# Safe sedation for surgeons

Ahmed Chishti

**Abstract**

Sedation, with or without the use of local anaesthetic, is a commonly used technique to allow patients to tolerate uncomfortable or unpleasant surgical procedures, avoiding the requirement for a general anaesthetic. Prevention of significant morbidity and mortality during sedation requires individuals to be appropriately trained in its use. This article aims to provide information into the techniques used, it discusses the generic principles and risks of sedation and should not be seen as a substitute for formal training. Attention is also drawn to the currently existing guidelines for various procedures.

**Keywords** Guidelines; safety; sedation

## Safe sedation for surgeons

Sedation is defined as 'A drug induced depression of consciousness with or without amnesia' and is a continuum which cumulates in general anaesthesia.

Sedation is being used more frequently in current medical practice to allow patients to tolerate a stimulating or painful procedure with or without the use of local anaesthetic, thereby avoiding the requirement for a general anaesthetic. Whilst sedation is a very useful tool, it can cause significant morbidity and even mortality if not executed correctly.

It is important to realize that the definitions of sedation vary between countries, and this has a marked influence on practical approaches to the technique. A main difference between UK guidelines and some others (e.g. US and Australian) is the use of the term 'conscious sedation' in the UK, and the consideration that 'deep sedation' is effectively general anaesthesia (Academy of Medical Royal Colleges). Another term often used is 'procedural sedation', which is typically used to describe whatever level of sedation is required for a particular intervention. Again, the UK view is that this is often more akin to general anaesthesia. This has important implications for the expected skill level of the practitioner involved.

The American Society of Anesthesiologists (ASA) define four levels of sedation (Table 1).[1]

**Level 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.

**Level 2** (moderate sedation)
Also referred to as 'conscious sedation'. Patients respond to verbal commands with or without light tactile stimulation. The airway and spontaneous ventilation should remain patent and cardiovascular function is usually maintained.

**Level 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.

**Level 4** (general anaesthesia)
Patients are not rousable. They require assistance to maintain a patent airway and ventilatory support, with/without cardiovascular support.

As Table 1 illustrates, sedation should be viewed as a continuum from minimal sedation with essentially normal responses to general anaesthesia with absent or obtunded responses. As the level of sedation deepens, the physiological derangements increase and the likelihood of adverse events increase. The UK Academy of Medical Royal Colleges regards minimal (conscious) sedation as the desired end point, with deeper sedation being akin to general anaesthesia. The ASA position statement declares:[1]

> Because sedation is a continuum it is not always possible to predict how an individual patient will respond. Hence, practitioners intending to produce a given level of sedation should be able to rescue patients whose level of sedation becomes deeper than originally intended. Individuals administering moderate sedation should be able to rescue patients who enter a state of deep sedation; those administering deep sedation should be able to manage patients entering a state of general anaesthesia.

### Safety issues related to sedation

The scope and complexity of procedures being carried out under sedation without the supervision of an anaesthetist is increasing. In addition, many of the cases are performed in areas remote from the main operating theatre with less support and facilities available should problems develop. A report from the Massachusetts General Hospital[2] showed the number and type of cases being performed outside the theatre environment — 25,774 versus 36,869 general anaesthetic cases; 64% of the cases were gastrointestinal endoscopies and 30% cardiology and vascular procedures. The remaining procedures were interventional radiology, surgical and bronchoscopies; 0.5% of the procedures were performed in the Emergency Department.

Sedation is often used as an alternative to general anaesthesia in the elderly patient, and as such there are often significant comorbidities to consider. Even in younger patients, problems such as obesity, cardiovascular and respiratory disease and liver or renal problems can cause problems.[3]

General anaesthesia is considered to be very safe. The 1987 CEPOD report showed that very few deaths were as a direct result of general anaesthesia with a quoted incidence of 1 in 185,086.[4] The RCOA quotes one death per 100,000 anaesthetics in healthy patients.[5] Clearly, there are cases where the risk is significantly higher, either due to patient or surgical considerations. In contrast, a 2001 report from the RCOA published figures showing a 30-day

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**Continuum of depth of sedation: definition of general anaesthesia and levels of sedation/analgesia *Committee of Origin: Quality Management and Departmental Administration**

| | Minimal sedation | Moderate sedation | Deep sedation | General anaesthesia |
|---|---|---|---|---|
| Responsiveness | Normal | Purposefully response to verbal or tactile stimulation | Purposeful response to repeated or painful stimulation | Unrousable |
| Airway | Unaffected | No intervention required | Intervention may be required | Intervention often required |
| Spontaneous ventilation | Unaffected | Adequate | May be inadequate | Frequently inadequate |
| Cardiovascular function | Unaffected | Maintained | Usually maintained | May be impaired |

(Approved by the ASA House of Delegates on October 27, 2004, and amended on October 21, 2009).

**Table 1**

post procedure mortality of 1 in 2000 for gastrointestinal endoscopy in the 1990s (out of over 14,000 procedures), primarily due to cardiovascular and respiratory factors.[6]

The closed claims database from the American Society of Anesthesiologists found that of the 6894 claims made between 1970 and 2001, patient injury was more likely when sedation was administered outside the operating theatre.[7] Over half of these claims were for gastrointestinal procedures and the most common mechanism of injury was inadequate ventilation and/or oxygenation. Therefore appropriate training in the principles and practice of safe sedation techniques are essential. Increasingly, non-anaesthetic specialities are providing structured training for sedation practices.

## Generic principles

### Patient 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.

Preoperative fasting for sedation is controversial and there are no firm guidelines; however, most anaesthetists follow accepted fasting guidance (generally two hours for clear fluids and six hours for solid food).

### Patient management and choice of technique

To successfully perform a procedure under sedation, the patient requires a clear explanation at every stage with ongoing reassurance.

There is no single sedation technique that is suitable for all patients and the simplest and safest method based on the preoperative assessment of that particular patient for that particular procedure should be used. With appropriate staff, patients and procedures, simply reassurance may be the most effective and safest approach. If the procedure is not painful, sedation alone may be used. If the procedure will involve pain, local or systemic techniques should be employed, as most sedatives do not have any analgesic effect.

Titrating drugs to effect is critical to avoid overdose. A minimum standard for safe sedation requires that the operator is aware of time of onset and duration of action of any drug used.

### Drug administration

The most commonly recommended sedative is midazolam. Increasingly, propofol is used due to many superior characteristics, but there are significant risks involved with this too, and it should only be used in a system which has been established to be safe. Typically, short acting opioids such as fentanyl are the first choice of analgesia, although the ultra-short acting drug remifentanil is increasingly used-again, this should only be in environments sufficiently controlled to provide adequate safety levels for this specific drug.

Sedatives can be administered orally, intravenously or via the inhaled route. The specific technique used should be the one defined by the relevant speciality organization and doses adjusted to specific patient requirements (see below).[8] The IV route is the most commonly used method, therefore secure IV access is mandatory and specific antagonist drugs must be to hand.

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 and difficult to titrate. 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 opiate so should be given with care.[3] Multiple drug techniques should only be considered where there is clear clinical justification.

### Monitoring

There must be a suitably trained individual present throughout the procedure and they must have the defined responsibility for monitoring patient safety and recording this. A pulse oximeter should be attached until the patient is discharged. The use of capnography should be considered during sedation procedures.[8] ECG and blood pressure may not always be required but this decision should be made on a patient-by-patient basis. An appropriate level of monitoring should continue until the discharge criteria are met and instructions on aftercare should be reinforced to the accompanying person.[9]

### Oxygen therapy

Oxygen and devices for administering it must be available. If there is any concern that the saturation may decrease then it should be administered remembering that saturations below 90% require immediate intervention.[9]

### General facilities

Both the above imply considerable human and physical resources, which must be available in both treatment and recovery


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