PAIN TOPICS

Converting Opioid Analgesics, Part I: Use of Equianalgesic Tables

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A barrier to effective pain management with opioids

It is sometimes necessary to change the route by which an opioid analgesic is given; in some circumstances it may also be desirable to change to a different opioid. The chemical differences between opioids effects their relative potency when compared milligram for milligram. Also, the pharmacokinetics of an opioid taken orally is different than when taken intravenously. For example, morphine and hydromorphone (Dilaudid) are very effective analgesics for moderate to severe pain. However, 7.5 mg of oral hydromorphone is as potent as 30 mg of oral morphine: these two doses are considered to be equianalgesic. Similarly, that same 30 mg of oral morphine is equianalgesic to 10 mg of parenteral morphine.

For some less experienced practitioners, conceptualizing the sometimes-dramatic differences between potencies of opioids can be a psychological barrier to effective use of these analgesics. For both experienced and inexperienced practitioners, having to "do the math" for these conversions is another potential barrier, especially when both route and drug change at the same time.

Lowering the barrier

Using an opioid equianalgesic table can help to lower both the psychological and practical barriers to selecting the best drug and route for a patient. There is an opioid equianalgesic table on the MGH Cares About Pain Relief web site. All listed doses are considered to be approximately equivalent to each other. No equianalgesic table is fool-proof and the fact that different tables sometimes display different equivalencies naturally leads one to question their validity. However, these tables can be effectively used with the following caveats:

1. **Use only one table**: Consistent use of the same table reduces errors and increases comfort with dose conversion.
2. **Start conservatively, then titrate to effect**: There is incomplete cross-tolerance between opioids and both route and drug "equianalgesic" calculations are approximate. When changing drugs, reduce the *calculated* equianalgesic dose by at least 25% to prevent overshooting the patient's analgesic needs, but be prepared to titrate in 25 – 50% increments per day.
3. **Treat the patient, not the table**: Available dosage forms may not match the calculated dose: in general, start with a dose lower than the calculated dose. For example, if the calculated dose minus 25% (to account for incomplete cross-tolerance) is 10 mg but the available dosage form is in 4 mg tablets, start with an 8 mg dose.
4. **Calculate doses based on 24-hour usage**: Equianalgesic tables usually list *per dose* equivalencies. In clinical practice, it is usually most appropriate to determine the patient's total opioid use in the previous 24 hours, calculate the equianalgesic dose of the new drug, subtract 25%, then divide by the number of desired doses per day, as determined by the standard dosing interval for that drug.
5. **Don't forget rescue doses**: As discussed in *Pain Relief Connection* Vol 1 #6, June 18, 2002, p 1, rescue doses should be available as a standard part of an around-the-clock dosing regimen. Use of rescue doses can be particularly helpful in titrating to the appropriate dose after a drug or route conversion. The rescue dose is generally calculated as 15-20% of the 24 hour dose.
6. **Know the drugs you are using**: Recognize that the conversion of certain agents may be different depending on whether the patient is relatively opioid naïve vs using opioids chronically.
7. **Get help**: Have a colleague check both your plan and your math.

1. The case: Mr. Mendez is maintained on MS Contin (sustained-release morphine) 30 mg q12 hours for chronic pain not related to a malignant disease. He also takes 15 mg of Roxanol (oral morphine) for breakthrough pain. He averages 1 - 2 rescue doses per day. His pain averages 2-3/10 and he requests the breakthrough dose when the pain reaches 5/10.

   Mr. Mendez is scheduled for an all-day GI procedure that requires a bowel prep. He will likely be NPO for a total of 48 hours. A continuous infusion is considered, but Mr. Mendez thinks it be unnecessarily cumbersome. He requests intermittent IV injections.

   Thinking it through: Mr. Mendez is stable on his basal morphine dose and is quite familiar with rescue doses. It is decided that his basal dose will be converted to q4 hour IV injections and his IV rescue dose will be available every 1 – 2 hours.

   Doing the math (use the equianalgesic table to confirm equivalent doses):
   a. First calculate the 24 hour basal dose: morphine 30 mg x 2 doses per day = 60 mg + (conservatively) 15 mg Roxanol = 75 mg morphine/24 hours
   b. Set up the simple proportion equation:

$$\frac{\text{morphine 30 mg PO}}{\text{morphine 10 mg IV}} = \frac{\textit{\{current dose\}}\ \text{morphine 75 mg PO}}{\textit{\{planned dose\}}\ \text{morphine } x \text{ mg IV}} = 25 \text{ mg morphine IV/24 hours}$$

   c. Morphine is generally dosed q 4 hours = 6 x/day: 25 mg ÷ 6 = 4 mg q 4 hours.
   d. The rescue dose is 10 – 15% of the 24 dose: 25 x .1 = 2.5 mg IV q 1 hour as needed for breakthrough pain.

2. **The Case**: Ms Anders has advanced endometrial cancer. Ms. Ander's abdominal pain is well controlled (range: 0 – 3/10) with 100 mg MS Contin q8 hours. She has ascites, lower extremity edema, and has recently experienced nausea and vomiting, so that the oral route has become unreliable for medications.
   The decision is made to change to continuous IV analgesia, and to convert the morphine to hydromorphone (Dilaudid) in order to minimize the volume of IV fluid she receives. Ms Anders has a rescue dose of immediate release morphine 30 mg PO ordered, but rarely needs it.

   Thinking it through:
   A simple conversion of the basal oral morphine dose to an hourly Dilaudid parenteral dose is the goal. Ms Anders has not needed her oral rescue dose, but it should be available now because route and drug changes are inexact. A relatively conservative rescue dose may be appropriate.

   Doing the math:
   a. First calculate the 24 hour basal dose: morphine 100 mg x 3 doses per day = 300 mg.
   b. Set up the simple proportion equation:

$$\frac{\text{morphine 30 mg PO}}{\text{Dilaudid 1.5 mg IV}} = \frac{\textit{\{current dose\}}\ \text{morphine 300 mg PO}}{\textit{\{planned dose\}}\ \text{Dilaudid } x \text{ mg IV}} = 15 \text{ mg Dilaudid IV/24 hours}$$

   c. Reduce dose by 25%: 15 x .75 = 11.25 mg IV to be deliver over 24 hours by continuous infusion. (Note that some practitioners recommend reducing an additional 25% because both drug and route are being changed).
   d. The hourly dose is 11.25 ÷ 24 = 0.5 mg/hour.
   e. The rescue dose is 10 – 15% of the 24 dose: 11 x .1 = 1.1 mg. Suggested rescue dose: 0.5 – 2 mg IV q 1- 2 hours as needed for breakthrough pain.

In each case the patient should be assessed frequently for both pain and side effects, and the doses adjusted accordingly.

Next step
Standardizing opioid conversion as described above is one step toward improving opioid use—but you still have to do the math. In Part II we will discuss the use of electronic calculators for equianalgesic dose conversions.

(**The URL for the equianalgesic table is**: http://www.massgeneral.org/painrelief/mghpain_equichart.htm)