⁷

Annual revenue at Cincinnati Children's Hospital rose by more than \$100 million during a period when patient volume rose significantly, all without the hospital having to spend \$102 million on its planned patient tower, which was no longer needed. Its average daily occupancy increased from 76% to 91%, much higher than the US hospital average. Litvak's methods smoothed the peaks and

valleys of the daily census to a more predictable middle level, making it easier for hospital management to staff appropriately and easing the stress on nurses and physicians and, in the process, reducing the likelihood of medical errors.¹⁸

Hospital officials said that waiting times in the emergency room and the operating rooms reduced significantly, expanding the hospital's capacity to treat more patients while improving quality. "There are fewer mistakes and adverse incidents, and the surgeons are happier because fewer of their scheduled surgeries are canceled," Anderson said, predicting that if Litvak's methods were applied to every hospital in America, "We would see enormous increases in capacity, while saving billions of dollars nationally."¹⁹

CFO Hamlin said Litvak showed hospital leaders that operating rooms, intensive care units, and emergency departments are all connected and that bottlenecks in one area lead to delays throughout the hospital.²⁰ In an interview that aired on the Institute for Healthcare Improvement's Wi-Fi internet channel, Hamlin said that in 2004, before the adoption of smoothing, Cincinnati Children's Hospital routinely experienced "operational failures" that caused it to decline referrals or cancel surgeries despite vacant beds.²¹

"You grow up with the idea that you can focus on the patients' needs, or you can focus on the needs of physicians that bring the patients to you. But you fall into the trap of believing those are mutually exclusive things," Hamlin said.²²

In a May 2016 *Chicago Tribune* story Anderson remembered, "We not only improved patient satisfaction levels, but instead of running around like crazy because of patient overcrowding or sitting doing nothing when few surgeries were planned, our nurses and physicians got home in time for dinner, they made their kids' soccer games, and life got a lot more orderly."²³

To date, Cincinnati Children's Hospital is the only US hospital that has fully implemented all three phases of Litvak's program to

improve patient flow. Other hospitals, including Boston Medical Center and Mayo Clinic in Florida, have adopted portions of the program. The hospital stands as a demonstration of the potential for quality improvement and cost savings by adopting Litvak's program for improving patient flow.

The Cincinnati Children's Hospital success story began with Ryckman, the pediatric surgeon specializing in organ transplantation. He arrived there in 1982 on a surgical fellowship and formally joined the surgical staff in 1984, retiring in 2017. "It was a great way to spend 35 years."²⁴

He first heard Litvak lecture at an IHI forum on smoothing surgical schedules in the early 2000s. "I listened to this 90-minute discussion and thought: he's either crazy or knew something no one else did. But it was intriguing to me. The logic behind what he talked about doing seemed clear. He was addressing a very significant problem for us," Ryckman said.²⁵

"I thought he hit an important nail on the head. The reason I was passionate to adopt this was that I was tired of patients, children, coming in sick and having trouble getting to the OR [operating room] for needed surgery. This was how we could deliver the best care and prevent kids from getting sicker as they're waiting in the waiting room. The consequence of doing that is we became more efficient taking care of these kids."²⁶

He said Cincinnati Children's Hospital was delivering "spectacular surgical care, just not as efficiently as we found that we eventually could. That foundation was in place and allowed us to do the work Eugene taught us."²⁷

He admitted that Litvak is not a cookie cutter consultant. "When we first heard his methods for smoothing surgical flow, we were a little skeptical. We had to be convinced that what he was talking about made sense. His methods were very different. The whole concept of

mathematical modeling was entirely foreign to how we historically solved medical flow problems in the hospital. We weren't going to listen to a mathematician – instead of a chief of orthopedics – tell us how to run the hospital.”²⁸

Ryckman said few in the hospital industry discussed patient flow in the early and mid-2000s. “For decades everyone believed that inefficiency was indelibly engrained in the system,” he said. “But we learned that it's not about the ED or the OR but understanding how to improve the entire system of care. That's where you'll get the savings and efficiency,” Ryckman said.²⁹

The hospital saw results within weeks. “We knew what it was like before Eugene [Litvak] came, and it was really clear within the first few weeks that we would radically improve access, especially for children with urgent needs, to get into the OR. Our waiting times decreased. Overtime went down. The data was pretty clear pretty soon,” Ryckman said.³⁰

Cincinnati Children's Hospital is now, 15 years later, building a new critical care tower. “We needed a better and more modern design that had to include the latest technology. But we were able to put it off for many years. In the first year we improved hospital-wide flow and efficiency by 5% for the entire OR system and it continued to grow for the next few years. That may not seem like much but multiplied across [Cincinnati Children's Hospital's] 20 ORs it's the equivalent of having an additional OR.”³¹

Ryckman said Litvak faces an entrenched bureaucracy when he tries to change OR culture. “The people who run ORs still run them the way they did 35 years ago. Surgeons like block time [a scheduled period in an OR 'owned' by a particular surgeon in which no one else can operate, regardless of whether the scheduled surgeon even shows] because they know that they'll be operating on a Tuesday or a Thursday. It requires some adjustments to put Eugene's

system in place and eliminate surgical block times. Change is hard,” he conceded. “The only people who like change are babies with dirty diapers.”³²

Litvak’s methods have survived at Cincinnati Children’s Hospital. Daniel Von Allmen, MD, the surgeon-chief and senior vice president of surgery there, worked at two other health systems before joining Cincinnati Children’s Hospital, logging stints at pediatric hospitals in Philadelphia and Chapel Hill, North Carolina. He said that after arriving five years ago, he helped to orchestrate with Director of Medical Operations Strategy Brooke Mullett how surgeries are planned and continued the surgical smoothing that Litvak and Ryckman introduced.

“Surgeons want patients who need surgery to be able to get it,” said Von Allmen, who noted that the hospital is erecting a \$600 million critical care tower. “We have maintained those core principles and core approaches. The system has evolved a little bit.”³³ He said that today the hospital allocates block times by surgical specialty, not at the whim of individual surgeons.

“We allocate block time based on service, whether that specialty is orthopedics, cardio, or neuro. By having this system and ability to address ED cases, it allows us more flexibility if we’re down an OR. We have the ability to run all cases without huge disruptions.”³⁴

Even 15 years later, Von Allmen said the hospital rarely diverts ambulance patients anymore, a problem plaguing US hospitals that impacts patient safety.³⁵ “By allocating block times to encourage smoothing out across the week, we reduce the chances of kids coming out of surgery without available hospital beds. In extreme cases, we’ve kept them in ORs overnight,” he noted.³⁶

He said Litvak’s methods of improving patient flow becomes even more important when a hospital is stressed. “If you have 20 ORs and only 11 are being used, you don’t need it. But as pressure goes up on costs and expenses, you cannot have empty ORs waiting for

patients to show up. You need to balance supply with demand and that will make it more and more important for people to use this kind of approach.”³⁷

Mullett said she learned Litvak’s theories and methods while working for Ryckman. Mullett, who joined the hospital 11 years ago after working in the pharmaceutical industry, said Ryckman worked to integrate Litvak’s program throughout the entire hospital. The Philadelphia native said pediatric hospitals didn’t always have to be as mindful about costs. “Now we really need to be.”³⁸

“We use it across the institution,” she added. “There is now a hospital department charged with overseeing capacity and flow. Our chief of staff, similar to a chief medical officer [CMO], manages flow.”³⁹



Ellis “Mac” Knight, MD, chief medical officer and senior vice president of the Atlanta-based The Coker Group, told the *Chicago Tribune* in 2016 that Litvak’s time in the USSR fighting the bureaucracy there instilled in him infinite patience. “He has been tilting at windmills for a long, long time,” Knight said.⁴⁰

Despite successes like those at the Cincinnati Children’s Hospital and others, American hospitals have not rallied en masse to embrace Litvak’s methods. Nonetheless, he sounds characteristically optimistic. He said if every US hospital did what the Cincinnati Children’s Hospital did to improve patient flow, the savings could pay for US healthcare reform while improving the quality of care in American hospitals.⁴¹

“Americans can always be counted on to do the right thing,” Litvak likes to say, quoting Winston Churchill with a decidedly different accent, “after they have exhausted all other possibilities.”⁴²

