

Drug utilisation in medical intensive care unit: a retrospective analysis from a tertiary care teaching hospital

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ABSTRACT

Background: The World Health Organisation has defined drug utilization study as “the marketing, distribution, prescription and use of drugs in a society, with special emphasis on the resulting medical, social, and economic consequences. The objective was to evaluate drug utilization pattern in medical intensive care unit (MICU) in a tertiary care teaching hospital.

Methods: A retrospective observational study was conducted in MICU for adult patients admitted from October to December 2013. Data collected was analysed for demographics, indication, duration of stay, World Health Organisation (WHO) prescribing indicators including anatomical therapeutic chemical classification and defined daily dose (DDD).

Results: A six hundred encounters from 63 male and 44 female patients with a mean age of 60.88 ± 16.87 were studied. Average duration of stay was 5.61 ± 3.88 days. The common indications for admission were dyspnoea 20 (18.69%), upper gastrointestinal bleed 16 (14.95%), cerebrovascular accident 14 (13.08%) and sepsis 13 (12.15%). Total number of drugs prescribed was 246. Total drug encounters were 7695. Average number of drugs per encounter was 12.83. Percentage of drugs prescribed by generic name was 38.21%, 44.7% and 40.65% of the drugs were prescribed from National and WHO essential medicine list respectively. Among the drugs prescribed 65.44%, 32.93% and 17.48% were oral, injectable and fixed dose combination preparations respectively. Percentage of encounters resulting in prescription of an antibiotic and an injection were 59% and 85.83% respectively. The most commonly prescribed drugs were pantoprazole (100%), human regular insulin (52.83%), piperacillin + tazobactam (45%) and ceftriaxone (38%). Their DDD/100 bed days were found to be 83.79, 12.78, 12.50, and 17.81 respectively.

Conclusions: Overall the prescribing pattern seems to be rational but may be further strengthened by increasing generic drug prescription, judicious use of pantoprazole and periodic longitudinal surveillance studies.

Keywords: Drug utilization study, Medical intensive care unit, Daily dose, Anatomical therapeutic chemical classification

INTRODUCTION

The World Health Organisation has defined drug utilization study as “the marketing, distribution, prescription and use of drugs in a society, with special emphasis on the resulting medical, social, and economic consequences”.¹ Such a research is an important means to study the clinical use of drugs in populations and its impact on health-care system. Medical intensive care unit caters to seriously ill patients suffering from disorders of multiple body systems resulting into prescriptions of numerous drugs of different classes especially

antimicrobial agents. On literature search it can be seen that drug utilization studies conducted in MICU settings of a tertiary care centre are very few.² Such studies at frequent intervals would monitor and evaluate prescriptions and suggest necessary changes for rational therapeutics and appropriate utilization of resources in the country. The objective of this study is to evaluate drug utilization pattern in medical intensive care unit (MICU) in a tertiary care teaching hospital located in central Kerala.

METHODS

The present study was a retrospective observational study. Adult patients of 18 years or above admitted in MICU from October to December 2013 were included in the study. Patients in other intensive care facilities like neonatal intensive care unit (NICU), pediatric intensive care unit (PICU), surgical intensive care (SICU) and post-operative recovery intensive care (RICU) were excluded.

Data was collected retrospectively from the case files obtained from the medical records department. A specially designed case record form was used to capture demographics (age, sex, address), primary indication for admission to MICU, clinical diagnosis, co-morbid conditions, duration of stay and information on prescribed drugs like name of the drug, dosage schedule (form, route and frequency) and duration of treatment was obtained in details.

Continuous data were expressed as mean±S.D and nominal data were expressed as percentages. Descriptive statistics using Microsoft excel was used for analysis of the data collected to determine various prescribing indicators as suggested by World Health Organisation (WHO) that is, a) average number of drugs per encounter, b) percentage of encounters with an antibiotic, c) percentage of encounters with an injection, d) percentage of drugs prescribed from the essential drugs list or formulary, and e) percentage of drugs prescribed by generic names. In addition, the drugs were classified as per anatomical therapeutic chemical classification which is based on their chemical, pharmacological and therapeutic properties and the defined daily dose (DDD)/100 bed days was calculated for commonly prescribed drugs using the following formulae.

$$\text{DDD}/100 \text{ bed days} = \frac{\text{Total dose in mg during study period} \times 100}{\text{DDD of drug} \times \text{study duration (days)} \times \text{bed strength} \times \text{Avg. bed occupancy rate}}$$

RESULTS

A Total of six hundred encounters (prescriptions) from 63 male and 44 female patients were collected. The mean age of the patients was 60.88±16.87 and in range of 20 to 98 years. Average duration of stay was 5.61±3.88 days (range 1-18 days). In 58.5% of the patients there was involvement of more than two body systems. The common indications for admission were dyspnoea 20 (18.69%), upper gastrointestinal bleed 16 (14.95%), cerebrovascular accident (CVA) 14 (13.08%), sepsis 13 (12.15%) and generalized tonic clonic seizure (GTCS) (12.15%) and acute kidney injury (7.48%) (Figure 1).

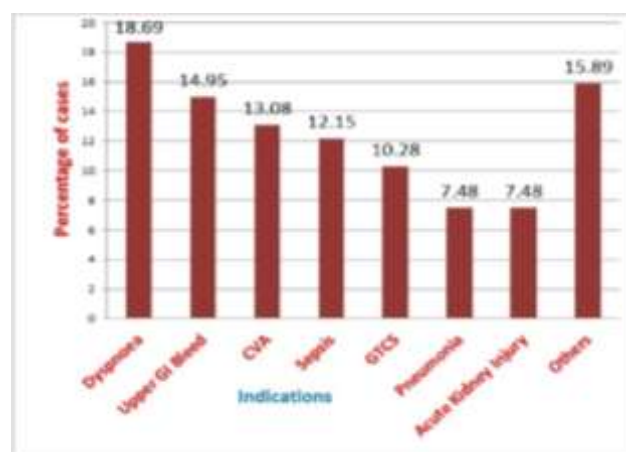


Figure 1: Indication for admission to MICU.

Table 1: Utilization pattern of drug classes with ATC code and DDD/100 bed days.

Drug with ATC code	No. of encounter n=600 (%)	DDD/100 bed days
Antimicrobials		
Piperacillin tazobactam* (J01CR05)	270 (45)	12.5
Ceftriaxone* (J01DD04)	232 (38.67)	17.81
Rifaximin (A07AA11)	110 (18.33)	15.22
Ciprofloxacin* (J01MA02)	110 (18.33)	2.48 (P), 0.3 (O)
Azithromycin* (J01FA10)	57 (9.5)	12.86
Clindamycin* (J01FF01)	57 (9.5)	1.43
Meropenem* (J01DH02)	51 (8.5)	2.26
Moxifloxacin (S01AE07)	34 (5.67)	-
Amoxicillin clavulanic acid * (J01CR02)	31 (5.17)	1.84 (P), 0.94 (O)
Ceftriaxone sulbactam * (J01DD54)	30 (5)	17.81
Anticholinergic antihistaminic		
Atropine* (A03BA01)	11 (1.83)	0.66
Pheniramine* (R06AB05)	8 (1.33)	
Inotropes		

Dopamine* (C01CA04)	15 (2.5)	0.54
Noradrenaline* (C01CA03)	7	
Corticosteroids		
Hydrocortisone*(H02AB09)	155 (25.83)	78
Prednisolone [#] (H02AB06)	47	7.93
Respiratory		
Deriphylline* (R03DA54) [#]	223 (37.17)	
Salbutamol (R03CC02) ^{#^}	67 (11.17)	1.01
CVS		
Furosemide* (C03CA01) [#]	214 (35.67)	10.87 (P), 23.7 (O)
Atorvastatin [#] (C10AA05)	156 (26)	27.55
Nifedipine [#] (C08CA05)	147 (24.5)	9.49
Losartan [#] (C09CA01)	126 (21)	12.68
Clopidogrel [#] (B01AC04)	90 (15)	14.49
GIT		
Pantoprazole * (A02BC02) [#]	600 (100)	44.24 (P), 38.05 (O)
Ondansetron* (A04AA01) [#]	158 (26.33)	6.08 (P), 0.34 (O)
Lactulose Syrup [#] (A06AD11)	135 (22.5)	47
CNS		
Phenytoin * (N03AB02) [#]	172 (28.67)	4.63 (P), 7.05(O)
Levodopa+Carbidopa (N04BA02)	113 (18.83)	
Lorazepam * (N05BA06) [#]	103 (17.17)	3.38 (P), 11.35(O)
Mannitol (B05BC01)	104 (17.33)	
Analgesics and antipyretics		
Paracetamol * (N02BE01) [#]	131 (21.83)	4.28
Tramadol+paracetamol (N02A03A)	87 (14.5)	
Antidiabetics		
Human actrapid insulin*	317 (52.83)	12.78
Metformin (A10BA02) [#]	31 (5.17)	1.02
Miscellaneous		
Multivitamin preparation [#]	227 (37.83)	
Sodium bicarbonate* (B05XA02) [#]	148 (24.67)	
Potassium chloride (A12BA01) [#]	194 (32.33)	
L ornithine L aspartate [#]	120 (20)	

* parenteral, # oral, @ eye drop, ^ inhalation, P = Parenteral, O = Oral

Total number of drugs prescribed was 246. Total drug encounters were 7695. Average number of drugs per encounter was 12.83. Percentage of drugs prescribed by generic name was 38.21%. 44.7% and 40.65% of the drugs were prescribed from national and WHO essential medicine list respectively.

Among the drugs prescribed 65.44%, 32.93% and 17.48% were oral, injectable and fixed dose combination preparations respectively. Percentage of encounters resulting in prescription of an antibiotic and an injection were 59% and 85.83% respectively. The most commonly prescribed drugs were pantoprazole (100%), human regular insulin (52.83%), piperacillin+tazobactam (45%)

and ceftriaxone (38%). The utilization pattern of various drugs classes with their ATC code and DDD/100 bed days is shown in Table 1.

DISCUSSION

Male preponderance (61.96%) and the average duration of stay (5.61±3.88 days) was in accordance with the previous reports but the mean age was higher.³⁻⁵ The most common indication for admission was noncardiac causes and not septicemia, in contrast to other studies.^{3,5} The variability in the mean age and indication might be due to presence of separate coronary care unit and other intensive care units like SICU in the hospital.

Average number of drugs per encounter is similar to other studies pointing to polypharmacy but the multiple comorbidities might have forced the physicians to prescribe more drugs.^{3,6} The use of brand names and FDCs were higher than previous studies.^{2,3} Drugs prescribed from national and WHO EML were low in comparison to the another study.⁶

The use of parenteral drugs was higher similar to previous studies.³ This might be due to the general condition of patients admitted in MICU. The most commonly prescribed drugs were pantoprazole (100%), human regular insulin (52.83%), piperacillin+tazobactam (45%) and ceftriaxone (38%). There was over use of pantoprazole which was prescribed in 100% of encounters.^{2,3} This may indicated for the prevention of stress ulcer in stomach. The second most common drug prescribed was human regular insulin as the most common co-morbidity in patients was diabetes mellitus. The prescription of insulin was higher compared to oral antidiabetic agents to tackle the stress and to tide over infections during MICU stay. Among the antimicrobial agents beta lactam antibiotics namely piperacillin+tazobactam (45%) and ceftriaxone (38%) were more commonly prescribed as seen in other studies.⁷⁻⁹ The drugs like meropenem, clindamycin and linezolid were only used if culture and sensitivity necessitated. The underutilization of atropine may be due to lesser incidence of organophosphorous poisoning. The higher utilization of hydrocortisone may be justifiable because of its advantages in emergencies especially dyspnea. The lower use of cardiovascular drugs in our MICU is due to management of cardiovascular emergencies in coronary care unit. In addition to this the majority of the cardiovascular drugs prescribed at MICU were for the management of previously known cardiovascular co-morbidities. The utilization of phenytoin was higher because of higher incidence of generalized tonic clonic seizure (GTCS) in our study. The utilization of multivitamins may not be justifiable as their role in emergency indications is few.

This study has certain limitations. In addition to being a retrospective, it could not be analyzed that the cost and the outcome associated with use of various drugs.

To conclude the prescribing pattern should be further strengthened by avoiding polypharmacy, increasing generic drug prescription, avoiding overuse of pantoprazole and multivitamins. Periodic longitudinal surveillance studies like this should be carried out at regular intervals.

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