Development of an Appropriate List of Surgical Procedures of a Specified Maximum Anesthetic Complexity to Be Performed at a New Ambulatory Surgery Facility

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A common but difficult task for a hospital when it decides to open a freestanding ambulatory surgery facility is how to decide which surgical procedures should be done at the new facility. This is necessary in order to determine how many operating rooms to plan for the new facility and which ancillary services are needed on-site. In this case study, we describe a novel methodology that we used to develop a comprehensive list of procedures to be done at a new ambulatory facility. The level of anesthetic complexity of a procedure was defined by its number of ASA *Relative Value Guide* basic units. Broad categories of procedures (e.g., eye surgery) were defined according to the International Classification of Diseases, Ninth Revision, Clinical Modification. We identified 22 categories that are of a type that every procedure in the category has no more than seven basic units. In addition, by analyzing all procedures that the hospital being studied actually performed on an ambulatory basis, we identified six other categories of procedures that were of a type that all procedures eligible for surgery at the new facility had seven or fewer basic units.

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A common but difficult task for a hospital when it decides to open a freestanding ambulatory surgery facility is how to decide what surgical procedures should be done at the new facility. This is often the first step to determining how many operating rooms to plan for the new facility. The decision also affects what ancillary services are needed on-site for safe care (e.g., on-site laboratory testing or blood storage).

No systematic method has been reported for deciding on a list of procedures that are of a sufficiently simple anesthetic (case) complexity that they can be done safely at an ambulatory surgery facility. The task is surprisingly difficult. Even at ambulatory surgery facilities, patients undergo tens of thousands of different surgical procedures and combinations of procedures (1,2).

This study was done from the perspective of a health care system planning a new freestanding, geographically independent, multiple-specialty ambulatory surgery facility. The hospital administrators had already decided that this facility would do outpatient surgery, including 18- or 23-h-stay cases such as laparoscopic cholecystectomy and laparoscopic gynecological procedures. Yet, otherwise, the surgical procedures to be done at this facility had not been chosen.

There had been informal surveys of surgeons, nurses, and anesthesiologists regarding what procedures should be done there. Yet these led to imprecise and contradictory lists.

The first of three goals of this study was to develop a comprehensive list of procedures being done at the hospital that could be done safely at this facility. For example, cardiac surgery procedures would be unsuitable, and cataract extraction would be acceptable.

To tackle this issue, we aimed to apply an automated strategy for describing the anesthetic complexity of cases (1). This strategy uses the American Medical Association's Current Procedural Terminology (CPT) codes and the corresponding American Society

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of Anesthesiologists' *Relative Value Guide* (ASA RVG) basic units (1,3). The two are related electronically by the ASA RVG Crosswalk™ (1999 edition; ADP Context, Inc., Westmont, IL). This computerized table has two columns: one with a CPT code and the other with the corresponding number of basic units. The ASA publishes annual updates of the ASA RVG base units to reflect changes in medical and surgical practice.

The anesthesia ASA RVG basic units measure the usual work of providing anesthesia care for a procedure "apart from" anesthesia time. The basic units are related, as a rank scale, to the physiological complexity of a procedure (1). For example, knee arthroscopy has three ASA RVG basic units. Prostatectomy has 7 U. Renal transplantation has 10 U. Heart transplantation has 20 U. An anesthesia group could specify, months or years before cases are scheduled, the maximum number of ASA RVG basic units that they consider suitable for doing a surgical procedure at a facility (1).

For example, the administrators, surgeons, and anesthesiologists at the hospital under study had decided that laparoscopic cholecystectomies would be done at the new ambulatory surgery facility. The ASA RVG basic units for this procedure are seven. Using this strategy, if a case is scheduled that has more than seven basic units, then the planned case is flagged immediately for review (1). Other institutions may choose a value different from seven basic units.

The hospital also needs to estimate the number and hours of cases currently performed at the hospital that can be moved to the new ambulatory surgery facility. This estimation can be done by counting all cases that have no more than the prespecified maximum number of basic units.

Yet this strategy of using the ASA Crosswalk has two limitations for estimating case volume at the new ambulatory surgery facility. First, the resulting list has thousands of acceptable procedures and is difficult to interpret. Second, CPT codes are the US physician billing codes. They are not used in other parts of the world. In this case study, for example, the hospital creating the ambulatory surgery facility was in Canada. Canadian physician billing codes and their corresponding anesthesia basic units cannot be used practically, because the codes are not available as electronic tables (Carole Steel, Ministry of Health of Ontario, Provider Services Branch, personal communication, 2000).

We hypothesized that we could develop a comprehensive list of procedures that could be done safely at this Canadian facility by using the following three steps. First, we would define broad categories of procedures (e.g., eye surgery) according to the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM). Then, we would identify which of the 86 categories are of a type that every procedure in the category has no more than the predetermined maximum threshold of seven ASA RVG basic units. We did this step twice, using different methodologies. Second, we would find, by using patient data from the study hospital, which other categories of procedures were of a type that all cases actually eligible for surgery at the new facility had seven or fewer basic units. This means that even though some of the procedures within the category had more than 7 U, they were either not done at the hospital or had a length of stay longer than overnight. Finally, we would use this list of procedures from the study hospital to decide for what categories of procedures the surgeons at the hospital performed an average of at least 8 h of ambulatory cases per week, making it worthwhile to perform the cases at the new ambulatory surgery facility.

Methods

We reviewed all 25,535 elective surgical cases done between April 1, 1999, and September 30, 2000, at two university-affiliated Canadian teaching hospitals. We included patients who were 11 yr or older and had hospital length of stays of 0 or 1 days, leaving 17,531 cases. We also excluded all orthopedic cases from the study, because surgeons did most of these cases at a different hospital from the two whose ambulatory cases were being consolidated.

We categorized the remaining 16,218 cases by using each case's primary ICD-9-CM procedure. This international standard is the US National Center for Health Statistics' modification of the World Health Organization's ICD-9. We did not use the World Health Organization's ICD-10 because it was not in use at the hospitals. ICD-9-CM coding contains many "categories," each of which refers to a specific body system (e.g., "operations on thyroid and parathyroid glands"). We wrote Excel Visual Basic computer code (Office 2000; Microsoft, Redmond, WA) to perform the analysis.

We reviewed all cases that had a primary ICD-9-CM category that had been done at the hospital at least 100 times (Tables 1 and 2). First, for each case reviewed, we got its primary ICD-9-CM procedure. From this ICD-9-CM procedure, by using a CPT/ICD Crosswalk, we obtained the corresponding CPT codes (Fig. 1). Each case's primary procedure had from 1 to 122 corresponding CPT codes. Second, for each of the possible CPT codes, we used the ASA 1999 Crosswalk to get the proper cross-referenced ASA RVG anesthesia basic units. Third, for all cases that had at least one corresponding CPT with seven or more basic units, we manually checked the CPT to ensure that it was relevant to the ICD-9-CM as the primary code. For example, ICD 65.39 is "other unilateral oophorectomy." One of the CPT codes for this ICD-9-CM code was

Table 1. Categories[a] of Procedures for Which All Cases' Procedures Had Seven or Fewer American Society of Anesthesiologists' *Relative Value Guide* (ASA RVG) Basic Units

ICD-9-CM classification	Classification of procedures	No. patients	Maximum no. ASA RVG basic units
8 to 16	Eye excluding the orbit	1876	6
18 to 19	External or middle ear	187	5
21	Nose	118	7
49	Anus	114	7
51	Gallbladder	408	7
53	Hernias, excluding diaphragmatic	253	6
54.21, 54.4, 54.51	Diagnostic laparoscopy, destruction of peritoneal tissue, lysis of adhesions[b]	311	6
58, 59.7	Urethra or bladder neck	197	6
65	Ovary	408	6
67	Cervix	1571	6
70	Vagina	294	7
71	Perineum	466	7
86	Skin	518	6

ICD-9-CM = International Classification of Diseases, Ninth Revision, Clinical Modification.
[a] There are 86 categories of procedures, represented by the first two digits of ICD-9-CM procedure codes.
[b] ICD-9 54 is "other operations on abdominal region." The ambulatory surgery procedures performed were these three ICD-9 codes.

Table 2. Categories of Procedures for Which All Cases Studied with Lengths of Stays of Zero Days or One Day Had Seven or Fewer ASA RVG Basic Units

ICD-9-CM classification[a]	Classification of procedures	No. patients	Maximum no. ASA RVG basic units	Observed maximum no. basic units
45 to 46	Intestine	2192	15	7
57	Bladder	330	8	6
68 to 69	Uterus	3047	8	6
85	Breast	1418	13	5

ASA RVG = American Society of Anesthesiologists' *Relative Value Guide*; ICD-9-CM = International Classification of Diseases, Ninth Revision, Clinical Modification.
[a] These are categories of procedures for which all cases performed at the hospital had seven or fewer basic units, even though within the categories there are procedures with more than seven basic units.

58210, "radical abdominal hysterectomy, with bilateral total pelvic lymphadenectomy and para-aortic lymph node sampling (biopsy), with or without oophorectomy." We excluded this CPT code from consideration, although we used ICD-9-CM 65.39, because in this context an ICD-9-CM code for radical abdominal hysterectomy would have been primary. Fourth, we recorded all categories of procedures for which all cases had seven or fewer basic units.

We also repeated the analysis, for results presented in Table 1, by using a different methodology from that described in the preceding three paragraphs. This method did not rely on patient data from the hospitals but on procedure codebooks. We manually reviewed the ASA RVG itself, which gives basic unit values for each anesthesia CPT procedure. We read for each description the relevant category of procedure (i.e., organ system). We compared the basic units with those that we had listed by using the above-mentioned analysis. Never did the maximum number of basic units differ.

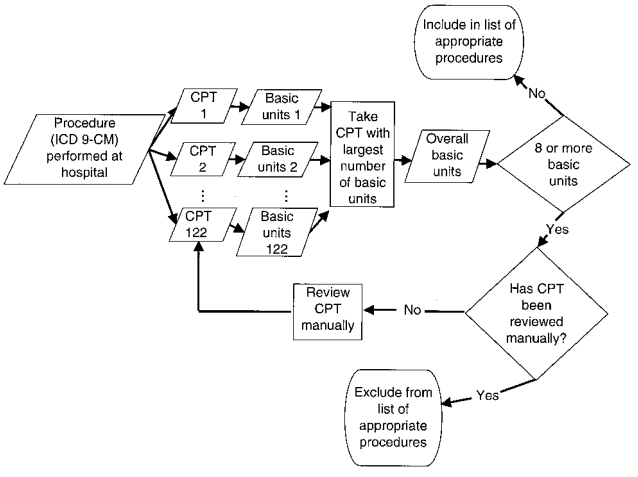

Figure 1. Methodology to identify the maximum number of basic units for each International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) procedure. The details are described in Methods. CPT = Current Procedural Terminology.

Table 3. Categories of Procedures for Which the Hospitals Under Study Had a Mean of At Least Eight Hours of Operating Room Time Per Week for Ambulatory Cases

Primary ICD-9-CM classification	Average no. hours per week	Description of the ICD-9 classification of procedures
85	25	Breast
13	18	Lens
45	13	Intestine
68	12	Uterus
86	10	Skin (e.g., plastic surgery, central line placements)
51	9	Gallbladder and biliary tract
65	9	Ovary
69	9	Uterus and supporting structures
14	8	Retina
67	8	Cervix

ICD-9-CM = International Classification of Diseases, Ninth Revision, Clinical Modification.

Results

We identified 22 categories of surgical procedures for which all procedures in a category (e.g., surgery on the lens) had seven or fewer ASA RVG basic units (Table 1). We identified six other categories of procedures for which the combination of length of stay of 0 days or 1 day and category was sufficient for all patients to have a maximum number of seven ASA RVG basic units or fewer (Table 2). For example, breast procedures have five or fewer basic units, except for unilateral (85.47) and bilateral (85.48) extended radical mastectomy. These two include the excision of internal mammary and mediastinal lymph nodes, giving 13 basic units. Yet no breast surgery case with a length of stay of 0 days or 1 day had ICD-9-CM codes of 85.47 or 85.48. Thus, all ambulatory breast surgery procedures had five or fewer basic units.

We then used this list of procedures to evaluate for what categories of procedures the surgeons at the hospital do enough ambulatory cases to make it worthwhile to do the procedure at the new ambulatory surgery facility. Nine of the categories of procedures had an average of at least 8 h of ambulatory cases per week at the hospitals (Table 3). All nine categories were ensured to have seven or fewer ASA RVG basic units, from Tables 1 and 2.

Discussion

Any facility can use Table 1 to list categories for which all procedures have seven or fewer basic units. Table 2 lists categories for which all cases at the hospital under study with a length of stay of 0 days or 1 day had seven or fewer basic units. However, since each category in Table 2 has procedures within it that have more than seven ASA RVG basic units, the results presented in Table 2 may not apply to some other facilities.

Table 2 would have contained more categories of procedures if it had been made for an ambulatory surgery facility at which patients could not stay overnight. Then, only patients with a length of stay of 0 days would have been included.

A limitation of our methods was that we did not consider differences between scheduled and actual procedures. This is unlikely to have affected our results. It is unusual for ambulatory surgery cases to have the scheduled and actual procedure(s) differ in the category (i.e., organ) of the procedure.

We did not include ASA physical status in our determination of a list of appropriate procedures for a new ambulatory surgery center. Although patient (ASA) physical status is an independent predictor of adverse patient outcome (4), the median ASA physical status of II is generally the same among facilities, even when ranging from an office-based dermatology practice to a tertiary surgical suite (1). Also, caring for an ASA physical status IV patient undergoing trigger-finger release under local anesthesia is probably less complicated than caring for an ASA physical status I patient undergoing donor hepatectomy. Still, the strength of the relationship between ASA physical status (i.e., patient condition) and adverse patient outcome (4) emphasizes the importance of preanesthesia evaluation and appropriate patient selection for each case.

We did not include the type of anesthesia in our calculations. The type of anesthesia is the previously reported method, other than using ASA RVG basic units (1), to assess anesthetic complexity over a wide range of surgical procedures (5–7). Yet the administrators, surgeons, and anesthesiologists at the hospital that we studied had already decided that the ambulatory surgery facility would do general anesthesia.

Tables 1 to 3 show that we succeeded at developing a systematic method to create a list of procedures of a given anesthetic complexity. Still, the extrapolation that these procedures can therefore be done safely at a free-standing ambulatory surgery facility is hypothetical. We have three reasons for thinking that this supposition is true.

First, we do know that there are marked differences in the distribution of ASA RVG basic units among all cases performed at different anesthetizing locations (e.g., office-based dermatological surgery practice versus ambulatory surgery center versus small rural hospital versus tertiary surgical suite). ASA RVG basic units can be used successfully to find cases that are seemingly unexpected for each location (1).

Second, the surgical risk score used by the American College of Cardiology and American Heart Association (8) both successfully predicts geriatric patients' in-hospital outcome (4) and is rank correlated to the ASA RVG basic units. Specifically, the "low-risk" procedures (e.g., cataract surgery) have fewer basic units than the "intermediate-risk" procedures (e.g., carotid endarterectomy) and "high-risk" procedures (e.g., aortic surgery).

Finally, we know that the Agency for Healthcare Research and Quality's Healthcare Cost and Utilization Project quality indicators include surgical procedures (e.g., pancreatectomy and coronary artery bypass grafting) that have been found to have strong relationships to quality of care at hospitals (9). There are Healthcare Cost and Utilization Project volume and mortality indicators for procedures with eight or more ASA RVG basic units, but not seven or fewer (9).

In summary, in this case study, we described a novel methodology to develop a comprehensive list of procedures with a prespecified maximum level of anesthetic complexity to be done at a new ambulatory surgery facility. If someone wants to know whether a certain procedure is sufficiently "minor" physiologically to be performed at the new facility, they can refer to Table 1 and 2 to determine whether the procedure is included within the approved categories.

References

1. Dexter F, Thompson E. Relative value guides in operating room scheduling to ensure compliance with anesthesia group policies for surgical procedures performed at each anesthetizing location. AANA J 2001;69:120–3.
2. Dexter F, Macario A. What is the relative frequency of uncommon ambulatory surgery procedures in the United States with an anesthesia provider? Anesth Analg 2000;90:1343–7.
3. American Society of Anesthesiologists' relative value guide 1999. Park Ridge, IL: American Society of Anesthesiologists, 1999.
4. Dzankic S, Pastor D, Gonzalez C, Leung JM. The prevalence and predictive value of abnormal preoperative laboratory tests in elderly surgical patients. Anesth Analg 2001;93:301–8.
5. Gil AV, Galarza MT, Guerrero R, et al. Surgeons and operating rooms: underutilized resources. Am J Public Health 1983;73:1361–5.
6. Khuri SF, Daley J, Henderson W, et al. The Department of Veterans Affairs' NSQIP: the first national, validated, outcome-based, risk-adjusted, and peer-controlled program for the measurement and enhancement of the quality of surgical care. Ann Surg 1998;228:491–507.
7. Twersky RS, Showan AM. Office-based anesthesia update: guidelines, education, and support are invaluable. ASA Newslett 1999;63:22–4.
8. Report of the American College of Cardiology and American Heart Association Task Force on Practice Guidelines (Committee on Perioperative Cardiovascular Evaluation for Noncardiac Surgery): executive summary of the ACC/AHA task force report for perioperative guidelines for perioperative cardiovascular evaluation for noncardiac surgery. Anesth Analg 1996;82:854–60.
9. Agency for Healthcare Research and Quality. Refinement of the HCUP quality indicators. Available at: http://www.ahrq.gov/data/hcup/qirefine.htm. Accessed May of 2001.