CLINICAL PRACTICE

Article 990294

Procedural Sedation and Analgesia Facilitator – Expanded scope role for paramedics in the Emergency Department

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ABSTRACT

Introduction

Procedural sedation and analgesia (PSA) is accepted as a standard of care in emergency departments (ED). PSA requires careful monitoring of a patient's cardio-respiratory status, and an ability to act immediately and appropriately in the event of any untoward event. The knowledge and skills necessary for this are a natural extension of the expertise of Advanced Care Paramedics (ACP). We report a series of PSA's conducted by ACPs over a 19 month period at a busy teaching hospital.

Methods

This is a retrospective descriptive study presenting data from a registry recording details of all cases of ACP-facilitated PSA conducted in our ED between August 1, 2004 and February 28, 2006. Baseline characteristics, indication for the procedure, medications used and adverse events are reported.

Results

1334 ACP-facilitated PSAs were conducted during the period. According to definitions used by this study, 'desaturation' - a SaO₂ of < 90% at any time during the procedure in patients with an initial SaO₂ of ≥ 95% occurred in only 11 (0.9%) patients, and 'hypotension' – systolic blood pressure (SBP) < 85 mm Hg in patients with an initial SBP ≥ 100 mm Hg occurred in 0.6% of patients. One significant adverse event was recorded, that of pulmonary aspiration. Medications used for PSA included fentanyl (94.1% of cases), propofol (65.5%), midazolam (36.7%) and ketamine (2.2%).

Conclusions

PSA conducted in the ED by specifically trained ACPs is not associated with a significant number of adverse effects. This role should be recognized and subjected to further study.

Keywords: *advanced care paramedics; analgesia facilitator; emergency department; emergency medical technician; PSA; procedural sedation; scope of practice.*

Introduction

Procedural sedation and analgesia in the emergency department (ED) has allowed patients to humanely undergo unpleasant or painful procedures in the ED. Many of these procedures previously either required transfer to the operating room or, when performed in the ED, were done with suboptimal sedation and analgesia for fear of uncontrolled cardiac or respiratory depression, or airway compromise.^{1,2} Modern sedative and analgesic drugs and modern techniques for the use of these drugs have made the use of potent sedatives in the ED safer;³ however the risk of over-sedation, with subsequent respiratory depression, hypotension and/or the loss of protective airway reflexes is still significant.⁴ Meticulous patient monitoring by dedicated caregivers trained in advanced airway and cardio-respiratory support is imperative to improve patient safety.⁴

At the Queen Elizabeth II Health Sciences Centre in Halifax NS, a regional referral centre with approximately 65,000 adult ED visits a year, about 900 PSAs are conducted annually.⁵ Drug administration and patient monitoring is conducted by Advanced Care Paramedics (ACP) trained in PSA, under the authorization of an emergency physician. In August 2003, a dedicated PSA patient care record (see Appendix 1) was introduced to assist ACPs with patient monitoring and administration of medication during PSA, and to document the process of each PSA conducted in the department.⁵ We used the information from these records to verify the effectiveness and safety of this practice.

Methods

We conducted a review of all PSA records between 1 August 2004 and February 28 2006. Data gathered included: patient age and gender, indication for PSA, type and doses of medications used, level of consciousness and patient vital signs every 5 minutes during the PSA. Data was entered into MS Access 2000. Ethics review was waived by the institutional research ethics board because of the quality improvement nature of the study. Patient names and identification particulars were concealed from investigators. Our a priori definitions of 'adverse event', for the purposes of the study were: Oxygen saturation (SaO₂) of less than 90% at any time during the procedure in any patient with a baseline SaO₂ of 95% or greater, or a systolic blood pressure of less than 85 mmHg in any patient with a baseline SBP of 100 mmHg or greater; evidence of aspiration; endotracheal intubation; or death.

Results

PSA was carried out on 1334 patients during the study period. 680 (51.6%) were female, and 305 (23.2%) of patients were older than 65 years of age (19 and 15 patients had age and gender data missing on their record, respectively). Indications for PSA were classified as 'orthopedic' in 80.2% of patients followed by 'incision and drainage' in 9.3% (Table 1).

Table 1: Breakdown of indications for ACP facilitated PSA

Procedure	n	%
Cardioversion	57	4.3
Chest tube placement	15	1.1
Endoscopy	1	0.1
Imaging (facilitating patient cooperation)	3	0.2
Incision and drainage	124	9.3
Lumbar puncture	8	0.6
Orthopedic	1070	80.2
Unknown/other	41	3.1
Wound care	15	1.1
Total	1334	100

Fentanyl, by far the most commonly used analgesic, was used in 94.1% of cases. Propofol and midazolam were used in 65.5% and 36.7% of cases, respectively, and ketamine in 2.2 %. Two or more drugs were used in 92.6% of PSAs. The most common combinations used were, propofol and fentanyl (P/F) and midazolam and fentanyl (M/F) at 62.38% and 34.9% respectively.

We noticed a trend to more frequent use of propofol, and less of midazolam as the study progressed. During the first nine months of the study, propofol was used 57.3% of the time, while midazolam was used 48.4% of the time. During the next 10 months, these figures changed to 73.6% and 25.0% respectively. Midazolam was the sedative used more frequently in female patients and in patients aged 65 or over. (Table 2)

Table 2: A comparison of propofol and midazolam use between the first nine and second ten months studies.

	Propofol (%)*	Midazolam (%)*	N (%)
Aug 1/05-April 30/06	384 (57.3)	324 (48.4)	670 (50.2)
May 1/06-Feb 28/06	489 (73.6)	166 (35.0)	664 (49.8)
n	873 (65.5)	490 (36.7)	1363*

* In some cases both medications were used on the same patient $\chi^2=61.61$ $p = <0.001$

A SaO₂ of < 90% at any time during the procedure in patients who had had an initial SaO₂ of ≥ 95% occurred in 11 (0.9%) patients. The baseline SaO₂ was recorded at less than 90% in 9 patients (0.7%), and between 90 and 95% in 101 patients (7.6% of the total). (Table 3). The lowest SaO₂ recorded during PSA was 64%, occurring in a 71 yr old, 75 kg female patient with COPD and a baseline SaO₂ of 74%, undergoing reduction of a right shoulder dislocation and proximal humeral fracture, using M/F. She recovered to her baseline status without further incident.

Table 3: A comparison of propofol and midazolam use according to patient variables

	Propofol (%)	Midazolam (%)	N (%)	P
Age ≥ 65	129 (42.3)	181 (59.3)	305 (23.2)*	0.038
Age < 65	746 (73.9)	308 (30.5)	1010 (76.8)*	<0.0001
Female	405 (59.6)	295 (43.4)	680† (51.6)	<0.0001
Male	459 (71.8)	191 (29.9)	639† (48.4)	<0.0001
Baseline SaO ₂ < 90%	5	6	11 (0.8)	NS
Baseline SaO ₂ 90-94%	51	52	103 (7.7)	NS
SaO ₂ < 90% at any time and initial SaO ₂ ≥ 95%	9	2	1220 (0.9)	0.065
Baseline SBP < 100 mmHg	9	10	19 (1.4)	NS
SBP < 85 mmHg at any time and initial SBP of ≥ 100 mmHg	4	4	1315 (0.6)	NS

*In 19 cases (1.4%) the age was not recorded

†In 15 cases (1.1%) the gender was not recorded

Pulmonary aspiration occurred in one case – a 65 year old female patient undergoing PSA with P/F for closed reduction of an ankle fracture. The aspiration was recognized and she was suctioned at once. She underwent endotracheal intubation, following which an x-ray confirmed aspiration pneumonitis. She was extubated after twelve hours with no evidence of long term sequelae. The full details of this case have been published elsewhere.⁶

Hypotension (SBP < 85 mmHg) occurred in 8 (0.6%) of patients with an initial SBP of > 100 mmHg. (Table 3). PSA was conducted in 19 patients who had a baseline SBP of less than 100 mm Hg, of which 6 had SBP < 85 mmHg recorded (although 2 of these had baseline SBP < 85 mmHg). The lowest SBP recorded was 42 mm Hg recorded in a 55 kg, 82 yr old female patient with baseline SBP of 96 mm Hg undergoing cardioversion using fentanyl as the only agent. Following the procedure and a small fluid bolus, her SBP was recorded at 100 mm Hg. The decision to conduct PSA on this patient, and the chronically hypoxic COPD patient mentioned above, was made after discussion with the patients and their families. The procedures were conducted in the presence of a staff physician.

Discussion

This paper is one of the largest published series describing PSA use in adults in an emergency department setting,^{3;5;7-12} and the first to specifically focus on the role of ACPs in independently facilitating PSA under the authorization of an emergency physician. The 2002 guidelines for “*sedation and analgesia by non-anesthesiologists*”, of the American Society of Anesthesiologists¹³ advise that individuals responsible for patients receiving PSA should understand the pharmacology of the agents used, that an individual with advanced life support skills be immediately available, and that resuscitation equipment should be present during PSA.

PSAs are conducted very frequently in the ED. In the busy teaching hospital setting, the task often falls to relatively inexperienced and overworked house staff. Patient monitoring may be neglected by house staff concentrating on the procedure at hand, and hurried residents may leave an apparently stable and breathing patient’s bedside prematurely, not recognizing how the respiratory depressive effects of the medication may be unmasked as success with the procedure relieves the painful stimulus that offset such depression.

Advanced Care Paramedics are adept at monitoring potentially unstable patients and reacting appropriately to any deterioration in a patient’s physiologic or pathologic status. Their proficiency at airway management (including the use of skilled bag-mask ventilation, intubation and alternative and rescue airway adjuncts) makes them especially suited to the management of patients that have been given medication with potentially detrimental physiologic effects. While some of the medications used in PSA are not part of the routine scope of practice of ACPs, their baseline training with the use of other sedatives and opioids make the finer points of the pharmacology and use of these medications easily taught with a combination of theoretical and applied instruction.⁵ The utility of propofol in an ED setting has been shown in studies both academic,^{7-10,12,14,15} and community¹¹ settings, including in critically ill¹⁶ or older¹⁷ patients. The use of this agent by non-physicians has also been described in the literature.^{18,19}

Our data shows that ACPs in our ED have successfully developed considerable experience in the use of potent analgesics and sedatives with fentanyl, propofol, and midazolam, in various combinations, being the most frequently used. In our series, one serious complication, that of pulmonary aspiration did occur. It was, however, immediately recognized, managed appropriately and the patient recovered fully. As would be expected,⁴ hypotension and desaturation did occur sporadically, but in all cases these were identified early and appropriately managed by the ACP without any untoward outcome. Surprisingly, the use of Ketamine, which has some advantages with reference to lower rates of RD or hypotension,^{20,21} was uncommon.

Although ACPs were not involved in the decision as to who should be given a PSA, they were strictly required not to proceed with any sedation where they felt that the patient was unsuitable for ED PSA. This resulted in a number of cases where PSAs requested by off-service caregivers were cancelled.

In publishing these results, we are not advocating the indiscriminate use of potent sedatives in the ED, or the use of these medications by ACPs without specific training in PSA. ACPs in our institution have received special training and expertise in the use of these medications, and have all completed a course in advanced airway management.²² PSAs are carried out according to a strict protocol (see Appendix 2). It should be noted that there are relatively few ACPs in

our ED (14 for an annual ED census of 65,000) allows relatively close supervision by their medical director and greater experience because they are doing relatively more PSAs compared to a situation in which there might be more ACPs. PSAs in our ED are conducted only after a full physical and airway assessment of the patient, and with resuscitation and advanced airway management equipment ready at the bedside. The ACPs principle responsibility is to administer medication and monitor the patient, and he/she is not involved in performing the actual procedure. ACPs facilitating PSA remain with the patient until the patient has fully recovered from the PSA. In spite of our good record, the reported number of PSAs with the use of these drugs is still relatively small, and these drugs have potentially devastating side effects, so caution with the use of these drugs is always appropriate.

Limitations

Although the data was 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 not used consistently, making this particular data unreliable. Our patient care record has since been revised to capture this data more reliably.

We recorded very few adverse events during the period studied. Most of the paramedics in our ED had actually gained significant experience in the use of these medications before the time studied. Adverse effects that may have arisen during this time of familiarization would not have been caught in this database.

Because end-tidal carbon dioxide monitoring is not used routinely for PSA in our ED, sub-clinical respiratory depression may have been missed. However we defined respiratory depression as a SaO_2 of $< 90\%$ at any stage during the procedure, while other authors have used this saturation level for at least 30 seconds as a definition of desaturation. A number of investigators have found that capnography-identified respiratory depression is commonly unrecognized by facilitators of procedural sedation.²³⁻²⁶ It has yet to be determined whether earlier recognition of clinically insignificant respiratory depression as a result of capnography might actually increase potential harm to patients, in that caregivers might be induced to use positive pressure ventilation prematurely, potentially increasing the danger of aspiration. ACPs in our department are currently conducting research on the utility of end-tidal capnography in ED PSA.

Finally, all patients in this series were over the age of 16, so our results may not be applicable to PSA in children.

Conclusion

Midazolam and Propofol, both in combination with fentanyl are frequently and safely used by ACPs in our ED for PSA, with the rare adverse effect identified early and managed appropriately. This new role of paramedics has the potential to contribute to easing the strain on emergency facilities, while improving patient safety.

References

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Appendix 1: From Journal of Emergency Primary Health Care 2008;6(3). Article 990294 – Campbell et al. “Procedural Sedation and Analgesia Facilitator” – Expanded scope role for paramedics in the Emergency Department.

Capital Health

Emergency Department

**Procedural Sedation and Analgesia
Patient Care Record**

Date: ____/____/____ YYYY MM DD	
Gender: M F	Age: _____
ASA Classification I Healthy II Mild Systemic Disease- No functional limits III Severe Systemic Disease - Functional limitations IV Severe Systemic Disease - Constant threat to life V Moribund - Will not survive without procedure	
Indication for Procedure ☐ Orthopedic ☐ Incision and drainage ☐ Imaging/behavior control ☐ Wound care ☐ Lumbar puncture ☐ Chest tube placement ☐ Cardioversion ☐ Endoscopy ☐ Other _____	
Intended Depth of Sedation ☐ Anxiolysis ☐ Conscious/Moderate sedation ☐ Deep sedation ☐ General anesthesia	
MD Discipline ☐ Emergency ☐ Orthopedics ☐ Surgery ☐ Gastro-enterology ☐ Plastics ☐ Other: _____	

Physician's Orders

CD0048MR_Rev_06_08

Patient History (please circle)	
Allergies:	N Unknown Y
List:	_____
Cardio/Respiratory Co-morbidities	
	N Unknown Y
List:	_____
Last PO intake (hrs):	
Liquid: ☐ < 2 ☐ 2 - 6 ☐ > 6	
Solid: ☐ < 2 ☐ 2 - 6 ☐ > 6	
Pathologic Substance use: ETOH Opioid	
List:	_____
Clinical Assessments I	
Chest exam:	Normal Abnormal
Specify:	_____
Pre Sedation score: _____	
(located on reference card)	
Clinical Assessment II - Airway	
Mallampatti score:	I II III IV
Hyomental distance:	≥ 3 < 3 fingers
Mouth opening:	≥ 3 < 3 fingers
Upper lip bite:	able unable
Neck ROM concern:	N Y
Neck pathology:	N Y
Beard	N Y
Obese	N Y
Edentulous:	N Y
Snoring history:	N Y
Times:	
Interview:	_____
First drug:	_____
Procedure start:	_____
Procedure end:	_____
Monitoring end:	_____

Vitals:	Height:	cm / in	Weight:	kg / lbs
Time				
BP				
Pulse				
RR				
O ₂ Sat				
Responsiveness*				
FIO ₂				
ETCO ₂				

*A - alert

V - voice

M - manual stimulation

P - painful stimulation

U - unresponsive

Pre medication: Drug(s) _____

Dose _____

Time _____

Time	Medication	Dose	Route	Initials

Events: ☐ Hypoxia (SaO ₂ <90%) ☐ Apnea > 30 seconds ☐ Hypotension (SBP<100 or 85 in baseline <100 mm Hg.) ☐ Arrhythmia: Specify _____ ☐ Vomiting: ☐ Other: _____ ☐ None	Intervention(s): ☐ Increase FiO ₂ ☐ Airway repositioning maneuver ☐ Oral/Nasal airway ☐ Assisted ventilation ☐ Endotracheal Intubation ☐ Other rescue device Specify _____ ☐ Rescue medication ☐ None
Disposition: ☐ Transfer to care of ED RN ☐ Discharge instruction discussed with caregiver ☐ Discharge handout given to caregiver ☐ Discharge handout delegated to area RN ☐ Admitted to hospital	Maximum Depth of Sedation achieved: ☐ Anxiolysis ☐ Conscious /Moderate sedation ☐ Deep sedation ☐ General anesthesia
Signature: _____ Physician initials: _____	Patient opinion of procedure: ☐ Very unpleasant ☐ Unpleasant ☐ No recollection/Indifferent ☐ Satisfied ☐ Delighted

Appendix 2: From Journal of Emergency Primary Health Care 2008;6(3). Article 990294 – Campbell et al. “Procedural Sedation and Analgesia Facilitator” – Expanded scope role for paramedics in the Emergency Department.

**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 contra-indicated.
- 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.

Reference:

Innes G, Murphy M, Nijssen-Jordan C, Ducharme J, Drummond A. Procedural sedation and analgesia in the emergency department. Canadian Consensus Guidelines. J Emerg Med. 1999 Jan-Feb;17(1):145-56.