

Improving the safety and quality of surgical patient care: what can we learn from quality management of industries?

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Perioperative management of surgical patients includes pre-, intra- and postoperative care, which has been disjointed and characterized by significant variability of care, depending on the individual experience and preference of the surgeon and anesthesiologist. However, varied and fragmented care by each physician may expose surgical patients to lapses in expected care, increase the chance of mistakes and accidents, and often result in unnecessary interventions. One way to reduce this variability is to manage patients undergoing surgery as one perioperative continuum of care, by the perioperative team [1, 2]. Recently, the concept of perioperative surgical home (PSH) has been advocated as a new model for the care of surgical patients. The American Society of Anesthesiologists strongly supports the development of PSH as the future model of anesthesia practice [2–5]. The PSH model is defined as a patient-centered and physician-led multidisciplinary and team-based system of coordinated care, which guides the patient throughout the entire surgical experience, from the minute the surgeon decides to operate until 30 days post-discharge.

There are five major goals of PSH: (1) provide a portal of entry to perioperative care and ensure continuity, (2) identify and manage patients according to acuity, comorbidities and risk factors, (3) deliver evidence-based clinical care before, during and after the procedure, (4) manage, coordinate and follow up on perioperative care across specialty lines and (5) measure and improve performance

and cost-efficiency [2–4]. The central idea is to optimize the patient for surgery based on risk stratification and pre-developed evidence-based protocols, and improve the outcome at the lowest cost.

Standardization of perioperative management by a team of professionals is a critical component of PSH. Kain et al. [2] reported the process of developing PSH for primary joint replacement surgery at University of California, Irvine, CA, USA. Multidisciplinary teams consisting of anesthesiologists, surgeons, nurses, pharmacists, physical therapists, case managers, social workers and information technology experts met weekly during the implementation phase. Interestingly, all team leaders underwent training in Lean Six Sigma methodology and Lean Six Sigma was used as a cornerstone for PSH implementation.

Lean Six Sigma is a management approach to performance improvement based on a combination of the different tools of Lean and Six Sigma. Lean methodology originated with Toyota, which revolutionized the car industry using rigorous standardization in its production lines. Lean focuses on speed, efficiency and taking waste out of a process, creating enhanced customer satisfaction and less wasted resources. Six Sigma methodology is a measurement-based strategy that focuses on process improvement and variation reduction to achieve Six Sigma quality with no more than 3.4 defects per million opportunities. When combined and implemented properly, it can be a powerful management tool that can greatly improve an organization's performance, by providing a structured approach to resolving problems. Conceptually, the perioperative environment could be similar to a production line and standardization of all perioperative procedures could result in an error-free, high-quality process.

There has been growing evidence of the efficacy of using quality improvement (QI) methodologies such as

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Lean Six Sigma in perioperative management [6, 7]. Nicolay et al. [6] reported the results of a systemic review to identify and evaluate the application and effectiveness of these QI methodologies in the field of surgery in 2012. Thirty-four of 1595 articles identified met the inclusion criteria, which were the use of QI methodologies including Lean and Six Sigma. The results indicated that QI methodologies from industry can have significant effects on improving surgical care, from reducing infection rates to increasing operating room efficiency, although the evidence is generally of suboptimal quality. Recently, Mason et al. [7] performed a systematic review of the use and utility of Lean Six Sigma methodologies in surgery. Of 124 studies which assessed the ability of Lean Six Sigma to improve specified outcomes in surgical patients, 23 studies were selected for the final analysis. The results indicated that the majority of studies (88 %) demonstrated an improvement in outcomes, aiming to optimize outpatient efficiency, to improve operating room efficiency, to decrease operative complications, to reduce ward-based harms, to reduce mortality and/or to limit unnecessary cost and length of stay. They concluded that Lean and Six Sigma QI methodologies have the potential to produce clinically significant improvement for surgical patients.

There have been several reports regarding the efficacy of PSH management, although the data remain limited. Raphael et al. [8] performed an observational cost analysis for patients undergoing unilateral elective total knee arthroplasty (TKA) or total hip arthroplasty (THA) under a total joint–PSH model at UC Irvine Health. Average hospital costs were substantially lower than USA benchmark levels (USD10,042 vs. USD17,588 for TKA; USD9,952 vs. USD16,267 for THA), probably due to the reduced length of stay (3 vs. 4 days). Gayed et al. [9] also reported that the application of a joint replacement program significantly reduced the length of stay by 36 %, from 5.3 days during the preproject period to 3.4 days during the 20-month sustainment period, in patients undergoing TKA or THA, while increasing total joint replacement volume at this medical center. Recently, Dexter et al. [10] summarized strategies for net cost reduction in the PSH model.

PSH requires a physician team leader, the “perioperative”, who can organize seamless continuity of current best practice of care. The anesthesiologist is considered to be a good candidate for developing PSH, because anesthesiologists have extensive experience in preoperative evaluation, intraoperative management, postoperative and critical care, and both acute and chronic pain management [4, 11]. In addition, anesthesiologists may have the ability

to organize the management with a team and to co-operate with other members from a wide range of medical fields. So anesthesiologists as “perioperativists” would be better placed to drive the standardization of care needed to reduce the risk and to optimize perioperative outcomes. In order to do so, anesthesiologists must learn the QI methodologies, including Lean Six Sigma, which have been used in industry to obtain high-quality outcomes. This process may provide anesthesiologists with new scope for future activity.

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