In the workers’ compensation industry, 60.2 percent of claimants utilize opioid analgesics for the treatment of pain caused by a workplace injury.[1] But with the use of opioids also comes inherent risks, such as addiction, tolerance, dependence, misuse, abuse and even death. According to a recent study by the Centers for Disease Control and Prevention, 46 people die every day from an overdose of prescription painkillers in the U.S. and for every opioid-related death, there are more than 150 people who abuse or are dependent on opioids.[2] Because of this, it is important to understand the potency of the medications being prescribed and when additional caution and monitoring is warranted. Morphine equivalent dose (MED) helps provide these cautionary measures.

What is an MED?

An MED is a numerical standard against which most opioids can be compared, yielding an apples-to-apples comparison of each medication’s potency. Although it’s easy to presume that 10 mg of medication A are equal to 10 mg of medication B, differences in how opioid medications work in the body prohibits this sort of comparison, thus the need for calculating the MED of each. It is not about a medications efficacy or how well it works, but about its relative potency.

Morphine is used as the basis for this comparison because it is considered the “gold standard” for the treatment of pain. Because there are many other derivatives of morphine used today, such as oxycodone, knowing the MED helps determine if the patient’s opioid doses are excessive and is useful if converting from one opioid to another.

How MEDs are used

Prior to 2007, there was no workers’ compensation definition for what constituted a high dose of opioids, until the Washington Department of Labor and Industries established guidelines. Their guidelines suggested that when an injured worker reached an oral MED of 120 mg, they undergo an evaluation by a pain specialist to determine if the treatment should be continued, the dose reduced or if they should be weaned off of the medication.[1]

Studies have indicated that higher doses of opioids lead to lower rates of return-to-work, higher rates of healthcare utilization and higher rates in future reception of Social Security Disability Income. With the introduction of the high dose of opioids definition as an MED of 120 mg or more by the Washington State Workers’ Compensation System there has been a 27 percent decrease in average morphine equivalents per day dispensed, a 35 percent decrease in the number of patients receiving more than 120 mg per day of morphine equivalents (both compared to before 2007), and a 50 percent decrease in the number of unintentional opioid deaths (2009-2010). By 2012, Studies have indicated that higher doses of opioids lead to lower rates of return-to-work, higher rates of healthcare utilization and higher rates of going on to receive Social Security Disability Income.

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Washington State began to recognize that the range for risk was lower than 120 mg, in the 100-120 mg MED range, although the official value remained 120 mg per day. Subsequent research now indicates that adverse effects secondary to opioid use occur in the range of 50 mg to 100 mg MED or even lower ranges in some studies, and increase significantly at doses greater than 100 mg MED.

Since that time, in an effort to promote more rational prescribing of opioids for the treatment of occupational injuries, organizations such as the American College of Occupational and Environmental Medicine (ACOEM) and the Work Loss Data Institute (Official Disability Guidelines or ODG) have published guidelines for the use of opioid analgesics that clearly establish best practices with regard to the treatment of injury-related pain. The ACOEM guidelines recommend a limit of 50 mg MED in most acute cases, although sub-acute and chronic pain patients may require higher doses. The ODG recommends a limit of 100 mg MED, with increased caution for dosing over 50 mg MED.

Additionally, the ODG offers specific guidelines for workers’ compensation injuries. They provide integrated medical treatment and disability duration guidelines, as well as a medication formulary that indicates which medications are appropriate as first-line therapy for various injuries. The guidelines provide recommendations and strategies to make decisions about appropriate treatment and focus on functional restoration. Many state governments have also established their own guidelines or instituted guidelines based on the ACOEM and ODG guidelines.

The purpose of these guidelines is not to have every patient taking a certain level of MED or less, rather they provide guidance on when additional precautions may be necessary. The guidelines let providers know that when a patient is taking a certain level of opioid analgesics, there should be a value-based assessment:

- Are opioid analgesics the right medication for this patient?
- Are they responding to the therapy?
- Should a pain management specialist be included in the treatment?
- Are there other medications that could be utilized instead of, or with opioids, such as a medication for nerve pain?

**Calculating MED**

To calculate MED, a standard conversion table can be used that sets an equivalent analgesic dose or equianalgesic dose for morphine. In Table 1, MED for Selected Opioids, that dose is 30 mg. Once that is established, a multiplication factor can be used to calculate MED.

There are a number of online MED calculators available; however, many of them have disclaimers stating that the authors make no claims to the accuracy of the information and that suggested doses are not a substitute for clinical judgment. As such, there are some inherent risks in using these calculators. When using them, be sure you thoroughly understand the disclaimers and the instructions. Entering the wrong information, using the calculator incorrectly or selecting the wrong formulation can all lead to inaccurate results. While these calculators can be useful, it is not only critical

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to read the directions carefully, but as the case studies below will demonstrate, it is important to take a holistic approach when evaluating medication usage.

**Table 1. MED for Selected Opioids**

<table>
<thead>
<tr>
<th>Opioid</th>
<th>Approximate Equianalgesic Dose (oral &amp; transdermal)</th>
<th>MED Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine (reference)</td>
<td>30 mg</td>
<td>1</td>
</tr>
<tr>
<td>Codeine</td>
<td>200 mg</td>
<td>0.15</td>
</tr>
<tr>
<td>Fentanyl transdermal</td>
<td>12.5 mcg/hr x 24 hr</td>
<td>2.4</td>
</tr>
<tr>
<td>Hydrocodone</td>
<td>30 mg</td>
<td>1</td>
</tr>
<tr>
<td>Hydromorphone</td>
<td>7.5 mg</td>
<td>4</td>
</tr>
<tr>
<td>Oxycodone</td>
<td>20 mg</td>
<td>1.5</td>
</tr>
<tr>
<td>Oxymorphone</td>
<td>10 mg</td>
<td>3</td>
</tr>
</tbody>
</table>

**MED calculation case studies**

The following cases demonstrate the value of understanding MED.

**Case 1**

- **Prescription:** 5 mg Vicodin x 4 per day = 20 mg per day
- **Conversion:** Vicodin = Hydrocodone
  
  1 mg hydrocodone = 1 mg morphine

- **MED:** 20 mg x 1 = 20 mg

Clark was prescribed a ten day supply of Vicodin® 5 mg to be taken four times a day. Vicodin is a form of hydrocodone, which according to our conversion table, has a conversion factor of 1, meaning 1 mg of hydrocodone equals 1 mg of morphine. This prescription calls for 5 mg taken four times daily for a total of 20 mg per day. That falls within industry guidelines for acute pain (<90 days).

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* list not all inclusive  
Source: Work Loss Data Institute ODG Opioid MED Calculator
Case 2

Prescription: 100 mcg/hour Duragesic patch
Conversion: Duragesic = fentanyl transdermal
1 mcg/hour fentanyl transdermal = 2.4 mg morphine
MED: 100 mcg/hour x 2.4 = 240 mg MED

Diana was prescribed ten Duragesic® 100 mcg/hour patches to be applied every three days. That means that one patch would provide a continuous dose of 100 mcg/hour each day for three days. The Duragesic patch is a form of fentanyl transdermal, which has an MED factor of 2.4. When you multiply 100 mcg/hour by 2.4 that equates to an MED of 240 mg, which is well above accepted industry guidelines.

Case 3

Prescription: 5 mg Percocet x 3 per day = 15 mg per day
30 mg OxyContin x 2 per day = 60 mg per day
Conversion: Percocet = oxycodone
OxyContin = oxycodone
1 mg oxycodone = 1.5 mg morphine
MED: 15 mg Percocet x 1.5 = 22.5 mg MED
60 mg OxyContin x 1.5 = 90 mg MED
Total = 112.5 mg MED

Bruce received two prescriptions, one for 60 Percocet® 5 mg tablets to be taken three times a day as needed, and one for 60 OxyContin® 30 mg tablets to be taken twice a day. Both Percocet and OxyContin are forms of oxycodone, which as an MED conversion rate of 1.5. If he does take the Percocet three times a day, that would equal 15 mg per day. Multiply that by the 1.5 MED factor and the total MED is 22.5 mg, which is well within leading industry guidelines.

The OxyContin at 30 mg taken twice a day is a total of 60 mg. Multiply that by the 1.5 MED factor, it is a total MED of 90 mg, within the ODG guidelines, but exceeding the ACOEM guidelines. But when you add the MED for the Percocet and the OxyContin together, it is a total of 112.5 mg, which exceeds both guidelines.
## Case 4

Peter received four prescriptions.

- A prescription for 60 OxyContin® 20 mg tablets to be taken twice a day was prescribed on April 1.
- Two prescriptions were given for 60 Percocet® 5 mg tablets to be taken four times a day as needed, one was prescribed on April 5 and one on April 12.
- Another prescription for 30 Exalgo® 8 mg tablets to be taken once a day was prescribed on April 15.
- A prescription from April 22 was for 60 Vicodin® 5 mg tablets to be taken four times a day as needed.

Following is the MED calculation for each:

<table>
<thead>
<tr>
<th>Prescription</th>
<th>Calculation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>OxyContin</td>
<td>20 mg x 1 per day</td>
<td>20 mg per day</td>
</tr>
<tr>
<td>Percocet</td>
<td>5 mg x 4 per day</td>
<td>20 mg per day (2 prescriptions = 40 mg)</td>
</tr>
<tr>
<td>Exalgo</td>
<td>8 mg x 1 per day</td>
<td>8 mg per day</td>
</tr>
<tr>
<td>Vicodin</td>
<td>5 mg x 4 per day</td>
<td>20 mg per day</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conversion</th>
<th>Calculation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>OxyContin</td>
<td>1 mg = 1.5 mg morphine</td>
<td></td>
</tr>
<tr>
<td>Percocet</td>
<td>1 mg = 1.5 mg morphine</td>
<td></td>
</tr>
<tr>
<td>Exalgo</td>
<td>1 mg = 4 mg morphine</td>
<td></td>
</tr>
<tr>
<td>Vicodin</td>
<td>1 mg = 1 mg morphine</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MED:</th>
<th>Calculation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20 mg x 1.5</td>
<td>30 mg MED</td>
</tr>
<tr>
<td></td>
<td>20 mg x 1.5</td>
<td>30 mg MED (2 prescriptions = 60 mg MED)</td>
</tr>
<tr>
<td></td>
<td>8 mg x 4</td>
<td>32 mg MED</td>
</tr>
<tr>
<td></td>
<td>20 mg x 1</td>
<td>20 mg MED</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>142 mg MED</td>
</tr>
</tbody>
</table>

Each of the individual prescriptions are below the industry recommended guidelines; however, because the durations of the therapy overlap, at different times, the patient will exceed guidelines. This emphasizes how MED’s are cumulative across all of the products to an injured worker is taking and can be used to calculate total daily doses and watch for duplications in therapy.
These cases demonstrate how MED calculations can be a valuable component of opioid management, but calculations should not be used alone. Proper monitoring is also important.

**What can be done if an MED threshold is exceeded?**

With a better understanding of MED and how to calculate it, what can be done if the MED level exceeds recommended guidelines?

- **Random urine drug screens:** This helps monitor whether an injured worker is taking their medications correctly and verifies whether they are taking any illicit drugs.

- **Medication agreements:** These help to make sure an injured worker understands the risks and benefits of their medication, as well as their responsibilities and how to properly follow their medication therapy.

- **Weaning protocols or guidelines:** Due to potential withdraw symptoms, it is important to have weaning protocols in place should that be the next step in patient care.

- **Team approach:** When implementing medication guidelines, it is optimal to have a team approach that includes the prescriber, pharmacist, case manager and Pharmacy Benefit Manager (PBM).

A PBM can help identify injured workers receiving opioid dosages that exceed guidelines and offer appropriate intervention. At Optum®, MED is one of the tools we use to identify injured workers who are high-risk. Once a high-risk injured worker has been identified, we can send a letter to the prescriber informing them of the excessive dosage level, perform a medication review, and/or have a physician peer reach out to the prescriber to discuss treatment concerns and options. This shows how MED calculation can be a beneficial component to your medication management program, providing guidance when additional monitoring and precaution is needed.

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**About Optum for Workers’ Compensation**

The workers’ comp division of Optum collaborates with our clients to deliver value beyond transactional savings while helping ensure injured workers receive safe and effective clinical care. Our innovative and comprehensive medical cost management programs include pharmacy, ancillary and managed care services from first report of injury to settlement.

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