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CONTINUING EDUCATION

Effectiveness of Transmucosal Sedation for Special Needs Populations in the Ambulatory Care Setting

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Purpose/Goal

To provide the learner with knowledge specific to providing perioperative care for patients receiving sedation medications via the transmucosal route of administration.

Objectives

1. Discuss the use of procedural sedation medications.
2. Discuss the perioperative nurse's role in procedural sedation.
3. Describe the use of transmucosal dexmedetomidine for procedural sedation.
4. Discuss the use of transmucosal midazolam for procedural sedation.
5. Identify medications used to counteract the effects of overdose after administration of sedation medications.

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ABSTRACT

Transmucosal is an alternative route for administering medications (ie, dexmedetomidine, midazolam, naloxone) that can be effective for procedural or moderate sedation in patients with special needs when other routes are not practical or are contraindicated. Special needs populations include children, older adults, pregnant and breast-feeding women, and people with disabilities or conditions that limit their ability to function and cope. Understanding the perioperative nurse's role in the care of patients receiving medications via the transmucosal route can lead to better clinical outcomes. Successful use of the transmucosal route requires knowledge of when to administer a medication, how often and how much of a medication should be administered, the onset and duration of action, the adverse effects or contraindications, and the key benefits. In addition, a case study approach suggests that transmucosal sedation can decrease patient stress and anxiety related to undergoing medical procedures or surgery in the ambulatory care setting. *AORN J* 100 (December 2014) 652-666. © AORN, Inc, 2014. <http://dx.doi.org/10.1016/j.aorn.2014.04.019>

Key words: *transmucosal, intranasal, dexmedetomidine, midazolam, naloxone, pediatric, moderate sedation, procedural sedation, case studies, special needs populations, patients with special needs, ambulatory care setting.*

The number of noninvasive and minimally invasive procedures performed outside the OR has grown exponentially during the past decades.¹ Sedation may be needed preoperatively and for interventional or diagnostic procedures. Managing the care of patients with special needs who require sedation for a medical procedure or surgery continues to be a challenge for health

care providers. Special needs populations include children, older adults, pregnant and breast-feeding women, and people with disabilities or conditions that limit their ability to function and cope. Clinicians need to continually identify and manage barriers to providing care when a patient with special needs requires sedation. Patients with special needs may require additional emotional

support and specialized care. Performing invasive procedures in an ambulatory setting may decrease patient stress and anxiety. The ambulatory setting can offer flexibility because it is not limited to the inpatient setting, provide less invasive and effective sedation for patients with special needs, and facilitate positive patient outcomes and positive patient experiences.

The administration of procedural sedation medications results in a depressed level of consciousness that allows the patient to independently maintain oxygenation and airway control.¹ Transmucosal is an alternative route to intramuscular (IM), IV, and oral administration to achieve sedation and can be administered to a variety of age groups and patient populations. Administering medications via the transmucosal route

- provides the patient with sedation without incurring the pain of an IM injection,
- allows medication administration to occur without an IV, and
- allows medication administration to occur when the patient is required to remain NPO.

Therefore, transmucosal medications decrease patient anxiety and discomfort and allow patients to receive necessary care. Understanding the efficacy and safety of transmucosally administered medications is essential to the clinician being able to perform procedures requiring procedural or moderate sedation. Transmucosal medications are effective for procedural sedation. However, transmucosal administration of medications for sedation has decreased effects in a patient

- with epistaxis (ie, nosebleed),²
- with high mucous production in the nasal cavity,² or
- who forcefully expels (ie, snorts out) the medication.

As with other medications, special considerations are required for transmucosal sedation in young children, older adults, and women who are pregnant or breast-feeding. Special considerations for

patients with special needs include lower medication doses, fewer doses, decreased or delayed medication metabolism, and differing onset of action. Although transmucosal medications have similar side effects when administered via the IV or IM routes, the efficacy depends on the patient's compliance when sniffing and the condition of the nasal cavity.

Medications delivered transmucosally are not diluted and are administered by using a syringe with an intranasal mucosal atomization device (MAD Nasal™). The onset of action and duration of medications administered transmucosally are similar to IV and IM medication administration. Clinicians should follow transmucosal medication delivery guidelines:

- Administer doses ranging from 0.25 mL to 0.3 mL per nostril to reduce runoff.
- Divide doses equally between each nostril, with a maximum of 0.5 mL in each nostril at one time.²
- Allow 5 to 10 minutes between doses if more than 1 mL is needed to increase absorption.
- Use the most concentrated and lowest volume of the medication available.²

CARING FOR PATIENTS RECEIVING MEDICATIONS FOR SEDATION

The nurse works in collaboration with the physician or anesthesia professional. In addition, to be qualified to administer medications for sedation, the nurse must

- have advanced cardiac life support (ACLS) certification if working with adult patient populations and pediatric advanced life support (PALS) certification if working with pediatric populations,
- attain and maintain competency in moderate or procedural sedation,
- be proficient in airway management and cardiovascular support, and
- possess the skills required to rescue a patient from unintended deep sedation if necessary.

Perioperative nurses should monitor the patient according to facility policies and procedures, to include

- verifying that the patient or guardian and surgeon have completed the informed consent process and signed the consent form;
- ensuring that a current history and physical examination are in the patient's medical record;
- ascertaining the patient's NPO status;
- monitoring the patient's vital signs before, during, and after the procedure;
- monitoring the patient's pulse oximetry continuously;
- applying oxygen and suctioning as needed;
- monitoring the patient's airway patency and respiratory status;
- monitoring and documenting the patient's sedation level;
- ensuring that reversal agents are available; and
- adhering to ACLS or PALS guidelines for emergent medical treatment.

UNDERSTANDING TRANSMUCOSAL MEDICATION DELIVERY

The benefits of using transmucosal medications for patients with special needs are that clinicians can administer the medications

- without an IV,
- if the patient refuses an IV, and
- with a simple sniffing action by the patient.

This decreases stress and anxiety in the patient and his or her family members and allows health care providers to provide care that would otherwise not be performed or would be uncomfortable or difficult for the patient.

Transmucosal Dexmedetomidine

Dexmedetomidine is an alpha2-adrenoceptor agonist and is indicated for sedation because it decreases sympathetic nervous system activity³ and can be used for patients of all ages. However, clinicians should individualize dosing and intervals depending on the indication for and length of the

procedure to be performed and should titrate the medication to the desired clinical effect. The recommended dose of transmucosal dexmedetomidine is 4 mcg/kg.² Table 1 provides an outline of recommended doses based on the patient's weight and accounting for dead space (ie, the small amount of solution remaining in the syringe when the plunger is fully depressed). To determine the volume to be administered, multiply the patient's weight in kilograms by the recommended dose (4 mcg/kg), divide by the medication concentration (100 mcg/mL), add 0.1 mL to account for dead space, and round up to the next highest 0.1 mL. For example, if a patient weighs 10 kg, the correct volume to administer would be calculated as follows:

$$10 \text{ kg} \times 4 \text{ mcg/kg} = 40 \text{ mcg} \div 100 \text{ mcg/mL} \\ = 0.4 \text{ mL} + 0.1 \text{ mL} = 0.5 \text{ mL total volume}$$

Half of the dose should be administered in each nostril. Volumes greater than or equal to 2 mL should be divided and administered 5 to 10 minutes apart to allow for absorption and to reduce runoff.

TABLE 1. Transmucosal Dexmedetomidine¹

Patient weight	Dose (4 mcg/kg)	Volume (100 mcg/mL + 0.1 mL)
3 kg to 5 kg	20 mcg	0.2 mL + 0.1 mL
6 kg to 10 kg	40 mcg	0.4 mL + 0.1 mL
11 kg to 15 kg	60 mcg	0.6 mL + 0.1 mL
16 kg to 20 kg	80 mcg	0.8 mL + 0.1 mL
21 kg to 25 kg	100 mcg	1.0 mL + 0.1 mL
26 kg to 30 kg	120 mcg	1.2 mL + 0.1 mL
31 kg to 35 kg	140 mcg	1.4 mL + 0.1 mL
36 kg to 40 kg	160 mcg	1.6 mL + 0.1 mL
41 kg to 45 kg	180 mcg	1.8 mL + 0.1 mL
46 kg to 50 kg	200 mcg	2.0 mL + 0.1 mL
51 kg to 55 kg	220 mcg	2.2 mL + 0.1 mL
56 kg to 60 kg	240 mcg	2.4 mL + 0.1 mL
61 kg to 70 kg	280 mcg	2.8 mL + 0.1 mL
71 kg to 80 kg	320 mcg	3.2 mL + 0.1 mL
81 kg to 90 kg	360 mcg	3.6 mL + 0.1 mL
91 kg to 100 kg	400 mcg	4.0 mL + 0.1 mL

1. Intranasal medication administration. In: Pharmaceutical Department Manual Policy. Valencia, CA: Henry Mayo Newhall Memorial Hospital; 2013.

The patient should be monitored continuously for respiratory depression.

Cautions and contraindications. Clinicians should exercise caution when administering dexmedetomidine to pediatric patients, older adults, and pregnant and breast-feeding women. Because dexmedetomidine decreases sympathetic nervous system activity, hypotension or bradycardia may be expected to be more pronounced in older adult patients and patients with hypovolemia, diabetes, or chronic hypertension.^{3,4} Dexmedetomidine clearance (eg, the rate that the medication is excreted from the body) decreases with increased hepatic impairment³; therefore, a dose reduction should be considered in patients with impaired hepatic function.^{3,4} Caution should be used when administering medications to older adults because of their delayed medication metabolism and potential comorbidities. Caution also should be used in pediatric patients because they have a lower body mass and are susceptible to hypotension. Hypotension and bradycardia should be avoided in pregnant patients to prevent a decrease in blood flow to the fetus.

Onset and duration. The onset of action of transmucosal dexmedetomidine is 20 minutes.³ The duration of transmucosal dexmedetomidine is one hour. Therefore, to avoid oversedation and prevent the potential for an increased incidence of adverse effects, clinicians should wait at least 20 minutes before determining the extent of each required dosage modification. The clinician should exercise caution to prevent oversedation, particularly because there is no reversal medication for dexmedetomidine. Patients receiving transmucosal dexmedetomidine are sedated but arousable to tactile stimuli, which is a normal response with dexmedetomidine and does not mean the medication is ineffective.⁵ As with other medications administered transmucosally, dexmedetomidine is less effective if the patient nasally expels some or all of the medication.

Adverse effects. Common adverse effects of transmucosal delivery of dexmedetomidine are similar to those of IM and IV routes of administration. These include bradycardia, hypotension, and dry mouth³; in addition, sinus arrests have been associated with dexmedetomidine administration.^{3,4} In clinical studies, adverse effects of dexmedetomidine have included

- a decrease in heart rate (7%);
- decreases in systolic blood pressure (SBP) and diastolic blood pressure (DBP) of 10% and 11%, respectively; and
- hypoventilation.³

Hypotension is defined as an SBP of less than 80 mmHg and a DBP of less than 50 mmHg or greater than or equal to 30% of baseline. Bradycardia is defined as a heart rate of less than 40 beats per minute or greater than or equal to 30% of baseline.³ Caution should be used when determining whether transmucosal dexmedetomidine is suitable for patients with advanced heart block and severe ventricular dysfunction.³ Concurrent administration of other anesthetics, sedatives, hypnotics, and opioids with dexmedetomidine, midazolam, and fentanyl are more likely to lead to potentiated effects.^{4,6} Hypotension and bradycardia occur most commonly when the preoperative nurse administers transmucosal dexmedetomidine in the preoperative unit and the anesthesia professional administers additional IV dexmedetomidine during the surgical procedure. Clinicians can treat hypotension and asymptomatic bradycardia with IV fluids when transmucosal and IV dexmedetomidine are administered together; if needed, they can administer atropine to treat symptomatic bradycardia after IV administration of dexmedetomidine. The effects of dexmedetomidine can be reversed with the alpha₂-adrenergic antagonist atipamezole.⁷ Clinicians should adhere to ACLS and PALS guidelines for emergent medical treatment.

Benefits. In addition to the benefits of sedation for a surgical procedure, an extra benefit

of dexmedetomidine is less postoperative opioid use. Dexmedetomidine can be administered transmucosally during the preoperative phase, and the anesthesia professional can administer additional IV doses intraoperatively if necessary. Patients who receive dexmedetomidine preoperatively and/or intraoperatively have been shown to require less opioids postoperatively. In a clinical study, only 28% of patients who received dexmedetomidine required morphine to manage postoperative pain versus 63% of patients who were given propofol.⁸ Patients who received transmucosal dexmedetomidine required significantly lower doses of fentanyl to maintain adequate analgesia.⁸

Transmucosal Midazolam

Midazolam is a benzodiazepine that is effective for sedation, anxiety, and seizures but not for analgesia.² Midazolam can be administered transmucosally or via IM or IV routes.⁹ Midazolam can be administered before diagnostic, therapeutic, endoscopic, or surgical procedures. As outlined in

Table 2, the recommended doses of midazolam are determined according to the patient’s weight and purpose of the medication. The recommended doses for transmucosal midazolam may be generalized as follows:

- 0.2 mg/kg for seizures in adults weighing more than 50 kg or in children (ie, a maximum dose of 10 mg);
- 0.3 mg/kg for sedation of patients before undergoing minor, nonpainful procedures (eg, radiographic imaging); and
- 0.5 mg/kg for sedation of patients before undergoing painful procedures (eg, laceration repair).²

To determine the total volume, add 0.1 mL to account for dead space. Then, round up to the next highest 0.1 mL. For example, if a patient weighs 20 kg and is undergoing sedation for a painful procedure, the correct dosage would be calculated as follows:

$$20 \text{ kg} \times 0.5 \text{ mg/kg} = 10 \text{ mg} \div 5 \text{ mg/mL} \\ = 2 \text{ mL} + 0.1 \text{ mL} = 2.1 \text{ mL total volume}$$

TABLE 2. Transmucosal Midazolam (5 mg/mL)¹

Age (years)	Patient weight	Seizures (0.2 mg/kg)		Nonpainful procedure (0.3 mg/kg)		Painful procedure (0.5 mg/kg)	
		Dose	Volume	Dose	Volume	Dose	Volume
Neonate	3.0 kg	0.6 mg	0.3 mL	0.9 mg	0.3 mL	1.5 mg	0.4 mL
< 1	6.0 kg	1.2 mg	0.4 mL	1.8 mg	0.5 mL	3.0 mg	0.7 mL
1	10 kg	2.0 mg	0.5 mL	3.0 mg	0.7 mL	5.0 mg	1.1 mL
2	14 kg	2.8 mg	0.7 mL	4.2 mg	1.0 mL	7.0 mg	1.5 mL
3	16 kg	3.2 mg	0.8 mL	4.8 mg	1.1 mL	8.0 mg	1.7 mL
4	18 kg	3.6 mg	0.9 mL	5.4 mg	1.2 mL	9.0 mg	1.9 mL
5	20 kg	4.0 mg	1.0 mL	6.0 mg	1.3 mL	10.0 mg	2.1 mL
6	22 kg	4.4 mg	1.0 mL	6.6 mg	1.5 mL	11.0 mg	2.3 mL
7	24 kg	4.8 mg	1.1 mL	7.2 mg	1.6 mL	12.0 mg	2.5 mL
8	26 kg	5.2 mg	1.2 mL	7.8 mg	1.7 mL	13.0 mg	2.7 mL
9	28 kg	5.6 mg	1.3 mL	8.4 mg	1.8 mL	14.0 mg	2.9 mL
10	30 kg	6.0 mg	1.4 mL	9.0 mg	1.9 mL	15.0 mg	3.1 mL
11	32 kg	6.4 mg	1.4 mL	9.6 mg	2.1 mL	16.0 mg	3.3 mL
12	34 kg	6.8 mg	1.5 mL	10.2 mg	2.2 mL	17.0 mg	3.5 mL
Small teenager	40 kg	8.0 mg	1.8 mL	12.0 mg	2.5 mL	20.0 mg	4.1 mL
Adult or full-grown teenager	≥ 50 kg	10 mg	2.0 mL	15.0 mg	3.1 mL	25.0 mg	5.1 mL

1. Intranasal medication administration. In: Pharmaceutical Department Manual Policy. Valencia, CA: Henry Mayo Newhall Memorial Hospital; 2013.

Volumes greater than or equal to 2 mL should be divided in half and administered 5 to 10 minutes apart to allow for absorption and reduce runoff. Half of the dose should be administered in each nostril. The patient should be monitored continuously for respiratory depression.

Cautions and contraindications. Clinicians should inform patients and their family members that transmucosal midazolam may cause a burning sensation that lasts for 30 to 45 seconds after administration.² For example, parents should be informed that transmucosal midazolam may cause their child to cry initially.

Onset and duration. The onset of action of transmucosal midazolam is less than 10 minutes. Clinicians should wait after each dose to determine the extent of each dosage modification, avoid oversedation, and prevent the potential for an increased incidence of adverse reactions. “In healthy volunteers, the elimination half-life of midazolam is between 1.5 to 2.5 hours.”¹⁰

Adverse effects. The adverse effects of transmucosal midazolam are similar to those of benzodiazepines administered via other routes, and primarily include cardiorespiratory depression.^{1,6} Respiratory depression or hypotension also may occur with transmucosal midazolam, particularly when administered with opioids; therefore, a

decreased dose of transmucosal midazolam is required when administering midazolam with opioids. Flumazenil should be administered by IV if needed to reverse excessive sedation after transmucosal administration of midazolam. Clinicians should adhere to ACLS and PALS guidelines for emergent medical treatment.

Benefits. The benefits of giving transmucosal medications are the same for midazolam as for dexmedetomidine. The primary difference is that midazolam causes a short, burning sensation after administration. In addition to the benefits of sedation for a surgical procedure, an extra benefit of midazolam is amnesia. The patient does not remember entering the OR suite, the procedure, any post-operative discomfort, or other events, which helps increase patient satisfaction.

Transmucosal Naloxone

Opioids are commonly administered in addition to other anesthetics for sedation. Naloxone is an opioid antagonist that is used to treat opiate overdose or oversedation; it is not a reversal medication for dexmedetomidine. Naloxone reverses the effects of opioids, including respiratory depression, sedation, and hypotension. Naloxone can be administered via IV or transmucosal routes (Table 3). The recommended transmucosal dose of naloxone is 2 mg (2 mL) for all patients because dosing is not

TABLE 3. Use of Naloxone (1 mg/mL) to Treat Opiate Overdose

Procedure
<ol style="list-style-type: none"> 1. Assess the patient’s ABCs: airway, breathing, and circulation. 2. For patients who are pulseless, proceed to advanced cardiac life support (ACLS) guidelines. 3. For patients who are apneic but have a pulse, establish an oral airway and begin bag ventilation with 100% oxygen. 4. Load a syringe with 2 mg (2 mL) of naloxone and attach to the nasal mucosal atomization device (MAD Nasal™). 5. Place the atomizer in the patient’s nostril. 6. Briskly compress the plunger into the syringe to administer 1 mL of atomized spray. 7. Remove and repeat in the other nostril for full administration of 2 mL (2 mg) of the medication. 8. Continue ventilating the patient as needed. 9. If no arousal occurs after 5 to 10 minutes, proceed with the standard unconscious protocol, including injectable naloxone, and secure the airway if necessary.
<p><i>MAD Nasal is a trademark of Teleflex Incorporated or its affiliates, Philadelphia, PA.</i></p>

based on weight.² The clinician's goal is to maintain the patient's airway and spontaneous breathing but not to achieve full arousal.² It is important that clinicians be patient. Most failures of inhaled naloxone are because clinicians expect the patient to instantly arouse. Inhaled naloxone results in breathing but not full arousal in every case.

Onset and duration. The onset of action of transmucosal naloxone is three to five minutes to become effective, which is similar to that of IV naloxone.² The half-life of naloxone is 30 to 81 minutes.¹¹ To avoid oversedation, clinicians should assess the patient's airway, breathing, and circulation and should continue to observe the patient for resedation for two hours because the half-life of naloxone is less than that of most opioids.

Adverse effects. Adverse effects include agitation, nausea, vomiting, pulmonary edema, hypotension, cardiac arrhythmias, and seizures.¹¹ Clinicians should adhere to ACLS and PALS guidelines for emergent medical treatment as well as the facility's policy and procedure for administration of naloxone.

TRANSMUCOSAL SEDATION: FOUR CASE SCENARIOS

The following case scenarios occurred in an ambulatory care setting. The patients were selected for transmucosal administration of medications for sedation because they had special needs that presented barriers to providing necessary preoperative care. The RNs in the case scenarios have ACLS and PALS certifications, have extensive training in the preoperative and postanesthesia care unit (PACU) settings, and have demonstrated competency with moderate or procedural sedation. After performing the preoperative nursing assessment, the perioperative nurse writes a nursing care plan specific to the patient receiving transmucosal medications for sedation before surgery or a procedure (Table 4). The nurses continuously monitor the patients when administering medications transmucosally and provide one-on-one nursing care

until released to OR personnel or until the patients have met discharge criteria. The perioperative nurses follow the facility's policy and procedures (Figure 1) as well as the American Society of PeriAnesthesia Nurses (ASPAN) standards of care. As outlined in Table 5, each case scenario includes the age, sex, and clinical or special needs of the patient; the transmucosal medications administered; and the effect of the medications on the patient's vital signs and length of stay.

Case 1

Sam, a four-year-old boy, is admitted for surgical removal of tonsils and adenoids. He weighs 13 kg. Sam is a candidate for transmucosal medications because of his age and anxiety level. The patient's parents and grandparents are present. The preoperative nurse confirms that Sam has remained NPO for the recommended time and gives the parents written information regarding the plan for sedation. Sam is sitting in a recliner in his mother's lap and is crying. The preoperative nurse is unable to attain accurate preoperative vital signs. The nurse administers 50 mcg of transmucosal dexmedetomidine via a MAD Nasal device. Despite the fact that Sam is uncooperative, all the medication is administered transmucosally without runoff or the patient nasally expelling the medication. After 25 minutes, the patient is asleep and the preoperative nurse is able to obtain vital signs and institute continuous monitoring. Sam remains asleep while the nurse applies monitors; however, he starts crying when the IV is started. The nurse documents these observations but understands that Sam's response does not mean that the dexmedetomidine is ineffective. After the IV insertion procedure is complete, Sam returns to sleep. Sam's SBP goes from 128 mmHg while he is crying on admission to 73 mmHg while he is asleep after the administration of dexmedetomidine; however, while asleep, he remains arousable to tactile stimuli. The nurse starts an IV of lactated Ringer solution and administers a 100-mL bolus. Sam's SBP increases to 100 mmHg after the

TABLE 4. Nursing Care Plan for a Patient Receiving Transmucosal Medications for Sedation Before Surgery or Other Procedure

Diagnosis	Nursing interventions	Interim outcome statement	Outcome statement
Ineffective family therapeutic regimen management	<ul style="list-style-type: none"> ■ Verifies allergies. ■ Identifies psychosocial status. ■ Assesses psychosocial issues specific to the patient's medication management. ■ Includes patient or designated support person in perioperative teaching. ■ Provides instruction about prescribed medications. ■ Evaluates response to instructions. 	<ul style="list-style-type: none"> ■ The patient, family members, designated support person, or legal guardian verbalizes realistic expectations regarding the effect of medications on postoperative recovery before discharge. 	The patient or designated support person demonstrates knowledge of medication management.
Anxiety	<ul style="list-style-type: none"> ■ Identifies psychosocial status. ■ Assesses baseline neurological status. ■ Identifies sensory impairments. ■ Identifies barriers to communication. ■ Assesses coping mechanisms. ■ Assesses psychosocial issues specific to the patient's medication management. 	<ul style="list-style-type: none"> ■ The patient or designated support person verbalizes the sequence of events to expect before and immediately after surgery. 	The patient or designated support person demonstrates knowledge of the expected psychosocial responses to the procedure.
Risk of injury	<ul style="list-style-type: none"> ■ Identifies the patient's and designated support person's educational needs. ■ Implements measures to provide psychological support. ■ Includes the patient or designated support person in perioperative teaching. ■ Explains the expected sequence of events. ■ Provides status reports to the designated support person. ■ Evaluates psychosocial response to plan of care. ■ Evaluates response to instructions. ■ Provides care in a nondiscriminatory, nonprejudicial manner regardless of the setting in which care is given. ■ Provides care without prejudicial behavior. ■ Provides care with respect for worth and dignity regardless of diagnosis, disease process, procedure, or projected outcome. ■ Maintains patient confidentiality. ■ Shares patient information only with those directly involved in care. ■ Acts as a patient advocate by protecting the patient from incompetent, unethical, or illegal practices. 	<ul style="list-style-type: none"> ■ The patient voices satisfaction with delivered care. 	The patient is the recipient of competent and ethical care within legal standards of practice.

Title: Intranasal (Transmucosal) Medication Administration													
Date													
Created	Revised	Reviewed											
Submitted by:													
Approved by:		Pharmacy & Therapeutics Committee											

PURPOSE: The hospital safely administers medication.

POLICY

- At the discretion of the ordering physician, the following medications may be ordered for intranasal (ie, transmucosal) administration:
 - dexmedetomidine
 - fentanyl
 - midazolam
 - naloxone
- The Moderate Sedation/Analgesia Policy PC.658, located in the Hospitalwide Administrative manual, outlines the qualifications required for nurses and physicians to administer these medications as well as the locations where these medications may be administered.
- Children 12 years of age or younger require the presence of an anesthesia professional except in the postanesthesia care unit or the emergency department in which a nurse who is certified in pediatric advanced life support is available to monitor the patient.

SUPPLIES

- Intranasal mucosal atomization device
- Select medications:
 - dexmedetomidine (100 mcg/mL)
 - fentanyl (50 mcg/mL)
 - midazolam (5 mg/mL)
 - naloxone (1 mg/mL)

PROCEDURE

- Use the most concentrated/lowest volume of the medication available.
- Ideal volumes are between 0.25 to 0.3 mL per nostril to increase absorption and reduce runoff. If a larger volume is required, administer it in two separate doses, allowing 5 to 10 minutes for the first dose to be absorbed.
- The total dose should be split between each nostril to double the absorptive surface area.
- Note that there may be reduced effect in a patient who has epistaxis (ie, bloody nose) or high mucous production in the nasal cavity.
- Midazolam may burn for 30 to 45 seconds after administration; warn parents that their child may cry initially.
- Dexmedetomidine sedation is deeper than midazolam sedation and has a slower onset (20 minutes) but longer duration.
- Recommended doses:
 - dexmedetomidine – 4 mcg/kg
 - fentanyl – 2 mcg/kg
 - midazolam – 0.2 mg/kg for seizures; 0.3 mg/kg for minor, non-painful procedures (eg, radiographic imaging); 0.5 mg/kg for sedation before procedures (eg, laceration repair)
 - naloxone – 2 mg (not weight based)
- See specific appendices for dosing charts and other pertinent information on each medication.

RESOURCES

- TJC Standards 2013 Patient education: medication management. http://ogg.osu.edu/media/documents/health_lit/JCAHO_Standards_Patient_Education_and_provision_of_information2013.pdf. Accessed September 11, 2014.
- Therapeutic intranasal drug delivery. Intranasal.net. <http://intranasal.net>. Accessed September 11, 2014.

Figure 1. A sample policy and procedure to guide practitioners in intranasal (ie, transmucosal) administration of suitable medications. Published with permission from the Henry Mayo Newhall Memorial Hospital, Valencia, CA.

infusion is completed. Sam's heart rate does not drop and he does not require additional medications to achieve desired effects. Naloxone is not administered, but the nurses make sure that it is readily available. Sam remains asleep while the RN circulator and anesthesia professional transfer him to the OR. Sam does not require additional dexmedetomidine intraoperatively. Postoperatively, Sam requires a single IV dose of hydromorphone and is then sent home alert, awake, and without nausea.

Case 2

Claire is a seven-year-old girl admitted for the surgical insertion of percutaneous pressure equalization tubes (PE tubes). She weighs 22 kg. Claire has a history of attention-deficit/hyperactivity disorder, which requires daily medication therapy. The preoperative nurse verifies that Claire has remained NPO for the required time and obtains Claire's preoperative vital signs without difficulty. Claire then becomes inconsolable and anxious. Both parents are present. Claire is sitting in her father's lap in a recliner. The preoperative nurse gives the parents written information regarding the plan for sedation, including Claire in the discussion of the plan of care. The preoperative nurse administers 5 mg of midazolam orally, but Claire spits out most of the dose because "it tastes bad." The preoperative nurse informs the anesthesia professional of the situation, who then decides that the patient is a candidate for transmucosal administration of sedation medications. To minimize runoff of the medication, the preoperative nurse gives Claire a conservative dose of 60 mcg of transmucosal dexmedetomidine via a MAD Nasal device. Claire nasally expels a portion of the medication; however, after 25 minutes, she is calm. The RN circulator carries Claire to the gurney and then helps the preoperative nurse apply monitors, without Claire waking up. Claire's blood pressure and heart rate are stable and unchanged after being medicated. The patient wakes while the nurse attempts to start

the IV. The nurse is unable to place the IV catheter successfully and Claire does not return to sleep. The RN circulator transports Claire to the OR awake and with her mother at her side. Claire does not receive additional dexmedetomidine intraoperatively. Postoperatively, Claire is cooperative and requires two doses of hydromorphone for pain; she is discharged home alert, awake, and without nausea.

Case 3

Tim is a 17-year-old boy admitted to the outpatient unit to have laboratory tests and preoperative medication levels drawn. Tim has autism and seizures and is taking medications for both conditions. The last time Tim had allowed any blood to be drawn was five years earlier. The patient's shoulder surgery had been cancelled a week before because of the patient's anxiety over having an IV inserted and a nerve block placed; Tim's father had been present at that time. For the current procedure, the preoperative nurse is able to communicate with Tim, and Tim is able to sign consent forms; he allows the preoperative nurse to obtain vital signs without difficulty. Tim weighs 91 kg. The patient's mother is at the bedside. After the nurse confirms that Tim remained NPO for the required time, the nurse discusses the sedation procedure and the required medications with Tim and his mother and answers all of their questions. The preoperative nurse monitors Tim's vital signs and administers 100 mg of dexmedetomidine transmucosally with a MAD Nasal device with no results after 25 minutes. The preoperative nurse repeats the medication after 30 minutes. Tim is minimally sedated after the second dose of dexmedetomidine. The nurse then administers 2.5 mg of midazolam transmucosally with a MAD Nasal device. After 10 minutes, Tim is sleeping. The patient wakes when the IV is started to obtain blood samples but returns to light sleep. Two additional nurses assist with holding the patient's arms still and are successful in verbally calming the patient down to enable the

TABLE 5. Transmucosal Sedation: Four Case Scenarios

Case number/ patient	Age and sex	Clinical or special needs	Medication administered	Stable BP	Stable HR	Effective	Required additional length of stay
Case 1: Sam	4-year-old boy	■ Young age	Transmucosal dexmedetomidine	No: required fluid bolus	Yes	Yes	No
Case 2: Claire	7-year-old girl	■ Attention-deficit/hyperactivity disorder ■ Young age ■ Anxiety	Oral midazolam; transmucosal dexmedetomidine	Yes	Yes	No: nasally expelled the medication	No
Case 3: Tim	17-year-old boy	■ Autism ■ Previous surgery cancelled because of needle phobia ■ Has refused blood draw for 5 years	Two doses of transmucosal dexmedetomidine followed by two doses of transmucosal midazolam	Yes	Yes	No: required repeat doses of medication	Yes: an additional hour because of sedation
Case 4: Tim (same patient as in case 3)	17-year-old boy	■ Autism ■ Needle phobia ■ Preoperative anxiety	Two doses of transmucosal dexmedetomidine followed by two doses of transmucosal midazolam	Yes: preoperatively No: required fluid bolus postoperatively	Yes	Yes: same dose as prior admission to achieve sedation	Yes: an additional hour because of onset of hypotension

BP = blood pressure; HR = heart rate.

blood to be drawn. The preoperative nurse repeats the transmucosal dose of 2.5 mg of midazolam. After eight minutes, Tim returns to sleep but is easily arousable after the blood draw procedure is completed. The RN circulator notes these observations and understands that a normal response with dexmedetomidine results in patients waking up easily with tactile stimuli and then returning to sleep. Tim remains asleep for another hour, after which he wakes, drinks water, and is sent home two hours after the blood draw procedure is completed. The duration of time that Tim was admitted, given medications, and observed postoperatively was four hours, during which he received one-on-one nursing care. Tim's mother expressed her appreciation for having the blood draw procedure performed for the first time in years.

Case 4

Tim is the same patient as in case 3. He is a 17-year-old boy with autism; he weighs 91 kg. Tim is admitted for shoulder surgery, with his father at the bedside. The plan is to sedate Tim preoperatively, start an IV, and administer a peripheral nerve block in the preoperative unit. The surgeon discusses the plan of care with Tim and his father. The preoperative nurse discusses the laboratory draw procedure and sedation that the patient received a few days earlier. Tim states that he is "happy" with the results and does "not remember" the blood draw procedure. The father expresses his appreciation for having his son's laboratory tests performed for the first time in five years. Tim is cooperative while the preoperative nurse obtains preoperative vital signs, after which the nurse administers 100 mg of transmucosal dexmedetomidine. The nurse repeats the dose 30 minutes later, as was done for the blood draw a few days earlier. Initially, Tim's heart rate before administration of dexmedetomidine was around 70 beats per minute and remains consistently around 50 beats per minute after receiving the medication. The patient's blood pressure does not significantly decrease. The anesthesia professional is at the

bedside and attempts to start an IV, but the patient refuses. The anesthesia professional administers 2.5 mg of transmucosal midazolam. After five minutes, Tim is drowsy but still verbally refuses an IV. The anesthesia professional administers an additional dose of 2.5 mg of transmucosal midazolam, after which the preoperative nurse starts an IV with minimal resistance from Tim. Immediately after the IV insertion, the anesthesia professional applies an oxygen mask and administers propofol. The anesthesia professional then performs a nerve block with ropivacaine without complications. The patient's blood pressure and heart rate remain stable throughout the nerve block procedure. The RN circulator transfers Tim to the OR.

The anesthesia professional administers general anesthesia, and Tim does not require additional doses of dexmedetomidine intraoperatively. In the PACU, Tim is comfortable and cooperative, does not have any episodes of nausea, remains pain-free, and has no significant hypotension or bradycardia. After one and a half hours, Tim experiences an episode of orthostatic hypotension. His SBP drops 20 mmHg to 80/42 mmHg. The PACU nurse returns Tim to the supine position and administers 200 mL of lactated Ringer solution. After an hour, Tim's blood pressure remains stable. Naloxone was not administered, but the nurses made sure that it was readily available. The PACU nurse discharges him home with his parents.

DISCUSSION OF CASE SCENARIOS

In the preceding case studies, medications were administered transmucosally to patients ranging from four to 17 years of age. Transmucosal medications have a consistent, expected time of onset if not nasally expelled. Some transmucosal medication doses were decreased because of the restricted quantities of medication to be administered transmucosally. In one case scenario, the patient reported a "bad taste" with midazolam and expelled some of the dexmedetomidine dose. Sam and Tim

PATIENT EDUCATION

Transmucosal Administration of Medications for Sedation

Overview

When a patient who has special needs—such as a child or a person who has a disability that affects their ability to cope—must undergo surgery or other care that may be painful, the clinician will first give the patient medicine to make him or her sleepy and decrease anxiety. Sometimes patients with special needs cannot tolerate having a shot or IV. To keep the patient as pain-free as possible during the procedure, a clinician may use transmucosal sedation instead, which is given in the nose.

What is the benefit of using medicine that is given in the nose?

Inhaling medicine may taste funny or be a little uncomfortable (burn for a few seconds), but it avoids the need for a shot, is less painful, and helps the patient relax.

What will the preoperative care include?

- The patient should not eat or drink anything before the procedure for the amount of time specified by the patient's doctor.
- Ask the doctor whether the patient should take any current medicines the morning of surgery.
- In the preoperative holding area, a nurse will measure the patient's vital signs and ask questions about allergies and the patient's medical and surgical history.
- An anesthesia professional will talk to you about the anesthesia the patient will receive.

What happens when the preoperative sedation is given?

You may be allowed to hold the patient in the sitting or reclining position during the sedation. The clinician will put a small nasal inhaler into one side of the patient's nose and then push the plunger to give a spray of medicine. The clinician will then repeat this in the other nostril. Although the medicine may taste bad or burn for about 30 seconds, it is important that the patient not snort the medicine out because it cannot work if it does not stay in the nose.

Does the medicine work right away?

It can take 5 to 20 minutes for the medicine to take effect, and the patient may need two or more doses of the medicine depending on his or her size. Although the patient may be sleepy, he or she may awaken if touched or moved. This is normal and does not mean that the medicine is not working. After the patient is sleepy enough, clinicians will carry the patient or use a stretcher to take him or her to the surgery or procedure room.

What will postoperative care include?

- After the procedure, the patient is taken to the recovery area, where nurses will monitor him or her very closely.
- If possible, the nurse will let you be with the patient while he or she is waking up.
- The nurse will give the patient additional medicine if needed for pain.
- The patient may seem tired or sleepy during recovery; this is normal.

What are possible complications of receiving medication for sedation?

- The medicine may cause the patient to feel drowsy, tired, or weak for one or two days.
- It also may cause problems with the patient's coordination and ability to think; the patient should not drive, use machines, or ride a bike until he or she has returned to a normal state of alertness.
- The patient should not drink alcoholic beverages or take medicines that slow down reaction time or cause drowsiness for about 24 hours. Examples of these medicines are medicine for hay fever, other allergies, or colds; sedatives; tranquilizers; sleeping medicine; prescription pain medicine or narcotics; and muscle relaxants. Remember to talk to the patient's doctor before changing any medications.

What happens after we go home?

- Make sure the patient gets enough rest.
- Give the patient the prescribed pain medicine as instructed to control pain.

Call the patient's doctor immediately if he or she experiences any of the following postoperative complications:

- weakness, dizziness, or light-headedness;
- nervousness, agitation, irritability, or headaches;
- confusion;
- excessive sweating;
- abdominal pain; or
- diarrhea or constipation.

Resources

- Midazolam. Mayo Clinic. <http://www.mayoclinic.org/drugs-supplements/midazolam-oral-route/description/drg-20072182>. Accessed September 4, 2014.
- Precedex [dexmedetomidine] — patient information. RxList. <http://www.rxlist.com/precedex-drug/medication-guide.htm>. Accessed September 4, 2014.



exhibited mild hypotension, which the nurses treated with IV fluids. None of the patients exhibited significant bradycardia with transmucosal medication administration. Postoperatively, the patients required less pain medication than is typical for patients after undergoing a medical procedure and did not exhibit additional cardiorespiratory problems.

The barrier to use of transmucosal medications is the risk of the patient nasally expelling it. Sam did not actively inhale the medication because of his young age, yet sedation still occurred. In addition, patients are still arousable to tactile stimulation, such as starting an IV, which sometimes makes it difficult to attain IV access or administer additional IV medications.

The time allotted for sedation and the blood draw procedure time were extensive with Tim; however, perioperative personnel were successful because he allowed blood samples to be drawn for the first time in five years. Tim required subsequent transmucosal medications so that the planned procedure could be completed. Tim was on seizure medications and medications for autism, which may inhibit the effectiveness of transmucosal medications. Although naloxone was not administered, the nurses made sure that it was readily available.

CONCLUSION

Providing patient care to special needs populations has inherent barriers and requires individual considerations. Special training and certification are required for clinicians in the transmucosal administration of medications for sedation. The precautions, contraindications, and adverse reactions associated with transmucosal sedation are similar to IV, IM, and oral routes but require additional knowledge and competency. In addition, the onset and duration of transmucosal dexmedetomidine and midazolam are similar to the IV route.

Perioperative personnel have observed that patients receiving dexmedetomidine are arousable and alert when stimulated, but this alone should

not be considered as evidence of lack of efficacy in the absence of other clinical signs and symptoms. The onset of sedation for dexmedetomidine is 20 to 30 minutes and midazolam is 10 minutes. Concurrent administration of other anesthetics, sedatives, hypnotics, and opioids with dexmedetomidine, midazolam, and fentanyl is more likely to lead to potentiated effects.^{4,6}

In conclusion, my clinical experiences with transmucosal medication administration suggest that it is as effective as IM or IV routes. Using transmucosal medications in the ambulatory care setting also improves patient outcomes and flexibility because it is not limited to the inpatient setting. Transmucosal is an effective alternative route for medication administration that can decrease patient anxiety and stress and also decrease the disparity of health care in special needs populations, thereby allowing clinicians to provide necessary care that would otherwise be ineffective or unobtainable and to contribute to positive patient outcomes. **AORN**

***Editor's notes:** The events and observations of transmucosally administered medications for sedation were made by the author while providing care at the bedside and were not attained from other research results. The clinical case scenarios of procedures performed in an ambulatory surgery setting are based on real patient experiences but are compilations and not specific patients. In addition, patient identifiers have been modified.*

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EXAMINATION

CONTINUING EDUCATION

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Effectiveness of Transmucosal Sedation for Special Needs Populations in the Ambulatory Care Setting

PURPOSE/GOAL

To provide the learner with knowledge specific to providing perioperative care for patients receiving sedation medications via the transmucosal route of administration.

OBJECTIVES

1. Discuss the use of procedural sedation medications.
2. Discuss the perioperative nurse's role in procedural sedation.
3. Describe the use of transmucosal dexmedetomidine for procedural sedation.
4. Discuss the use of transmucosal midazolam for procedural sedation.
5. Identify medications used to counteract the effects of overdose after administration of sedation medications.

The Examination and Learner Evaluation are printed here for your convenience. To receive continuing education credit, you must complete the online Examination and Learner Evaluation at <http://www.aorn.org/CE>.

QUESTIONS

1. The administration of procedural sedation medications
 1. results in a depressed level of consciousness.
 2. allows the patient to maintain oxygenation independently.
 3. allows the patient to maintain airway control independently.
 4. requires intubation in the second stage of anesthesia.
 - a. 1 and 3
 - b. 2 and 4
 - c. 1, 2, and 3
 - d. 1, 2, 3, and 4
2. Sedation can be administered via routes including
 1. intramuscular.
 2. IV.
 3. oral.
 4. transmucosal.
 - a. 1 and 2
 - b. 3 and 4
 - c. 2, 3, and 4
 - d. 1, 2, 3, and 4
3. Transmucosal administration of medications for sedation has a decreased effect in a patient
 1. with epistaxis (ie, nosebleed).
 2. with high mucous production in the nasal cavity.
 3. who forcefully expels (ie, snorts out) the medication.
 - a. 1 and 2
 - b. 1 and 3
 - c. 2 and 3
 - d. 1, 2, and 3

- 4.** To be qualified to administer transmucosal medications for sedation, the nurse must
1. attain and maintain competency in moderate or procedural sedation.
 2. be proficient in airway management and cardiovascular support.
 3. have advanced cardiac life support (ACLS) certification if working with adult patient populations.
 4. have pediatric advanced life support (PALS) certification if working with pediatric populations.
 5. possess the skills required to rescue a patient from unintended deep sedation if necessary.
a. 4 and 5 *b.* 1, 2, and 3
c. 1, 2, 3, and 4 *d.* 1, 2, 3, 4, and 5
- 5.** The correct volume of dexmedetomidine to administer to a child weighing 10 kg is
a. 0.5 mL. *b.* 0.6 mL.
c. 0.8 mL. *d.* 1 mL.
- 6.** In addition to the benefits of sedation for a surgical procedure, an extra benefit of dexmedetomidine is less postoperative opioid use.
a. true *b.* false
- 7.** Midazolam is a benzodiazepine that
1. can be administered transmucosally or via IM or IV routes.
 2. is effective for sedation, anxiety, and seizures.
 3. is effective as an analgesic.
 4. can be administered before diagnostic, therapeutic, endoscopic, or surgical procedures.
a. 1 and 2 *b.* 3 and 4
c. 1, 2, and 4 *d.* 1, 2, 3, and 4
- 8.** The correct volume of midazolam to administer to a child weighing 20 kg who is undergoing a painful procedure is
a. 1.3 mL. *b.* 2.1 mL.
c. 3.5 mL. *d.* 4.1 mL.
- 9.** If the patient experiences excessive sedation after transmucosal administration of midazolam, clinicians should administer
a. IV flumazenil.
b. IV naloxone.
c. transmucosal flumazenil.
d. transmucosal naloxone.
- 10.** Naloxone
1. maintains the patient's airway and spontaneous breathing but does not achieve full arousal.
 2. can only be administered transmucosally.
 3. is used to treat opiate overdose.
 4. is a reversal agent for dexmedetomidine.
a. 1 and 3 *b.* 2 and 4
c. 1, 2, and 3 *d.* 1, 2, 3, and 4

LEARNER EVALUATION

CONTINUING EDUCATION PROGRAM

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Effectiveness of Transmucosal Sedation for Special Needs Populations in the Ambulatory Care Setting

This evaluation is used to determine the extent to which this continuing education program met your learning needs. The evaluation is printed here for your convenience. **To receive continuing education credit, you must complete the online Examination and Learner Evaluation at <http://www.aorn.org/CE>.** Rate the items as described below.

OBJECTIVES

To what extent were the following objectives of this continuing education program achieved?

1. Discuss the use of procedural sedation medications. *Low 1. 2. 3. 4. 5. High*
2. Discuss the perioperative nurse's role in procedural sedation. *Low 1. 2. 3. 4. 5. High*
3. Describe the use of transmucosal dexmedetomidine for procedural sedation. *Low 1. 2. 3. 4. 5. High*
4. Discuss the use of transmucosal midazolam for procedural sedation. *Low 1. 2. 3. 4. 5. High*
5. Identify medications used to counteract the effects of overdose after administration of sedation medications. *Low 1. 2. 3. 4. 5. High*

CONTENT

6. To what extent did this article increase your knowledge of the subject matter? *Low 1. 2. 3. 4. 5. High*
7. To what extent were your individual objectives met? *Low 1. 2. 3. 4. 5. High*

8. Will you be able to use the information from this article in your work setting? *1. Yes 2. No*
9. Will you change your practice as a result of reading this article? (If yes, answer question #9A. If no, answer question #9B.)
- 9A. How will you change your practice? (*Select all that apply*)
 1. I will provide education to my team regarding why change is needed.
 2. I will work with management to change/ implement a policy and procedure.
 3. I will plan an informational meeting with physicians to seek their input and acceptance of the need for change.
 4. I will implement change and evaluate the effect of the change at regular intervals until the change is incorporated as best practice.
 5. Other: _____
- 9B. If you will not change your practice as a result of reading this article, why? (*Select all that apply*)
 1. The content of the article is not relevant to my practice.
 2. I do not have enough time to teach others about the purpose of the needed change.
 3. I do not have management support to make a change.
 4. Other: _____
10. Our accrediting body requires that we verify the time you needed to complete the 3.5 continuing education contact hour (210-minute) program: _____