Moderate Sedation: Risks and Challenges

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Objectives

By the end of this exercise, the clinician will be able to:

1. Discuss the evolution of moderate sedation
2. Identify risks and complications of moderate sedation
3. Apply principles of nursing care to moderately sedated patients

Moderate sedation is known by many different names: conscious sedation, procedural anesthesia, analgesia, or sedation. The need for moderate levels of sedation has increased due to the ever-expanding rate of outpatient procedures being performed, such as colonoscopies and endoscopies. The development of less invasive procedures, has also increased the demand for moderate sedation, as more and more patients are receiving medical care, minor to moderate surgeries, and diagnostic exams without ever spending time as an inpatient. Most colonoscopies and endoscopies are performed without the presence of a full surgical team; the physician performing the procedure is most frequently responsible for the administration of anesthesia prior to or during the procedure. This has lead to quite a bit of controversy within the field of anesthesia.

Moderate sedation is defined as a state that closely resembles deep relaxation in which the patient should still be able to respond purposefully to verbal or light stimulus, yet still maintain adequate ventilation and airway management (Baxter, 2008). However, some physicians who thought that they were practicing moderate sedation were actually practicing deep sedation with the potential of airway compromise and apnea for the patient (Egan, 2007). While not always

the case, most generally moderate sedation is achieved when speech becomes slurred.

The American Association of Anesthesiologists has recommended that all persons involved with the care and monitoring of a patient undergoing moderate sedation have training to recognize the various levels of sedation, be able to react to unexpected levels of sedation, and assess the patient responses to and complications of commonly administered sedating drugs (Egan, 2007)

The clinician must grasp the concept that the difference between one level of sedation and the next level is a fluid and dynamic process without clearly defined bridges between the different levels. This explains the reason that a patient can be in a deeper level of anesthesia than is at first clinically apparent. The transition form one level of sedation into another level can occur rapidly. In a study of 80 patients undergoing moderate sedation for endoscopy, 68% reached a level of deep sedation at some point during the procedure. The clinician must employ good assessment skills and never assume that the patient is in or remains at the intended level of sedation regardless of the dosage of medication administered (Egan, 2007).

Sedation Level	Characteristics
Minimal Sedation / Anxiolysis	Patient responds normally to commands Cognitive and coordination functions may be impaired. Respiration and cardiac function not affected.

Moderate Sedation / Analgesia	Depression of consciousness Responsive to verbal and tactile stimulus, able to follow commands Spontaneous ventilation, no airway intervention needed CV function is usually maintained
Deep Sedation / Analgesia	Depressed consciousness, not easily aroused. Responds purposefully to repeated or painful stimulus Independent airway function may be impaired. May require airway or ventilation assistance CV function is maintained
General Anesthesia	A drug induced loss of consciousness from which patients cannot be aroused. Often requires airway and ventilation assistance CV function may be impaired

American Society of Anesthesiologists Task Force on Sedation and Analgesia by NonAnesthesiologists (Egan, 2007).

Comprehending differences in terminology used to define sedation can assist the clinician in understanding the need for multiple medications in achieving adequate comfort for the patient during procedures.

- Anxiolysis- Relief of agitation or fear with minimal alteration in sensorium
- Amnesia- Lapse in memory for a period of time
- Analgesia- Relief of pain without altered sensorium (Holder, 2006).

Medications for sedation can include all the above qualities, however one usually predominates, and thus the application of two medications at reduced dosages provides a better overall effect for the patient than one medication at a higher dose (Holder, 2006).

The focus on the risks of sedation that is deeper than the clinician intended is reflected in the most recent guidelines produced by both JCAHO's guidelines and the AAP (American Academy of Pediatrics). JCAHO requirements state that the clinician must anticipate and be prepared to intervene and rescue the patient from sedation that is one level deeper than anticipated. They also mandate that the patient must have a history and physical performed with an emphasis on airway and respiratory health and that the patient re-evaluated immediately prior to induction. They also require that the patient be continuously monitored throughout the procedure.

Pediatric guidelines from the AAP mandate the ability to rescue from unintended depths of anesthesia, but also emphasize patient discharge criteria and home care. The AAP states that for moderate sedation an assistant who is involved with the procedure itself may also assist in the monitoring of the patient's response to anesthesia, while deep sedation requires a third individual whose sole responsibility is to monitor the patient. The AAP recommends supplemental oxygen, but does not mandate end tidal CO_2 monitoring.

The Ramsey score is another tool for the assessment of the level of sedation and is divided into six different categories, which may make it more useful for clinicians evaluating pediatric patients (Baxter, 2008).

Sedation Score	Clinical Response
1.	Fully Awake
2.	Drowsy, but awakens spontaneously
3.	Asleep, but awakens and responds appropriately to simple verbal commands
4.	Asleep, unresponsive to commands, arouses to shoulder tap or loud verbal stimulus
5.	Asleep and only responds to firm facial tap and loud verbal stimulus
6.	Asleep and unresponsive to both firm facial tap and loud verbal stimulus.

Airway obstruction is a major concern with moderate sedation as it is the chief cause of adverse events during sedation. It is important to inquire during the assessment of the history and physical about the patient's history of snoring, bearing in mind that family members are better equipped to answer this question, unless the patient reports that he awakens himself often due to snoring. Although this area is constantly evolving in wisdom, the current thought is that the patient's propensity for airway obstruction during natural sleep will most closely resemble the response of the airways during sedation Warning signals should be excessive snoring and nighttime awakening, episodes of apnea during sleep, and excessive daytime sleepiness. Patients that experience these symptoms may be more prone to airway compromise during moderate sedation (Egan, 2007).

Emphasis is now being placed on the honing of skills necessary for the prevention of situations that would require rescue. There are a couple of useful tools to help the clinician be able to make the appropriate assessments. The Mallampati score is an assessment tool for the difficulty of intubation. This tool may be more important that the ASA physical class rating system. A child, or adult, may be healthy, but if they have a small mouth or airway can make them more prone to respiratory compromise and more difficult to intubate if a rescue situation arises, and therefore would require more specialized care or additional team members to perform the procedure safely (Baxter, 2008). The American Board of Pediatrics recommends that for moderate sedation less than a total of three medications are used and a ASA physical condition score of I or II only be considered for moderate sedation without further specialist consult.

Mallampati Score

- Class 1: Full visibility of tonsils, uvula, and soft palate
- Class 2: Visibility of hard and soft palate, upper portion of tonsils and uvula
- Class 3: Soft and hard palate and base of uvula are visible
- Class 4: Only hard palate visible (Egan, 2007).

In addition, patients with certain physical characteristics may be more prone to obstructive airway problems during moderate sedation. The patients include, but are not limited to "obesity of the head and neck, a short distance between the mentum of the chin and thyroid cartilage (< 3 ordinary finger breadths) when the head and neck are fully extended, a small mouth opening (< 3 cm in adults), or a large tongue" (Egan, 2007). Ho

Class	Description	Examples
I	A Normally Healthy Patient	Unremarkable medical history
II	A patient with mild systemic disease (no physical limitation)	Mild asthma, controlled seizures, anemia, controlled diabetes mellitus
III	A patient with severe systemic disease (definite physical limitation)	Moderate to severe asthma, poorly controlled seizures, pneumonia, poorly controlled diabetes mellitus, moderate obesity
IV	A patient with sever systemic disease that is a constant threat to life	Severe BPD, sepsis, advanced pulmonary, cardiac, hepatic, renal, or endocrine disease
V	A moribund patient who is not expected to live without immediate care	Septic shock, severe trauma

ASA Physical Classification Rating System (Baxter, 2008)

When considering patients for moderate sedation, careful thought must be given to each patient situation. It is not appropriate to withhold or exclude patients from sedation based on their Physical Classification Score alone. For instance, an anxious patient needing a procedure who has a history of moderate obesity and angina would fall into a category III. The anxiety and pain of having to endure a procedure with no or inadequate sedation could precipitate a cardiac event more readily than sedation would.

In addition, the clinician should be familiar with how the medical history affects the patient's response to sedation, previous responses and effects of sedation, drug allergies and current medications, time and type of last food or fluid intake, and history of smoking, alcohol or substance abuse (Egan, 2007).

For scheduled procedures, opinions differ as to the length of time a patient should be NPO before receiving sedation. For emergency procedures, medications to increase gastric emptying such as Reglan, and medications to raise gastric pH such as Tagamet, Zantac, or Pepcid can be given to minimize the risks of gastric aspiration.

The most common site of airway obstruction during moderate sedation is the soft palate. The structures of the airway include bone with

attached cartilage, which add rigidity to the airway, and soft tissues. In areas where bone and cartilage are absent, the only rigidity comes from muscles tone, which may diminish under anesthesia, causing airway collapse with sedation. Other areas of the airway that are prone to collapse are the epiglottis and the base of the tongue. During airway collapse a patient may still be breathing, but gas exchange may be impaired leading to hypoxia. Airway collapse is a common occurrence during sedation, necessitating diligent skill in airway maintenance when using moderate sedation (Egan, 2007).

Informed consent should be obtained from the patient before the administration of sedation with options and risks clearly explained to the patient for both the procedure and sedation before the administration of any medications.

Medications

The clinician may use multiple drug regimens for achieving moderate sedation. The nurse should be familiar with the most common regimens and the characteristics of each one. These medications can include benzodiazepines, opioids, propofol, and propofol combinations.

Benzodiazepines

Benzodiazepines have beneficial effects in moderate sedation that include: amnesia, Anxiolysis, and anticonvulsant properties. There are no analgesic properties. Midazolam (Versed) is one of the most popular benzodiazepines used in moderate sedation for many reasons; it produces higher levels of amnesia, earlier sedation, less injection pain, improved recovery over diazepam (Windle, 2008). The dosage is 0.02-0.1 mg/kg in adults. The duration is about 30 minutes. Versed is metabolized through the hepatic pathway, making it ideal for used in patients with compromised renal function; however it should not be used in patients who have liver disease (Holder, 2006).

Ativan is another commonly used sedative for moderate sedation. However, Ativan has a relatively long time to peak of action when compared to Versed, 15-20 minutes, and a duration of 6-8 hours over Versed (30-60 minutes). Because of these effects, Ativan is more commonly used for longer procedures or in the ICU setting. When combined with opioids or alcohol the effects of benzodiazepines are enhanced and the risks of respiratory and cardiac depression increased (Windle, 2008). The initial adult dosage is 1-4 mg. Ativan can be

used in patients with renal or hepatic compromise and is suitable for use as a continuous infusion at 0.03-0.1 mg/kg/hr (Holder, 2006).

Opiates

Opiates provide sedation and anesthesia during procedures. Fentanyl is preferred because of its rapid onset and short duration. Fentanyl has minimal cardiovascular depressive effects and hypotensive episodes are seldom encountered. Opioids suppress the cough reflex, and cause respiratory depression, drowsiness, and sedation, in addition to analgesia (Windle, 2008). Fentanyl should not be administered by rapid IV push as chest wall rigidity and difficulty breathing can occur. This effect can be reversed with Narcan or with neuromuscular depolarizing agents and intubation.

The clinician must recognize the synergetic effects of benzodiazepines and opiates. When combined together the equation resembles something like 1 + 1 = 4. Smaller dosages of each individual drug are needed in order to achieve the same effect (Egan, 2007).

Ketamine

Ketamine is a medication that when used for sedation, induces a disassociative state. The patient may not be able to purposefully follow commands. It produces amnesia, but does not cause airway compromise. Cardiovascular and respiratory stimulation are seen after an occasional event of transient respiratory depression. Transient respiratory depression is more common if given by IV rapidly or in large doses. The medication is contraindicated in patients in whom increases in blood pressure could prove dangerous. Ketamine is usually recommended for adults as delirium is frequently experienced, this effect is not commonly seen in pediatric patients younger than 15 years of age.

Because of the resulting disassociative state, Ketamine does not fit the JCAHO guidelines for moderate, deep, or general anesthesia it must be considered differently than drugs with a classic sedation pattern (Windle, 2008).

Propofol

Propofol (Diprivan) is a phenolic compound with an unknown mechanism of action. It provides rapid and potent sedation, but no analgesic properties. It can achieve levels of anesthesia that are

equivalent to general anesthesia, with rapid deepening from one level to the next. For this reason, an experienced member of the anesthesia team generally monitors the use of Diprivan outside the OR, however, because of its rapid elimination from the body and short recovery time, Diprivan is finding increased popularity for procedural or moderate sedation in the emergency room and several studies have found it to be safe (Windle, 2008). The usual dosage is 10-20mg IV in adults. The onset is <1 minute and the duration is approximately 10 minutes depending on the dose. It is suitable for use in both renal and hepatic impairment. CV depression is noted with Diprivan so heart rate and blood pressure should be monitored during the sedation period. Diprivan is contraindicated in patients with allergies to soy or eggs (Holder, 2006).

When given in concert with benzodiazepines, Diprivan can have greater effects. The clinician should be aware of the propensity of Diprivan to rapidly produce deeper levels of sedation than intended and be ready to assist the patient with airway management.

The nurse is responsible for validating the physician's order, obtaining the medications, and administration according to hospital policy. Nurses should be aware of their state board of nursing practice rights and not administer anesthetic agents unless that right is specifically indicated in state board regulations. Agents that are most commonly used in moderate sedation are sedatives, hypnotics, and narcotics. The nurse has the responsibility for following the five rights when administering sedating agents: right patient, right drug, right dose, and right route, right time. All medications administered to the patient must be documented in the medical record, along with patient responses to the medications.

Monitoring

Monitoring of patients receiving moderate sedation is an ongoing process that begins before the procedure, continues during the procedure, and culminates when the patient is fully recovered. Monitoring parameters for the patient receiving moderate sedation include:

- Vital signs at 5-minute intervals.
- EKG monitoring. Should be continuous for high-risk patients, or during prolonged procedures.

- Pulse oximetry should be used when patients have a history of respiratory or heart disease or when high or multiple doses of medication may be administered that depress the respiratory system.
- Observe the appearance of the patient
- Evaluate airway patentcy by observation or auscultation
- Assess response to stimuli and verbal commands
- Consider the need for blood gas studies (Windle, 2008).

The clinician should ensure that appropriate rescue equipment (adult or pediatric as necessary) is immediately available before the sedation process begins. A crash cart generally has all necessary supplies. Reversal agents appropriate to the medications being utilized for the procedure should also be immediately available (Narcan for opioids and Mazicon for benzodiazepines). Ketamine and Diprivan are not reversible (Windle, 2008).

Interventions for respiratory compromise include the following:

- Repositioning of the head and neck to open the airway
- Supplemental oxygen
- Stimulation
- Placement of adjunctive airway
- Positive pressure ventilation
- Administering reversal agents and intubation (Egan, 2007).

If supplemental oxygen is utilized it is imperative that the nurse understand the functions and limitations of each type of delivery device utilized. For instance, the minimum flow rate of oxygen for a simple facemask must be 5L/ min. At levels lower than this, $CO_{2\ can}$ build up inside the mask and lead to respiratory acidosis. Restlessness and agitation can be symptoms of hypoxia and should be treated as such until assessment proves otherwise. These can also be signs of inadequate analgesia as well so the nurse must carefully assess for the cause and intervene appropriately.

Type	FIO_2	Flow (L/Min)	Comments
Nasal Cannula	24% - 40%	3-6	Comfortable, only slight increase in O_2 levels, cost effective, high flow rates increase complications

Simple Face Mask	25% - 55%	5-8	Poorly tolerated if too tight
Face Tent	30% - 50%	4-10	Less confining, can be used to provide humidification during longer procedures
Nonrebreather Mask	40%-100%	6-15	Mask with reservoir and one-way valves, best noninvasive device, requires tight seal to achieve high %
Venturi Mask	24% - 55%	2-14	Adjustable FIO2
Bag Valve Mask	Up to 100%	10-15	self-inflating, may increase gastric distension

Litwack (1995)

Recovery

Patients continue to be at risk for respiratory depression and complication from sedation after the procedure is completed. Diligence in monitoring and assessment of the patient should be carried out until the patient reaches their pre-sedation state and discharge occurs. The intensity of monitoring should be individualized to the patient's response to the sedation, the overall condition of the patient, and the nature of the procedure. Oxygenation should be monitored until the patient is discharged. Emergency equipment must remain immediately available throughout the recovery period Level of consciousness, oxygenation, and vital signs should be recorded at regular intervals. A nurse should remain in attendance with the patient and a person capable of administering emergency airway management should be immediately available until the patient meets discharge criteria (ASA, 2002).

Aldrete Recovery Score

Awake

➢ Voluntary movement of all limbs to command – 2 points ➢ Voluntary movement of 2 extremities to command- 1 point ➢ Unable to move- 0 points ➢ Apneic- 0 points
Respiration ➢ Breathe deeply and cough – 2 points ➢ Dyspnea, hypoventilation - 1 point
Circulation ➢ BP ± 20mm Hg of preanesthesia level- 2 points ➢ BP > 20-50mm Hg of preanesthesia level- 1 point ➢ BP > 50 mm Hg of preanesthesia level –0 points
Consciousness ➢ Fully Awake – 2 points ➢ Arousable – 1 point ➢ Unresponsive – 0 points
Color ➢ Pink – 2 points ➢ Pale, blotchy – 1 point ➢ Cyanotic – 0 points
Total score must be >8 at the conclusion of monitoring.

Discharge

The patient should be alert and oriented. For infants and children or patients who had pre-sedation mental impairment the patient should be recovered to baseline status before discharge. For pediatric patients, the parents should be made aware that the infant or child may be at risk for airway compromise should the head fall forward while secured in a car seat or child carrier. Vital signs should be stable and within acceptable limits. The ASA recommends the use of scoring systems to assess and document the readiness for discharge. If reversal agents have been employed during the procedure, at least 2 hours should elapse from the time of last administration of any reversal agent before discharge. This allows for any rebound effects from anesthesia after the reversal agents have worn off. It is also important to be sure that the patient is able to void before discharge.

Some sedating medications can cause transient changes in bladder and sphincter tone causing the patient to be unable to void later. This is particularly important for older males having prostate problems or anyone with a history of urinary obstruction. Outpatient adults must not be allowed to drive and should be discharged with a responsible adult present and this person should be informed about potential complications and how to seek care for the patient should problems arise (ASA, 2002).

Conclusion

Quality patient care is the responsibility of everyone. However, nurses especially are in positions to advocate on behalf of patients to reduce painful procedures, leading to increased patient safety and satisfaction. Nurses also have the responsibility to ensure that patients receive procedures and moderate sedation in a safe and prudent manner.

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