National Journal of Physiology, Pharmacy and Pharmacology

RESEARCH ARTICLE

Drug utilization and prescription pattern study in medicine intensive care unit at tertiary care teaching hospital

Ujwala P Gawali, Rasika S Khobragade

Department of Pharmacology, Dr. Vaishampayan Memorial Government Medical College, Solapur, Maharashtra, India

Correspondence to: Rasika S Khobragade, E-mail: rasikarockz@gmail.com

Received: May 01, 2019; **Accepted:** May 22, 2019

ABSTRACT

Background: Drug utilization evaluation performs a key role in the managing health-care system to evaluate, understand, interpret, and improve the prescribing, administration, and use of medications. **Aims and Objectives:** The aim of the study is to evaluate and compare the drug prescribing trends in the intensive care unit (ICU) and correlate them with the disease patterns and patients outcome. **Materials and Methods:** The case records of 150 patients admitted to the ICU at Shri. Chhatrapati Shivaji Maharaj Sarvopchar Rugnalaya, a teaching hospital in Solapur, during 1-year period from June 1, 2017, to May 31, 2018, were analyzed. The variables collected were demographic and clinical characteristics. We also considered the duration of hospitalization, indications, and utilization of different drugs. The total number of drugs, dose, route, sensitivity pattern, and cost was collected from patients' case paper. **Results:** Among 150 evaluated patients, the average age was 45 ± 17 years. The average length of stay at ICU was 4 to 10 days. The average number of drugs per prescription was 5 to 10. The parenteral route (61%) followed by the enteral route (27%) was common route used. Antimicrobial drugs and gastrointestinal drugs were the most commonly prescribed class of drugs, i.e., (30%) and (21%), respectively. The 1235 generic and 174 branded drugs were prescribed. The fixed drug combinations were 427 while single drug utilization was 715 in number. **Conclusion:** Antimicrobials are the most commonly used drugs. There is a need of antimicrobial agents' usage guidelines and restriction policies for the rational prescribing of antimicrobials.

KEY WORDS: Drug Use Evaluation; Antimicrobial Agents; Intensive Care Unit; RICU; Generic Drug; Branded Drug

INTRODUCTION

Problems associated with drug prescription are quite common worldwide. Errors in the drug prescription are considered as a key threatening factor that affects patient safety throughout hospital practice. Adverse drug reactions (ADRs) are one of the main causes of injury and death; it is estimated that they cause 100,000 deaths annually in the United States.[1]

Access this article online	
Website: www.njppp.com	Quick Response code
DOI: 10.5455/njppp.2019.9.0516822052019	

More than 2 million serious ADRs occur each year, 350,000 in nursing homes alone. In recent years, the number of medications prescribed to patients has increased dramatically and so that percentage of ADRs have also increased.[1,2] Adverse drug effects (ADEs) are one of the serious public health problems and also leading cause of injury and death which need to be focused with effective solutions. ADEs account about one-third of hospital adverse events and approximately 280,000 hospital admissions annually. It affects about 2 million hospital stays each year, prolong hospital stays by 1.7 to 4.6 days.[3]

The reference standard for drug utilization is the WHO Anatomical Therapeutic Chemical/Defined Daily Dose (ATC/DDD) methodology. For each drug and route of administration, DDD is defined by the WHO Collaborating Centre for Drug Statistics and Methodology as the assumed

average maintenance adult dose per day for its main indication. The DDD, therefore, is an international unit serving for international or regional comparisons. However, DDD does not necessarily reflect the recommended or prescribed daily dose (PDD). In fact, several studies have reported discrepancies between DDD and PDD for different groups of drugs.[22]

Drug utilization is nothing but the process of appraising and reconsidering the usage of drugs to determine the effectiveness of drug treatment. Multiple drugs are prescribed since patients admitted to the ICU. The most of the drugs are empirically prescribed and mainly based on physician previous experience, resulting in the lack of quantitative precision of drugs usage.[6] Therefore, utilization trends and costs of drugs prescribed in the ICU need to be urgently addressed.

Aim and Objectives

1. To evaluate and compare the drug prescribing pattern in the intensive care unit (ICU).
2. To correlate them with the disease patterns and patients outcome.

MATERIAL AND METHODS

This is retrospective study in which the case records of 150 patients admitted to the ICU at Shri. Chhatrapati Shivaji Maharaj Sarvopchar Rugnalaya, a teaching hospital in Solapur, during a 1-year period from June 1, 2017, to May 31, 2018, were analyzed. The variables collected were demographic and clinical characteristics. We also considered the duration of hospitalization, indication, and utilization of different drugs. The total number of drugs, dose, route, sensitivity pattern, and cost was collected from patients' case paper.

Data Collection

Data collection was done using a pre-designed pro forma which included patient characteristics such as age, gender, diagnosis, duration of hospitalization, and prescription characteristics such as name of the drug, strength and dosage form, and number of units dispensed, whether prescribed in generic name or not.

Medication prescription details were collected meticulously, including number of drugs prescribed on the day of admission, route of administration, and class/name of medications prescribed for each patient.

Ethical Committee

Proper permission of college ethical committee was taken before study started.

Statistics

Descriptive statistics were used to describe the data.

RESULT

Findings of the present study are presented in Tables 1 to 5.

DISCUSSION

In the present study, we studied 150 patients' case papers admitted in ICU. The mean age of patients was

Table 1: Demographic/clinical characteristics of patients during intensive care unit stay

Clinical characteristic	*n*
Total number of patients	150
Mean age of study patients	45±17
Age groups	
Up to 20 years	11
21–40 years	75
41–60 years	54
>60 years	10
Sex	
Male	87
Female	63
Number of drugs prescribed	5 to 10
Duration of stay at hospital in days	4 to 10

Table 2: List of commonly prescribed drugs in intensive care unit

Drug administered	Route of administration	Number of prescription
Omeprazole	Oral/parental	115
Paracetamol	Oral/parental	85
Ranitidine	Oral/parental	114
Tramadol	Oral/parental	52
Ceftriaxone	Parental	134
Clindamycin	Parental	121
Levofloxacin	Oral/parental	53
Meropenem	Parental	62
Amikacin	Parental	127
Azithromycin	Parental	56
Ciprofloxacin	Parental	86
Doxycycline	Oral/parental	48
Vancomycin	Oral/parental	52
Ceftazidime	Parental	74
Cefotaxime	Parental	89
Ampicillin	Parental	41
Teicoplanin	Parental	46
Colistin	Parental	54

Table 3: Classes of drugs prescribed in the intensive care unit

Classes of drug administered	Percentages (%)
Antimicrobial agents	30
Gastrointestinal	21
Blood-related drugs	15
Cardiovascular	12
Anesthetics	19
Respiratory	18
Antiepileptic	8
NSAIDs	20
Others	15

NSAIDs: Non-steroidal anti-inflammatory drugs

Table 4: Number of generic and branded drugs utilized in intensive care unit

Type of drug utilized	*n*
Generic drugs	1235
Branded drugs	174

Table 5: Utilization of FDC and single drug in study patients

Drug utilized	*n*
FDC	427
Single drug	715

FDC: Fixed drug combination

45 ± 17 years; among 150 patients, 87 were male and 63 were female. Average duration of hospital stay was 4–10 days. The average number of drug prescribed was 5–10. The most frequent route of drugs administration found in the current study was the parenteral route (61%) followed by enteral route (27%). In the present study, most frequently used drugs were omeprazole, ranitidine, ceftriaxone, clindamycin, amikacin, and anti-infective agents which were the most commonly administered class of drugs (25%). In our study, we found that 1235 generic and 174 branded drugs were prescribed. The fixed drug combinations (FDCs) were 427 while single drug utilization was 715 in number.

In study done by Al-zakwani *et al*.,[8] they found that among 138 patients admitted to the ICU during the 5-month study period revealed that the mean age of the patients was 46 ± 19 years, with males representing 64% of the patients. This finding was similar to the two studies conducted in eastern and southern India in 2007 and 2011.[11-13] In study by Smythe *et al*.,[14] they observed equal number of male and female patients admitted to the ICU having average age 65 years.[14] Another Iranian study reported that more male patients than female patients (68% and 32%, respectively).[15] Al-zakwani *et al*.[8] in their study stated that the most frequent age group was 21–40 years. This was in contrast to Shankar *et al*. study, which reported >49 years as the most frequent age group.[5] The mean length of stay of all patients admitted to the ICU was 4.5 days in the study of Al-zakwani *et al*. This was similar to a retrospective study conducted in Canada, and they showed that the average duration of ICU stay was 4.7 days.[4] This number was significantly low compared with American and Iranian studies with 9.4 and 6.0 days, respectively.[9,15] In this study, average number of drug prescribed was 5–10. The average number of drugs per patient (encounter) was 8.0 with a maximum number of 22 drugs per patient in the study of Al-zakwani *et al*.[8] In an American study, the average number of prescribed drugs was 9.1[16] while an Indian study showed an average of 13.5 drugs.[9] A study in a French medical ICU reported that the average number of prescribed drugs was 5.0.[17] The most frequent route of drugs administration found in the current study was the parenteral route (61%) followed by enteral route (27%). Results of other studies carried out in India and Nepal also documented that parenteral drugs were the most frequent routes of administration (87%, 51.12%, and 53%, respectively).[5,10,19] In contrast, Paudel *et al.* reported that oral tablets (48%) were the most commonly used dosage form in the ICU followed by injection and intravenous fluid (33% and 7.8 %, respectively).[18] In the study of Al-zakwani *et al*.,[8] the frequent route of drugs administration was parenteral route (66%) followed by enteral route (26%). In the present study, we found that most frequently used drugs were omeprazole, ranitidine, ceftriaxone, clindamycin, and amikacin. In ICU, the most frequently prescribed antimicrobial agents (AMAs) were ceftriaxone followed by amikacin and clindamycin.[20,21] In the study of Al-zakwani *et al*.,[8] the most commonly prescribed drug was omeprazole followed by enoxaparin and paracetamol. A study in Western Nepal found that pantoprazole was the most frequently prescribed.[18] Among the ten most prescribed medicines, ranitidine was the most prescribed in another previous study.[10] In the current study, anti-infective agents were the most commonly administered class of drugs (25%). This was similar to a study performed in Iran in 2010.[15] and study done by Al-zakwani *et al*.[8] Similarly, an Indian study observed that anti-infective agents were the second most prescribed class among the top five dug classes in the ICU.[12] In our study, we found that 1235 generic and 174 branded drugs were prescribed. The FDCs were 427 while single drug utilization was 715 in number. Study was performed by Mahadeo *et al*.[23] shown 259 FDC and 240 single drug prescription out of 499 prescriptions in their study.

Strength of Study

This is very limited studies and data available about similar study in India and also in developing countries so this data will be useful for medical professionals in India and developing countries.

Limitations of Study

Although it is need of developing countries, this sample is only a very small proportion of the entire population of in the country, and the data collection was confined to only particular limited area of country since constraints were faced during data collection.

CONCLUSION

Antimicrobials are the commonly used drugs. There is a need of guidelines and restriction policies for the rational prescribing of AMAs usage. Appropriate prescription protocols need to be addressed to guide for proper use of drugs in the ICU.

REFERENCES

1. U.S. Food and Drug Administration (FDA). (2014). Preventable Adverse Drug Reactions: A Focus on Drug Interactions. Retrieved August 6; 2015. Available from: http://www.fda.gov/Drugs/DevelopmentApprovalProcess/DevelopmentResources/DrugInteractionsLabeling/ucm110632.htm. [Last accessed on 2019 Jan 23].
2. Wachter TM, Shojania KG. Internal Bleeding: The Truth behind American's Terrifying Epidemic of Medical Mistakes. New York: Rugged Land; 2004.
3. U.S. Office of Disease Prevention and Health Promotion (ODPHP). National Action Plan for Adverse Drug Event Prevention; 2015. Available from: http://www.health.gov/hcq/pdfs/ADE-Action-Plan-508c.pdf. [Last accessed on 2015 Jul 15].
4. Yamashita SK, Louie M, Simor AE, Rachlis A. Microbiological surveillance and parenteral antibiotic use in a critical care unit. Can J Infect Dis 2000;11:107-11.
5. Shankar PR, Partha P, Dubey AK, Mishra P, Deshpande VY. Intensive care unit drug utilization in a teaching hospital in Nepal. Kathmandu Univ Med J (KUMJ) 2005;3:130-7.
6. Williams A, Mathai AS, Phillips AS. Antibiotic prescription patterns at admission into a tertiary level intensive care unit in Northern India. J Pharm Bioallied Sci 2011;3:531-6.
7. Bobek M, Hoffman-Hogg L, Bair N, Mion L, Arroliga A, Slomka J. Utilization patterns, relative costs, and length of stay following adoption of MICU sedation guidelines. Formulary 2001;36:664-73.
8. Al-Zakwani I, Al-Thuhli M, Al-Hashim A, Al Balushi KA. Drug utilization pattern in an intensive care unit at a tertiary care teaching hospital in Oman. Asian J Pharm Clin Res 2017;10:194-7.
9. Biswal S, Mishra P, Malhotra S, Puri GD, Pandhi P. Drug utilization pattern in the intensive care unit of a tertiary care hospital. J Clin Pharmacol 2006;46:945-51.
10. Patel MK, Barvaliya MJ, Patel TK, Tripathi C. Drug utilization pattern in critical care unit in a tertiary care teaching hospital in india. Int J Crit Illn Inj Sci 2013;3:250-5.
11. Chatterjee S, Mandal A, Lyle N, Mukherjee S, Singh AK. Drug utilization study in a neonatology unit of a tertiary care hospital in eastern India. Pharmacoepidemiol Drug Saf 2007;16:1141-5.
12. John L, Devi P, John J, Guido S. Drug utilization study of antimicrobial agents in medical intensive care unit of a tertiary care hospital. Asian J Pharm Clin Res 2011;4:81-4.
13. Abideen S, Vivekandan K, Mishra P. Assessment of prevalence of potential drug-drug interactions in medical intensive care unit of a tertiary care hospital in India. Asian J Pharm Clin Res 2015;8:125-30.
14. Smythe MA, Melendy S, Jahns B, Dmuchowski C. An exploratory analysis of medication utilization in a medical intensive care unit. Crit Care Med 1993;21:1319-23.
15. Tavallaee M, Fahimi F, Kiani S. Drug-use patterns in an intensive care unit of a hospital in Iran: An observational prospective study. Int J Pharm Pract 2010;18:370-6.
16. Boucher BA, Kuhl DA, Coffey BC, Fabian TC. Drug use in a trauma intensive-care unit. Am J Hosp Pharm 1990;47:805-10.
17. Bonmarchand G, Czernichow P, Chrétien P, Massari P, Lecomte F, Hantute N, *et al.* Drugs used in a medical intensive care unit. Ann Fr Anesth Reanim 1986;5:497-501.
18. Paudel R, Palaian S, Giri B, Hom K, Sah A, Poudel A. Clinical profile and drug utilization pattern in an intensive care unit of a teaching hospital in Western Nepal. Arch Pharm Pract 2011;2:163-9.
19. Balaji V, Aithal S, Geetha S, Swetha ES. Drug utilization pattern among geriatric patients admitted in medical intensive care unit of a tertiary care teaching hospital. Asian J Pharm Clin Res 2015;8:281-3.
20. ASHP therapeutic guidelines on stress ulcer prophylaxis. ASHP commission on therapeutics and approved by the ASHP board of directors on november 14, 1998. Am J Health Syst Pharm 1999;56:347-79.
21. Benjamin B, Kumar BS, Udaykumar P, Swamy VN. Comparative drug utilization of antimicrobial agents in medical and respiratory intensive care units of a tertiary care teaching hospital in South India. Indian J Pharm Pract 2016;9:123.
22. Mittal N, Mittal R, Singh I, Shafiq N, Malhotra S. Drug utilisation study in a tertiary care center: Recommendations for improving hospital drug dispensing policies. Indian J Pharm Sci 2014;76:308-14.
23. Mahadeo R, Gounder S, Graham SM. Changing from single-drug to fixed-dose combinations: Experience from Fiji. Public Health Action 2014;4:169-73.

How to cite this article: Gawali UP, Khobragade RS. Drug utilization and prescription pattern study in medicine intensive care unit at tertiary care teaching hospital. Natl J Physiol Pharm Pharmacol 2019;9(7):674-677.

Source of Support: Nil, **Conflict of Interest:** None declared.