June 2005

Pain : Improving Medication Safety and Efficacy

University of Connecticut Health Center

June 2005 | 263 Farmington Avenue, Farmington, Connecticut 06030 | Volume III

Collaborative Center for Clinical Care Improvement

"PAIN: IMPROVING MEDICATION SAFETY AND EFFICACY"

Endorsed by our Board of Directors, we have set out to become the safest hospital within the State of Connecticut.Management of pain is one of the key areas of focus to achieve this goal.

Please take the true or false personal responsibility test below:

1. As a caregiver, I react the same to a pain score of 10 and a temperature of 104° F or a pulse of 160. True or False

2. Patients who take narcotics for acute pain have a very low risk of addiction. True or False

3. Many patients do not like to ask for pain medicine they need. True or False

How did you do?

If you answered 'true' to all three questions, patients would be getting what they need with little risk of overdosing.

But do we really trust patients' perceptions?

Do we understand the differences among tolerance, dependence and addiction?

And, are we aware of the wide range of reactions to pain? After the same surgical procedure, some patients 'suffer in silence,' others cry out for more medication and perhaps few ask for what we consider to be the 'right amount'. And, after we undergo the same surgery, perhaps the 'right amount' of medication may increase?

And, haven't we been doing a pretty good job all these years?

Perhaps not! Acute pain is common in hospitalized patients and education of physicians, nurses and other care givers has been limited. Statistics show that **under-treatment of pain occurs in 60% of the more than 25 million patients having surgery each year.**

Other studies show that of the 500,000 cancer patients who die each year, 70% have pain (350,000 patients). In addition, 80-90% of cancer patients who die each year have pain which can be easily controlled, but only 40% receive adequate treatment. That means, 312,500 patients suffer from needless pain in the U.S. each year.

Also, there are 50 million patients with chronic, non-cancer pain in the US. In addition to the suffering, the economic burden is staggering because 550 million work days are lost at a cost of over $100 billion.

So we just need to give more pain medication?

Unfortunately, it is not that simple. Giving more and more pain medication is not the answer. Strong pain medications have dangerous side effects, including death, inability to breathe and sedation-to-coma. There are also other serious side effects such as nausea, intense itching, and severe constipation which can occur. In addition, patients bring other variables to treatment – some are so stoic that they do not request pain medication which may lead to poor healing. Others have such a low pain threshold that overdosing can easily occur. And, there are those with pain-seeking behavior and addiction problems.

We'll only know how to proceed when we all know what we all know!

To use an old teachers' slogan in a different context, **"If you think education is expensive, try ignorance."** Well, we can correct ignorance –

UConn Health Center

APRIL 2005

Collaborative Center for Clinical Care Improvement

and we need to do so. Why? Remember the words of Charles Darwin: **Ignorance is a more important determinant of confidence than knowledge.**

CLINICAL CAREGIVER'S SECTION

Where do we go from here?

The first step is to find out what we know.

The principles of treatment and the dimensions of both caregiver and patient perceptions form an attainable knowledge base. A demonstration internet application has been developed: it begins with a test and then provides down-loadable source material containing the particular answer 'hidden' in a one page discussion of the relevant principle or technique. In testing our surgical residents, the average correct initial test scores were 63% and on retest, after exposure to the source materials, the average improved to 96%. We plan to develop a similar application structured for all health care providers which can kindle the 'tension to learn' needed by adult learners and at the same time guide them to greater knowledge, understanding and application.

Then what comes next?

Our demonstration project shows that knowledge can be improved. We must show that this new knowledge becomes a determinant of confidence. Chart audits can abstract the amounts of pain medication ordered and, as JCAHO requires, a recording of pain scores and the results of treatment. The number and type of changes in orders also serve to document implementation of the new knowledge. Better control of pain while avoiding side effects result in better and safer patient outcomes.

How about answering a few practical questions?

Is there a problem with prescribing oral opioids every (q) 4-6 or q 6 hours?

In the inpatient setting, nursing research from the 1980's indicated that nurses are more likely to administer the minimum drug dose at the longest allowable interval-an order written 1-2 tabs q 4-6 h, will often result in 1 tab q 6 h, with inadequate analgesia. In the home setting, patients and families are often excessively concerned about opioid addiction and opioid side effects, so that if the prescription on the bottle says "take every 6 hours", patients are apt to follow this recommendation, even if the pain returns in 2-4 hours.

Is there a danger to more frequent drug administration?

There is no danger of dosing intervals as often as every 2 hours for single agent products (e.g., morphine), in patients with normal renal function, as the peak effect will be reached in 60-90 minutes and there is rapid renal excretion. For combination products, the dosing interval should not be less than every 4 hours to avoid excessive acetaminophen (e.g., 2 Percocet tabs every 4 hours = 4 grams acetaminophen/24 hours, the maximum daily recommended dose).

What are Opioid Equianalgesic Values?

Morphine 10 mg parenteral = Morphine 30 mg oral = Hydromorphone 1.5 mg parenteral = hydromorphone 7.5 mg oral.

In order to teach and reinforce information, we often use [or equi-analequi-analwill use] multiple choice questions (MCQ). According to the'rules' of test-taking, MCQ have only 1 'correct'answer. And we teach prescribing as if it were an exact science. There really isn't ONE correct answer in real life. Initial pain medications are like horseshoes and hand grenades. You don't have to be right on the mark, just in the right general area to achieve your goal. Think of it as similar to skeet shooting – you need to be close but you have to 'lead the target' which, for the patient, means not to 'overshoot' more than not to 'undershoot' on first try. If we overshoot, then we risk respiratory depression – and worse. If we undershoot, then, provided, we check frequently to ensure that pain relief has been attained, there is little downside. So, although equivalency, ratios and other 'exact' conversions are often presented, adjustment is expected. Patients differ in their ability to tolerate pain, have different sensitivities to drugs and routes and there are many other variables, which can not be calculated but can be corrected with subsequent orders.

How about examples of changing route and drugs?

Change route, keeping drug the same (e.g. oral to IV morphine)

Example: Change 90 mg q12 MS Contin to MS by IV continuous infusion

1. Calculate the 24 hour current dose: 90mg q 12 = 180 mg MS/24 hours
2. Look up equianalgesic ratio: 30 mg po MS = 10 mg IV MS
3. Calculate new dose using ratios: 180/30 x 10 = 60 mg IV MS/24 hours or 2.5 mg/hour infusion

Change drug, keep the same route: (e.g. po morphine to po hydromorphone)

There is incomplete cross-tolerance between all different opioids, but the exact amount will differ, thus, equianalgesic tables are only approximations. Depending on age and prior side effects, most experts recommend starting a new opioid at 50% of the calculated equianalgesic dose.

Example: Change 90 mg q 12 MS Contin to oral hydromorphone.

1. Calculate the 24 hour current dose: 90 Q12 x 2 = 180 mg po MS/24 hrs
2. Look up equianalgesic ratio: 30 mg po morphine = 7.5 mg po hydromorphone
3. Calculate new dose using ratios: 180/30 X 7.5 = 45 mg oral hydromorphone/24 hours.
4. Reduce dose 50% for cross-tolerance: 45 x 0.5 = 22 mg/24 hours = 4 mg q 4 h

Changing drug and route (e.g. oral morphine to IV hydromorphone)

Example: Change from 90 mg q12 MS Contin to IV hydromorphone as a continuous infusion.

1. Calculate the 24 hour current dose: 90 Q12 x 2 = 180 mg po MS/24 hrs
2. Look up equianalgesic ratio of po to IV morphine: 30 mg po MS = 10 mg IV MS
3. Calculate new dose using ratios: 180/30 x 10 = 60 mg IV MS/24 hours
4. Look up equi-analgesic ratio of IV morphine to IV hydromorphone: 10 mg MS = 1.5 mg hydromorphone
5. Calculate new dose using ratios: 60/10 x 1.5 = 9 mg IV hydromorphone/24 hours
6. Reduce dose 50% for cross-tolerance: 9 x.5 = 4.5 mg/24 hours = 0.2 mg IV continuous infusion

Whoa! You're going a little fast for me! I need a bit more than this Q&A format! Where can I get some more background material NOW??

An excellent resource for material on Pain and Palliative Care is the End of life/palliative care Educational Resource Center [www.eperc.mcw.edu]. Take a minute to register – it's free. They have many features, one of the best being Fast Facts. They are one page discussions of specific topics. There are over 120 and you can search for them. In addition, you can receive them each week by e-mail. Other services include a newsletter, source materials, references, reviews, PPT presentations, etc. Everything you need to get started in Pain and Palliative Care – if you care to access and read!

A journey of 1000 miles starts with the first step – old proverb. This was the first step, but the journey isn't any where near that long!

Joseph M. Civetta, M.D.
Professor, Department of Surgery

Equianalgesic Dose Ratio

- The "Equianalgesic Dose Ratio" is the ratio of the dose of two analgesic agents required to produce the same analgesic effect
- Principles for using the "Equianalgesic Dose Ratio" table
  - The ratio does not reflect variability observed between single dose and multi-dose cross-over study
  - Does not take into account the phenomenon of incomplete cross tolerance in switching from one agent to another
  - For most opioid agonists, the equianalgesic relationship with morphine is linear
  - For methadone, the relationship is curvilinear and the equianalgesic dose ratio increases as the dose of morphine increases. For example:
    - **At oral morphine doses between 30-300 mg the equianagesic ratio to oral methadone is 4:1 to 6:1**
    - **At oral morphine doses > than 300 mg the equianalgesic ratio to oral methadone is 10:1 to 12:1**

Drug[a]	Equivalent Dose (mg)		Equivalent Dose[c]	
	Parenteral	Oral	Oral Morphine TDD (mg/d)	Transdermal Fentanyl (μg/h)
Morphine	10	30	45 – 134	25
Oxycodone	NA	15 – 30	135 – 224	50
Hydromorphone	1 – 1.5	6	225 – 314	75
Fentanyl inj.	0.1	NA	315 – 404	100
Methadone[b]	2.5	5	405 – 494	125
Meperidine	75 – 100	300	495 – 584	150
Codeine	120 – 130	200	585 – 674	175
Hydrocodone	NA	30	675 – 764	200
			765 – 854	225
			855 – 944	250
			945 – 1034	275
			1035 – 1124	300

a. Equianalgesic dose to 10 mg IM morphine
b. See caution above regarding methadone dosing
c. Based upon Duragesic® package insert. Accessed June 2004.