ABSTRACT

Prescription of analgesics after surgery is an important criteria. Drug utilization evaluation is a system of ongoing, systematic, criteria-based evaluation of drug use that will help ensure that medicines are used appropriately (at the individual patient level). If the therapy is deemed to be inappropriate, interventions with providers or patients will be necessary to optimize drug therapy. DUE is required to check whether the drug usage is rational or not. This prospective observational study was done to evaluate the prescribing pattern of analgesics in postoperative patients. A total of 288 patients satisfied the inclusion and exclusion criteria of the study. All of them were informed regarding the study and patient’s consents were taken. The required information was collected from the patient case sheet and the patient. Data regarding Analgesics prescribed for pain management post-operatively were recorded. The commonly prescribed post-operative analgesic in orthopedic department was ketorolac with 35.06%. About 28.12% patients used analgesics for RTA, followed by degenerative diseases (25.34%). Along with analgesics Ceftriaxone (83.68) and Pantoprazole (63.88) were used concomitantly in most of the patients. DUE revealed drug interactions in the prescriptions which were severe drug- drug interactions (6.93%) and minor drug-drug interactions (17%). Pain management aims to effectively alleviate or eliminate pain with minimal adverse effects and as cheaply as possible. An adequate acute pain management reduces the frequency of certain complications (respiratory infections, urinary retention, and impaired motility of the
gastrointestinal tract), reduces the cost of hospitalization and increases patient satisfaction with hospitalization.

**KEYWORDS:** Analgesics, Drug utilization evaluation (DUE), Ketorolac, Ceftriaxone, Pantoprazole, Pain management.

**INTRODUCTION**

Rational drug use is an important factor to be checked for the optimal benefit of drug therapy in patient care. The drug utilization evaluation (DUE) studies become one of the potential tools in evaluation of health system. Drug utilization studies focuses on factors related to prescribing, dispensing, administering and taking of medication and associated events.[1] According to World Health Organization (WHO), DUE is a system of ongoing, systematic, criteria-based evaluation of drug use that will help ensure that medicines are used appropriately (at the individual patient level). If the therapy is deemed to be inappropriate, interventions with providers or patients will be necessary to optimize drug therapy. A DUE is drug or disease-specific and can be structured so that it will assess the actual process of prescribing, dispensing or administering a drug (indications, dose, drug interactions, etc.). Other terms used to describe DUE include drug utilization review (DUR), medication use evaluation (MUE), and medication use management.[2]

**DUE is classified into three categories**

- Prospective - evaluation of a patient's drug therapy before medication is dispensed.
- Concurrent - ongoing monitoring of drug therapy during the course of treatment.
- Retrospective - review of drug therapy after the patient has received the medication.[3,4]

DUE programs play a key role in helping managed health care systems understand, interpret, evaluate and improve the prescribing, administration and use of medications. Pharmacists play a key role in this process because of their expertise in the area of medication therapy management. DUE affords the managed care pharmacist the opportunity to identify trends in prescribing within groups of patients whether by disease-state or by drug-specific criteria. Pharmacists can then, in collaboration with prescribers and other members of the health care team, initiate action to improve drug therapy for patients.[5] Pain is defined by the international association for the study of pain as “an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.”[6] Pain management is an attainable goal for the greater part of patients with acute
and chronic pain. Analgesics are defined as the drugs that relieve pain without blocking nerve impulse conduction or markedly altering sensory function.[7]

Periodic Good postoperative analgesic management probably carries benefits other than increased patient comfort. Evaluation of drug utilization patterns need to be done to enable suitable modifications in the prescription of drugs to increase the therapeutic benefit and decrease the adverse effects. The magnitude of the neuro-endocrine stress response, postoperative pulmonary complications and the incidence of myocardial ischemia can be decreased. Early mobilization can be achieved and the patient can be discharged from hospital sooner. In developing countries like India, where the financial resources are scarce and affordability of the patients is less, implementation of Rational use of medicines become more important and therefore, the assessment of drug utilization is vital for clinical, economic, and educational purposes.[8]

MATERIALS AND METHODS
This was a hospital based prospective observational study carried out over a period of 6 months (July – December 2018) in a Tertiary Care Hospital, Karimnagar, Telangana. The patients who were receiving analgesics in post-operative orthopedic department during study period irrespective of age, sex, diagnosis and treatment were included and Patients who got discharged earlier without any consent were excluded from the study.

Collection of data: A total of 288 patients were enrolled in the study and the data was collected in a specially designed data collection form. The demographic data comprising age, sex was collected from the patient. The clinical data included diagnosis, indications for analgesics prescribing, names of analgesics prescribed, the concomitant drugs prescribed, various co-morbidities, number of analgesics per prescription and drug interactions were analyzed.

STATISTICAL ANALYSIS
The data was analyzed by using MS-excel and the result was given by percentage.

RESULTS
In our study, a total of 288 patients were enrolled and all of them have admitted in orthopedic department with various conditions. Out of 288 patients, 191(66.31%) were males and 97(33.68%) were females.
Figure. 1: Gender wise distribution of patients.

Figure. 2: Graph shows indications for analgesic prescribing to the patients.

Table. 1: Commonly prescribed Analgesics.

<table>
<thead>
<tr>
<th>Commonly prescribed Analgesics</th>
<th>Number of patients (n = 288)</th>
<th>Frequency in percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tramadol</td>
<td>52</td>
<td>18.05</td>
</tr>
<tr>
<td>Diclofenac</td>
<td>74</td>
<td>25.69</td>
</tr>
<tr>
<td>Ketorolac</td>
<td>101</td>
<td>35.06</td>
</tr>
<tr>
<td>Paracetamol</td>
<td>61</td>
<td>21.18</td>
</tr>
</tbody>
</table>

Figure. 3: Graph shows commonly prescribed analgesics for patients.
Figure. 4: Pie diagram shows the concomitant medications other than analgesics.

Table. 2: Various co-morbidities observed in the patients.

<table>
<thead>
<tr>
<th>Various co-morbidities</th>
<th>No. of patients</th>
<th>Frequency in percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes mellitus</td>
<td>37</td>
<td>12.84</td>
</tr>
<tr>
<td>Hypertension</td>
<td>42</td>
<td>14.58</td>
</tr>
<tr>
<td>Diabetes + Hypertension</td>
<td>11</td>
<td>3.81</td>
</tr>
<tr>
<td>Neurologic conditions</td>
<td>13</td>
<td>4.51</td>
</tr>
<tr>
<td>Pre-existing orthopedic conditions</td>
<td>16</td>
<td>5.55</td>
</tr>
<tr>
<td>Others</td>
<td>09</td>
<td>3.12</td>
</tr>
</tbody>
</table>

Drug interactions

Table. 3: Severe drug-drug interactions found.

<table>
<thead>
<tr>
<th>Drug-Drug interactions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fentanyl + Tramadol</td>
<td>Fentanyl, tramadol. Either increases effects of the other by pharmacodynamic synergism. Avoid or use alternate drug. Co-administration with other CNS depressants, such as skeletal muscle relaxants, may cause respiratory depression, hypotension, profound sedation, coma and/or death. Consider dose reduction of either or both agents to avoid serious adverse effects.</td>
</tr>
<tr>
<td>Diclofenac + Ketorolac</td>
<td>Either increases toxicity of the other by pharmacodynamic synergism. Contraindicated. Both the drugs increase anti-coagulation and serum potassium levels. Use caution/monitor.</td>
</tr>
</tbody>
</table>

Figure. 5: Graph shows severe drug-drug interactions observed in the patients.
Table 4: Minor drug-drug interactions found.

<table>
<thead>
<tr>
<th>Drug-Drug interactions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ketorolac + Amikacin</td>
<td>Ketorolac increases the levels of Amikacin by decreasing renal clearance. Interaction mainly occurs in preterm infants.</td>
</tr>
<tr>
<td>Diclofenac + Amikacin</td>
<td>Diclofenac increases the levels of Amikacin by decreasing renal clearance. Interaction mainly occurs in preterm infants.</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Pain relief after surgery is important for the well-being and comfort of the patient because it contributes to faster and better recovery. Postoperative pain after traumatic and orthopedic surgery (TOS) is severe, increases patients’ suffering and the risk of postoperative complications, prolongs hospital stay, and raises hospitalization costs. Effective analgesia is an essential part of postoperative management based on the best available evidence on efficacy and safety.

The reason for choosing this project is to study the utilization pattern of post-operative analgesics in orthopedic inpatients. In India, many factors like illiteracy, poverty, use of...
multiple health care systems, drug advertising and promotion, sale of prescription drugs without prescription, competition in medical and pharmaceutical market place and limited availability of drug information are the main reasons for not achieving the optimal health care.

This study is to analyze the use of analgesics, commonly prescribed analgesics, other concomitant drugs prescribed, co-morbidity conditions of the patients, drug-interactions etc.

Majority of patients admitted in orthopedic inpatient department belongs to the age group of 53 – 60 yrs (16.31%) followed by the age group of 27-35 yrs with the frequency of 15.27%. 14.93% of patients were in the age group of 36-45 yrs and least patients of 16 (5.55%) were in the age group of 11-17 yrs (Fig 1).

In our study most of the patients admitted had a diagnosis of Road Traffic Accident (28.12%) and 73 patients had degenerative diseases with the frequency of 25.34%. Self fall fractures are seen in 65 patients (22.56%) (Fig 2). In a study conducted by Pooja Agrawal et al, self-fall fractures (72%) were the most common condition followed by road traffic accident (21%).

In present study, Ketorolac (35.06%) was prescribed mostly for post-operative pain management followed by Diclofenac (25.69%). 61 patients were prescribed with Paracetamol (21.18%) and 52 patients were prescribed with Tramadol (18.05%) (Table 1). T. Kumarasingam et al, in his study reported that Diclofenac (60%) was the most frequently used non-opioid analgesic. In another study conducted by Pooja Agrawal et al, Diclofenac was the most commonly prescribed analgesic 265 (45.39%) followed by aceclofenac and paracetamol 246 (42.12%).

Figure 4 shows that Ceftriaxone (83.68%) was found to be more prescribed in orthopedic department other than Analgesics followed by Pantoprazole (63.88%), Metronidazole (41.66%), Amikacin (23.95%), Ranitidine (17.01), and Multivitamins (16.31%). We have observed that 183 patients with analgesics are co-prescribed with gastro-protective agents i.e., Pantoprazole (63.88%). Adverse drug reactions were not found during the study.

Various co-morbidities were observed in the patients of which Hypertension (14.58%) was found in most of the patients followed by Diabetes mellitus (12.84%). 16 patients had Pre-existing orthopedic conditions (5.55%) and 13 patients had Neurologic conditions (4.51%).
Diabetes + Hypertension (3.81%) in combination are seen in about 11 patients. Other co-morbidities (3.12%) were also rarely seen (Table 2).

In our study, we observed the chances of drug interactions in patients administered with analgesics and other medications. Out of 288 patients, severe drug – drug interactions were seen in 20 patients. About 16 prescriptions out of 288 are having the interaction between Diclofenac and Ketorolac (5.55%). Remaining 4 prescriptions are having interaction between Fentanyl and Tramadol (1.38%) (Figure 5). Majority of minor drug – drug interactions were seen in 49 prescriptions out of 288. About 26 prescriptions had an interaction between Diclofenac and Amikacin and the frequency is 9.02%. 23 prescriptions had interaction between Ketorolac and Amikacin with the frequency of 7.98% (Figure 6). But none of their effects were seen in the patients. The patients in this hospital were always under observation and they were taken care of everything.

Figure 7 indicates analgesics per prescription - 169 prescriptions contain only one analgesic prescribed during their treatment with the frequency of 58.68%. 91 prescriptions contain two analgesics to alleviate the pain during their hospital stay and the frequency is 31.55%. 28 prescriptions contain three analgesics in their treatment chart which are prescribed to relieve more severe pain and the frequency is 9.72%.

CONCLUSION
We have included 288 patients who satisfied the study criteria. During the study we have found that ketorolac was prescribed mostly for the management of postoperative pain. Utilization of analgesics was found to be based on Physicians preference and most of the analgesics were prescribed for appropriate indication. It is suggested that the choice of analgesic should be based on age of the patients. Theoretically we have found many drug interactions (42 prescriptions) but none of their effects were seen in the patients. This shows the need of clinical pharmacist services, who will fulfill the need regarding interaction check, ADR and for the checking of any kind of clinical abuse/misuse related to drugs. With proper and safe use of analgesics it will be possible to achieve good and effective pain control in post-operative patients. With DUE we can avoid such problems like therapeutic duplication of drugs, adverse drug reactions, dosage errors, treatment failures, over-use, under-use and non-formulary medicine use etc. This helps in the enhancement of rational drug use and ensures the quality of health of the patient, increases drug adherence and decreases the economical stress on the patient.
Creating awareness by continuing medical education programs regarding rational use of drugs and routine auditing of prescriptions will be helpful for the improvement of proper use of drugs. It is also essential to encourage and promote generic prescribing to reduce the cost of therapy. This utilization study is intended to be an initial step in the broader evaluation of analgesic drug prescriptions in various teaching hospitals.

REFERENCES
3. NCQA Health Plan Accreditation.