ORIGINAL ARTICLE

Sedation practice in a Scottish teaching hospital emergency department

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Objectives: To conduct a prospective survey in a teaching hospital emergency department to evaluate performance according to safe sedation principles, to establish the demographics of those sedated, and to review the drugs used and doses given to patients in the department. Any adverse events were reviewed for identification of preventable causes.

Methods: Pre-sedation checklists, peri-procedural observations, and patient notes were reviewed for 101 cases from 4 December 2004 to 3 September 2005. There are departmental guidelines outlining the principles of safe sedation.

Results: Emergency department procedural sedation was performed for a variety of acute conditions in patients aged from 7 to 91 years old. A variety of sedation agents were administered, morphine and midazolam being used most frequently. Drug administration, maximum sedation level, and time to recovery and discharge were recorded. Four adverse events were reported, none of which were clinically significant. Departmental guidelines were followed.

Conclusion: Emergency department sedation is a safe and effective procedure if appropriately trained practitioners follow the principles of safe sedation.

Procedural sedation is a common practice in UK emergency departments.[1] The aims are to relieve anxiety, to facilitate an assessment or procedure, and to provide amnesia. It is recognised that the drugs used for analgesia and sedation have a depressing effect on the CNS and can produce cardiovascular and respiratory complications.

Sedation has been reported to have a significant morbidity and mortality.[2 3] A national survey found that sedation techniques were inconsistent and not always performed in a safe manner.[1] A report by the UK Academy of Medical Royal Colleges and Faculties restated the general principles of procedural sedation.[4]

There are clear, published guidelines for procedural sedation from several professional bodies.[4–6] There is, however, a lack of literature describing actual sedation practices in UK emergency departments.

A prospective survey was designed to evaluate performance according to safe sedation principles, to establish the demographics of those sedated, and to review the drugs used and doses given to patients in an emergency department. Any adverse events were reviewed for identification of preventable causes.

METHODS

This survey was performed in a Scottish teaching hospital emergency department with approximately 55 000 new presentations per year. There is a 24 h specialist registrar presence.

Pre-sedation checklists, peri-procedural observations, and patient notes were reviewed for 101 cases from 4 December 2004 to 3 September 2005.

There are departmental guidelines outlining the principles of safe sedation. All procedures were undertaken on a tilting trolley in the resuscitation room or equivalent by a minimum of two trained staff. In addition, a middle or senior grade practitioner trained in safe sedation and advanced airway management techniques supervised the procedure.

Prior to sedation a full medical, drug, previous anaesthesia, and allergy history was taken, fasting time was documented, and cardiorespiratory observations made. The patient's airway was assessed. During sedation there was continuous ECG, SaO_2, and conscious state monitoring, and blood pressure was measured at 5 min intervals. The observing nurse documented these recordings (the forms used are shown as supplemental information at http://www.emjonline.com/supplemental). A safe recovery area was provided. Level of sedation was measured using the American Society of Anaesthetists classification of grades of conscious depression (table 1).[7]

Hypoxia (SaO_2<92%), hypotension (systolic BP<90 mm Hg), bradycardia (<50 bpm), airway compromise, apnoea, or level 4 sedation (general anaesthesia) were considered adverse events of the procedure.

Discharged patients had returned to full consciousness, had normal vital sign recordings, had taken oral fluids, and had demonstrated normal mobility. Appropriate written advice was provided and a responsible adult accompanied the patient on departure.

Subjective and objective pain scores were recorded by the observing nurse using a 100 mm visual analogue scale.

RESULTS

A total of 101 patients were included in the study and ranged from 7 to 91 years of age (median 42 years, mean 45 years). The majority (60%) of patients were adults between 18 and 65 years old. The attendances were for a variety of reasons (table 2). Ninety five of the procedures performed under sedation were successful.

Table 1 American Society of Anaesthetists classification of grades of conscious depression

Level of sedation	1. Minimal sedation (anxiolysis)	2. Moderate sedation (conscious sedation)	3. Deep sedation	4. General anaesthesia
Responsiveness	Normal response to verbal stimulation	Purposeful response to verbal or tactile stimulation	Purposeful response after repeated or painful stimulation	Unrousable even with painful stimulus
Airway	Unaffected	No intervention required	Intervention may be required	Intervention often required
Spontaneous ventilation	Unaffected	Adequate	May be inadequate	Frequently inadequate
Cardiovascular function	Unaffected	Usually maintained	Usually maintained	May be impaired

Table 2 Diagnoses of patients undergoing procedural sedation

Presentation	Number
Dislocated shoulder	37
Fractured/dislocated ankle	31
Fractured tibia and fibula	10
Dislocated elbow	7
Arrhythmia	3
Fractured femur	3
Fractured radius and ulna	2
Dislocated hip	2
Dislocated jaw	2
Entrapment	1
Nail plate procedure	1
Patellar dislocation	1
Dislocated thumb	1

The mean arrival to analgesia time was 18 min and the median time was 9 min. Table 3 describes the use of opiates in the study group.

Sixty two patients were admitted to an inpatient bed for definitive management. Of the 39 who were discharged, the duration of observation from sedation to discharge ranged from 40 to 290 min (median 120 min, mean 135 min).

Fasting time was documented in all patients (range 60–840 min, median 270 min, mean 291 min). Twenty patients had consumed alcohol in the 12 h preceding presentation.

Intravenous midazolam (1–10 mg, median 4 mg, mean 4 mg) was used in 85 cases. Intravenous ketamine (20–100 mg, median 40 mg, mean 45 mg) was used only under consultant supervision. Table 4 describes the different sedation agents used and the associated sedation level and median recovery time.

The median objective pain score was 12 mm (range 0–77 mm, mean 19 mm) and the median subjective pain score recorded by the patient was 3 mm (range 0–81 mm, mean 11 mm). Data were often incomplete; objective and subjective scores were not recorded for 13% and 41% of patients, respectively.

ADVERSE EVENTS

Four adverse events were reported. There was one episode each of hypotension and hypoxaemia that were brief, required minimal intervention, and were clinically insignificant. There were two episodes of level 4 sedation.

There were no episodes of vomiting or aspiration in a patient with a reduced level of consciousness.

DISCUSSION

Pain and anxiety are common in patients presenting to emergency departments. Much can be achieved by adopting a sensitive, caring manner and employing management techniques specific to the problem presented. However, drugs are occasionally required to relieve pain, anxiety, or both.

All agents used in procedural sedation have cardiorespiratory depressing effects and the effects are synergistic. By giving the opiate first and then slowly titrating the sedative agent, the risk of adverse events can be minimised.[6] It has been postulated that emergency patients have increased sympathetic tone and that this may account for the low incidence of clinically significant episodes of hypotension or bradycardia.[8]

It is recognised that delayed gastric emptying may occur after injury; however, the risk of aspiration is extremely low.[9] Recommendations for elective sedation suggest a fasting time of 6 h post solid meals and 2 h post liquids.[7] However, sedation in the emergency department is not an elective procedure and patients presenting with painful conditions usually require urgent management. The American College of Emergency Physicians advises that procedural sedation is not contraindicated by recent food intake but does recommend that it be taken into consideration when assessing the need for a particular procedure.[6]

An admission rate of over 60% was not unexpected as many of the procedures were manipulations of long bone fractures or major joint dislocations and were often performed on elderly patients in whom safe discharge can be a problem. Both median and mean times from sedation to discharge were approximately 2 h. Proponents for the use of propofol for procedural sedation cite a more rapid recovery time as one of the main benefits.[10] Most of the patients in this study had recovered to full consciousness after approximately 20 min despite midazolam being the most commonly used sedation agent.

Conscious sedation with intact verbal communication and airway reflexes is the target sedation level for patients in the emergency department. In this study, 75% of cases had a maximum sedation level of 2 or less. Six of the patients who reached a sedation level of 3 had received ketamine,

Table 3 Type, frequency, and dose of opiate used during sedation

Analgesia	Number of patients	Min dose	Max dose	Mean dose	Median dose
Nalbuphine IV	17*	8 mg	40 mg	20 mg	20 mg
Morphine IV	93	2 mg	28 mg	11.7 mg	10 mg
Fentanyl IV	5	50 μg	100 μg	80 μg	75 μg
Diamorphine IV	1	5 mg	5 mg	5 mg	5 mg

*Prehospital.

Table 4 Sedation agents used, maximum sedation level, and median recovery time

Sedation agent	Number of patients	Level 1	Level 2	Level 3	Level 4	Level not recorded	Successful procedures	Median time to return to level 1
Midazolam only	57	3	38	11	2	3	52	20 min
Midazolam and ketamine	8	0	4	4	0	0	9	20 min
Ketamine only	4	0	2	2	0	0	4	20 min
Midazolam, ketamine, and entonox	1	1	0	0	0	0	1	0 min
Entonox only	12	7	5	0	0	0	11	0 min
Entonox and midazolam	19	3	12	3	0	1	19	10 min

producing a dissociative state that is difficult to classify. More than half of those with a sedation level of 3 or 4 reached their peak at least 10 min after the procedure had begun; this may be related to removal of the painful stimulus. This phenomenon is particularly likely to occur in emergency department sedation. As the onset of action of intravenous midazolam is approximately 3 min, titration of dose to effect should be done slowly to prevent a rapid drop in conscious level.[11]

It is important to be aware that unsuccessful sedation will result in patient dissatisfaction. However, 95% of the procedures reported had a successful outcome. Pain scores were recorded both subjectively and objectively using a 100 mm visual analogue scale. Median figures for both were less than 20 mm, which suggests that procedural discomfort was acceptable to both the patient and the observing nurse. Unfortunately, the subjective score was not completed for 40% of patients, which is a limitation. It must be acknowledged that this part of the study will be affected by the patient's presenting condition and pre-sedation care.

There were four recorded adverse events: one episode each of hypotension and hypoxaemia and two episodes of level 4 sedation. An elderly female was given 20 mg of morphine and 8 mg of midazolam and then had a 5 min episode of general anaesthesia. Both of these doses were greater than the dose usually required to produce adequate analgesia and sedation. Of the five patients given more than 7 mg of midazolam, two had adverse events. Of 85 patients given less than 8 mg of midazolam, the only adverse event was a brief episode of hypotension that required no specific intervention.

The risk of clinically significant adverse events during emergency department sedation in adults is extremely low.[6 8] Our study was especially rigorous in reporting adverse events and included oversedation with no cardiorespiratory compromise resulting in a reported rate of adverse events of approximately 4%. Including only those patients with a clinically significant adverse event suggests a complication rate of less than 1%.

It should be recognised that practitioners of emergency medicine have experience of managing critically ill patients and of using the drugs described above and other sedative and anaesthetic agents. They practice in an environment that is equipped for resuscitation and has full monitoring facilities. Airway management skills are a core part of emergency physician training. Patients often have painful conditions that require urgent action to save life or limb regardless of past history or fasting status. Guidelines specifically for emergency department sedation should reflect this while staying true to the principles of safe sedation.

CONCLUSION

Departmental guidelines ensure that sedation is practiced by appropriate staff, in a safe environment, and in a consistent manner. Emergency department sedation is a safe and effective procedure if appropriately trained practitioners follow the principles of safe sedation.

CONTRIBUTORS

Dr RA Duncan conducted the survey and wrote the paper. Dr Linda Symington designed and conducted the survey. Mr S Thakore edited the manuscript and acts as guarantor for the paper.

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