Development and Implementation of Computerized Acetaminophen (APAP) Alert
University of Maryland Medical Center

Program/Project Description.
A Medication Utilization Review of a new combination analgesic product containing APAP showed that adult patients were at risk of receiving greater than the maximum recommended dose (4,000 mg) of APAP in a 24 hour period. The existing dose range checking alert system could only notify the prescriber and pharmacy if the maximum daily dose was exceeded for an individual APAP containing medication order. No alert was available if multiple APAP containing products were administered to an individual patient. The as needed nature of many of the APAP containing products makes it more difficult for clinicians to keep track of the total amount of APAP administered in the previous 24 hours. The institution realized that exceeding the recommended total daily dose could potentially apply to other products containing APAP and to our pediatric patients. Our goal was to prevent patients from receiving more than the recommended total daily dose of APAP in 24 hours, regardless of product(s) used or age.

Process.
To address this issue, a multidisciplinary team consisting of pharmacy, nursing, physicians, and information technology (IT) representatives collaboratively discussed the key requirements of an ideal APAP alert system. Then, the group determined how the key requirements could be met using our current electronic medical record system to generate an electronic alert.

Solution.
The multidisciplinary team developed an open electronic medication administration record (MAR) alert system in our electronic medical record. Pharmacy provided a list of all formulary APAP containing drugs and the respective amount of APAP they contain to Information Technology representatives (IT). Using this information, IT built an alert that functions as follows. When the electronic medical record is opened, the total amount of APAP administered and documented in the MAR for the previous 24 hours is calculated. The alerts are generated based on the conditions in Table 1 (See attachment).

Measurable Outcomes.
As a result of implementing this solution, alerts trigger to notify the nurse and pharmacists of the amount of APAP the patient has received in the previous 24 hours and includes the recommended total daily dose (See attachment Diagrams 1 & 2). A warning alert fires when approximately 75% of the maximum total daily dose has been administered to the patient. A maximum total daily dose alert fires when the total daily dose has been administered to the patient. There are separate alerts for pediatric and adult patients. We anticipate that these APAP alerts will prevent patients from receiving greater than the maximum recommended total daily dose of APAP.

Sustainability.
The electronic alerts are sustainable because they are automatically generated in the electronic medical record. The Pharmacy and IT representatives are responsible for updating the APAP containing product table used in generating the alerts.

Role of Collaboration and Leadership.
The alert system was a collaborative effort of nursing’s Pain Task Force, the multidisciplinary Pharmacy and Therapeutics Committee and the multidisciplinary Pain Committee. Pharmacy and Nursing representatives met with IT representatives as a sub-group to brainstorm the key requirements of an ideal APAP alert system. Then, the group discussed how these could be met within our existing electronic medical record system. IT developed a prototype that was vetted through the subgroup, the above Committees as well as other multidisciplinary committees such as Clinical Practice Committee and the Clinical Information Committee for feedback. Revisions were made and the final solution was again vetted through the above Committees. The multidisciplinary Pharmacy and Therapeutic Committee and Medical Executive Committee, which consist of senior leadership approved the final alert system and asked to be kept abreast of the alerts system’s success.

Contact Person Karen Snow Kaiser
Title Clinical Practice Coordinator
Email kkaiser@umm.edu
Phone 410-328-7690
Table 1. APAP Alert Conditions

<table>
<thead>
<tr>
<th>Threshold to trigger previous 24 hour APAP warning alert</th>
<th>Adult (≥ 18 years old)</th>
<th>Pediatric (&lt; 18 years old)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 3000 mg</td>
<td>≤ 45 kg</td>
<td>&gt; 45 kg</td>
</tr>
<tr>
<td>Threshold to trigger maximum recommended daily APAP dose alert</td>
<td>4000 mg</td>
<td>75 mg/kg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 3000 mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>90 mg/kg</td>
</tr>
</tbody>
</table>

Diagram 1. Adult APAP Warning MAR Alert

Diagram 2. Pediatric Warning APAP MAR Alert