Operations engineering for more efficient operating rooms

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Work by specialists from the USC Viterbi School of Engineering has led to significant improvements in turnover times for operating rooms at three California safety net hospitals, allowing "many more hours of daytime surgery per year." Because of the success of the program, the work will be expanded to include three more hospitals.

A team from the Viterbi School's Epstein Department of Industrial and Systems Engineering began work in January, 2008 at Childrens Hospital of LA, Riverside County Regional Medical Center and Ventura County Medical Center. "The USC team, along with the nurses and doctors at the hospitals, applied engineering principles such as is done to streamline productivity at Toyota and other efficient organizations," explained researcher David Belson.

According to a September 26, 2008 report on the project made to the study funder, the California HealthCare Foundation, reducing O.R. turnover time was adopted as a goal because "this single metric is easily calculated and can be compared to industry benchmarks."

Turnover time was reduced at all three hospitals, at Childrens Hospital from 34 minutes in November 2007 to 28 in July 2008; from 49 minutes to 39 minutes at Riverside County Regional Medical Center; and from 45 minutes to 34 minutes at Ventura County Medical Center.

"Recommendations are still being implemented and a greater impact is expected," the report states adding that "the 21% average reduction thus

far adds many hours of daytime surgery per year for each of the three hospitals studied."

The operational changes made were implemented with cooperation and extensive input from hospital staff. They included, at all three hospitals, efforts to:

-- Balance the capacities of the processes, to reduce queuing, particularly between pre-op and the operating rooms.
-- Improve communications so that people responsible for patient flow were aware of current patient status, when to move patients and overall performance.
-- Develop an accurate published schedule based on past history of surgery and realistic turnover times for all surgeries scheduled in advance.
-- Define scheduling rules so as to avoid bottlenecks, such as equipment shortages, and manage housekeeping support.
-- Implement checklists to avoid delays due to incomplete paperwork on the day of surgery.
-- Implement communications to alert surgeons and anesthesiologists to the time they are needed in the operating room for the next case and when patients are available for interviewing.
-- Create a stable staffing level for housekeeping through the workday.
-- Implement a report card that lets staff know how they are performing and circulate this information widely as an improvement incentive.

Three other hospitals, including San Francisco General in Northern California and Valley Presbyterian and St Francis Hospital in Southern California are now working with the Viterbi School team.

The kind of conditions observed and changes recommended are exemplified in one section of the report, discussing general factors involved in the problem:

"Patient flow in surgery consists of several sequential steps. Just as in a manufacturing flow or other sequential processes, there must be a balance of capacity and a smooth flow of patients. Late arrival at any one step creates delays in subsequent steps. Often a crucial step is the pre-op holding area just before the patient is moved into the operating room. The patient must be in pre-op in sufficient time for interviews by the clinical staff, checking of paperwork and various clinical tasks.

"If the patient arrives without sufficient time before the start of surgery, then the surgery start will be delayed until all the interviews and paperwork is completed. We often found that patients arrived in pre-op less than 15 minutes before surgery was scheduled when one-half of an hour or more was needed."

Some useful adjustments were based on common sense factors rather than sophisticated process engineering. For example: "Given the costs, it would be better to have patients arrive at pre-op early rather than late. Some pre-op and related areas felt that patients were less comfortable in per-op than in the admitting area and therefore slowed movement to pre-op. A better solution would be to improve conditions in pre-op. In one case, we recommended – and the hospital acted – to move a TV set from admitting to pre-op."

The study is part of the Epstein Department's continuing effort health care engineering. In addition to Belson, the team included Professor Randolph Hall and graduate students Eun Ae (Michelle) Cho, Benigno De Vera and Ashley Crowder, and undergraduate Jessica Midkiff.

"Management engineering improves access to health care as well as reduces costs for the patient," says Belson. "Southwest Airlines has shown how faster turnaround times for planes helps reduce costs and increase passenger satisfaction. We believe health services delivery can learn from examples like these."

Source: University of Southern California