

Factory Efficiency Comes To the Hospital

By JULIE WEED

TWO years ago, the supply system at Seattle Children's Hospital was so unreliable that Susanne Matthews, a nurse in the intensive care unit, would stockpile stuff — catheters in the closet, surgical dressings in patients' dresser drawers and clamps in the nurse's office. And she wasn't the only one.

"Nurses get very anxious when we can't get our hands on the tools we need for our patients," Ms. Matthews says, "so we grabbed them when we saw them, and stashed them away." This, in turn, made the shortages more acute.

On a busy day last month in the I.C.U., it took Ms. Matthews just a few seconds to find the specialized tubing she needed to deliver medicine to an infant recovering from heart surgery. The tubing was nearby, in a fully stocked rack, thanks to a new supply system instituted by the hospital early last year following practices typically used in manufacturing or retailing, not health care.

There are two bins of each item; when one bin is empty, the second is pulled forward. Empty bins go to the central supply office and the bar codes are scanned to generate a new order. The hospital storeroom is now half its original size, and fewer supplies are discarded for exceeding their expiration dates.

The system is just one example of how Seattle Children's Hospital says it has improved patient care, and its bottom line, by using practices made famous by Toyota and others. The main goals of the approach, known as kaizen, are to reduce waste and to increase value for customers through continuous small improvements.

Manufacturers, particularly in the auto and aerospace industries, have been using these methods for many years. And while a sick child isn't a Camry, Seattle Children's Hospital has found that checklists, standardization and nonstop brainstorming with front-line staff and customers can pay off.



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Susanne Matthews, a nurse at Seattle Children's Hospital, uses a supply system based on factory methods. In the past, nurses had makeshift stockpiles.

"It turns out the highest-quality care also is the most cost-effective because we make fewer mistakes and create better outcomes," says Patrick Hagan, the hospital's president.

The program, called "continuous performance improvement," or C.P.I., examines every aspect of patients' stays at the hospital, from the time they arrive in the parking lot until they are discharged, to see what could work better for them and their families.

Last year, amid rising health care expenses nationally, C.P.I. helped cut Seattle Children's costs per patient by 3.7 percent, for a total savings of \$23 million, Mr. Hagan says. And as patient demand has grown in the last six years, he estimates that the hospital avoided spending \$180 million on capital projects by using its facilities more efficiently. It served 38,000 patients last year, up from 27,000 in 2004,

without expansion or adding beds.

Similar methods are now in place at other hospitals and health systems, including Beth Israel Deaconess Medical Center in Boston, Park Nicollet Health Services in Minneapolis and Virginia Mason Medical Center, also in Seattle. So many others have called for advice that Seattle Children's put together a two-day workshop, presenting it to more than 200 medical workers and health care leaders from the United States and Europe.

"Some people think they have to choose between quality of care and saving money," said Dr. David Chand, who attended the training and now uses C.P.I. methods at Akron Children's Hospital in Ohio. "C.P.I. improves both patient outcomes and the hospital's bottom line."

To increase the number of surgeries the hospital could perform, Dr. Chand's team spent about \$20,000 overhauling the

process to sterilize instruments, avoiding a \$3.5 million expenditure to expand that department. More efficient scheduling in the M.R.I. department reduced the average waiting time for non-emergency M.R.I.'s from 25 days to 1 to 2.

All medical centers, especially larger ones, would have significant return on investment by using operations management techniques like C.P.I., says Eugene Litvak, president and chief executive of the Institute for Healthcare Optimization and an adjunct professor of operations management at the Harvard School of Public Health.

"The health care industry could be on the verge of an efficiency revolution, because it is currently so far behind in applying operations management methodologies," says Professor Litvak.

TO be sure, not everyone believes that factory-floor methods belong in a hospital ward.

Nellie Munn, a registered nurse at the Minneapolis campus of Children's Hospitals and Clinics of Minnesota, thinks that many of the changes instituted by her hospital are inappropriate. She says that in an effort to reduce waste, consultants observed her and her colleagues and tried to determine the amount of time each of their tasks should take. But procedure times can't always be standardized, she says. For example, some children need to be calmed before IV's are inserted into their arms, or parents may need more information.

"The essence of nursing," she says, "is much more than a sum of the parts you can observe and write down on a wall full of sticky notes."

On June 10, Ms. Munn helped lead a one-day strike by the Minnesota Nurses Association against six local health care corporations, including her employer, partly in protest of lower staffing levels her union thinks have resulted from hospitals' "lean" methods. "We felt the cuts created an unsafe environment for patients," she said. The nurses' contract was settled on July 1, with no increase in staff levels.

Brian Lucas, a spokesman for Children's Hospitals and Clinics of Minnesota, says the lean efforts have been used to reduce unnecessary tasks and have not resulted in lower nurse-to-patient ratios. "To the contrary," he said, "they have allowed nurses to spend more time delivering care to patients."

Techniques like C.P.I. may indeed be hard for many hospitals to put into effect, says Mark Graban, a senior fellow at the Lean Enterprise Institute, a nonprofit research, education and publishing company. The process takes a large amount of time and requires a culture shift that many hospitals may not be able to accommodate or sustain. "If the leadership tries to force new ways of doing things, the



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Dr. Howard Jeffries of Seattle Children's Hospital says one of his favorite improvements is a color-coded board for the cardiac intensive care unit, which provides an update on patients.

staff may chafe under the successive changes," he says.

And George Labovitz, a management professor at Boston University, says there are limits to performance-improvement methods in hospitals. "Human health is much more variable and complex than making a car," he said, "so even if you do everything 'right,' you can still have a bad outcome."

Physical layouts can also interfere with changes that hospitals want to make, like reducing the distance a chemotherapy patient has to walk. And the techniques can fall short of their potential if they are used in just one area of a hospital, because a patient typically moves through many different departments.

At Seattle Children's Hospital, Dr. John Waldhausen, the division chief of pediatric general and thoracic surgery, acknowledges that he and other doctors weren't initially very enthusiastic about C.P.I. because they thought it would take some decisions about patient care out of their hands.

Over time, he changed his mind, and he is now a vocal advocate of C.P.I. "When you look closely, C.P.I. is the same scientific method we learned in medical school, including hypotheses, data collection and analysis," he says. "It is not opinion and conjecture — it is data-driven."

TEN years ago, Seattle Children's set a goal to become the top hospital of its type in the country, and hired Joan Wellman & Associates, a process improvement consulting firm in

Seattle, to help it get there. Ms. Wellman, who had worked with Boeing on its lean-manufacturing processes, suggested that the hospital apply similar principles.

Mr. Hagan says he became enthusiastic about lean manufacturing and C.P.I. after doing research and visiting local manufacturers. He directed the hospital staff to examine the "flow" of medicines, patients and information in the same way that plant managers study the flow of parts through a factory.

In a typical workshop at Seattle Children's, a group of doctors, nurses, administrators and representatives of patients' families set aside a 40-hour week to work through C.P.I. methods. They plot each "event" a patient might encounter — like filling out forms, interacting with certain staff members, having to walk various distances or having to wait for assistance — and brainstorm about how each could be improved, or even eliminated.

The hospital staff has been rolling out the program in stages over the last decade. "We have probably made over 1,000 small changes, and frankly it never ends," says Mr. Hagan.

In his C.P.I. training, Dr. Bryan H. King, director of the department of psychiatry and behavioral medicine, was one of the first Seattle Children's staff members to visit Japanese manufacturers. He learned that "waste" could be viewed as any action that didn't add value to the customer.

Turning to his psychiatric inpatient unit, he and his team worked to pinpoint the goal of each child's stay and to com-

municate daily with families. They also made other changes, like starting to arrange outpatient resources as soon as children enter the unit, rather than waiting until they are ready to leave. These kinds of changes increased satisfaction ratings from families and helped cut the average time in the hospital from 20 days to 10. The unit can now accommodate 650 children a year instead of 400.

Changes like these are celebrated by the hospital administration. "Their support fosters the idea that everyone can make positive changes to their departments," Dr. King said.

Dr. Howard E. Jeffries, the hospital's medical director of C.P.I., is a fan of visual aids. One favorite is a white board at the entrance of the cardiac intensive care unit. A map of the rooms, labeled with patient names, provides a quick status report on how full the unit is and how ill the patients are. Stick-on stars indicate a patient who needs to be in isolation; a blue circle shows a patient on a ventilator.

"At a glance, staff coming in for their shift can get an idea of what's going on and what to be aware of," Dr. Jeffries says.

The same types of visual cues are used for inventory levels or inspection status in factories.

Another of his favorites is the "Days Without Infection" poster, like a construction site's "Days Without an Accident" sign. "It keeps our new safety protocols top of mind for people," he says.

Standardization is also a C.P.I. cornerstone. Last year, 10 surgeons at Seattle Children's performed appendectomies,

and each doctor wanted the instrument cart set up differently. The surgeons and other medical staff members used C.P.I. to come up with a cart they all could use, reducing instrument preparation errors as well as inventory costs.

Dr. Lynn D. Martin, director of the anesthesiology and pain medicine department, says changes previously were instituted only when existing systems failed. Using C.P.I., teams can now make changes any time they think they can improve a process. When the operating room team saw that a tonsillectomy procedure involved filling out 21 separate forms, it sat down with the print vendor to remove duplications — and cut the number to 11.

The staff doesn't have to wait for the perfect solution, Dr. Martin says, just a better one, because they can "keep making improvements year after year."

Using C.P.I., the hospital has reduced the waiting time for many surgeries from three months to less than one. Recently, the bottleneck was not the surgeons' time, but a lack of available inpatient beds for recovery. Examining the hospital's census, administrators saw that there were empty beds on weekends. They realized that by scheduling more surgeries on Fridays, patients could recover over the weekend, when more beds were free. The change also benefited parents and patients who would miss fewer work and school days.

Lack of space in the recovery room was another logjam, and the hospital planned a \$500,000 renovation to enlarge it. But a C.P.I. team saw that if a child's parents

went to a common waiting room during surgery, instead of an individual recovery room, more surgeries could be scheduled. Parents were given beepers to alert them when their child would arrive in the recovery room — and maps and colored lines on the walls helped point the way. Plans for the expensive renovation have been scrapped.

IN the hospital's largest C.P.I. project yet, Lisa Brandenburg, the chief administrative officer, used the method to design a new \$70 million clinic and surgical facility in Bellevue, Wash., just east of Seattle.

Medical buildings often have standard benchmarks — basing the number of examination rooms, for example, on the expected volume of patients. Ms. Brandenburg and her team instead used C.P.I. to map out common paths that patients, staff members, supplies and information would flow through. They worked in an empty office building, using cardboard mock-ups of surgical sites, recovery rooms, anesthesia areas and waiting rooms. Fifty staff members then played various scenarios to test the design's effectiveness.

The final design reduces walking distances and waiting times for patients by grouping related facilities together and creating rooms that can be used for more than one purpose. The hospital was able to shave 30,000 square feet and \$20 million off of the new building, which is to open July 20.

"We can't wait to see it in use," says Ms. Brandenburg.