

Safety of intravenous midazolam and fentanyl for pediatric GI endoscopy: prospective study of 1578 endoscopies CME

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Background: Data on safety of intravenous sedation in pediatric GI endoscopy are sparse.

Objective: To evaluate safety of intravenous sedation for GI endoscopy.

Design/Setting: Single-center prospective series of outpatient GI endoscopies performed from February 2003 to February 2004 at The Children's Hospital of Philadelphia. The recorded information included demographic, medication, and adverse event data.

Patients: A total of 1226 patients were studied.

Main Outcome Measurements: Description of adverse events relating to intravenous sedation.

Results: A total of 2635 endoscopies were performed, of which 1717 were outpatient procedures with the patient under intravenous sedation. Sedation data were available on 1578 procedures (92%, M/F 674/552): 758 esophagogastroduodenoscopies (EGD) alone, 116 colonoscopies (COL) alone, and 352 combined EGD and COL. The median dose of fentanyl was 2.77 µg/kg (SD 0.97, range 0-6.73), and of midazolam was 0.11 mg/kg (SD 0.06, range 0-0.39). The mean recovery time was 118 minutes (SD 47.3, range 31-375). Ten patients (0.8%) failed intravenous sedation. Serious adverse events (apnea) were noted in 2 patients (0.2%). Mild or moderate adverse events included desaturation below 92% for less than 20 seconds (100 patients, 9%), vomiting (64 patients, 5%), agitation (15 patients, 1%), desaturation below 92% for greater than 20 seconds (12 patients, 0.7%), and rash (8 patients, 0.7%). No cardiopulmonary resuscitation or sedation reversal was necessary. No patients required hospitalization. Patients younger than 6 years were more likely to develop respiratory adverse event ($P < .01$).

Conclusions: Intravenous sedation with midazolam and fentanyl is safe for pediatric GI endoscopy. Serious adverse events are rare and no patient required hospitalization. (Gastrointest Endosc 2007;65:203-10.)

GI endoscopy can be completed without sedation, by using intravenous sedation, or with general anesthesia.¹⁻³ Although it has been reported that highly motivated pediatric patients can undergo endoscopy without sedation, endoscopic procedures in children and adolescents in the United States are uniformly performed with the patient under some form of sedation.^{1,4} This is a topic much debated over the last decade, and there is no consensus on the best sedation technique. Sedation practices vary widely in the United States; a recent study in France demonstrated the degree of variation that may occur in

1 country.⁵ Various medication combinations have been used for pediatric sedation, including intravenous ketamine, diazepam, midazolam, meperidine (pethidine in Europe), and fentanyl.^{2,6-9} Inhaled agents (sevoflurane and nitrous oxide) and intravenous propofol have been investigated.¹⁰⁻¹² Some pediatric centers use general anesthesia as their primary modality.¹³ Standard sedation practice at our institution is to use intravenous fentanyl and midazolam for the vast majority of endoscopic GI procedures as described in a retrospective case series of 61 children undergoing upper endoscopy.² A prospective experience with intravenous midazolam alone in 257 children was recently published.¹⁴

Intravenous sedation for GI endoscopy is frequently referred to as conscious sedation, although the more appropriate term is moderate sedation.¹⁵ Moderate sedation is

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0016-5107/\$32.00

doi:10.1016/j.gie.2006.05.002

defined as a drug-induced depression of consciousness during which patients respond purposefully to verbal commands, either alone or accompanied by light tactile stimulation, no interventions are required to maintain a patent airway, spontaneous ventilation is adequate, and cardiovascular function is usually maintained. The depth of sedation during procedures varies widely, and many patients drift from moderate to deep sedation.¹⁶ The updated American Academy of Pediatrics guidelines for management of patients undergoing sedation define deep sedation as “a medically controlled state of depressed consciousness or unconsciousness from which the patient is not easily aroused.”¹⁷ Therefore, it is recognized that nonanesthesiologists administering sedation should be trained in administering resuscitative measures (advanced life support), and 1 person should be solely in charge of sedation monitoring.^{15,18}

Large prospective studies investigating pediatric endoscopy sedation adverse events do not exist, and, therefore, we aimed to prospectively investigate the safety profile of intravenous sedation with midazolam and fentanyl for pediatric GI endoscopy in a large cohort of patients.

PATIENTS AND METHODS

We conducted a prospective analysis of a cohort of pediatric patients who underwent GI endoscopy at a single center during a 12-month period between February 2003 and February 2004. The institutional review board at The Children’s Hospital of Philadelphia (CHOP) approved the study.

Inclusion criteria

All patients undergoing outpatient GI endoscopy at The Children’s Hospital of Philadelphia during the study period were deemed eligible.

Exclusion criteria

The following criteria were applied: (1) inpatient status, (2) procedures performed in the operating room (the information on recovery was not available), and (3) administration of general anesthesia. By using the American Society of Anesthesiologists (ASA) score, the patients were assessed for the risk of complication with sedation. Patients with a score of III or higher were evaluated by the anesthesiology team regarding a need for general anesthesia. General anesthesia was scheduled for therapeutic procedures (dilation therapy, esophageal varices therapy, therapy of acute GI bleeding, and foreign-body removal), and if the patient had a history of behavioral problems or had previously failed intravenous moderate sedation.

The data collected included the following: patient’s age, sex, and weight; type of sedation (intravenous or general anesthesia); type and amount of medication used; sedation time (defined as the time from the onset of intra-

Capsule Summary

What is already known on this topic

- Intravenous ketamine, diazepam, midazolam, meperidine, and fentanyl have been used for sedation in pediatric GI endoscopy.

What this study adds to our knowledge

- In a single-center prospective study of 1578 pediatric endoscopic procedures performed when using fentanyl and midazolam for sedation, serious adverse events (apnea) were noted in 2 patients (0.2%); mild or moderate adverse events included desaturation below 92% for <20 seconds in 9%, vomiting in 5%, and agitation in 1%.
- No cardiopulmonary resuscitation or sedation reversal was necessary.

venous sedation to the onset of procedure); time to complete the procedure; recovery time (the time from the completion of the procedure to discharge); sedation failure (defined as failure to complete procedure because of inadequate sedation); and vital signs, which were obtained immediately before the procedure and immediately after the completion of the procedure. The following adverse events were recorded: hypotension (decrease by 20% from baseline and below normal for age), hypertension (increase by 20% from baseline and above normal for age), bradycardia (decrease in heart rate by 30% from baseline and below normal for age), skin reaction, chest rigidity, vomiting, paradoxical reaction (defined as agitation), transient oxygen desaturation ($\text{SaO}_2 < 92\%$ for <20 seconds), and prolonged oxygen desaturation ($\text{SaO}_2 < 92\%$ for >20 seconds), apnea, and cardiac arrest. Actions taken and medications given for the treatment of adverse events were recorded and included the following: spontaneous resolution, intravenous fluid bolus, increase in oxygen supplementation, patient stimulation (tactile or auditory stimulation, sternal rub), jaw thrust, bag and mask ventilation, intubation, cardiorespiratory resuscitation (chest compressions), sedation reversal medications (flumazenil and naloxone), and medication used to treat other adverse events (diphenhydramine for skin rash or agitation, flumazenil for agitation, and ondansetron for vomiting). The information on indications and endoscopy findings were not recorded.

Procedures and equipment

Parents or legal guardians of all patients scheduled for an endoscopy at CHOP are contacted several days before the procedure and given detailed instructions regarding the endoscopy protocol and necessary preparations. Patients are allowed to drink clear liquids after midnight on the day of the procedure but are instructed to take nothing by mouth 3 hours before outpatient EGD and

colonoscopy (COL). Preparation for outpatient COL included 1 day of full liquid diet, followed by a day of clear liquids (24 hours preceding the procedure). An oral dose of senna was given for 2 days before the procedure and an enema (given to children older than 2 years) was administered on the morning of the procedure. Older adolescents were given a choice of an oral phosphate solution (Fleet Phosphosoda, C.B. Fleet Co, Inc, Lynchburg, Va) preparation, which included a liquid oral diet 1 day before the procedure, in addition to two 45-mL oral phosphate solution doses.

After arrival to the endoscopy suite, the patient is weighed and vital signs are obtained. Intravenous access is established, and the patient is brought to the procedure room accompanied by parents or guardians. Consent for the procedure is obtained. Cardiorespiratory monitoring (Dinamap ProSeries 300; General Electric Co, Medical Systems, Hamburg, Germany), including oxygen saturation, heart and respiratory rate, and blood pressure measurements, is performed. Vital signs are documented every 5 minutes for the duration of the procedure. After sedation is administered, parents are asked to leave the procedure room, and the patient is positioned for endoscopy. Young children up to approximately 6 years of age are placed in a physical restraint for upper endoscopy. All patients received 2 L of supplemental oxygen per minute via a nasal cannula for the duration of the procedure. After completion of the procedure, repeat sets of vital signs are obtained, and the patient is transferred to the recovery area, where cardiorespiratory monitoring is continued. The medication dosing and monitoring during endoscopy and recovery are performed according to the CHOP sedation protocol. Patients are discharged home when they are medically fit and meet discharge criteria (awake, alert, able to follow commands, tolerate at least 120 mL of oral fluid without emesis for children 3 years and older, and have stable vital signs). All the personnel involved in the care of patients in the endoscopy suite are certified in pediatric advanced life support. The team consists of a registered nurse, who monitors the patient; a technician, who assists the endoscopist; and an attending physician, who performs the procedure and administers sedation; and, in some instances, a pediatric gastroenterology fellow.

Medications used for sedation include intravenous midazolam (2 mg/2 mL; Bedford Laboratories, Bedford, Ohio) and fentanyl (100 mcg/2 mL; Baxter Healthcare Corp, Deerfield, Ill). The medications are administered in slow intravenous boluses up to 1 minute in duration. Midazolam dosing administered was 0.05 to 0.1 mg/kg, and fentanyl was 1 mcg/kg. The maximum individual dose given is 2 mg for midazolam and 75 mcg for fentanyl. The maximum recommended total dose is 0.5 mg/kg of midazolam, and 5 mcg/kg of fentanyl. Other medications used include oral midazolam for patients exhibiting anxious behavior before the procedure, and intravenous diphenhydramine as additional sedative if the recommended

maximum total dose of other medications was reached without the desired effect.

The equipment used included standard pediatric and adult endoscopes and colonoscopes (PCF-160AL, GIF-XP160, GIF-160, SIF-100, GIF-XQ140; Olympus America, Inc, Lake Success, NY), depending on patient age and size. During an upper endoscopy, 2 biopsy specimens were routinely obtained from the esophagus, the stomach, and the duodenum.

Statistical analysis was performed by using the χ^2 test for categorical variables and the Student *t* test for continuous variables. Statistical significance was defined as a *P* value of $\leq .05$. Calculations were performed by using the statistical software package Stata 7.0 (Stata Corp, College Station, Tex).

RESULTS

During the study period, a total of 2635 EGD and COL were performed, of which 2041 were outpatient procedures (Fig. 1). Of these, 324 (16%) were performed with the patient under general anesthesia and 1717 procedures were performed with the patient under intravenous sedation. Sedation data were obtained on 1578 procedures (92%) performed under intravenous sedation on 1226 outpatients (45% girls). A total of 758 EGD alone, 116 COL alone, and 352 combined EGD and COL were performed. Fourteen patients had incomplete data collected. Five patients received midazolam only and 1 patient received fentanyl only and were excluded from the study.

The demographic data are presented in Table 1. The median age was 10 years (mean, 9.05 years; standard deviation [SD], 5.8 years; range, 0.1-34 years). Fifty-five patients (4%) were 18 years and older. Ten patients (0.8%) failed conscious sedation. The COL completion rate was 84% to the cecum and 70% to the terminal ileum when 62 flexible sigmoidoscopies (13%) were excluded. Fourteen patients (3%) did not have the extent of COL documented, and 28 patients (6%) had documented the reason for incomplete examination: severe inflammation or stricture in 13, poor bowel preparation in 12, and inadequate sedation in 3 patients. Those were counted as incomplete examinations. When procedures with no documentation on the extent of COL and the reason for incomplete examination were excluded, the cecal intubation rate was 91%. The cecal/TI intubation rate was higher in children older than 10 years compared with younger children ($P < .001$).

The median dose of fentanyl was 2.77 $\mu\text{g}/\text{kg}$ (mean, 2.84 $\mu\text{g}/\text{kg}$; SD, 0.97 $\mu\text{g}/\text{kg}$; range, 0-6.73 $\mu\text{g}/\text{kg}$), and the median dose of midazolam was 0.11 mg/kg (mean, 0.13 mg/kg; SD, 0.06 mg/kg; range, 0-0.39 mg/kg). The maximum dose of medication per procedure was 12 mg of midazolam and 300 μg of fentanyl. The mean dose of fentanyl per age group, and the procedure type and the

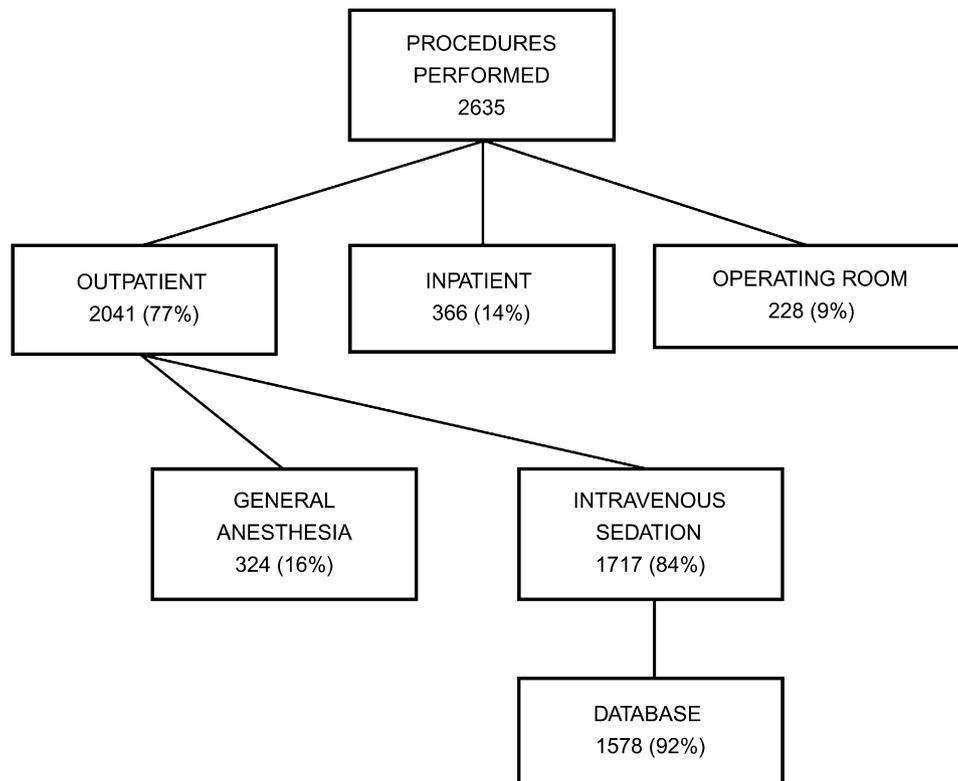


Figure 1. Number of procedures performed during the study period.

mean dose of midazolam per age group and procedure type are presented in Table 2. The overall mean dose of fentanyl used for EGD alone was 2.6 $\mu\text{g}/\text{kg}$ (SD, 0.85 $\mu\text{g}/\text{kg}$; range, 0.43-5.86 $\mu\text{g}/\text{kg}$), and the mean dose of midazolam was 0.13 mg/kg (SD, 0.06 mg/kg; range, 0.02-0.39 mg/kg). The overall mean dose of fentanyl used for COL alone was 2.99 $\mu\text{g}/\text{kg}$ (SD, 0.85 $\mu\text{g}/\text{kg}$; range, 1.21-5.72 $\mu\text{g}/\text{kg}$), and the mean dose of midazolam was 0.10 mg/kg (SD, 0.04 mg/kg; range, 0.04-0.26 mg/kg). Patients who underwent both procedures did not require significantly more medication than patients who underwent a single procedure. Patients in the 0- to 2.99-year-old age group required more midazolam when compared with children in the 2 older groups for both EGD alone and COL alone ($P < .05$). Patients older than 10 years required more fentanyl when compared with children in the younger 2 groups for EGD alone and more than children in the 3- to 9.99-year-old group for COL alone ($P < .05$). In addition to fentanyl and midazolam, diphenhydramine was required to achieve adequate sedation in 12 patients (1%). Oral midazolam was used in 39 patients (3%).

The mean sedation time was 10.75 minutes (SD, 4.07 minutes; range, 1-31 minutes) and did not differ by procedure type or age. The median EGD time was 6 minutes (mean, 7.08 minutes; SD, 3.8 minutes; range, 1-35 minutes) and the median COL time was 24 minutes (mean, 26.31 minutes; SD, 14.26 minutes; range, 4-88 minutes) when flexible sigmoidoscopies were excluded. No

difference was noted in procedure times among different age groups. The mean recovery time was 118.0 minutes (SD, 47.3 minutes; range, 31-375 minutes). The average recovery time per procedure and age are depicted in Table 3. Older patients required more time to recover after EGD and if both procedures were performed at the same time.

Adverse events

Overall, 308 patients experienced adverse events (25% of patients, 95% confidence interval [CI] 0.227-0.275; 20% of procedures). Respiratory adverse events occurred in 9% of patients, 95% CI 0.076-0.109, and comprised 34% of all adverse events. There was no difference in the proportion of adverse events based on procedure type ($P = .34$). No patients required hospitalization, and no unexpected adverse events were noted.

Respiratory adverse events. One hundred patients (8%) experienced desaturation below 92% for <20 seconds, and 12 patients (1%) experienced desaturation for >20 seconds. Of the 12 patients with prolonged desaturation, 2 experienced apnea (0.2%). Patients younger than 6 years were more likely to develop desaturation ($P < .01$). The procedure type did not influence the likelihood of desaturation events ($P = .34$). Adverse events were not seen in children who received more than 2 medications for sedation. No chest-wall rigidity was noted.

Cardiovascular adverse events. Thirty-nine patients (3%) experienced hypertension, and 96 experienced hypotension (8%). No bradycardia was noted. No cardiac arrest was noted.

Other. Skin rash was recorded in 8 (0.6%), agitation in 15 (1%), and vomiting during recovery in 64 patients (5%). No pulmonary aspiration was noted. The total medication dose was not associated with a higher risk of vomiting ($P = .75$).

Therapy per adverse event. Treatment for respiratory adverse events included an increase in oxygen supplementation from a baseline 2 L/min (116 patients), tactile stimulation in 16 patients, jaw thrust in 5 patients, and bag and mask ventilation in 2 patients who experienced apnea. No intubation or sedation reversal was required during endoscopy. Twenty patients were treated with intravenous fluid bolus for hypotension. During the recovery period flumazenil was used in 2 (0.2%), ondansetron in 30 (3%), and diphenhydramine in 10 patients (0.8%).

DISCUSSION

Several modes of sedation for pediatric GI endoscopy exist, but very few have been investigated in a prospective fashion in a large group of patients. Our aim was to investigate the safety of intravenous sedation with midazolam and fentanyl for outpatient GI endoscopy. We performed approximately 80% of endoscopic procedures by using a combination of intravenous fentanyl and midazolam because previous data from our institution supported this practice.² These medications are also frequently used by adult gastroenterologists, although propofol has been gaining wide acceptance and has an excellent safety profile, with more than 20,000 adult patients reported in the literature.^{19,20} In the pediatric age group, this anesthetic is administered exclusively by anesthesiologists, which increases the cost of the procedure.²¹ A retrospective case series from Arkansas Children's Hospital described successful anesthesiologist-administered propofol for pediatric endoscopy.²² Kaddu et al²³ found that propofol required less anesthesia time and faster recovery than an inhaled anesthetic; however, transient apnea was seen in 20% of children who underwent EGD. Finally, a prospective trial of nonanesthesiologist, resident-administered propofol for pediatric procedures found no significant complications with oxygen supplementation for COL but not EGD.²⁴

The population included in this study encompassed children and adolescents, as well as young adults. We decided to present all the collected data and not only of patients younger than 18 years old, because this was representative of our daily practice and likely that of many academic centers in the United States. Only 4% of patients were 18 years and older, and the rates of adverse events did not significantly differ if these patients were excluded from the analysis.

TABLE 1. Demographic and adverse event data

No. patients	1226
No. boys (%)	674 (55)
No. girls	552
Median age, y	10
No. EGD	758
No. COL	116
No. both	352
EGD median time, min	6
COL median time, min	24
Sedation median time, min	10.75
Recovery mean time, min	118
COL completion rates, no. (%)	
Terminal ileum	283 (70)
Cecum	57 (14)
Adverse events, no. (%)	
Respiratory	
Desaturation <20 s	100 (9)
Desaturation >20 s	12 (1)
Apnea	2 (0.2)
Other adverse events, no. (%)	
Hypotension	96 (8)
Vomiting	64 (5)
Hypertension	31 (3)
Agitation	15 (1)
Rash	8 (0.7)

The average doses of medication used were the same as in the previous study from our center but higher than commonly used in adults if calculated per body weight.² The most likely explanation is that children metabolize these medications differently. For example, Tolia et al showed that children between ages 8 and 17 years have greater clearance and a shorter terminal half-life of midazolam compared with adults, which was seen in other pediatric trials as well as in younger vs older adults (24-33 years old vs 60-74 years old).²⁵⁻²⁸

The mean recovery time was longer than previously noted, and older children required significantly more time to recover from EGD. It is not clear why, because the dose of medication used was not higher in older children, but may indicate differences in drug metabolism at different ages. This implies that there is a need for better sedation medications, with shorter recovery time, to reduce the number of staff necessary to recover patients

TABLE 2. Mean midazolam and fentanyl dose by procedure type and age

	N	0-2.99 Y old	N	3-9.99 Y old	N	> 10 Y old
Midazolam		mg/kg (SD, range)		mg/kg (SD, range)		mg/kg (SD, range)
EGD	196	0.17 (0.05, 0.05-0.39)	251	0.14 (0.05, 0.22-0.29)	305	0.09 (0.03, 0.03-0.21)
COL	3	0.23 (0.03, 0.20-0.26)	19	0.14 (0.05, 0.05-0.25)	92	0.09 (0.03, 0.04-0.17)
Both	66	0.18 (0.06, 0-0.35)	56	0.18 (0.06, 0.05-0.31)	229	0.12 (0.04, 0-0.29)
Fentanyl		mcg/kg (SD, range)		mcg/kg (SD, range)		mcg/kg (SD, range)
EGD	191	2.72 (0.9, 0.8-5.9)	252	2.79 (0.84, 0.4-5.1)	305	2.37 (0.75, 0.8-5.3)
COL	3	3.86 (1.48, 2.2-5)	19	3.55 (0.92, 1.48-5.14)	92	2.85 (0.76, 1.21-5.72)
Both	66	2.85 (1.09, 0-6.17)	56	3.62 (1.18, 1.25-6.73)	229	3.34 (1.0, 0.03-6.53)

TABLE 3. Mean recovery time in minutes by procedure type

	0-2.99 Y old	3-9.99 Y old	> 10 Y old
	min (SD, range)	min (SD, range)	min (SD, range)
EGD* † ‡	101.1 (40.8, 31-245)	118.4 (66.6, 40-845)	132.9 (48.1, 45-375)
COL	125.3 (71.9, 65-205)	106.5 (38.5, 45-160)	116.4 (43.4, 45-270)
Both* †	94.4 (41, 40-202)	123 (50.4, 50-267)	125 (43.2, 45-287)

*P < .05 for 0-2.99 y old vs 3-9.99 y old.

†P < .05 for 0-2.99 y old vs > 10 y old.

‡P < .05 for 3-9.99 y old vs > 10 y old.

and to decrease the procedure cost. Alternatively, discharge criteria may need to be revised, because the requirement of liquid tolerance may not be necessary before discharge.²⁹ In addition, more objective discharge criteria will need to be used in future trials to be truly reflective of recovery. Younger children required more medication and a longer time to recover from COL. Although these differences were statistically significant, it is questionable whether they are clinically meaningful.

In this study, we detected a relatively high overall rate of adverse events in 20% of procedures. This rate is higher than that commonly reported, and there may be several explanations. Our study was prospective, and we used very strict criteria in defining adverse events. If only significant respiratory adverse events, such as prolonged desaturation or apnea are counted, the adverse event rate was only 1%, which corresponds to other published studies,³⁰ and, if only serious adverse events are included, the rate is only 0.2%. In the largest-to-date study describing a 12-year experience with pediatric endoscopy in 2026 patients, minor complications were reported in 0.35% of patients.³⁰ However, this was a retrospective study; the complication criteria included only prolonged desaturation that required bag and mask ventilation; and, for the

first half of the study, monitoring during the procedure was not routinely performed. Our previous study of intravenous sedation for EGD conducted 10 years ago showed an almost identical overall rate of adverse events of 25%, which were noted in 19% of patients.² It should be noted that the data from the current study represent a relatively select group of patients without significant comorbid conditions who were deemed appropriate for outpatient intravenous sedation. We believe the appropriate selection of patients for general anesthesia is very important for everyday practice and has most likely reduced the rate of adverse events. In addition, supplemental oxygen was uniformly administered, which might have artificially lowered the rate of respiratory adverse events. Finally, the use of pulse oximetry to monitor for hypoxemia, especially in cases when supplemental oxygen is administered, was shown to be inadequate in adults and children for the assessment for apnea and adequacy of ventilation, where capnography is a more sensitive method.^{31,32} In regard to the absence of events requiring resuscitation or hospitalization, it would be incorrect to conclude that the risk for one does not exist. To be 95% confident that our risk estimate of these events is correct when using a “rule of three,” in which the chance of this event is at most 3 in n

(where n is the number of subjects studied), we estimated that, in our series, the risk of such event is 0.19%.³³

Arrhythmias may have been underreported, because patients did not have full electrocardiography (EKG) monitoring performed. Two pediatric studies of 34 and 32 children, respectively, looked at heart arrhythmias during sedation for pediatric endoscopy. One study advocated continuous cardiac rhythm monitoring,³⁴ while no significant electrocardiologic abnormalities were noted in the other study.³⁵ Finally, late adverse events that may have occurred after patients were discharged were not recorded in this study. These events would seem unlikely when considering the level of the discharge criteria and the pharmacokinetics of the medications used.

The 84% success rate of cecal intubation is similar to previously reported completion rates and indicates efficacy of intravenous sedation.³⁶⁻³⁸ This is a conservative calculation, not taking into consideration the fact that some procedures were not completed because of inflammation or poor bowel preparation, and that the intent of individual endoscopist regarding the extent of COL was not known. This also reflects results in a large academic practice with multiple endoscopists of various endoscopy experience and fellows in training. However, it should be noted that completion rates for younger children were lower than in children older than 10 years, which might be related to sedation efficacy, and, therefore, to reach terminal ileum, general anesthesia in young children should be considered. In addition, the low sedation failure rate, less than 1%, indicates that outpatient GI endoscopy can be completed with intravenous sedation almost universally when patients are selected appropriately. The use of manual restraint for younger patients may have led to an underestimation of sedation failure, because this potentially enables the completion of procedures, even when patients are inadequately sedated.

In summary, based on a large prospectively evaluated cohort of patients, sedation for outpatient pediatric endoscopy with intravenous midazolam and fentanyl was safe. Serious adverse events were rare and did not require hospitalization. It is our conclusion that intravenous sedation, with appropriate monitoring and personnel, remains a valuable and appropriate tool for endoscopy in a selected group of pediatric patients.

DISCLOSURE

None of the authors have any disclosures to make.

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Received December 12, 2005. Accepted May 1, 2006.

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The study was presented as a poster at the World Congress of Pediatric Gastroenterology, Hepatology and Nutrition, July 3-7, 2004, Paris, France (*J Pediatr Gastroenterol Nutr* 2004;39[Suppl 1]:S359).

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