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Use of anesthesia on the rise in gastrointestinal endoscopy

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Abstract

Conscious sedation has been the standard of care for many years for gastrointestinal endoscopic procedures. As procedures have become more complex and lengthy, additional medications became essential for adequate sedation. Often time's deep sedation is required for procedures such as endoscopic retrograde cholangiography which necessitates higher doses of narcotics and benzodiazepines or even use of other medications such as ketamine. Given its pharmacologic properties, propofol was rapidly adopted worldwide to gastrointestinal endoscopy for complex procedures and more recently to routine upper and lower endoscopy. Many studies have shown superiority for both the physician and patient compared to standard sedation. Nevertheless, its use remains highly controversial. A number of studies worldwide show that propofol can be given safely by endoscopists or nurses when well trained. Despite this wealth of data, at many centers its use has been prohibited unless administered by anesthesiology. In this commentary, we review the use of anesthesia support for endoscopy in the United States based on recent data and its implications for gastroenterologists worldwide.

Key words: Propofol; Ketamine; Conscious sedation; Deep sedation; Anesthesiology; Gastrointestinal endoscopy

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INVITED COMMENTARY ON HOT ARTICLES

The fiberoptic endoscope, patented in 1956, has revolutionized the diagnosis and treatment of gastrointestinal disorders[1]. Since its introduction, the indications for use of the gastroscope and colonoscope have grown exponentially, and newer endoscopic tools including the side viewing and double balloon endoscopes with the ability to perform endoscopic therapy have further expanded these indications. According to a national survey of the general population in 2010, 54.6% of Americans underwent colon cancer screening with colonoscopy at least once within the past 10 years[2]. This number is expected to rise further given recent evidence suggesting a 53% reduction in colon cancer mortality from colonoscopy and polypectomy[3]. Additionally, colonoscopy has become the standard diagnostic tool for the investigation of other colonic complaints including rectal bleeding, change in bowel habits, abnormal radiological findings, anemia, and abdominal pain.

Healthcare expenditures in the Unites States have been climbing significantly, and the use of anesthesia services for endoscopy is no exception. In 2010, healthcare costs exceeded $2.6 trillion dollars, which is twice the amount spent in 2000, and ten times the national cost in 1980[4]. In the wake of escalating health care costs, attention at the national level has been given to cost-cutting measures in all healthcare sectors. One area of potential cost-savings is minimizing overuse of medical services. For example, Korenstein *et al*[5] reviewed recent

literature related to the overuse of procedures, tests, and medications between 1978 and 2009. They found evidence of overuse in 18.4%-60.8% of colonoscopies and 5.2%-23.0% of upper endoscopies. Likewise, the burgeoning use of anesthesia support for gastrointestinal procedures has further escalated the overall cost for endoscopy. In this article, we summarize a recent important study that examines the actual trends in sedation utilization across the United States in the past few years reported by Liu *et al*[6] and discuss selected aspects of anesthesia support for endoscopy.

Liu *et al*[6] recently reported on the overall utilization of anesthesia services for gastrointestinal procedures in the United States and assessed temporal changes and geographic patterns. The authors analyzed data from insurance claims paid by medicare and commercial health insurers for services provided between 2003 and 2009. The authors used data from the Medicare Limited Data set which is a nationally representative sample comprised of 5% of the general population. Data about commercial insurers were taken from the MarketScan data set which holds information from approximately 150 commercial health plans, about 40 million commercially insured individuals, who comprise 20% of the population covered by employer-sponsored healthcare plans. They evaluated all patients who underwent outpatient upper and lower endoscopy over the 6 year period. Exclusion criteria included patients younger than 18 years of age and patients with incomplete claims data for the 6 mo prior to the endoscopy. They calculated the number of upper and lower gastrointestinal endoscopies, the proportion of procedures which used anesthesia services, the average and aggregate payments for these services, and the proportion of anesthesia services utilized for patients deemed low-risk for conscious sedation. They defined low-risk patients as those with American Society of Anesthesiologists (ASA) physical status 1 or 2. Patients without an associated ASA physical status classification in the insurance claim were assigned one based on a predictive statistical model. They estimated the patient's likelihood of having an ASA physical status of 3 or higher based on age, gender, comorbid medical conditions, and any inpatient hospitalization within the 3 mo prior to the procedure. Pertinent comorbidity contributing to anesthesia risk included cardiopulmonary conditions such as cardiac arrest, congestive heart failure, chronic obstructive pulmonary disease, coronary artery disease, asthma, and cystic fibrosis. A number of other additional medical conditions were used as predictors like cerebrovascular disease, hypertension, peripheral artery disease, *etc*.

They found that 26.6% of 1.1 million Medicare patients had anesthesia services billed for either an upper endoscopy or colonoscopy. Of the 5.5 million privately insured patients, about 28.6% of patients had billed for anesthesia services. For medicare patients, the number of procedures per million patients remained steady at 136 718 from 2003 to 2009. While the number of gastrointestinal procedures per million for privately insured patients grew, however, by more than 50% from 33 599 in 2003 to 50 816 in 2009. Over that same time period, the percentage of procedures utilizing anesthesia services for endoscopy rose in both cohorts. The proportion of medicare patients undergoing gastrointestinal endoscopy with anesthesia support grew from 13.5% in 2003 to 30.2% in 2009. Similarly, anesthesia support for procedures among privately insured patients grew from 13.6% to 35.5% in the same time period. Marked geographic variations were also found. The lowest region was the West with 14% of medicare patients and 12.6% of privately insured patients utilizing anesthesia in 2009, while the highest was the Northeast region with 47.5% of medicare patients and 59% of privately insured patients billing for anesthesia services for endoscopy.

The most significant finding in this study was the large number of patients deemed as low-risk who received anesthesia services for their procedures. Overall of the studied patients, approximately two-thirds of the medicare patients with ASA physical status level < 3 and more than three-quarters of commercially insured patients had anesthesia support for their procedures. This represents an almost doubling of the Medicare patients over the course of the study, increasing from 13 989 per 1 million in 2003 to 25 069 per 1 million in 2006. For privately insured patients, the increase was more dramatic rising from 3938 to 15 108 per 1 million patients, representing an almost 4 fold increase.

This study has much strength. It is one of the most exhaustive studies published utilizing a large population of both government and privately insured patients. With a total of 6.6 million patients across the United States, it covers a variety of racial, socioeconomic, and geographic backgrounds. The authors were able to overcome the possible lack of information inherent to studies examining records of specific hospitals because insurance billing information enabled them to evaluate all available records regardless of healthcare system. The major weakness was the definition of high and low risk patients. The basic assumption was that patients with ASA physical status > 2 are at higher risk for complications and would thus benefit from anesthesia services. There are, however, few studies which compare the risk of complications associated with moderate sedation *vs* deep sedation in these particular patient groups although prior studies show a link between cardiopulmonary complications and ASA class with conscious sedation[7]. Secondly, only 14.1% of the study population had ASA physical status documented. As noted above, the investigators used a calculated predictive model for the rest of their population. This mathematical model utilized a number of diagnoses and criteria to determine the patient's risk but provided no evidence to confirm the accuracy of this statistical model. Lastly, this study excluded children under the age of 18, hospitalized patients, patients covered by Medicaid, and those paying out of pocket. These populations, particularly self-paying patients, could alter the percentage of patients necessitating anesthesia services.

The increasing use of anesthesia support by anesthesia specialists for both diagnostic and therapeutic endos-

copy revolves around the use of propofol. Since its introduction in the 1980's, its use has slowly expanded into endoscopic sedation principally because of its pharmacologic properties: it is a very short acting sedative agent without analgesic effect resulting in both sedation and amnesia[8]. A wealth of data including randomized controlled trials has shown that non anesthesiologist administered propofol (NAAP) is both safe and effective[9-14]. This data has been generated worldwide including from Asia[15,16]. For example, randomized trials comparing NAAP to meperidine and midazolam combinations have shown no difference in hypoxemia, bradycardia, or need for airway interventions[9]. Indeed, these studies show the safety of NAAP is comparable to endoscopist administered standard sedation. Most studies do demonstrate NAAP sedation is superior to standard sedation regarding time to sedation as well as speed of recovery. Patient satisfaction with propofol is variable from equivalent to slightly superior to the standard regimens. It should be stressed, however, that the reporting of the use of NAAP comes from centers with much experience in its administration and only after a rigorous training program for administering staff.

Despite this apparent efficacy and safety, the use of propofol by non-anesthesiologists is a highly charged area both in the United States and abroad[17,18]. In the United States, the labeling on propofol states that "it should be administered only by persons trained in the administration of general anesthesia". Recently, the United States Food and Drug Administration denied a change in this labeling thus essentially preventing the use of gastroenterologist administered propofol for endoscopic procedures. Increasingly, anesthesia societies suggest that patients undergoing deep sedation which can occur during endoscopy require a similar level of care to those undergoing general anesthesia[19,20]. More recently, many institutions such as our own have established policies where other agents resulting in deep sedation such as ketamine are being withheld from the gastroenterologists purview thus essentially forcing the use of anesthesia services for complex patients that in the past were safely managed by the gastroenterologist.

For many years, the standard of care for endoscopic procedures was sedation with benzodiazepines and narcotics, referred to as conventional or conscious sedation. However, with the availability of propofol, much literature has been dedicated to the increasing use of propofol and monitored anesthesia care (MAC) sedation in gastrointestinal endoscopy as compared to conventional sedation[21-25]. In addition, many gastroenterologists favor the use of propofol because of more rapid patient recovery and better patient tolerance[21].

Without question, a major reason for the increasing use of NAAP for gastrointestinal procedures is a financial one. Because it provides for quicker sedation, recovery, and discharge, gastroenterologists are able to be more efficient in providing endoscopy to patients. Vargo *et al*[26] showed the gastroenterologists were able to perform three colonoscopies under propofol sedation in the time it takes to perform two colonoscopies with conventional sedation. This significant improvement in efficiency translated into measurable decreases in the operating costs, nurse requirements, and bed requirements in the recovery area. In addition, the payment to anesthesiologists by private insurance as documented by Liu *et al*[6] is another economic driver and perhaps one reason for the increasing interest in performing endoscopic procedures by the anesthesiology community. However, Cohen *et al*[27] postulated that the cost of anesthesia services used for every endoscopic procedure annually could amount to $8 billion per year and other models support this large financial cost[28]. This is based on an average cost of $400 for anesthesia with endoscopy, although this number is somewhat variable. No study to date documents whether the expediency benefits of anesthesia care provides sufficient economic cuts to offset its additional cost if used for all 20 million endoscopic procedures performed annually in the United States.

Although anesthesia administered propofol is increasingly used worldwide, other options for sedation exist but are overlooked and perhaps underused in the general community. One such practice is the use of unsedated procedures[29-31]. Dumortier *et al*[29] studied 1100 patients in 3 institutions in France who underwent unsedated transnasal upper endoscopies. These patients underwent EGD for various indications with either a 5.9 mm or 5.3 mm endoscope. They found the procedure was feasible in 93.9% of patients. In those that failed, the cause was unsuccessful insertion in 62.7% of the times, patient refusal in 19.4% of the times, and pain in 17.9% of the times. Characteristics associated with failure were young age, female sex, and the need for larger endoscopes. A similar study was performed for unsedated colonoscopy. Petrini *et al*[30] performed 2091 colonoscopies between June 6, 2006 and December 7, 2006 in an ambulatory endoscopy center in California. These patients were given the option to have the procedure with or without sedation. 578 patients (27.6%) started without any sedation. Of these patients, 470 (81.1%) completed the exam without any sedation. Cecal intubation rates were similar in the sedated and unsedated groups, 99.1% and 97.4% respectively. Most importantly, about 97.4% of the patient who underwent unsedated colonoscopies were satisfied with their comfort level and would be willing to under go their next colonoscopy without any sedation. The time to cecum in these patients was not significantly different in the sedated and unsedated patients, 9.71 min *vs* 9.87 min respectively. It, however, was significantly different for those who required sedation after the procedure started with a mean cecal intubation time of 15.24 min. This significant delay in time would prevent many gastroenterologists from pursuing this option seriously unless there was some way to predict the patient that would not tolerate unsedated procedures.

It is not yet clear which option best maximizes patient safety, patient and provider satisfaction with the endoscopy experience, and cost saving. The desire to use propofol over benzodiazepines and narcotics is obvious

because it shortens the endoscopy time, while improving the experience for both the patient and the endoscopist. The use of an anesthesiologist for more complicated procedures is intuitive particularly in those with significant comorbidity (ASA Class 4 or greater) or risk factors for complications. However, we previously found that even in these patients the use of standard conscious sedation supplemented with low dose ketamine was highly effective and safe[32] and such a sedative cocktail may be of benefit in regions of the world where an anesthesiologist is not available. Certainly the lack of formal training in the use of sedatives in gastrointestinal fellowship does affect the practices of gastroenterologists in the community. Thus the utilization of anesthesia services for MAC and propofol may stem from lack of experience with the use of sedatives such as propofol or the desire to avoid the legal liability it involves. It also allows the endoscopist to abdicate the responsibility of sedation and monitoring to another trained medical staff, allowing them to focus on the endoscopy solely. That being said, the most recent recommendations from the ASGE standards of practice committee in 2008[33] suggest that the use of anesthesia services for MAC or propofol sedation in gastrointestinal endoscopy is indicated only for patients undergoing prolonged or therapeutic endoscopic procedures that require deep sedation, patients with anticipated intolerance to conventional sedation, patients with severe comorbidities (ASA physical status class Ⅲ or higher), and patients with higher risk of airway obstruction due to some anatomical variant. Similar guidelines have been published by the American Society of Anesthesiologists Task Force[34].

In addition to the discussion regarding sedation, technical factors may play a role in the decision to use conscious sedation *vs* propofol-based sedation. Methods to reduce discomfort during endoscopy, principally colonoscopy, such as the use of carbon dioxide insufflation[35], water aided colonoscopy[36] as well as an ultrathin colonoscopy[37,38].

More studies are needed to prove improved safety or decrease in healthcare costs before anesthesia can become the new standard for endoscopic procedures. However the "cat may be out of the bag" given the widespread use of propofol, the increasing pressure from consumers, the burgeoning use of narcotics and other medications making conscious sedation more difficult, and stringent regulations on the use of drugs such as ketamine and propofol by the government and anesthesia societies.

Ultimately, the decision to use conscious sedation, nurse-administered propofol sedation, or anesthesia provided propofol will be dictated by the expertise of the physician and the local environment. In areas of the world where the use of NAPS and ketamine are not restricted, these could be used more liberally with the assurance that the providers are well experienced in the pharmacology of the medications and rescue. Ketamine is a wonderful addition to conscious sedation and should be used more. At our institution, however, despite our experience with using ketamine and its remarkable safety, we are now limited by our hospital policy such that we cannot provide deep sedation and must rely on anesthesia support for difficult to sedate patients. Like much we do in medicine, sedation for endoscopic procedures is an art.

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