Safe sedation practice for surgeons

Jon Walton

Abstract

Sedation is increasingly used to enable patients to tolerate uncomfortable or painful surgical procedures, avoiding the use of a general anaesthetic. Historically, inappropriately administered or monitored sedation was associated with a high morbidity and mortality. National guidance now exists which sets standards for safe sedation for healthcare procedures. This article uses this guidance as a framework to discuss the generic principles and practice of sedation and should not be seen as a substitute for more formal training.

Keywords Benzodiazepines; conscious sedation; general anaesthesia; monitoring; opioids

Introduction

"Sedation is a drug induced depression of consciousness, a continuum culminating in general anaesthesia" (Academy of Medical Royal Colleges (AoMRC) Safe Sedation Practice for Healthcare Procedures 2013).[1]

Sedation is increasingly employed within healthcare practice to enable patients to tolerate stimulating or painful procedures with or without local anaesthetic, thereby avoiding the need for a general anaesthetic. As such it is often used in settings where anaesthetic assistance and equipment is distant or absent.

From the definition above, it is clear that sedation is on the continuum leading to general anaesthesia and therefore if not executed correctly can cause significant morbidity and mortality.

Definitions

The nomenclature of sedation varies with country. The state of sedation necessary for surgical procedures to be performed is sometimes referred to as 'conscious sedation' in the UK and may be called 'procedural sedation' in the USA and Australia.

These terms can cause confusion and the reader is advised to use the 2009 American Society of Anesthesiologists (ASA) definitions when discussing sedation practice (Table 1).[1]

This was the definition table utilized by the AoMRC 2013 guidance on UK sedation.

Sedation should be viewed as a continuum from minimal sedation, with essentially normal responses, to general anaesthesia, with absent or obtunded physiological responses.

As the level of sedation deepens, the physiological derangements increase and the likelihood of adverse events in-crease. The AoMRC regards minimal sedation as the desired end point, with deeper sedation being considered a form of general anaesthesia.[1]

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The 2021 update to the AoMRC guidance on safe sedation avoids the term 'conscious sedation' because the purpose of much sedation is to provide a *relative lack* of consciousness.[2]

The key point is that this level of sedation should not affect a patient's ability to maintain their own airway, breathe normally and has a minimal impact on the patient's cardiovascular system.

Because sedation is a continuum it is not always possible to predict how an individual patient will respond. Practitioners intending to produce a given level of sedation should always be able to rescue patients whose level of sedation becomes deeper than originally intended. In particular, those administering deep sedation should be able to manage patients entering into a state of general anaesthesia.

Safety

General anaesthesia in the developed world is very safe.

The 1987 Confidential Enquiry into Perioperative Death (CEPOD) report showed that very few deaths resulted directly from general anaesthesia with a quoted incidence of 1:185,086 anaesthetics.[3] The UK Royal College of Anaesthetists quotes one death per 100,000 anaesthetics directly attributable to the anaesthetic itself.[4]

Sedation, rather than general anaesthesia for minor invasive procedures has significant operational benefits for healthcare systems. Specialized anaesthetic personnel, equipment and facilities are not required and as a result throughput may increase with a decrease in costs. This has led to drive to increase sedation use for an increasing number of clinical indications.[5]

Many sedation procedures have historically taken place in distant locations with inadequate resuscitation facilities and access to anaesthetic assistance. As a result, the quoted mortality risk of sedation is significantly higher than that of general anaesthesia. This may be as high as 1:40,000 depending on the procedure. Inappropriately high sedation doses combined with inadequate patient pre-assessment and poorly trained sedation staff have all been highlighted as contributive factors in this increased risk of death.[1,6,7]

Table 1 classifies sedation into four levels[1]

1. **Minimal sedation:** patients respond normally to verbal commands. They may have impaired coordination and cognitive function but airway reflexes, respiratory and cardiovascular functions are unaffected
2. **Moderate sedation/conscious (procedural) sedation:** patients respond to verbal commands with or without light tactile stimulation. The airway and spontaneous ventilation should remain patent and cardiovascular function is maintained
3. **Deep sedation:** patients cannot be easily roused but respond purposefully following repeated or painful stimulation. They may require airway opening manoeuvres or adjuncts and can have impaired spontaneous ventilation. Cardiovascular function is usually maintained
4. **General anaesthesia:** patients are not rousable. They require assistance to maintain a patent airway and ventilatory support, with/without cardiovascular support

Following a 2001 AoMRC review into sedation practice in the UK, at least six different medical and dental specialties have produced guidance for the safe practice of sedation.

Levels of sedation

	Minimal sedation anxiolysis	Moderate sedation/analgesia ("conscious sedation")	Deep sedation/analgesia	General anaesthesia
Responsiveness	Normal response to verbal stimulation	Purposeful[a] response to verbal or tactile stimulation	Purposeful[a] response following repeated or painful stimulation	Unarousable even with painful stimulation
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

[a] Reflex withdrawal from a painful stimulus is NOT considered a purposeful response.

Table 1

In October 2013 this spectrum of guidance was consolidated into one cross-specialty document published as *Safe Sedation for Healthcare Procedures: Standards and Guidance*.[1] This was subsequently updated in 2021.[2]

These documents set out a number of generic principles for the safe practice of sedation and firmly recommends formal training in safe sedation for all those involved in the sedation team. They have formed the basis of commercially available practitioner training such as those delivered by SedateUK and National Safe Sedation.

Generic principles

Pre-assessment

Inadequate pre-assessment is a recurring factor in sedation-related adverse events; therefore the importance of preoperative assessment and preparation of patients cannot be over-estimated. A full medical history and examination should be performed including an airway assessment and psychological assessment of compliance. This should all be done taking into account the potential remoteness of the setting. Protocols should be in place to guide the management of intercurrent disease.

"Sedating practitioners should always ask themselves beforehand 'Will I be able to ventilate this patient, if necessary?'"

It should always be remembered that most sedation complications are secondary to issues with respiratory or cardiovascular function and occur more frequently in the elderly.

Preoperative fasting for sedation is controversial and there are no firm guidelines; however, most anaesthetists follow accepted fasting guidance (generally 2 hours for clear fluids and 6 hours for solid food). The AoMRC states that "clinicians who choose to sedate patients without fasting should be prepared to justify their choice".

Information and consent

Valid consent is an essential preliminary to sedation for which Department of Health guidance is available.[8] Patients should have adequate information provided at an appropriate time giving them the chance to have a discussion about the expected procedure with the sedation practitioner. Certain patient groups will require bespoke information (children, pregnant women).

Patient management and choice of technique

The principal aims of conscious or moderate sedation are to:

- relieve anxiety
- maintain consciousness and patient cooperation
- maintain control of physiological parameters.

No one sedation technique is suitable for all patients and all procedures, therefore the simplest and above all safest effective technique should always be used.

Titrating drugs to effect is critical to avoid overdose. Using analgesic drugs to control pain and hypnotics to control anxiety, both titrated to effect, is the recommended safe practice. It remains a cliche, but it is easier to give more than to remove medication already administered.

If possible, the intelligent use of local anaesthesia may reduce or even remove the need for sedation in some settings.

Drug administration

The most commonly recommended sedative is midazolam as it is easily titratable and rapid-acting.

In some healthcare systems propofol is used due to many superior characteristics. Propofol has a narrow therapeutic range and can easily and rapidly reduce airway reflexes and cardiovascular tone. As such the AoMRC recommends its use only under the supervision of a dedicated and appropriately trained anaesthetist.

Typically, short-acting opioids such as fentanyl are the first choice of analgesia, although in some gastroenterological procedures pethidine is used.

The IV route is the most commonly used method, therefore secure IV access is mandatory.

As a general rule, single dugs are easier to titrate and predict than the concurrent administration of several drugs. Drugs in combination may produce synergistic effects and be unpredictable. This narrows the safety margin and increases the likelihood of adverse effects. Benzodiazepines can be up to eight times more potent after the administration of an opioid so should be given with care. Multiple drug techniques should only be considered where there is clear clinical justification.

There is no specific published guidance on maximum doses but procedures which are likely to require more than 5–10 mg midazolam or 100 micrograms of fentanyl may be more safely carried out under general anaesthesia.

A simple and effective way to reduce the risk of overdose is to prepare only the safe maximum doses for immediate use.

The benzodiazepine and opioid antagonists, flumazenil and naloxone should be available but reserved for emergency use only.

Routine use of sedation or opioid reversal is fraught with risk due to the longer action of the sedation agents compared to their antagonists.

Reversal use should be audited as a marker of excessive sedation drug administration.

Finally, the sedationist should be aware that at extremes of age, drug sensitivity may vary significantly. Specific training is required for those who sedate children and National Institute for Health and Care guidance exists for practitioners intending to administer sedation to those under 19 years of age.[9]

Monitoring and the use of supplementary oxygen

The most important monitor of patient safety during sedation is regular communication with the patient.

There must be a suitably trained individual present throughout the procedure and they must have the defined responsibility for monitoring patient safety. A pulse oximeter should be attached until the patient is discharged.

ECG and blood pressure may not always be required but this decision should be made on a patient-by-patient basis.

The 2021 AoMRC update states that when the patient is in a "deeper plane of sedation", capnography, non-invasive automated blood pressure and ECG monitoring should all be present.[2]

An appropriate level of monitoring should continue until the discharge criteria are met and instructions on aftercare should be reinforced to the accompanying person.

The use of capnography should be considered during sedation and should be available wherever sedated patients are being recovered post procedure. Respiratory depression may accompany the use of intravenous sedatives and opioid analgesics. Oxygen should therefore usually be provided from the start of sedation through to discharge.

The use of checklists such as that produced by the World Health Organization is also recommended and is considered by the AoMRC as a developmental standard.[10]

The sedation team

The AoMRC advises that a three-person team be present for any procedure undertaken under conscious sedation. In many current services, this would typically consist of an operator-sedationist who administers the sedative drugs and then performs the procedure, an assistant to help with the procedure itself and an assistant dedicated wholly to patient care. At least one assistant should be a qualified nurse or equivalent.

All those on the procedural team should be trained to Basic Life Support (BLS) level. An Intermediate Life Support (ILS) trained staff member is required for more than minimal sedation and in the case of deep sedation, Advanced Life Support (ALS) training is mandatory.[7]

In complex or prolonged cases it is advisable to have a dedicated sedationist who is solely responsible for the safety of the sedated patient.

Sedation training has yet to be standardized across the country but a number of courses now exist for practitioners in different specialties. These range from sedation awareness study days to full competency based national training programmes run by the different colleges.

Recovery and discharge

After the procedure, patients should be transferred to a recovery area with dedicated staff, monitoring and oxygen delivery where they will stay until deemed fit for discharge.

Fit for discharge assessments are best done with a checklist and typically take into account the patient's conscious level, cardiovascular and respiratory vital signs and whether their pain or discomfort has been adequately addressed.

Patients should be discharged into the care of a third party having been given post-procedure verbal and written instructions.

Audit of sedation practice

Routine audit should be conducted to include as a practice standard:

1. The number of procedures performed under sedation by location and operator
2. The sedation techniques and drugs used
3. The monitoring used during sedation
4. The occurrence of adverse events such as sustained hypoxia (<90%), hypotension (< systolic blood pressure < 90 mmHg), the use of reversal agents, unplanned hospital admissions and cardiac or respiratory arrest.

In addition, it is recommended that all institutions carrying out routine sedation have a designated sedation committee to approve, oversee and audit sedation.[2]

Summary

Sedation for healthcare procedures is becoming more common in the UK. Correctly used, sedation can improve the experience and efficacy of procedure in many differing specialties. However, much evidence exists to demonstrate that poorly administered or inadequately monitored sedation can lead to a defined increase in patient morbidity and mortality.

The 2013 AoMRC guidance and the 2021 update on safe sedation exist to improve the overall standard of sedation care. All practitioners involved in non-anaesthetic sedation practice should be fully conversant with these documents and their respective recommendations. ◆

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Practice points

- Non-anaesthetic sedation services within surgical practice should be benchmarked against the national guidelines published by the Academy of Medical Royal Colleges
- Focused patient pre-assessment is critical in reducing complications in non-anaesthetic sedation
- Most sedation-related complications occur as a result of issues with respiratory or cardiovascular function and are more frequently encountered in the elderly
- The use of reversal agents is a surrogate marker for oversedation and should be regularly audited by clinical governance
- As a basic rule, if a procedure cannot be safely carried out with conscious sedation the patient should be referred for a general anaesthetic