

What Health Care is Learning From Transportation

The Transformational Power of Workflow Control Systems



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Summary

Automated workflow control systems transformed the manufacturing industry and then transportation, and now health care is seeing how powerful these systems are at enhancing transparency, accountability, and productivity. Hospitals around the country are installing these systems in surgical and other operational areas to manage, in real time, the movements of patients, physicians, and staff. As a result, these hospitals are handling many more cases, with less employee overtime, and seeing dramatic improvements in room turnover times and procedures starting on time. Satisfaction is high among patients, surgeons, and staff, while stress and frustration are down.

Introduction

When the World Health Organization (WHO) launched a global effort to tackle surgical deaths caused by human error, it embraced a lesson from aviation: the checklist.⁽¹⁾ The flight checklist transformed the aviation industry and has saved countless lives since its widespread adoption in the 1980s.⁽²⁾ In much the same way, WHO's Surgical Safety Checklist, introduced in 2008, has reduced patient deaths and complications around the world. In Scotland alone, the 19-point checklist cut patient mortality over a decade by 36%.⁽³⁾

***"I have not gotten through a week of surgery where the checklist has not caught a problem."* ⁽⁴⁾**

– ATUL GAWANDE, MD, MPH, CELEBRATED SURGEON, WRITER, AND RESEARCHER

Once again, health care is adopting an important innovation from transportation — which followed manufacturing's lead. It's called workflow control technology, and it has dramatically improved efficiency in transportation and manufacturing. Now, it's revolutionizing health care.

Forward-thinking hospital executives are using workflow control technology on top of their EMR systems (Cerner, Epic, and others) to solve a big stressor and money loser – the failure of hospital departments to coordinate in real time, both internally and with each other. Such coordination allows hospitals to act quickly so that surgical areas and other high-dollar resources get used more efficiently. Poor coordination wastes staff time, idles operating rooms, and leads to patient errors. It also increases anxiety among families and patients forced to endure unnecessary delays and spotty communication with staff.⁽⁵⁾ Delayed and canceled surgeries are missed opportunities to capitalize on costly OR space and staff. This topsy-turvy work environment takes focus away from patient care and leaves physicians, staff, and consumers frustrated and stressed.

With health care industry margins declining, using the OR efficiently is crucial to staying in business. Surgical care consumes nearly one-third of all health care spending.⁽⁶⁾ The mean cost of one minute of hospital OR time in 2014 in California was \$37, an amount that has been rising faster than the consumer price index and the medical CPI for the past 15 years.

“Understanding hospital costs is critical to value-based care. ... Whereas in traditional fee-for-service models, more services equate to more revenue, new models, such as bundled payments, will reimburse hospitals a set amount for the surgical episode. These capitated models focus on cost control, shifting the burden of cost minimization away from insurers and onto clinicians and administrators.” (6)

– JAMA SURGERY

A few decades ago, the U.S. manufacturing sector was experiencing drastic financial losses in the face of global competition. Manufacturers had to solve logistical difficulties to ensure that vendors could supply needed components just in time. Simply put, manufacturers had to become hyper-efficient to survive. Automation was making it possible to manage workflows in real time so the industry could immediately identify and prevent logjams, all while the production line was running at top speed. Real-time workflow control became an industry best practice in the late 1970s and the standard in the 1980s. By the early 1990s, plants either had adopted an effective workflow control system, or they were out of business.

Railroad, trucking, and steamship companies faced a similar threat to their profit margins in the 1990s. In response, they deployed workflow control systems that made them more efficient and competitive globally. The improvements were not marginal. In the case of intermodal yards in North America, workflow control systems increased throughput of shipping containers by 240%, all while reducing labor costs by 20% and total crashes and damage by 30%, according to Thomas Feo, an expert on transportation system and former CEO and co-founder of Optimization Alternatives, Inc.

Hospitals are now following in the footsteps of the manufacturing and transportation industries by deploying these unique control systems. The arguments for doing so are compelling. Lack of effective coordination within and across departments limits hospitals from adding between 4 to 80 surgical cases during prime time, 7 a.m. to 3 p.m., each weekday. With average contribution margins per surgical case across the U.S. running over \$5,000, hospital CFOs have documented that the efficiency delivered by workflow control systems has increased their bottom lines by \$1 million to \$20 million per year. This benefit is on top of verified savings achieved from reduced overtime, improved nurse retention, lower consumable costs, higher reimbursements, and, most importantly, increases in patient safety and satisfaction.

The hospital’s return-on-investment is striking. The all-in cost to deploy and sustain a workflow control system at a major medical center typically is less than \$300,000 per year.



What Does a Workflow Control System Do?

An automated workflow control system uses real-time information to monitor processes so that tasks can be executed as efficiently as possible. These systems provide instant accountability by continuously answering, “Who is doing what and where at this very moment?” They focus workers on executing tasks in the here and now, rather than on waiting for after-the-fact reports and analyses. Workflow control systems are proactive rather than reactive. All stakeholders have simultaneous, digital access to the same timely information, and they receive alerts enabling them to immediately address problems and prevent delays.

“It made me proactive to the tenth power rather than reactive to things I couldn’t control. ... Now we’re looking out of the front windshield rather than reacting to things that already happened.”

– DANIEL ERNST, CHIEF NURSE ANESTHETIST, DELL CHILDREN’S MEDICAL CENTER

Again, aviation demonstrates the power of these systems. An airport can have a world-class scheduling system with incredible analytics and reporting capabilities, but it cannot operate effectively or safely without an air traffic control system used in real-time by 100% of its pilots, ground crews, and other stakeholders. Imagine the chaos — not to mention the crashes and deaths — if pilots did not have real-time access to such systems.

Hospitals are no different. They send large numbers of patients on a journey each day in which the expectation is for an efficient and safe experience. In an environment with disparate workers and objectives, workflow control systems put everyone on the same page.

“I like to describe it as the control tower of the OR.”

– DR. J. SEAN FUNSTON, PROFESSOR OF ANESTHESIOLOGY AND MEDICAL DIRECTOR OF PERIOPERATIVE SERVICES, UNIVERSITY OF TEXAS MEDICAL BRANCH AT GALVESTON

These systems schedule and track patients, staff, rooms, and equipment. They are not data entry and retrieval reporting systems that are used to fulfill clinical, accounting, and regulatory requirements. They are a truly different breed of information technology. Workflow control systems must be easy-to-use and require little, if any, end-user training or manual data entry. Furthermore, these systems must be highly adaptable and customizable so that they can be tweaked on the fly as a facility’s operational needs evolve month after month. They empower all stakeholders to take ownership of their responsibilities and to intervene to prevent snafus.

Even communicating with a workflow control system is more transparent and seamless than the tedious transactions required by data entry and retrieval systems. Large, easy-to-read electronic touchscreens are hung throughout patient care and work areas in surgical departments, cath labs, endo suites, sterile processing, blood bank, and other departments. Each is constantly updated automatically via data feeds from the hospital’s other IT systems. Real-time tracking devices placed on charts that travel from room-to-room with patients and worn by physicians and staff are detected by wall-mounted sensors. This real-time location technology provides additional automatic updates to the workflow control system. In addition, workflow control systems regularly communicate real-time information via users’ cell phones.

The beauty of workflow control systems is they make it possible for all stakeholders to see the current status of all cases at all times – before, during, and after a procedure. This is no different than the systems that “show” all stakeholders at an airport which aircraft are landing, which are taking off, and which are taxiing. Like at an airport, no one in the hospital is left to wonder whether a patient has checked in, if the surgeon has arrived, whether a case was just cancelled, or any other critical piece of temporal data.

Effective workflow control systems use a minimal amount of text, along with icons and color-coding, to provide at-a-glance updates that are highly digestible by busy clinicians and administrators. Authorized personnel can adjust schedules or move a case or staff member to a different room by a simple touch of their finger on a screen. This change is then instantly visible and produces proactive alerts to all stakeholders in the OR, blood bank, radiology, housekeeping, pharmacy, pathology, and beyond. Furthermore, when a patient is moved from say, surgery to recovery, housekeeping is automatically alerted that the room is now ready to be cleaned so the next case can proceed on time.

Even in waiting rooms, families track their loved one’s status from registration to recovery. Screens showing the patient’s initials or a code the family has been given maintain HIPAA privacy requirements.

Hospitals also use workflow control systems to coordinate and balance staffing across multiple facilities. These systems have become critical in plugging holes during hectic days by shuffling available staff across hospitals in the same network. If a surgery at one hospital is suddenly cancelled, anesthesiologists and nurses can be immediately sent to a sister hospital grappling with emergencies. Real-time control systems allow hospitals to unlock and use more of their human and physical resources.

Stakeholders are enthusiastic adopters because workflow control systems truly help them do their jobs better and with less stress. These systems seamlessly integrate with existing IT systems and require no changes to existing clinical, accounting, and regulatory practices. They fully complement the many planning and data entry and retrieval systems that hospitals have so heavily invested in over the last decade.

“I was the cynical OR director, but this exceeds my expectations every single day. ... I drank the Kool-Aid.”

– MARA ROSALSKY, DIRECTOR OF SURGICAL AND INTERVENTIONAL SERVICES AT DELL SETON MEDICAL CENTER

No Longer ‘Flying Blind’

As an OR director at an Ascension Seton hospital, Mara Rosalsky had doubted a workflow control system would improve the way her hospital scheduled and managed surgical cases. She had seen other efficiency “solutions” come and go. At University Medical Center Brackenridge, which closed when its replacement, Dell Seton Medical Center, opened in 2017, OR staff used a digital board to report status updates. But the information had to be inputted manually, and it was neither timely nor complete. Even though that system was designed to be a step up from the white board and magnets that many hospitals use to display such information, hardly anyone ever looked at the digital board, Rosalsky said. They knew that “if the nurse doesn’t do her documentation, it’s not there,” she said.

Consequently, physicians and staff did what most of their American peers do when they need to find out where someone is or the status of a case: They called, called again, and then walked down the hall until they found an answer. At Dell Children’s Medical Center, another Ascension facility, staff knew there had to be a better way.

“Staff spent their days physically running around looking for people, peeking into rooms, calling on the phone. No one knew where everyone was. You truly were flying blind. You were just hoping this surgeon would be done by this time, but (now) you can see it in real time.”

– DANIEL ERNST, CHIEF NURSE ANESTHETIST, DELL CHILDREN’S MEDICAL CENTER

Dell Children’s became the first Ascension Seton hospital to use an automated workflow control system, 7 others followed. Surgeons like the system because they are alerted on their cell phones if one of their cases has an issue – a room isn’t ready, a patient hasn’t arrived, or sterile processing is delayed. It also gives them a visual assessment of how efficiently they and the hospital are performing.

“Surgeon satisfaction is much greater, and I’m thrilled, too,” Ernst said. “I can show new employees this, and in a few minutes, they know how to get to everything they need.”

He can now leave work on time and make scheduling changes from home. “My phone no longer blows up,” he said. At Dell Seton, case start times are posted just outside the doctors’ lounge, and everyone can see who was on time and who wasn’t. “Doctors are super-competitive,” Rosalsky said. It quickly became unacceptable for a surgeon to show up late. Starting the first case of the day on time is especially crucial.

“Initial delays may be associated with further delays because there is already deviation from the schedule from the start, setting off a “domino” effect. Moreover, the anxiety and frustration felt by the operating room team over the delay may affect their subsequent performance and contribute to more delays.”⁽⁷⁾

– CANADIAN JOURNAL OF SURGERY

At Dell Seton, the percentage of first cases starting on time improved from 36% to 82%, when comparing pre-deployment numbers to the last six months of 2019. In addition, the system, with its stakeholder alerts and at-a-glance status updates, has shortened the time it takes for operating rooms to be cleaned and readied for the next case. These turnover times fell from an average of 34 minutes to 26 minutes by the end of 2019, a 24% improvement.

In addition, the hospital was able to end a longstanding practice of pre-assigning blocks of OR time to each surgeon [block times], a common practice among U.S. hospitals that results in diminished room and staff utilizations and lower case volumes. Rooms go unused because surgeons have little motivation to maximize the productivity of the hospital. Instead, Dell Seton surgeons were asked to use a unique feature of the hospital’s workflow control system to reserve an open OR slot by submitting a request via their cell phone, much like a diner uses OpenTable to request a restaurant reservation. The workflow control “application allowed me to build the confidence with the surgeons to eliminate block times,” Rosalsky said. As a result, the hospital increased prime-time room utilization from 56 percent to over 80 percent. More importantly, it helped Dell Seton add 31.8% more surgical cases by the end of 2019.

Making Patients Safer

When he was executive vice chancellor for health affairs at the University of Texas, Dr. Ken Shine visited Dell Children’s to see its workflow control system in action. Shine said he was so impressed he wanted hospitals throughout the University of Texas System to investigate using the tool.

“I was, frankly, flabbergasted. The first thing that struck me was how quiet the pre-op area was.”

– DR. KEN SHINE, PROFESSOR OF MEDICINE AT DELL MEDICAL SCHOOL

Shine also noticed that the parents knew exactly where their child was at all times. “Not only was the recovery room alerted that the kid was coming, the mother was alerted, and so was the cleaning crew,” he said.

Shine, who was president of the Institute of Medicine when its famous report, “To Err Is Human,”⁽⁸⁾ was released in 1999, said workflow control systems enhance patient safety in various ways. Everyone knows what is happening, and patient care does not have to wait for a piece of equipment or a person to show up. “It shows what can be accomplished when industrial engineering is applied to health care,” he said.

“You don’t have people who need to do catch-up and that increases patient safety. There is a sense in medicine that only physicians and health care providers can figure out how to be more efficient. That is a false dichotomy.”

– DR. KEN SHINE, PROFESSOR OF MEDICINE AT DELL MEDICAL SCHOOL

At the UT Medical Branch in Galveston, officials wanted to reduce room turnover times and took Shine’s words to heart. After installing a workflow control system in 2013, room turnover times dropped drastically, from 48 minutes to 28 minutes, said Dr. J. Sean Funston, the anesthesiology professor and medical director of perioperative services. “We did it in about six months ... and it has stayed that way,” he said. “The program and the hardware paid for itself quickly.”

“With a third of our patients being inmates of Texas, the fact that we have been able to have this effect on OR efficiency is remarkable. We have turnover times comparable to large, private hospitals. We all love it.”

– DR. J. SEAN FUNSTON, PROFESSOR OF ANESTHESIOLOGY AND MEDICAL DIRECTOR OF PERIOPERATIVE SERVICES, UNIVERSITY OF TEXAS MEDICAL BRANCH AT GALVESTON

Dr. Mark Dentz, an anesthesiologist and perioperative operations director at Williamson Medical Center in Franklin, Tennessee, said his hospital installed its workflow control system a little more than a year ago, too soon to have longitudinal data but long enough for him to call it indispensable.

“It allows you to stay ahead of the curve in terms of patient care. I can’t imagine doing my job without it.”

– DR. MARK DENTZ, ANESTHESIOLOGIST, PERIOPERATIVE OPERATIONS DIRECTOR, WILLIAMSON MEDICAL CENTER, FRANKLIN, TENNESSEE

At too many hospitals, patients undergoing surgery enter a disorganized world. “When multiple silos exist without coordination, risks rise,” said Dr. Sam Awad, Professor of Surgery and Vice Chair for Quality and Safety at Baylor College of Medicine. Like Shine, Awad said he sees patient safety benefits. Awad uses a workflow control system at two hospitals where he works in Houston.

“There are probably 50 different variables that must happen to a patient before they enter the operating room, and all of this leads to inefficiencies,” he said. “It also leads to, basically, the chance for error, it leads to cancellations, and it leads to bad morale because everyone else is finger-pointing.”



A workflow control system is transparent. If a consent hasn't been obtained from the patient or the patient's family, everyone can see it still needs to be done. "The feedback from the families is uniformly positive," Awad said, adding that staff morale has improved and the work environment has become more collegial. "It's a sin that people are not fully aware of these systems and their capabilities." He saw other benefits beyond patient safety, including efficiencies that exceeded his expectations.

"If you're at 90% on time for your first case of the day, you're supposed to be awesome. We are up to 95% on-time starts at one of our hospitals. It was 60% when we started in 2012."

– DR. SAM AWAD, PROFESSOR OF SURGERY, VICE CHAIR FOR QUALITY AND SAFETY, BAYLOR COLLEGE OF MEDICINE

He also saw room turnover times fall dramatically, from 55 minutes to 28 minutes, and surgical volumes rise over five years from 6,500 cases to 9,500, a 46% increase.

The Veterans Health Administration, using a workflow control system at a hospital in Texas, reported in 2013 that the system reduced surgical delays overall by 56%.⁽⁹⁾ At the same time, the VA said, the number of surgical cases increased by 12%; first case of the day on-time starts rose from 50% to better than 80%; and overall OR utilization jumped from 52% to 80%. Room turnover times fell by 9 minutes, while the time it took from patient check-in to surgery declined by 30 minutes. Overtime was reduced by 50%. The VA's hard-dollar return on its initial \$200,000 investment to install the system was \$4.6 million in just one year.

A Paradigm Shift

So why isn't every hospital adopting workflow control technology?

Paradigm shifts aren't easy to achieve. They require new approaches to problem-solving. Health care is known for traditional thinking, discomfort with new technology, resistance from over-worked IT staff, and skepticism from physicians and C-level leaders. Health care professionals want reports and are wed to a traditional approach to process improvement. They collect data, evaluate it, meet to reach consensus on the findings, implement process changes, and then collect more data to repeat the cycle. Months, maybe even years pass, all while the hospital is losing money and possibly degrading patient outcomes. It doesn't seem to occur to most hospital executives that their planning and processes are already truly excellent, but they only lack an effective means of executing those plans and processes. That is, they are not aware of workflow control systems and the huge bang for the buck that can be achieved, especially when compared to buying into yet another consulting engagement or set of reports.

Transportation and manufacturing faced the same barrier. They followed a classical approach to process improvement until they hit a ceiling operationally that forced a paradigm shift. By expanding their focus to execution, they increased productivity and enhanced quality.

“There is an old saying in transportation – you can have a flawless plan, but if you can't execute, it's worthless! That is the paradigm shift: It's not about further improving your already excellent processes; it's about how you execute those processes in an effective and coordinated manner.”

– DR. TOM FEO, CEO AND CO-FOUNDER, HEALTHCARE CONTROL SYSTEMS

In health care, there are additional barriers that impede this new way of thinking and the deployment of workflow control systems. They include executives who have no way of spending money that is not explicitly budgeted. Rarely are funds set aside for a novel technology that brings a new approach to problem-solving. And then there is IT resistance to any project that adds to the existing workload. Paradoxically, hospital CIOs have documented that their workflow control system required very few IT resources to deploy and even fewer to maintain year over year.

“When I first heard about our workflow control project and how many stakeholders it involved across our entire medical center, I was convinced that it was going to expose us to significant risks plus severely strain my IT resources. I am happy to report three years later that deployment costs were quite small, ongoing IT costs are almost zero, and, to date, no risks have emerged.”

– DANNY SIERRA, SENIOR DIRECTOR INFORMATION TECHNOLOGY GROUP, METHODIST HOSPITAL AND METHODIST CHILDREN'S HOSPITAL, SAN ANTONIO, TEXAS

What is promising is that staff resistance to any change in existing systems is usually mild and fleeting. For example, surgeons often balk at sharing their cell phone numbers to receive critical alerts. That was the biggest stumbling block at the UT Medical Branch when it moved to an automated workflow control system, but it quickly faded, Funston said. “Once we had it (the system), we were all very happy with it.”

One Size Doesn't Fit All – Flexibility Is Key

A successful workflow control system must adapt to all types of physical plants, operations, and personnel. It also must be responsive to the challenges hospitals face, whether they are unannounced visits from accreditors, a new electronic health record system, or a demanding surgeon. It cannot impose a standard method of operation on every facility using the system. In fact, a successful workflow control system molds itself seamlessly to each hospital's local practices to improve work execution and productivity. This concept alone took years for senior management at manufacturing plants and transportation companies to appreciate. Their approach was to standardize everything, forcing everyone, especially frontline staff, to do things exactly the same way, and, surely, things would have to improve.

Consequently, the initial workflow controls systems developed for manufacturing and transportation failed. Designed as inflexible add-on modules to their existing IT systems, they couldn't be modified on the fly. Nor did they have a proper support model allowing for quick modifications from their vendors. Leaders in those industries eventually learned that the team making these modifications must be on-site regularly to identify problems and reconfigure the control system accordingly. They discovered that if changes weren't made within a day or two, stakeholders became disengaged and disgruntled.

Again, the experience of manufacturing and transportation holds true for health care. A one-size-fits-all approach does not work. Hospitals with pre-op areas adjacent to ORs must have a different second-by-second workflow configuration than a hospital with its pre-op on one floor and its ORs on another. Likewise, a teaching hospital with dozens of residents and 40 operating rooms must be run very differently than a surgery center with just six ORs.

Having a highly customizable workflow control system that can easily be tweaked relies on maintaining a close relationship with the system's vendor. That proved to be a huge benefit at Dell Children's, Ernst said. He can get help reconfiguring the system the same day he discovers a pressing need or a way to make everything work better. Here again, the contrast between workflow control systems and data entry and retrieval systems is stark. It can take months to make a change in a system like Cerner or Epic.

“That's one of the beautiful things about our workflow control system, it's completely customizable.”

– DANIEL ERNST, CHIEF NURSE ANESTHETIST, DELL CHILDREN'S MEDICAL CENTER

Shine said he immediately noticed that doctors and nurses were “much happier” because the system removed many of their daily frustrations. “They didn't see it as some terrible encroachment on their autonomy,” he said.

Future of Workflow Control Systems

Given the experience of manufacturing and transportation, workflow control technology is versatile and has staying power. Dell Children's has been using it for 10 years and improving it every month since to maximize its benefits. Hospitals that have seen the impact of workflow control systems in the OR are now using it across multiple departments and compiling identical track records of success. These include managing procedures in their cath labs, endo suites, ICU, IR, and maternity wards.

Traditional data entry and retrieval systems require specific personnel to manage and sustain them, with a heavy burden placed on IT personnel. Staff turnover can quickly reverse process improvements. But workflow control solutions are easy to sustain because they do not rely on any individual or group of managers to oversee and maintain logistical practices. History has borne this out, not only in manufacturing and transportation, but now, for over a decade, in health care.

Shine said he believes workflow control systems in health care have a bright future, but like in other industries, hospital leaders likely will not take notice and act until the assault on profit margins becomes intractable.

"I believe that these kinds of systems are inevitable, but I don't believe we have reached a tipping point yet."

– DR. KEN SHINE, PROFESSOR OF MEDICINE AT DELL MEDICAL SCHOOL

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Footnotes

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