

Sex Differences in Response to Opioid Analgesia and Conscious Sedation: Case-based Small Group Discussion Planning Notes

Education Problem Addressed by the Scenario:

Sex differences in response to opioid analgesia and conscious sedation medications such as propofol.

Session Objectives:

1. State the differences in response to opioid medications such as morphine between males and females.
2. State the differences in response to sedation medications such as propofol between males and females.
3. Understand the need for titration of morphine for pain while considering that female patients are at increased risk of respiratory depression and over-sedation when compared to males receiving equivalent dosing.
4. Understand the need for titration of propofol for procedural sedation while considering that female patients may require higher doses and more frequent re-dosing of propofol.
5. State the potential sex-based differences in response to neuromuscular blockade should the patient need to be intubated.

Performances expected from learners:

-The verbalization of dosing of morphine and propofol that take sex-based differences in response to pharmacologic therapy into account.

-Ability to describe titration of morphine to analgesic effect with reassessment of patient for adverse effects and efficacy of analgesia.

-Ability to describe titration of propofol dosing to sedation effect.

-Ability to describe sex-based dosing of rocuronium.

Learners:

Emergency medicine residents participating in simulation during emergency medicine residency.

Case:

This is a 54 year old female with a history of osteoarthritis and diet-controlled HTN who presents with right hip pain after tripping while walking up several steps. She states she felt her 'right hip pop out of place' and believes her hip replacement has 'dislocated again'. She states the same thing happened 1 month after her surgery, as well as 2 weeks ago and 'you doctors put me to sleep and put it right back in each time'. She denies any other pain, known injuries or recent illness. EMS notes her vitals have been normal with the exception of some mild tachycardia to 106. Her BP is 138/76, normal SpO2. They provided one dose of intranasal fentanyl 100 mcg en route with some relief of her pain.

Detailed focused history: Sharp constant pain in right hip with no radiation, worse with movement, improved with fentanyl; feels 'just like the last time' patient dislocated her hip. Notes right hip arthroplasty was performed by Dr. Smith, orthopedic surgeon at this same hospital 2 months ago. No other complaints.

PMH:

Diet-controlled hypertension

R hip arthroplasty

Meds: None

Allergies: 'Bad reactions to dilaudid and ketamine during prior sedations and surgeries'.

Social: married, volunteers at local humane society, no tobacco, alcohol or drug use

Family history: Father with stroke in his 80s. Otherwise normal.

ROS otherwise negative.

Examination:

- HEENT: Normal
- Lungs: Good chest rise and symmetric BS
- Heart: RRR, normal S1 and S2
- Abd: soft, non-tender
- Ext: notable for a tender, externally rotated and shortened right LE; distal pulses intact; normal distal sensation and able to move toes.
- Neuro: GCS 15

Group to discuss ED interventions:

The patient requests pain control. Discussion facilitator to note that female patients are more susceptible to adverse effects such as over-sedation and respiratory depression and that providers should titrate morphine to effect. Normal weight based dosing is 0.1 mg/kg or 8 mg for this patient.

What dosing might be considered in this patient given she is a female patient?

Suggestion: Administer 0.05 mg/kg or 4 mg of morphine, followed by reassessment and accompanied by monitoring for desaturations or CNS sedation.

Sex-specific use of propofol for procedural sedation:

Facilitator to remind learners that the patient has had adverse outcomes from other deep sedation medications, but has done well with propofol sedation.

ED resident to discuss propofol dosing. Resident should note range of dosing is 1-2.5 mg/kg IV, typically given as 1 mg/kg IV followed by 0.5 mg/kg every 3-5 minutes for sedation. Facilitator to note that female patients may require higher doses of propofol than male patients, and wake up more quickly than male patients, so may require more frequent dosing. Resident should plan for a minimum of 1 mg/kg IV propofol with re-dosing to effect.

Sex-specific dosing of rocuronium:

Facilitator notes the patient has become very agitated and needs to be intubated for further intervention and presumed clinical course. Facilitator to ask if there are any sex-specific differences in response to neuromuscular blocking agents?

Facilitator to ask what normal dosing range is for rocuronium: correct response is 0.6-1.2 mg/kg. Facilitator to note that female patients have a longer duration of effect and are more sensitive to the effects of rocuronium. This has not been found for succinylcholine. Facilitator to ask residents to discuss potential dosing options – facilitator can point out that while still using standard dosing range, a lower standard dose may be considered in a female patient such as 0.6-1.0 mg/kg while still providing standard of care, and while providing a sex-tailored approach to patient safety.

Main themes for discussion:

Discussion of sex differences in response to opioid analgesia – female patients suffer from more chronic painful conditions, are more likely to be on multiple medications, and have increased risk of sedation and respiratory depression than males with equivalent morphine dosing.

Sex-based dosing of propofol. While females initially, and briefly (for several minutes) have higher blood concentrations of propofol, blood concentrations rapidly decline and are lower than male patients given equivalent dosing. Females often need higher doses of propofol, more frequent re-dosing, and wake up more quickly than male patients.

Measurements of whether learners met objectives:

Materials:

- Summary slides/outline on sex differences in pharmacologic responses to analgesic and sedation medications.

Stimulus 1: Pre-reduction X ray of right hip



Stimulus 2: Post-reduction X ray of Right Hip

