

ADVANCES

Procedural sedation and analgesia in a Canadian adult tertiary care emergency department: a case series

Sam G. Campbell, MB BCh;* Kirk D. Magee, MD;* George J. Kovacs, MD, MHPE;* David A. Petrie, MD;* John M. Tallon, MD;* Robert McKinley, ACP;† David G. Urquhart;* Linda Hutchins, RN†

ABSTRACT

Objectives: To examine the safety of emergency department (ED) procedural sedation and analgesia (PSA) and the patterns of use of pharmacologic agents at a Canadian adult teaching hospital.

Methods: Retrospective analysis of the PSA records of 979 patients, treated between Aug. 1, 2004, and July 31, 2005, with descriptive statistical analysis. This represents an inclusive consecutive case series of all PSAs performed during the study period.

Results: Hypotension (systolic blood pressure ≤ 85 mm Hg) was documented during PSA in 13 of 979 patients (1.3%; 95% confidence interval [CI] 0.3%–2.3%), and desaturation ($Sa_{O_2} \leq 90$) in 14 of 979 (1.4%; CI 0.1%–2.7%). No cases of aspiration, endotracheal intubation or death were recorded. The most common medication used was fentanyl (94.0% of cases), followed by propofol (61.2%), midazolam (42.5%) and then ketamine (2.7%). The most frequently used 2-medication combinations were propofol and fentanyl (P/F) followed by midazolam and fentanyl (M/F), used with similar frequencies 58.1% (569/979) and 41.0% (401/979) respectively. There was no significant difference in the incidence of hypotension or desaturation between the P/F and M/F treated groups. In these patients, 9.1% (90/979) of patients received more than 2 different drugs.

Conclusions: Adverse events during ED PSA are rare and of doubtful clinical significance. Propofol/fentanyl and midazolam/fentanyl are used safely, and at similar frequencies for ED PSA in this tertiary hospital case series. The use of ketamine for adult PSA is unusual in our facility.

Key words: procedural sedation; analgesia; propofol; ketamine; midazolam

RÉSUMÉ

Objectifs : Examiner la sécurité de la sédation et de l'analgésie procédurales (SAP) au département d'urgence et les habitudes d'utilisation des agents pharmacologiques dans un hôpital universitaire canadien pour adultes.

Méthodes : Il s'agit d'une analyse rétrospective des dossiers de 979 patients ayant subi une SAP et ayant été traités entre le 1er août 2004 et le 31 juillet 2005, à l'aide d'une analyse statistique descriptive. Cette analyse représente une série de cas consécutifs inclusive de toutes les SAP effectuées au cours de la période d'étude.

Résultats : L'hypotension (tension artérielle systolique ≤ 85 mm Hg) fut documentée pendant la

*Department of Emergency Medicine, Dalhousie University, Halifax, NS

†Queen Elizabeth II Health Science Centre, Halifax, NS

Received: June 15, 2005; revisions submitted: Jan. 9, 2006; accepted: Jan. 23, 2006

This article has been peer reviewed.

Can J Emerg Med 2006;8(2):85-93

SAP chez 13 des 979 patients (1,3 %; intervalle de confiance [IC] de 95 % 0,3 %–2,3 %) et la désaturation ($SaO_2 \leq 90$) chez 14 des 979 patients (1,4 %; IC 0,1 %–2,7 %). Aucun cas d'aspiration, d'intubation endotrachéale ou de décès ne fut documenté. Le médicament le plus couramment utilisé était le fentanyl (94,0 % des cas), suivi du propofol (61,2 %), du midazolam (42,5 %) et de la kétamine (2,7 %). Les combinaisons de deux médicaments les plus fréquemment utilisées étaient le propofol et fentanyl (P/F) suivis du midazolam et fentanyl (M/F), utilisés à des taux similaires de 58,1 % (569/979) et de 41,0 % (401/979) respectivement. Il n'y avait aucune différence significative quant à l'incidence de l'hypotension ou de la désaturation entre les groupes traités au P/F ou au M/F. Parmi ces patients, 9,1 % (90/979) reçurent plus de deux médicaments différents.

Conclusions : Les événements indésirables pendant la SAP au département d'urgence sont rares et sont d'une importance clinique douteuse. Les combinaisons propofol/fentanyl et midazolam/fentanyl sont utilisées en toute sécurité et à des fréquences similaires pour la SAP au département d'urgence dans cette série de cas dans un hôpital de soins tertiaires. Le recours à la kétamine pour la SAP chez l'adulte est inhabituel dans notre établissement.

Introduction

Procedural sedation and analgesia (PSA) in the emergency department (ED) has allowed patients to undergo unpleasant or painful procedures that, in earlier times, would have entailed a general anesthetic in the operating room, or would have been performed with inadequate analgesia, for fear of uncontrolled cardiac or respiratory depression, or airway compromise.¹⁻³ In North America, PSA agents were traditionally comprised of a combination of benzodiazepine sedatives and opioid analgesics. Prolonged onset and recovery times⁴ delayed respiratory depression,⁵ and the variable efficacy of these agents promoted the search for better options.^{3,6,7} The use of propofol, ketamine and etomidate have become commonplace in the ED as a result.^{2,8-13} The literature has supported this change for patients of all ages,¹²⁻¹⁴ and even for those with significant pre-existing disease.^{15,16} Evidence supports the use of such agents even in settings outside the ED or operating room by supervised nurses or by physicians without formal advanced airway or cardiac life support training.^{4,16-20} Despite this, the risk of inadvertent deep sedation or general anesthesia, with the attendant respiratory and hemodynamic depression^{3,21} has raised concerns about the safety of these drugs. Opinions as to their appropriateness in the ED vary in the literature.^{1,22,23}

Objections by anesthesiologists have resulted in restrictions of drugs like propofol to the operating room in some hospitals.^{11,22} These objections are often based on the relative paucity of published data when compared with that accrued in the operating room.²² In their 2002 "Practice guidelines for sedation and analgesia by non-anesthesiologists," the American Society of Anesthesiologists (ASA) place emergency physicians under the same umbrella as dentists, radiologists and gastroenterologists.²⁴ They recommend that non-anesthesiologists providing PSA should

understand the pharmacology of the agents used, that an individual with advanced life skills be immediately available, and that resuscitation equipment should be present during PSA.²⁴ A call has been made for further data to support the use of potent sedative agents in the ED.¹⁹ A 1999 consensus statement by the Canadian Association of Emergency Physicians summarized the use of PSA in the ED and made clear recommendations regarding monitoring, administration and dosage of agents, and discharge instructions. This paper is still extremely useful for ED PSA today.¹

At the Queen Elizabeth II Health Sciences Centre in Halifax, NS, a regional tertiary care referral centre with approximately 70 000 adult (>15 years of age) ED visits per year, approximately 80 patients receive PSA every month. Drug administration and patient monitoring is conducted by advanced level paramedics (Advanced Care Paramedics [ACPs]) trained in PSA, under the supervision of an emergency physician. The ACPs receive both specific didactic and on-the-job training in the use of the medication options for PSA before assuming the role of PSA facilitator. Didactic education covers the aims, objectives and dangers of PSA, the mechanisms and potential adverse effects of PSA drugs, and criteria for the selection of appropriate patients for PSA (ASA Class I and II²⁴). ACPs are required to attend a specific advanced airway management course with particular emphasis on airway assessment, basic airway manoeuvres, bag-valve-mask ventilation and laryngoscopy. On-the-job training includes accompanying a Primary Care Paramedic with PSA experience for 4–8 shifts with graduated responsibility for drug administration and monitoring. PSAs are conducted according to a specific ED PSA protocol (Appendix 1). They administer medications only on the order of a physician instructed in the use of PSA who is at the bedside. In August 2003, a dedicated PSA patient care record was in-

troduced to document the process of each PSA conducted in the department (Appendix 2).

The purpose of this paper was to collect data prospectively in order to ascertain the frequency of recorded adverse events associated with PSA, and to review our current practice with regard to PSA drug choice in our institution.

Methods

We performed a chart review of all PSA records between Aug. 1, 2004, and July 3, 2005. Data gathered prospectively, on the standardized PSA form (Appendix 2) included:

- evaluation of the patient's suitability for ED PSA;
- indication(s) for PSA;
- medications and doses used;
- level of consciousness; and
- vital signs every 5 minutes during PSA.

Data were transcribed from the forms directly into MS Access 2000. This study was approved by the institutional research ethics board.

The *a priori* definition of an adverse event included: oxygen saturation (SaO_2) of $<90\%$ at any time during the procedure in any patient with a baseline SaO_2 of $\geq 95\%$; systolic blood pressure (SBP) of <85 mm Hg in any patient with a baseline (pre-procedure) systolic blood pressure of 100 mm Hg or greater; evidence of aspiration; endotracheal intubation; or death. Descriptive statistical analysis of the data were performed to determine if we could assess whether adverse events were more common with either of the 2 most commonly used medication combinations. The null hypothesis was that there is no statistical difference.

Results

PSA was carried out on 979 patients during the study period; 481 (49.2%) were recorded as women, 484 (49.4%) as men. In 14 patient records (1.4%), the age and gender of the patient was not entered on the chart (these patients were excluded from any calculations involving gender or age). Two hundred and ten (21.8%) of the patients were >65 years of age. Indications for PSA were classified as "orthopedic" in 786 (80.3%), followed by "incision and drainage" in 61 (6.2%) (Table 1).

Adverse events

Adverse events were documented in 17 patients: 9/900 (1%) with oxygen desaturation and 8/969 (0.8%) with hypotension. One case of emergence agitation was recorded

in a patient receiving ketamine. No pressor agents were prescribed during PSA, and no cases of aspiration, endotracheal intubation or death were recorded.

The lowest SaO_2 recorded during PSA was 64%, occurring in a 71-year-old, 75-kg woman (with baseline SaO_2 of 74% due to severe chronic pulmonary disease) who was undergoing reduction of a right shoulder dislocation and proximal humeral fracture, using fentanyl alone. The lowest SBP recorded was 42 mm Hg recorded in a 82-year-old, 55-kg woman with a baseline SBP of 96 mm Hg who was undergoing emergency cardioversion under etomidate and fentanyl.

Patterns of medication use

Fentanyl was used in 94.0% of cases (marginal error = 1.49%). Propofol and midazolam were the most frequently used sedative agents, at 61.2% and 42.5% use, respectively. Ketamine was used in only 26 cases. Nine hundred and twelve (93.2%) patients received 2 or more drugs, and 90 (9.2%) received 3 or more. The commonest drug combinations were propofol (P) and fentanyl (F) (i.e., P/F) in 487 (49.7%) and midazolam (M) and fentanyl (F) (i.e., M/F) in 324 (33.1%). In 71 cases (7.3%), fentanyl was used in combination with both midazolam and propofol (F/M/P). When ketamine (K) was used, it was the sole agent in 11 cases, and was combined with a benzodiazepine in 7 cases: with propofol in 3 (K/P), with fentanyl in 2 (K/F), with both midazolam and fentanyl in 2 (K/M/F), and midazolam and propofol (K/M/P) in 1. Etomidate was only used in 1 case, in combination with fentanyl. The breakdown of medication combinations is shown in Table 2. Other medications recorded as being administered during PSA were,

Table 1. Indications for the 979 patients who required procedural sedation and analgesia in the emergency department of a tertiary care hospital during the study period

Indication	No. (and %) of patients N = 979
Orthopedic	786 (80.29)
Incision & drainage	61 (6.23)
Other	39 (3.98)
Cardioversion	38 (3.88)
Chest tube placement	37 (3.78)
Wound care	11 (1.12)
Lumbar puncture	4 (0.41)
Imaging / behaviour control	2 (0.20)
Endoscopy	1 (0.10)

lorazepam (1 patient), morphine (5) diphenhydramine (7), metoclopramide (1) and succinylcholine (1). The administration of succinylcholine was done by a staff anesthesiologist for a difficult reduction by an orthopedic resident. The ACP was present to document the procedure and assist with the monitoring.

Association between medications and adverse events or sub-optimal SaO_2 or systolic blood pressure

The medications associated with oxygen desaturation in patients with an initial SaO_2 of $\geq 95\%$ were P/F in 5, M/F in 2, and one each of M/K and fentanyl. There was no significant difference ($p = 0.7422$) in the incidence of desaturation between the P/F (1.0%; confidence interval [CI] 0.1%–1.9%) and M/F (0.6%; CI 0.0%–1.5%) treated groups. This study had 80% power to detect an absolute risk difference of 2.6% between the 2 groups.

In 79 patients (8.1% of the total), in whom the baseline SaO_2 was less than 95%, medications chosen were M/F (38), P/F (25), M/P/F (8) and 8 other regimens (including fentanyl alone in 4, and F/K/P in 2, and one each of propofol and midazolam alone).

M/F was used in the 6 patients who had baseline SaO_2 $< 90\%$. Of these 6 patients, 3 had only M/F and 3 had M/F in combination with other medications.

Thirteen (1.3%) patients had an SBP of 85 mm Hg or less recorded during the procedure, of whom 5 started with a SBP of < 100 mm Hg. Of these, M/F was used in 2, M/P/F in 1, P/F in 1, and fentanyl alone in 1. Of the 8 who became hypotensive during the procedure, M/F and P/F were each used in 4.

The medications used for the 10 patients (1.0%) with a baseline SBP of < 100 mm Hg were P/F in 4, M/F in 5, ketamine in 1, and M/P/F in 1.

Table 2. Pharmacologic agent or combination of agents used for the 979 study patients who required procedural sedation and analgesia

Medication / Combination	No. (and %) of patients <i>N</i> = 979
Propofol + Fentanyl	496 (50.7)
Midazolam + Fentanyl	327 (33.4)
Propofol + Midazolam + Fentanyl	71 (7.3)
Propofol	28 (2.9)
Ketamine*	26 (2.7)
Fentanyl	20 (2.0)
Midazolam	9 (0.9)
Morphine	2 (0.2)

*As single agent in 11, in combination in 15.

Additional associations with medication choice

Interestingly, P/F was used more frequently in male patients (58.7% [284/484]) than in female patients (41.6% [200/481]). M/F was used in 41% of women but used in only 25.8% of men (125/484). Both of these differences were statistically significant ($p < 0.001$).

Medication preferences were also found to vary with age. In patients > 65 years of age, M/F was used in 56.7% (119/210) compared with P/F use of 25.2% (53/210). This difference was statistically significant ($p < 0.0001$).

Discussion

This paper is the largest published series describing PSA use in a Canadian adult ED setting.¹⁹ Our data show that midazolam, propofol and fentanyl are frequently used for PSA and are associated with few adverse effects when used by well trained practitioners following a standardized protocol. We were unable to demonstrate the difference in side-effect profiles of the different agents demonstrated in a pediatric series.²⁵ Surprisingly, the use of ketamine, which has some advantages with regard to lower rates of respiratory depression or hypotension,^{11,26,27} and from which the hazards of psychic emergence reactions have been exaggerated,²⁸ was uncommon in this case series. We reported 1 case in which succinylcholine was used by an anesthesiologist in the ED because it was entered in to our database. The use of this drug as part of ED PSA is not “standard of care,” and we do not support the use of succinylcholine in the ED for any objective, apart from rapid sequence intubation.

We were interested to find an association between medication selection by the physician and the age and sex of the patient. This likely reveals a sense of greater comfort with more “traditional” PSA drugs and patients who might, consciously or subconsciously, be considered more vulnerable. The numbers of adverse events and patients with suboptimal baseline SaO_2 and SBP were too low to demonstrate an association between these features and drug choice.

In publishing these results, we are not advocating the indiscriminate use of potent sedatives in the ED. PSA utilization in our institution is facilitated by ACPs with special training and expertise in the use of the drugs under the supervision of and in partnership with a dedicated emergency physician or resident. In addition, PSAs are performed according to a strict protocol. All PSAs in our ED are conducted after an appropriate physical (including a systematic airway) assessment of the patient, and with resuscitation and advanced airway management

equipment ready at the bedside. The paramedic's principal responsibility is to administer medication and monitor the patient. He or she is not involved in performing the actual procedure. Facilitating PSA is one of the many ED duties of the ACP (their duties include assisting with resuscitations, casting and obtaining difficult venous access); PSA facilitation has, however, become their primary responsibility. Most of the paramedics, therefore, had gained significant experience in the use of these medications before the time studied. In spite of our low adverse event rate, the reported number of PSAs with the use of these drugs is still relatively small, so caution is always appropriate when introducing unfamiliar drugs into the ED. In this paper we have defined and measured the use of PSA using paramedic-physicians and have demonstrated safe use of this essential clinical intervention in a tertiary care ED. PSA remains a key skill for all emergency physicians, and its use demands a safe and clear protocol with close monitoring.

Limitations

Although the data were recorded prospectively on a standardized form, this study still suffers from many of the limitations of retrospective chart audits. In addition to this, the review illustrated a number of limitations of the PSA record used in our ED. The intended depth of sedation was not recorded, so we were unable to ascertain the degree of "overshoot" that occurred. Although the record included check boxes to gather data regarding the patient's suitability for ED PSA (namely ASA grade, and risk factors for basic and advanced airway management), these were used in an inconsistent fashion, making these particular data unreliable. Specific complications that might be feared during PSA, such as death, endotracheal intubation, pulmonary aspiration, or hospital admission as a result of an event attributable to the PSA, were not specifically solicited, and for these we had to rely on a free text area on the form. Although we doubt that the ACP would neglect to enter a significant adverse event on the form, and note that none of the investigators (who are aware of the vast majority of ED mishaps) heard of any significant complication, it is possible that such a complication may not have been recorded. A thorough assessment of these factors is considered mandatory, and our patient care record has been revised to capture this more reliably.

Because end-tidal carbon dioxide monitoring is not used routinely for PSA in our ED, subclinical respiratory depression may have been missed. In an effort to identify all such cases, we used an SaO_2 of $\leq 90\%$ at any stage during

the procedure as indication of respiratory depression, while other authors used this saturation level for at least 30 seconds as a definition of desaturation.²⁹ Soto and colleagues³⁰ showed that apnea of >20 seconds occurred in 26% of the PSAs performed in their study, all of which were diagnosed by capnography. None were detected by the provider monitoring the patient.³⁰ While recognizing apnea is important, reacting to very brief periods identified with capnography could induce caregivers to use positive pressure ventilation before oxygen desaturation, which could actually increase the danger of aspiration. If brief apnea was missed in some of our patients, the universally good outcome in our series suggests that detecting such apnea is probably unnecessary.²³

The post-hoc power calculation demonstrated that we had a chance of detecting an absolute risk difference of 0.026 (2.6%) in desaturation rates between groups treated with P/F and M/F. However, this should be interpreted with caution; patients were not randomly assigned to their treatment groups, so it is difficult to conclude that medications used in the study would have equivalent safety in all circumstances.

Finally, the assistance of ACPs in the ED is still atypical in Canada, and our results might not mirror those that would be expected in a busy ED where a single physician is expected to administer medication, perform the procedure and monitor the patient. The findings may also not apply to PSA facilitated by paramedics without specific training in ED PSA and advanced airway management.

Conclusion

PSA is being conducted safely in our tertiary care ED. Midazolam and propofol, both in combination with fentanyl are frequently used for PSA, without significant adverse effects. Further registry-based research will tell us more about preferences of PSA agents by physicians of different disciplines, and the incidence of levels of sedation deeper than originally intended. PSA remains a key skill for all ED MDs, and its use demands a safe and clear protocol with close monitoring.

Acknowledgements: We thank Ms. Corrine Burke of the Department of Emergency Medicine, Dalhousie University, for transcribing the data into the database, Jun Gao of the School of Health Services Administration, Dalhousie University, for statistical analysis, and the Advanced Care Paramedics of the QE II HSC for collecting the data and for their ongoing dedication to the perfection of PSA in our Department.

Competing interests: None declared.

References

1. Innes G, Murphy M, Nijssen-Jordan C, et al. Procedural sedation and analgesia in the emergency department. Canadian Consensus Guidelines. *J Emerg Med* 1999;17:145-56.
2. Bahn EL, Holt KR. Procedural sedation and analgesia: a review and new concepts. *Emerg Med Clin North Am* 2005;23:503-17.
3. Miller MA, Levy P, Patel MM. Procedural sedation and analgesia in the emergency department: What are the risks? *Emerg Med Clin North Am* 2005;23:551-72.
4. Holger JS, Satterlee PA, Haugen S. Nursing use between 2 methods of procedural sedation: midazolam versus propofol. *Am J Emerg Med* 2005;23:248-52.
5. Bailey PL, Pace NL, Ashburn MA, et al. Frequent hypoxemia and apnea after sedation with midazolam and fentanyl. *Anesthesiology* 1990;73:826-30.
6. Swanson ER, Seaberg DC, Mathias S. The use of propofol for sedation in the emergency department. *Acad Emerg Med* 1996;3:234-8.
7. Shankar V, Deshpande JK. Procedural sedation in the pediatric patient. *Anesthesiol Clin North Am* 2005;23:635-54.
8. Taylor DM, O'Brien D, Ritchie P, et al. Propofol versus midazolam/fentanyl for reduction of anterior shoulder dislocation. *Acad Emerg Med* 2005;12:13-9.
9. Coll-Vinent B, Sala X, Fernandez C, et al. Sedation for cardioversion in the emergency department: analysis of effectiveness in four protocols. *Ann Emerg Med* 2003;42:767-72.
10. Godwin SA, Caro DA, Wolf SJ, et al; for the American College of Emergency Physicians. Clinical policy: procedural sedation and analgesia in the emergency department. *Ann Emerg Med* 2005;45:177-96.
11. Sobel RM, Morgan BW, Murphy M. Ketamine in the ED: medical politics versus patient care. *Am J Emerg Med* 1999;17:722-5.
12. Guenther E, Pribble CG, Junkins EP Jr, et al. Propofol sedation by emergency physicians for elective pediatric outpatient procedures. *Ann Emerg Med* 2003;42:783-91.
13. Pershad J, Godambe SA. Propofol for procedural sedation in the pediatric emergency department. *J Emerg Med* 2004;27:11-4.
14. Heuss LT, Schnieper P, Drewe J, et al. Conscious sedation with propofol in elderly patients: a prospective evaluation. *Aliment Pharmacol Ther* 2003;17:1493-501.
15. Miner JR, Martel ML, Meyer M, et al. Procedural sedation of critically ill patients in the emergency department. *Acad Emerg Med* 2005;12:124-8.
16. Weston BR, Chadalawada V, Chalasani N, et al. Nurse-administered propofol versus midazolam and meperidine for upper endoscopy in cirrhotic patients. *Am J Gastroenterol* 2003;98:2440-7.
17. Ulmer BJ, Hansen JJ, Overley CA, et al. Propofol versus midazolam/fentanyl for outpatient colonoscopy: administration by nurses supervised by endoscopists. *Clin Gastroenterol Hepatol* 2003;1:425-32.
18. Hasen KV, Samartzis D, Casas LA, et al. An outcome study comparing intravenous sedation with midazolam/fentanyl (conscious sedation) versus propofol infusion (deep sedation) for aesthetic surgery. *Plast Reconstr Surg* 2003;112:1683-9.
19. Brown TB, Lovato LM, Parker D. Procedural sedation in the acute care setting. *Am Fam Physician* 2005;71:85-90.
20. Vargo JJ. Propofol: a gastroenterologist's perspective. *Gastrointest Endosc Clin N Am* 2004;14:313-23.
21. Frazee BW, Park RS, Lowery D, et al. Propofol for deep procedural sedation in the ED. *Am J Emerg Med* 2005;23:190-5.
22. Green SM. Propofol for emergency department procedural sedation — not yet ready for prime time. *Acad Emerg Med* 1999;6:975-8.
23. Green SM, Krauss B. Propofol in emergency medicine: pushing the sedation frontier. *Ann Emerg Med* 2003;42:792-7.
24. American Society of Anesthesiologists Task Force on Sedation and Analgesia by Non-Anesthesiologists. Practice guidelines for sedation and analgesia by non-anesthesiologists. *Anesthesiology* 2002;96:1004-17.
25. Roback MG, Wathen JE, Bajaj L, et al. Adverse events associated with procedural sedation and analgesia in a pediatric emergency department: a comparison of common parenteral drugs. *Acad Emerg Med* 2005;12:508-13.
26. Cromhout A. Ketamine: its use in the emergency department. *Emerg Med (Fremantle)* 2003;15:155-9.
27. Chudnofsky CR, Weber JE, Stoyanoff PJ, et al. A combination of midazolam and ketamine for procedural sedation and analgesia in adult emergency department patients. *Acad Emerg Med* 2000;7:228-35.
28. Green SM, Sherwin TS. Incidence and severity of recovery agitation after ketamine sedation in young adults. *Am J Emerg Med* 2005;23:142-4.
29. Miner JR, Biros MH, Seigel T, et al. The utility of the bispectral index in procedural sedation with propofol in the emergency department. *Acad Emerg Med* 2005;12:190-6.
30. Soto RG, Fu ES, Vila H Jr, et al. Capnography accurately detects apnea during monitored anesthesia care. *Anesth Analg* 2004;99:379-82.

Correspondence to: Dr. Sam G. Campbell, Department of Emergency Medicine, QE II Health Science Centre, 1796 Summer St., Halifax NS B3H 3A7; Samuel.Campbell@CDHA.nshealth.ca

Appendix 1. Emergency department procedural sedation and analgesia protocol


**EMERGENCY DEPARTMENT
POLICY AND PROCEDURE**

TITLE:	Procedural Sedation and Analgesia	NUMBER:	4.1
CATEGORY:	Patient Care Process	DATE:	04.03.10
SOURCE:		APPROVAL:	

**Sedation for painful procedures
(‘Conscious’ sedation, sedation and analgesia)**
1.0 General

It is an accepted practice that sedation and analgesia is required for certain painful procedures in the Emergency Department. The physician caring for the patient will be responsible for performing a full clinical assessment on the patient to determine their fitness for undergoing procedural sedation/analgesia in the relatively uncontrolled ED environment. The physician is also responsible for the safe administration of medications and monitoring of the patient for such procedure.

If there is any doubt in any caregiver regarding the appropriateness of performing a procedure on a particular patient in the ED, any procedure should be postponed until the charge emergency physician has been consulted.

Prior to initiating any procedural sedation/analgesia in Area A, the Charge Nurse must be consulted to ascertain the availability of nursing resources and an appropriate treatment area. In Area B, the decision to proceed with procedural sedation/analgesia in that area should only be made after consultation with the Area B nurse. In all cases, sedation should be undertaken only when there is a certified Emergency physician or trained ED staff available to provide proper sedation/analgesia, physician staff to perform the procedure and nursing or Advanced Care Paramedical (ACP) staff available to monitor the patient during the procedure and during the recovery phase. There will be times, due to department workload, when there may not be nursing or paramedical staff available. At these times, the Emergency physician or delegate can provide the monitoring and documentation during and after the procedure if the procedure cannot be safely delayed until adequate staff is available.

With regard to procedural sedation/analgesia by non-ED services (e.g. orthopedics, surgery, cardiology etc), at least one certified emergency physician with current clinical responsibilities in the part of the department should be made aware that a procedural sedation/analgesia is proposed before any of the sedative drugs are administered. This communication can be done by the ACP, nurse, or resident, but this should be recorded in the clinical record (see 2.8 below). All housestaff, ACP's will have attended a procedural analgesia/sedation session before embarking on sedation/analgesia in the ED. (Given monthly by ED staff physicians.) (For details, contact Dianne West, 2020.)

Procedural sedation should be considered a hazardous situation for the patient, a similar situation to that involving a potentially unstable ED patient. No procedural sedation should be carried out unless there are at least two certified emergency physicians present in the ED.

2.0 Guidelines

- 2.1 When patient stability and clinical situation permit, the patient (or legal guardian) will be informed of the objectives of the sedation/analgesia and the benefits, risks and limitations of therapy, the anticipated changes in patient behaviour during and after sedation, and the expected duration of post-sedation monitoring. Written or verbal informed consent should be documented.
- 2.2 All cases should be performed in a clinical area which permits the adequate monitoring and provision of patient care. This includes equipment and sufficient space to allow close monitoring and (if necessary) resuscitation of the patient.
- 2.3 All patients with underlying cardiopulmonary disease require continuous cardiac monitoring until full recovery from the procedure and sedation/analgesia. Patients under the age of 30 years, who are healthy generally, require only vigilant O₂ saturation and blood pressure monitoring during short procedures.
- 2.4 In cases where medications are used that might be expected to drop blood pressure, consideration should be given to preloading with IV fluid. All patients should receive oxygen by non-rebreather face mask unless specifically contraindicated.

Appendix 1 continued on the next page.

Appendix 1. continued

- 2.5 In all cases of procedural sedation/analgesia equipment for advanced airway support should be immediately present, including assembled suction equipment, an intubation kit opened at the bedside, and a bag valve mask connected to the O₂ outlet. (A list of equipment and drugs required to be present is supplied in Innes et al, referenced below.)
- 2.6 Naloxone and Flumazenil must be available if narcotics and/or benzodiazepines are used.
- 2.7 The patient is to have continuous observation during and post procedure until the patient has recovered fully from the medication.
- 2.8 The ED procedural sedation chart (see annexure) should be used to document the course of the sedation and analgesia process. This includes all medications and fluids given during the procedure, (with special attention to dose and time administered) as well as vital and clinical signs and any complications. The names of all providers involved with the procedure and sedation/analgesia must be legibly documented, as well as the emergency physician who has been informed (as under 'general' above), that the process is occurring.
- 2.9 It must be remembered that not all patients respond to sedation/analgesia in the same fashion. Therefore, the patient may require observation well past the time of peak effect of medication. Patients are at highest risk of complications within 5 and 20 minutes of receiving IV medication and during the post procedure when external stimuli have been removed.
- 2.10 Sedative medications should always be ordered by the physician. Medications with rapid onset and short duration of action — and thus short recovery times should be considered first line. High dose benzodiazepines should not be used unless there is a contraindication to first line agents.
- 2.11 Paramedics or nurses with the relevant training and experience may administer the medication in the presence of the physician. All nurses and paramedics must be certified to give these medications per hospital policy. The person performing the sedation/analgesia should focus exclusively on the sedation/analgesia and monitoring process and should not take part in the procedure itself.
- 2.12 Prior to discharge, all patients must have the pamphlet 'After Care for Sedation' reviewed with them and/or their caregiver. Appropriate follow-up care must be arranged prior to patient discharge.
- 2.13 After recovery of the patient had been verified and documented, a report must be given to the nurse resuming care of the patient prior to the medical staff leaving the patient.
- 2.14 Any complications should be reported both on the patient care records and through an incident report form, as required.
- 2.15 All procedures under sedation/analgesia sedations will be under the guidance of physicians. Failure to properly carry out documentation and to ensure safe patient care procedures will be brought to the attention of the Head of the Department of Emergency Medicine for review.
- 2.16 An audit of procedures performed under sedation/analgesia will be conducted periodically.



EMERGENCY DEPARTMENT CARE MAP — PROCEDURAL SEDATION

GUIDELINES:

- Consent obtained by physician
- Baseline vital signs and O₂ sat
- Allergies / Medical history reviewed
- Patient's weight _____
- Last po intake _____ Liquids Solids
- Suction present
- Sedation cart present
- VS during & post procedure:
 - q 5 minutes for 15 minutes
 - q 15 minutes X3 or until D/C criteria met
- Discharge criteria met/report to area RN

PROCEDURE: _____

Time start: _____ **Time finish:** _____

PRE-SEDATION ASSESSMENT ASA Score is < 2

AIRWAY:

Assess potential for difficult mask ventilation

- Beard Obese No teeth Elderly Snores

Assess potential for difficult intubation

- Mallampati Evaluate 3-3-2 Anatomy
- Pathology

BREATHING: Easy Shallow Wheezy

- Cough Accessory muscles Laboured
- Congested Retractions Stridor

CIRCULATION: Pink Warm Dry Pale

- Cool Diaphoretic Cyanosed Hot
- Mottled Pedal edema

IV ACCESS: IV NS 1000 cc (document on pt record)

OXYGEN: Face Mask 40% 100%

Comments:

Signature: _____ **Initials:** _____

Signature: _____ **Initials:** _____

Physician signature: _____
(For medications verbally ordered)

Written discharge instructions explained to:

Patient Family **Initials:** _____

Vital Signs: During and Post Procedure

Time	Baseline				
BP					
Pulse					
RR					
O ₂ Sat					
Discharge criteria					
Activity					
Breathing					
Circulation					
LOC					
Total scores					

Time	Medication	Dose	Route	Initials

Discharge Criteria Key

1. Activity
 - 0 = Unable to lift head or move extremities voluntarily or on command
 - 1 = Lifts head spontaneously and moves extremities voluntarily or on command
 - 2 = Able to ambulate as prior to sedation
2. Breathing
 - 0 = Apneic
 - 1 = Dyspnea or shallow, irregular breathing
 - 2 = Able to breathe deeply & cough on command
3. Circulation
 - 0 = Systolic BP below 100 mm Hg
 - 1 = Systolic BP above 100 mm Hg
 - 2 = Systolic BP within normal limits for pt.
4. Consciousness
 - 0 = Not responding, or responding only to painful stimuli
 - 1 = Responds to verbal stimuli but falls asleep readily
 - 2 = Awake, alert and oriented to baseline

TOTAL SCORE PRIOR TO D/C MUST BE 7

White copy: CHART Canary copy: MEDICAL CONTROL