

Analysis of Drug Utilization Pattern in Intensive Care Units of Department of Paediatrics in Dr. B. R. Ambedkar Medical College and Hospital, Bangalore, India

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Abstract

Objective: To analyze the drug utilization pattern in intensive care units of department of pediatrics at a teaching hospital, to identify drug-drug interaction, identify length of stay. **Methodology:** This is a longitudinal observational investigation. Every one of the patients conceded in the pediatric Intensive care unit and Neonatal Intensive Care Unit who met incorporation criteria were enlisted for the investigation. The patients or the care givers were informed about the details of the study and their oral consent has been obtained. The information has been gathered from the patient case sheets, treatment outline, by speaking with the physicians and nurses. The patient's demographics like age, gender, body weight was collected by direct interview from patient/patient care givers. The medication profile of the patient was obtained from the medication chart which includes the data like time and dosing of antibiotics administered, past medical history, purpose behind confirmation, co morbidities, clinical information, for example, different laboratory reports and restorative information including dose, duration, frequency, route, time of organization and associative medication. **Result:** A total of 120 patients were enrolled in the investigation based on the inclusion and exclusion criteria. Majority of these patients (90.00%) were admitted to the Pediatric ICU, while 10.00% were admitted to the Neonatal ICU. With near equal number of males and females (50.83% and 49.17% respectively). The minimum LOS was 2 Days, and maximum LOS was 35 days. Out of 120 patients, 13 (10.83%) patients were suspected to have drug-drug interactions and the remaining 107 (89.16%) prescriptions did not have drug-drug interactions. A total of 668 agents were prescribed to the 120 study patients. The most common group of agents prescribed was Gastrointestinal Agents (143, 21.41%), followed by Analgesics & Antipyretics (135, 20.21%) and Antibiotics (119, 17.81%). Electrolyte replenishes were prescribed to 102 (15.27%) patients. Corticosteroids were seen in only 17 (2.54%) prescriptions. Anticonvulsants were seen in 28 (4.19%) prescriptions. A total of 119 antibiotics were prescribed to 76 study patients, out of which 7 antibiotics (5.88%) were given orally and 112 (94.12%) were administered through IV route. No antibiotics were prescribed to 44 study patients. Only 76 out of 120 study patients had received an antibiotic. Majority of the patients (47, 61.84%) received only a single antibiotic, while only one patient (1.32%) received 5 antibiotics. **Conclusion:** From the present study majority of the patients were admitted in Pediatric ICU. The study showed that most of the patients admitted in PICU were suffering from infective diseases. Most of the study patients belonged to the age group of child (3-12 years). The maximum length of hospital stay was 35 days. Majority of the interactions were Pharmacokinetic interactions. The most common group of agents prescribed was Gastrointestinal Agents, followed by Analgesics & Antipyretics and Antibiotics, anticonvulsants were least prescribed drug. The prescribed antibiotics were Third Generation Cephalosporin which were the most commonly prescribed class of antibiotics followed by the combination of Penicillin with β -lactam inhibitors. The most common antibiotic used was Amoxicillin + Clavulanic Acid and the least common was Trimethoprim-Sulphamethoxazole.

Key words: Pediatrics, Antibiotics, Anticonvulsants, Pharmacokinetic

Introduction

Intensive care units (ICUs) care for the most seriously ill patients. Therefore, a number of drugs are employed to save these patients, of which some are therapeutic, whereas others are prophylactic in nature. The cost effect of ICU drug use on a medical clinic's all out medication use can be gigantic (Weber et al., 2003). ICU medicate costs represented 38.4% of the total drug costs and have expanded at a rate more noteworthy than non-ICU tranquilize costs (12% vs 6%). The ICU pharmacy charges ranked as the fourth costliest among the various ICU charges, with an average of 11.1% of the total ICU charges.

Even though there are a number of guidelines regarding proper drug use in ICUs, sometimes it may not be possible to implement them

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because of patient specific disease states, the resident learning curve, and physician medication preferences (Bobek et al., 2001). The application of simple techniques of drug utilization has proved to be a useful, inexpensive tool for creating favorable conditions for wide-scale improvements in therapeutic practices (Hartmann et al., 2004).

ICUs are highly controlled departments, that typically limit the number of bystanders visiting the patient. The patient's condition is monitored continuously with the assistance of several monitors attached to various parts of his or her body for real-time evaluation of medical stability. The physician in control will make periodic evaluations of the patient's cardiac status, breathing rate, urinary output, and blood levels for nutritional and hormonal problems that may emerge and require quick consideration or treatment. Patients who are admitted to the ICU for perception after surgery may have special prerequisites for monitoring. These patients may have catheters set to identify hemodynamic changes, or require endotracheal intubation to assist their breathing, with the breathing tube connected to a mechanical ventilator. The physician in charge coordinates the care provided by the multi-disciplinary team, which allows for an integrated treatment approach to the patient. The nurse's role usually incorporates clinical evaluation, determination, and an individualized arrangement of expected treatment results for every patient (Truog, Cist and Brackett, 2001).

The pharmacists working in ICU can provide a wide range of services that can play an important role in the procurement of medications and improve adherence to clinical practice guidelines and patient's therapeutic outcomes. Notwithstanding preparing medicine arranges and planning the landing of prescriptions these pharmacists can likewise help with therapeutic drug checking, drug dosing, renal dosing, and reacting to medical emergencies. Critical care pharmacists also assume a functioning role on hospital committees, in the education of staff, students, and residents (pharmacy and medical), and in the usage of new institutional strategies and conventions (Krivoy et al., 2007).

Antibiotics are commonly prescribed to hospitalized patients in the departments like surgery department and ICUs. Antibiotics resistance is the major problem; irrational use of antibiotics is the primary cause of antibiotic resistance. However, the other cause of antibiotic resistance includes the frequent use of broad spectrum antibiotics. Antibiotic resistance may lead to increased morbidity, mortality, increased healthcare expenditure and increased length of hospital stay. Antibiotic resistance is occurring more rapidly and more frequently in gram-positive bacteria and gram-negative bacteria all over the world. Due to increasing antibiotic resistance in the Intensive Care Units and with limited availability of narrow spectrum antibiotics to treat new forms of organisms, there is a need for continuous monitoring of drugs prescribed specially antibiotics administered. Critically ill patients treated in ICUs frequently have an infection or are prone to developed new infections (Hanberger et al., 1999).

Drug utilization evaluations are an important exercise to keep ICUs safe. Prescribing in ICUs are fast paced, and there are higher chances of medication errors as compared to normal treatment rooms. The presence of a clinical pharmacist in ICUs can play a great role in reducing the risk for medication errors (Suryawanshi et al., 2015).

Materials and Methods

The study was conducted in the Paediatric and Neonates intensive care units of Dr. B.R. Ambedkar Medical College and Hospital, which is a 760-bedded multispecialty tertiary care teaching hospital in Bengaluru. Patient details and all other medical relevant information of 120 patients was collected and documented. This is a longitudinal observational study. All the patients admitted in the Paediatric Intensive care unit and Neonates Intensive Care Unit who met the inclusion criteria were recruited for the study. The patients or the care givers were informed about the details of the study and their oral consent has been obtained. The data has been collected from the patient case sheets, treatment chart, by communicating with the physicians and nurses. The patients' demographics like age, gender, body weight was collected by direct interview from patient/patient care givers. The medication profile of the patient was obtained from the medication chart which includes the data like time and dosing of antibiotics administered, past medical history, reason for admission, co morbidities, clinical information, for example, different laboratory reports and therapeutic information including dose, duration, frequency, route, time of administration and concomitant medication the collected data was then entered in Microsoft Excel and the analysis of drug utilization pattern was done.

Result and Discussion

The study was conducted from January 2017 to March 2017. Majority of these patients (90.00%) were admitted to the Pediatric ICU, while 10.00% were admitted to the Neonatal ICU.

Age Distribution of Patients

The study population was grouped into age groups based on the WHO classification for pediatrics. The patients were categorized into neonates (aged birth to 30 days), infants (2 months to two years), child (3 to 12 years) and adolescents (13 to 17 years). Majority of the patients belonged to the Child age group (58, 48.33%). The child group had more females as compared to males (54.24% compared to 42.62%), while the gender distribution was generally comparable in the other groups in table 1.

Table 1. Distribution of patients by gender and age-group

| gender and age-group | No of patient | | | % of patient | | |
|----------------------|---------------|------|---------|--------------|-------|---------|
| | female | male | overall | female | male | overall |
| Neonate | 5 | 7 | 12 | 8.27 | 11.48 | 10 |
| Infant | 20 | 23 | 43 | 33.9 | 37.7 | 35.83 |
| Child | 32 | 26 | 58 | 54.24 | 42.62 | 48.33 |
| Adolescent | 2 | 5 | 7 | 3.39 | 8.2 | 5.83 |

Infection was present in about 73 (60.83%) patients. More females presented with infections as compared to males (66.10% compared to 55.74%). Length of Stay (LOS) plays a major role in the quality of life of the patient and the caregivers. Longer LOS is associated with higher economic burden and lower quality of life. The average LOS in the ICUs was found to be 5.15 ± 3.77 days. The minimum LOS was 2 Days, and maximum LOS was 35 days. The average LOS in NICU was higher than the average LOS in PICU (8.33 ± 8.68 days compared to 4.79 ± 2.61 days). The LOS was also categorized based on the age group. Longer LOS were associated with neonates, while infants mostly had shorter LOS. Overall, most the ICUs had LOS in the range of 3 to 5 days.

Table 2: Distribution of LOS by age group of patient

| Length of Stay | Neonate | Infant | Child | Adolescent |
|----------------|---------|--------|-------|------------|
| 1--3 | 1 | 16 | 18 | 3 |
| 3--5 | 4 | 14 | 24 | 2 |
| 6--10 | 5 | 11 | 14 | 32 |
| 11--20 | 1 | 2 | 2 | 5 |
| ≥ 20 | 1 | 0 | 0 | 1 |

Out of 120 patients, 13 (10.83%) patients were potential interaction to have drug-drug interactions and the remaining 107 (89.16%) prescriptions did not have drug-drug interactions. There were a total of 17 interactions in the 13 prescriptions that were identified with drug-drug interactions. Majority of the interactions (14, 82.35%) were Pharmacokinetic interactions.

Table 3: Distribution of Drug-drug interactions by interacting agents.

| Drug-drug interactions | No of patient | % of patient |
|-------------------------------|---------------|--------------|
| Antisecretory+Antibiotic | 7 | 41.18 |
| Antianxiety+Anticonvulsant | 2 | 11.76 |
| Antibiotic+Antibiotic | 3 | 17.68 |
| Antibiotic+Anticonvulsant | 2 | 11.76 |
| Anticonvulsant+Corticosteroid | 1 | 5.88 |
| Antipyretic+Anticonvulsant | 1 | 5.88 |
| Antipyretic+Corticosteroid | 1 | 5.88 |

Drug Use Indicators

Drug Use Indicators were analyzed using WHO Core Drug Use Indicators. The average number of drugs prescribed per patient was 5.79 ± 2.23 . The average number of antibiotics per prescription was 1.04 ± 1.13 , and average number of IV agents was 3.13 ± 0.4 . Detailed distribution is presented in Table 4.

Table 4: Average no of drugs administered

| Drug use indicator | Average no. of agents |
|--------------------|-----------------------|
| Oral agents | 1.87 ± 1.32 |
| IV agents | 3.13 ± 0.4 |
| Nebulizer | 0.64 ± 1.09 |
| Suppository | 0.15 ± 0.4 |
| Antibiotics | 1.04 ± 1.13 |
| Total drugs | 5.79 ± 2.23 |

Prescribing Pattern

A total of 668 agents were prescribed to the 120 study patients. The most common group of agents prescribed was Gastrointestinal Agents (143, 21.41%), followed by Analgesics & Antipyretics (135, 20.21%) and Antibiotics (119, 17.81%). Electrolyte replenishers were prescribed to 102 (15.27%) patients. Corticosteroids were seen in only 17 (2.54%) prescriptions. Anticonvulsants were seen in 28 (4.19%) prescriptions. A graphical representation of the prescribing pattern may be seen in Figure 1.

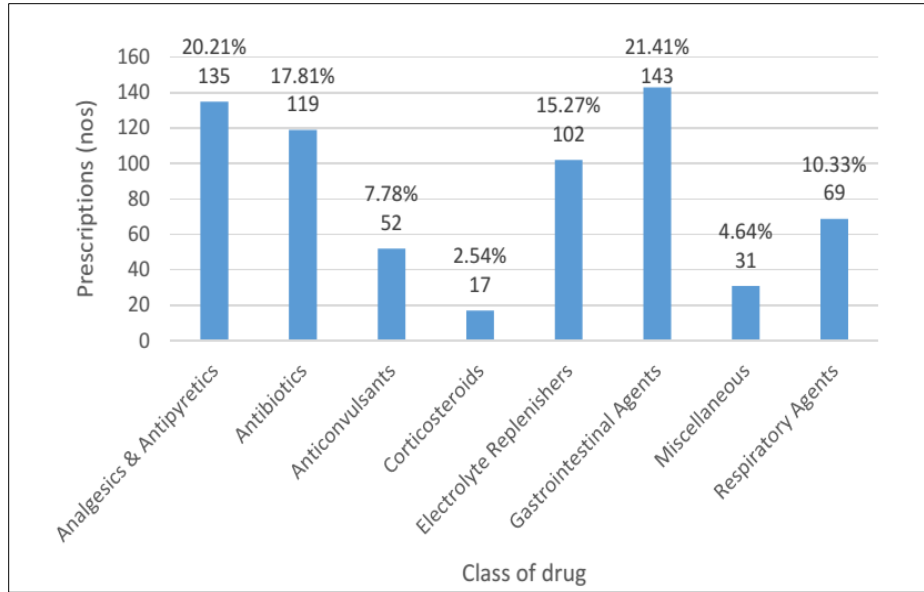


Figure 1: Drug prescribing pattern

Antibiotic Prescribing

A total of 119 antibiotics were prescribed to 76 study patients, out of which 7 (5.88%) patients received oral antibiotics and 112 (94.12%) were administered through IV route. No antibiotics were prescribed to 44 study patients. Only 76 out of 120 study patients had received an antibiotic. Majority of the patients (47, 61.84%) received only a single antibiotic, while only one patient (1.32%) received 5 antibiotics. The average number of antibiotics per patient was 1.04 ± 1.13 .

Third Generation Cephalosporins were the most commonly prescribed class of antibiotics (46, 38.66%) followed by the combination of Penicillins with β -lactam inhibitors (38, 31.93%). The most common antibiotic used was Amoxicillin + Clavulanic Acid (30, 25.21%), and the least common was Trimethoprim-Sulphamethoxazole (2, 1.68%).

Prescribing Pattern of Gastrointestinal Drugs

Gastrointestinal agents were the most commonly prescribed drugs among the study population. The Gastrointestinal agents group had anti-acid and anti-emetic agents. Ranitidine (47.20%) and Ondansetron (44.00%) were the most commonly prescribed GI agents. Figure 2.

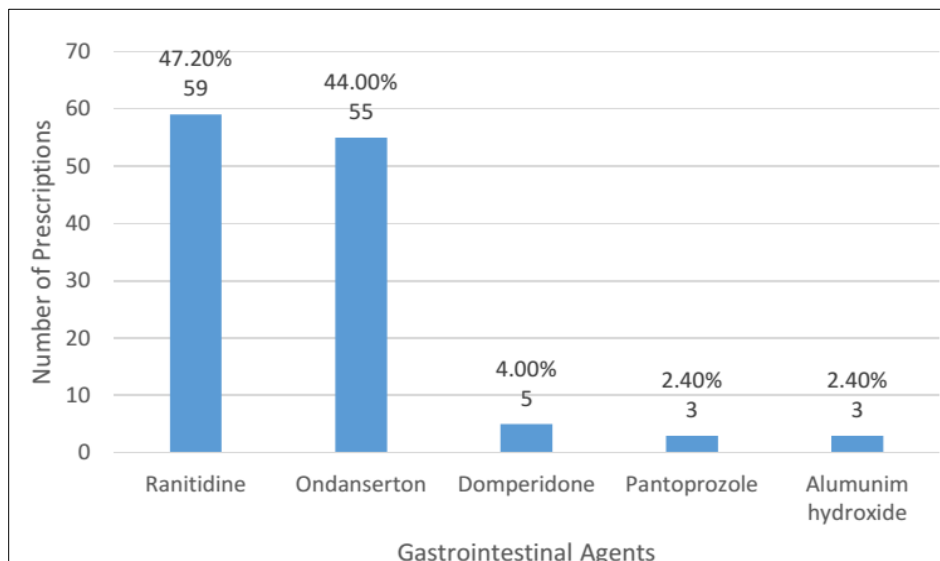


Figure 2: Distribution of gastrointestinal agents.

Prescribing Pattern of Analgesic & Antipyretic Agents

Analgesics & Antipyretics are common classes of drugs used in management of paediatric illnesses. In the present study 20.21% of the prescriptions consisted of Analgesics and Antipyretics. The most commonly used agent of this category was Paracetamol (88.81%) and the least prescribed was Diclofenac (0.75%).

Prescribing Pattern of Respiratory Agents

Respiratory agents comprised of 10.33% of all drugs prescribed to the study population. The most common respiratory agent prescribed was Salbutamol (39, 55.71%). Detailed distribution of respiratory agents may be seen in Table 5.

Table 5: Distribution of respiratory agents.

| respiratory agents | No of Respiratory Agents | % of Respiratory Agents |
|----------------------------|--------------------------|-------------------------|
| Salbutamol | 39 | 55.71 |
| Adrenaline | 12 | 17.14 |
| Budesonide | 10 | 14.29 |
| Normal saline | 6 | 8.57 |
| Ipratropium bromide | 2 | 2.86 |
| Ambroxol | 1 | 1.43 |

Conclusion

The study was conducted in a teaching hospital in suburban premises of Bengaluru. The study included patients from Neonatal and Paediatric ICU. Majority of the patients were admitted in Paediatric ICU. The study showed that most of the patients admitted in PICU were suffering from infective diseases. Most of the study patients belonged to the age group of child (3-12 years). The maximum length of hospital stay was 35 days and most patients had a stay of 3-5 days at the hospital. From the prescriptions documented it was found out that 17 prescriptions had drug-drug interactions. Majority of the interaction were pharmacokinetic interactions. Based on the severity of the infection some patients were prescribed with multiple antibiotics. A total of 119 antibiotics were prescribed to 76 study patients, out of which majority were administered through IV route followed by orally administered antibiotics. Majority of the patients 47 received only a single antibiotic, while only one patient received 5 antibiotics. Third Generation Cephalosporins were the most commonly prescribed class of antibiotics, followed by the combination of Penicillin with β -lactam inhibitors. The most common antibiotic used was Amoxicillin + Clavulanic Acid, and the least common was Trimethoprim-Sulphamethoxazole. All the antibiotic prescriptions were found to be rational.

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