Strategies for Net Cost Reductions with the Expanded Role and Expertise of Anesthesiologists in the Perioperative Surgical Home

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The Perioperative Surgical Home is a model adopted by the American Society of Anesthesiologists to increase quality and patient safety and to decrease costs. This Special Article is about the latter topic. Using narrative review, we show that there are two principal opportunities for net cost reduction. One opportunity is to reduce unnecessary interventions that do not have potential to benefit patients (e.g., preoperative laboratory studies in healthy patients undergoing low-risk surgery and use of substantial fresh gas flows with volatile anesthetics). The other opportunity is to optimize staff scheduling, case scheduling, and staff assignment. These two are the same as the principal ways that a positive return on investment can be achieved from use of an anesthesia information management system. Three other opportunities are much less likely to achieve as large (if any) net cost reduction among all patients but may at some hospitals. These are to reduce cancellations, operating room times, and/or hospital postoperative lengths of stay. (Anesth Analg 2014;118:1062–71)

1. REDUCE UNNECESSARY INTERVENTIONS THAT DO NOT HAVE POTENTIAL TO BENEFIT PATIENTS

One substantial opportunity for cost reduction with the Surgical Home is decreasing unnecessary interventions in the preoperative, intraoperative, and/or postoperative periods (i.e., waste). Preoperative and intraoperative interventions are described in this section. Cost reduction from changes in the use of different implant and disposable products and negotiation of contracts are considered in the Discussion. Performing routine screening tests in patients who are otherwise healthy is of little or no known value in detecting diseases and in changing anesthetic management or outcome. At some hospitals, preoperative tests are ordered excessively, causing unnecessary costs. When
Table 1. Summary of Article

Substantive Opportunities for Cost Reduction

1. **Reduce Unnecessary Interventions That Do Not Have Potential To Benefit Patients**
   - Anesthesiologists’ roles are as managers (systems-based practice):
     - Medical Director of Preoperative Assessment Clinic
     - Director of Anesthesia Informatics
   - Effectiveness depends on feedback to clinicians from AIMS
   - Use applies to nearly all facilities
   - Use is encouraged by the “Choosing Wisely” campaign
   - Use is related to new payment systems
   - Research opportunities for additional interventions and assessment of value

2. **Staff Scheduling, Case Scheduling, and Staff Assignment**
   - Anesthesiologists’ roles are as managers (systems-based practice):
     - Director of Anesthesia Informatics
     - Operating Room Medical Director
   - In this role, the anesthesiologist has other opportunities to reduce costs
     - Example: decreasing use of expensive disposables and implants
     - Cost reduction applies principally to facilities with workdays > 8 hours (e.g., hospitals)

Limited Opportunities for Cost Reduction

3. **Preoperative: Reducing Non-Administrative Causes of Cancellations**
   - Anesthesiologists’ roles potentially not only as managers but also as clinicians
   - Facilities can have typical or low cancellation rates using traditional systems
   - Decreasing typical cancellation rates to low rates does not decrease costs
     - Such unexpected findings highlight the value of anesthesiology research

4. **Intraoperative: Reducing Operating Room Time (i.e., Increased “Throughput”)**
   - Anesthesiologists’ substantive roles are while functioning as managers:
     - Operating Room Medical Director
     - Director of Anesthesia Informatics
   - Facilities have had financial incentives (profit) for rapid throughput for decades
   - Interventions require investment of increased resources (e.g., extra housekeepers)
     - Potential for cost reduction at some (few) facilities:
       - Same surgeon filling OR for > 8 hours
       - Application of Section 2 staff scheduling, case scheduling, and staff assignment

5. **Postoperative: Reducing Length of Stay (“Enhanced Recovery”)**
   - Anesthesiologists’ roles heavily clinical
   - Hospitals have had financial incentives (profit) for reducing length of stay for decades
   - Efficacy of Enhanced Recovery programs not in question, cost reduction is critical
     - Potential for cost reduction at some (few) facilities:
       - Interventions can be applied to large percentage of patients on a ward
     - Potential for decreasing number of ward nurses

Anesthesiologists in preoperative assessment clinics (e.g., Medical Director of the Preoperative Assessment Clinic) determine which laboratory tests are ordered, the rate of ordering is less than if internists or surgeons are involved.12 When anesthesiologists manually select the tests ordered, the number and cost of the preoperative tests is reduced.14

The “Choosing Wisely” campaign is encouraging because its focus is logical and its choices of interventions to be reduced are evidence-based.3 The criteria are those that are “(1) common clinical practices for which there is (2) little or no evidence of benefit to patients,” and for which “(3) avoidance would lead to improved quality of care and/or (4) reduced costs.”46 For example, “Do not obtain baseline laboratory studies in patients without significant systemic disease …”4 Another example is not “to obtain baseline diagnostic cardiac testing” (e.g., echocardiography) “in asymptomatic stable patients with known cardiac disease …”15–18

The Medical Director of the Preoperative Assessment Clinic can manage implementation of the reduction in unnecessary interventions.12 Data for monitoring performance can be obtained from the AIMS. Statistical analysis can be performed by someone with a background in analytics including process improvement control charts. For example, the percentage of patients without significant systemic disease but having at least 1 preoperative test can be monitored.12 Methods of monitoring unnecessary type and screen and blood ordering also have been developed.20,23 Future comparative effectiveness research will identify more opportunities, and these should be embraced.

Additional cost reduction can be achieved using the AIMS data. An anesthesiologist serving as the “Director of Anesthesia Informatics” can lead its use. The American Board of Preventive Medicine recently offered its first Board Certification in Clinical Informatics, and several anesthesiologists became certified.5

AIMS and their data can be used to decrease drug and supply costs and wastage. Anesthetic practice guidelines were developed and updated with information compiled using an anesthesiology department’s AIMS.22–24 Using the AIMS, anesthesia providers were given ongoing monthly feedback, summarizing their use of expensive drugs relative to their peers.23,24 Anesthetic drug costs were reduced,23,24 Reducing fresh gas flow by providing feedback to providers by e-mail25 or real-time alerts26,27 was effective because wastage was not a problem of a few rare cases having very large flows but principally small excess usage for many cases by many providers.20 The expert in analytics can assist by adjusting feedback based on each clinician’s drug and supply costs, available since the AIMS provides the necessary data to permit valid comparisons between providers.29

An advantage of cost reduction by reducing unnecessary interventions is that essentially no one argues against reducing waste. However, the opportunities for cost reduction among all patients often are small, because many of the laboratory tests and anesthetic drugs are inexpensive (<$10). Substantial cost reduction may be achieved only for a small minority of patients. For example, consider the Choosing Wisely criterion of not “to administer packed red blood cells in a young healthy patient without ongoing blood loss” and low hemoglobin “unless symptomatic or hemodynamically unstable.”29,19 This is important medically, resulting in substantial net cost reduction for these patients. Blood

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1 Onwuegbu OC, Arkoosh V, Fleisher LA. “Choosing wisely” in Anesthesiology: Top-5 list – addressing the gap between evidence and practice. ASA Newsletter 2014;78(1):44–45
transfusion is performed in 12% of hospitalized patients and is the most common procedure during hospitalization. However, far fewer than 5% of patients undergoing anesthesia receive a blood transfusion.

2. STAFF SCHEDULING, CASE SCHEDULING, AND STAFF ASSIGNMENT

An opportunity for cost reduction through the Surgical Home’s enhanced coordination of care is literally the coordination of care: staff scheduling months in advance, case scheduling into the staff time, and then staff assignment to the most appropriate cases. Such coordination has substantive opportunity for net cost reduction because: (1) for every surgical case, anesthesiologists, nurses, and so on are scheduled, the case is scheduled, and personnel are assigned, and (2) labor is the largest total variable cost of surgical care. Unlike interventions in the preceding section (e.g., not all patients undergo preoperative echocardiogram), this section applies to all patients undergoing anesthesia.

Substantial Heterogeneity Among Hospitals Limits the Maximum Potential Cost Reduction

Substantial heterogeneity in net cost reduction should be expected among hospitals. The percentages of operating rooms (ORs) with >8 hours of cases vary markedly not only among hospitals but also among services and days of the week at individual hospitals. For example, suppose every OR at one hospital has 5.5 to 7.5 hours of cases and turnovers each workday. Staff schedules are for at least 8 hours daily. At this hospital, there generally would be no opportunity for cost reduction by revising staff schedules, case scheduling, and/or staff assignment. In contrast, suppose every OR at a different hospital has at least 8.5 hours of cases daily and >10 hours on most days. At this second hospital, there is substantial opportunity to use statistical methods to reduce costs through changes in staff scheduling.

How There Can be Substantial Cost Reduction?

Vocabulary terms used in scientific studies of OR management have been reviewed. Without knowing these terms, managers may be unable to find articles relevant to their hospitals in the scientific literature. For example, the “allocated hours” are the hours into which cases are scheduled. How to calculate the OR allocations appropriately (to maximize the efficiency of use of OR time), given the hours of cases forecasted months in advance, has been reviewed. How to calculate OR allocations for services with single ORs has been reviewed. Decision-making on the day of surgery has been reviewed. The derivations in the Appendices of the articles show that the methods are rational and sufficient for case scheduling decisions beginning the morning of the workday before surgery through the day of surgery.

Substantial excess costs are caused partly by a common cognitive bias. The hours of each OR into which cases are scheduled are chosen to be briefer than the optimal choice of allocated time. For example, some schedulers simplify the problem of scheduling cases into allocated hours by treating all ORs at the hospital identically, allocating the same number of hours to each OR. They base their decisions on what would be appropriate on average, neglecting to consider service and day of the week combination. Although some managers express concern about extra labor costs because of personnel (anesthesiologists, nurses, etc.) working late, they then perform staff scheduling and staff assignment that result in the personnel working late. These are some of the sources of excess and reducible labor costs.

Anesthesiologists’ Role in OR Management

An OR Medical Director having knowledge of scientific OR management is essential to achieve the cost reduction. This anesthesiologist plays a pivotal role in achieving cost reduction by being responsible for staff scheduling and for case scheduling starting a few days before surgery. This responsibility is important in part because OR nursing directors often are not rewarded for making decisions that increase anesthesiologists’ productivity. The relative costs based on wages are anesthesiologists >nurse anesthetists >OR nurses >surgical technologists, and thus, the bottlenecks economically to providing care generally should also be in that sequence. The OR Medical Director should use the OR allocations for staff scheduling, months before the day of surgery, to achieve suitable numbers of anesthesiologists, nurse anesthetists, OR nurses, and so on with appropriate skills each morning. However, the Director’s principal use of the OR allocations is on the workday before surgery and on the day of surgery. These management decisions rarely need to be made at night (e.g., 7:00 PM to 6:59 AM), because during such periods a mean of only 0.2% of OR-date combinations have a change made to their schedules. The use of the OR allocations the workday before surgery through the day of surgery is necessary, because most ORs have a change in one or more cases within 1 workday of surgery. Many changes in cases are made, because at hospitals approximately 20% of OR scheduled hours are derived from patients who are inpatient preoperatively. These cases need to be done promptly for patient safety, patient centered care, etc.

The OR Medical Director also can work as a facilitator of group level decision-making, guiding surgeons in adjusting their days of surgery, if physical hospital bed capacity (wards or intensive care unit) is the perioperative bottleneck. By physical, we mean not nurses but numbers of beds. At these facilities, adjusting days of the week that individual surgeons work can decrease health care costs by leveling capacity among weekdays and thereby reducing disruption of admission of medical and emergency medicine patients. Similarly, at hospitals with extensive extra hospital capacity to accommodate peaks caused by variation in surgical workload (e.g., overall hospital occupancy 65%), smoothing by changing the days of the week that certain surgeons operate can decrease nursing ward labor costs. Such changes can be done one hospital ward at a time, with the necessary engagement of all surgeons admitting to that...
ward. Costs are reduced when nursing staff scheduling is changed.

**Role of Anesthesia Information Management Systems for Decisions on the Day of Surgery**

Staff scheduling and assignment of anesthesiologists, nurse anesthetists, and so on depend not only on the OR information system but also on the AIMS. Decisions that can be made with either information system are interchangeable, but an AIMS includes all anesthetizing locations. Therefore, traditionally use of AIMS data has been superior, although this may be less of an issue in the future as enterprise-wide systems are used more commonly. Regardless, the AIMS data are essential on the day of surgery for case and staff assignment to ORs. Such decision-making is based not simply on having displays showing data from the AIMS such as real-time usage but displays with recommendations or displays and brief checklists. Consequently, in our experience, achieving a cost reduction depends not only on having a knowledgeable OR Medical Director and someone with an analytics background but also on the Director of Anesthesia Informatics. Many of the AIMS data used for this purpose are the basic signals (e.g., when there is pulse oximetry and heart rate monitoring in use in an OR, the OR is occupied by a patient).

**3. PREOPERATIVE: REDUCING NONADMINISTRATIVE CAUSES OF CANCELLATIONS**

**Absence of Substantive Net Cost Reduction in Reducing Typical Cancellation Rates to Low Rates**

The Surgical Home likely will decrease the incidence of non-administrative causes of cancellations. However, at hospitals with typical or less than average cancellation rates (e.g., 1% to 8%), this will not significantly reduce total costs (i.e., among all patients). Rather, cancellations within 1 workday of surgery (slightly) reduce variability in services’ workloads among days (P < 0.0001). Cancellations soon before the day of surgery are associated with (slightly) increased net hours of cases scheduled. This apparent paradox occurs because cancellation of cases influences the timing of decision-making in the scheduling office. The workload for the date of surgery is known incompletely when cases are scheduled many weeks in advance. When a cancelled case is replaced by an inpatient close to the day of surgery, the schedulers have a better idea of the anticipated workload. Consequently, schedulers can (and in practice do) fully fill, but not exceed, the allocated hours for the specific OR into which the case is placed. Furthermore, when the cancelled case is rescheduled (as are 90%) for a later day, usually it is rescheduled to a day that the surgeon has slightly less than the surgeon’s median workload (P = 0.022). In other words, as long as the OR allocations have been calculated using the appropriate statistical methods, decreasing (typical) cancellation rates will not reduce OR costs at hospitals. Reducing cancellations is important from a patient perspective, but its value is intangible.

AIMS data and analytics were needed for anesthesiologists to understand the economic cost of cancellation. The traditional U.S. health care system of fee-for-service (i.e., more compensation for doing more cases) has been in use for decades and creates an incentive not to cancel cases. Reducing administrative causes of cancellations (e.g., insufficient remaining OR time) does substantively reduce costs, but doing so involves interventions of the OR Medical Director (i.e., of the preceding Section 2). Private U.S. hospitals achieve very low cancellation rates (e.g., <2%). A survey study nearly 2 decades ago even evaluated anesthesiologists’ perceptions of production pressure not to cancel cases. Thus, incremental reductions in nonadministrative causes of cancellations would be expected not to achieve substantial net cost reduction when considered among all surgical patients.

**Surgical Home Is Not Necessary to Substantially Lower Cancellation Rates**

The above analysis is fully in contrast to that for hospitals with substantial (e.g., >8%) cancellation rates. Having an active Medical Director of the Preoperative Assessment Clinic and the provision of multidisciplinary care may facilitate a reduction in cancellation rates for nonadministrative causes from substantial to typical. However, the benchmarking studies predating Surgical Home showed that to achieve low percentages the Surgical Home model is neither a necessary criterion nor novel.

**4. INTRAOPERATIVE: REDUCING OPERATING ROOM TIME (I.E., INCREASED “THROUGHPUT”)**

Another area where costs can be reduced but substantial net cost reduction among all surgical patients should not be expected is from reducing OR time, including delays. The reason why we expect overall limited reduced cost is that most perioperative costs are fixed (e.g., building and AIMS). Yet since new equipment and hospitals must be built, fixed costs are included in reimbursement by Diagnosis Related Groups (DRG). Consequently, averaged among all surgical patients, the difference between reimbursement and variable costs vastly exceeds $1000/h of OR time. Thus, there has been for decades strong financial incentives to increase throughput (e.g., for surgeons to work as quickly as possible so that they or their corporation can bill more Relative Value Units). Nevertheless, we review the topic.

**Anesthesiologists Have Managerial Role in Reducing Total (Overall) OR Times**

Reductions in OR times do not appear to be influenced directly by anesthesiologists while they supervise nurse anesthetists and anesthesiology residents but rather by anesthesiologists functioning as OR Medical Directors. (Supervision is used here generically, not as a U.S. billing term.) For example, coordination of anesthesiologists’ physical presence in ORs does not appear to reduce OR time substantively. OR times can be segmented into surgical times (positioning to application of dressing)...

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For administrative causes, the number needed to treat to prevent the cancellation is 1, because the specific patient who would be cancelled for “lack” of OR time is known. However, for changes made in the Preoperative Assessment Clinic, the number needed to treat is at least 6.
plus nonsurgical times (i.e., anesthesia-controlled times). OR times are affected principally by surgical times, not anesthesia-controlled times. Mean anesthesia times are brief relative to standard deviations (SDs) of surgical times. Among joint replacement cases at several community hospitals, there was no association between increases in the physical presence of the anesthesiologist from 0% to 21% of the case and reductions in OR times. At an academic “day surgery” center, anesthesia-controlled times were no briefer (<1 minute, \( P = 0.19 \)) with anesthesiologist supervision of nurse anesthetists (i.e., 2 providers present) than with an anesthesiologist practicing alone.

The anesthesiologist as OR Medical Director can achieve decreases in OR times by hiring additional nonphysician providers. Examples include not only having more (1) housekeeping teams to reduce turnover times, but also more (2) postanesthesia care unit (PACU) nurses, (3) transporters to reduce delays in PACU exit when patients are ready for discharge, and/or (4) nurses to setup, assist anesthesiologists, and monitor patients after peripheral nerve blocks. More expensive anesthetic drugs can be used to reduce OR times and staff waiting by reducing annoying prolonged times to extubation (i.e., 15 minutes or longer from end of surgery). Finally, the OR Medical Director can provide leadership to ensure the availability of 1 extra staffed OR when a service with 3 or 4 surgeons each has scheduled at least 8 hours of cases.

### Achieving Reduction in OR Time Requires Investment of Increased Resources (Variable Costs)

Examination of the resources used reveals one of the limitations of decreasing OR time, including delays. Changes described in Section 1 occupy the time of a Medical Director of the Preoperative Assessment Clinic, a Director of Anesthesia Informatics, and a few hours a month of an analyst (statistician). Changes described in Section 2 take the time of an OR Medical Director, a Director of Anesthesia Informatics, and a few hours a month of an analyst. The interventions in the preceding paragraph to decrease OR time include the time of the latter three individuals. However, the interventions also include incremental variable costs (e.g., more PACU nurses).

### Potential to Achieve Net Cost Reduction Is Limited to ORs with More Than 8 Hours of Cases

Another limitation to decreasing costs through a reduction in OR time is that it is rarely effective except when there are at least 8 hours of OR time consistently for the service on the day of the week. Many hospitals do not satisfy this condition. There are even fewer hospitals that have many individual surgeons consistently filling an OR with at least 8 hours of cases each weekday that the surgeon is doing at least one case. Consequently, the potential for substantive net cost reduction is limited by the fact that although reducing OR time does make very good economic sense, this is so only when targeted to those individual surgeons with many hours of cases. It is close to meaningless to read a statement that reducing OR time by 10 minutes reduces costs by $33.50 (or some even larger value), because OR time is not simply a variable cost (see Section 2).

Suppose that reducing OR time can be achieved. When calculating the reduction in costs achieved through a decrease in the OR time of an OR with >8 hours of cases, do not blindly use a value for the cost per minute of OR time derived from the hospital financial cost accounting system. Often the values are vast overestimates because they attribute costs that are not decreased (fixed costs) into the value. Instead, identify through observation the personnel who would have been in the OR had the time not been reduced (e.g., for prolonged extubations: anesthesiologist, surgical physician assistant, OR nurse, and surgical technologist). The cost per minute of the OR time reduced should be similar to the sums of those individuals’ typical salaries plus benefits for the time period (e.g., $3.35/min or $200/h).

### 5. POSTOPERATIVE: REDUCING LENGTH OF STAY (“ENHANCED RECOVERY”)

The intraoperative role of anesthesiologists to enhance recovery has changed over the past decade, and we expect it will continue to improve, thereby reducing patient morbidity. For example, antibiotic administration was not traditionally considered an anesthesiologist role, being limited simply to following surgeons’ orders. With informatics, automatic AIMS messages can be sent if the antibiotic has not been administered, resulting in an increased rate of appropriate antibiotic administration. Near 100% compliance can be achieved when there are not only real-time alerts but also e-mail feedback and summary reports by provider. Incidences of surgical site infections can be decreased, likely with concomitant reductions in length of stays. Patients likely are far better off because of such programs. However, this does not imply that net costs will be less unless these interventions are applied consistently by multiple providers to many patients.

### Traditional Hospital Financing in the United States and Length of Stay

A system of reimbursing hospitals and surgeons based on DRG and primary surgical procedure creates incentives for reducing lengths of stay. The reason is that longer lengths of stay fill hospitals and thereby impair throughput. If no physical beds are available, the hospital cannot do more cases and make even more money (see 2nd to last paragraph of Section 2). Thus, surgeons in the United States and other countries with fee-for-service type compensation have had incentives to reduce lengths of stay when this can be achieved without substantive increases in costs. For specific procedures, decreases in lengths of stay that are accompanied by decreases in costs will be achievable as medical advances are made.

Recently, Eappen et al. studied the “relationship between occurrence of surgical complications and hospital finances.” Among U.S. Medicare patients (i.e., DRG payments), one or more complications were associated with $1700 extra contribution margin per patient (i.e., the hospital benefited financially from the complications through recoding into higher paying DRGs, \( P < 0.001 \)). Such results...
do not contradict our perspective, because 93.3% of patients have no complications. Among all payers, 94.7% have no complications. The financial benefit of reducing length of stay is achieved principally not by reducing complications in a few patients but by reducing the average length of stay of the vast majority of patients. This is evident from an end point typically studied, the median length of stay. The median will not be decreased by reducing the incidence of complications and longer lengths of stay occurring in only 5% to 10% of patients.

**Patients Per Day Benefiting from Enhanced Recovery programs**

Enhanced Recovery programs have achieved, and we expect will continue to achieve reductions in length of stay. A single anesthesiologist can “work in tandem with the same group of … certified registered nurse practitioners and a registered nurse … case coordinator to consistently provide … focused and integrated postoperative patient care—from the PACU to the intensive care unit and/or the regular inpatient unit.” More frequent rounding on patients can be done, with discharge in early evenings, thereby reducing length of stay. However, the economics of enhanced recovery is very sensitive to the numbers of patients per day.

Suppose that an intervention will be applied to many patients on a surgical ward, reducing the median length of stay by several days. Then, the intervention will reduce costs because the number of surgical ward nurses employed will progressively be reduced. In contrast, suppose that the intervention will be applied to <1 patient every other day per hospital, the reduction in length of stay will be a median of 1 day, and the specific days will be variable due to patient and surgeon factors. Then, it is unlikely that nurse staff scheduling can be changed to achieve the cost reduction. As summarized at the end of Section 2, hospitals with large variability among days in the admission of Enhanced Recovery patients have fewer opportunities for cost reduction.

**Estimating Variable Costs Per Day**

When quantifying the cost reduction from each reduction in length of stay, be cautious in calculating precisely what has been reduced. Quoting the title of Taheri et al., 2000 cost accounting study in the Journal of the American College of Surgeons, “Length of stay has minimal impact on the cost of hospital admission.” Hospital cost accounting systems may attribute substantial costs to a hospital ward but those costs are not reduced by decreasing length of stay. The labor costs in caring for a surgical patient are substantially more on the first few days following surgery. When length of stay is reduced for the average patient, as applies to net cost reduction, sometimes only minimal nursing labor and supply costs are reduced. As a check on estimates of cost reductions for reducing length of stay by 1 day, divide the national annual compensation for the surgical ward nurses by 250 workdays per year and by the typical number of patients cared for by each such nurse (e.g., 5).

Finally, as part of the Surgical Home, anesthesiologists may also be able to reduce length of stay through educational interventions made as part of the Preoperative Assessment. For example, patient expectations postoperatively may be established so that arrangements for home care may be made. The economics of such interventions made preoperatively are the same as the economics for the reductions in length of stay described in this section.

**DISCUSSION**

The Perioperative Surgical Home is an approach designed to increase quality, patient safety, and shared decision-making and to decrease costs. This Special Article is limited to the net cost reducing interventions (Table 1). The article is of limited scope in that topics with increased utility to patients, absent small incremental decreases in costs, were not reviewed. In addition, strategies that increase profit and patients served were not reviewed (e.g., reducing length of stay with the objective of doing more surgery). Such profit opportunities for anesthesia departments have been reviewed.

In Sections 1 to 5, we showed that two principal economic opportunities for cost reduction from the Surgical Home are the same as those derived from the use of AIMS data. One opportunity is ceasing ineffective interventions (Section 1). Doing this means: (1) using mathematics when scheduling staff; (2) knowledgeable anesthesiologist(s) (i.e., OR Medical Director) working with the surgical scheduling office(s) starting late afternoons two workdays before surgery through the day of surgery; and (3) anesthesiologists involved in informatics. These two principal economic opportunities for cost reduction from the Surgical Home are the same as for AIMS.

Once the OR Medical Director is doing these activities, the anesthesiologist can also be engaged in other substantial perioperative cost reduction activities, such as leading surgical group discussions on implant and disposable costs, purchasing, and preference cards. Using both a payment (price) cap model when negotiating with manufacturers and providing relative cost information to surgeons when >1 type of implant may be suitable are multiple specialty interventions that can benefit from physician leadership. Computational and other engineering methods can be used to optimize numbers of preference cards.

In Sections 3 to 5, we showed that although there are other potential strategies for net cost reduction from the Surgical Home, currently well-managed organizations will probably not achieve substantial (if any) net cost reductions from them: improved preoperative assessment, faster intraoperative care, and/or enhanced recovery (reduced length of stay). They have economic value when used selectively (e.g., for specific ORs with long workdays of single surgeons). However, the traditional system of surgeon and hospital paid per case (e.g., DRG) created incentives for those strategies and has been in use for decades. Our economic assessment for hospitals would have been different if there had not been many years of such a method of reimbursement.
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