Assessment of Drug-Drug Interactions in Critical care Unit of a Tertiary Care Hospital

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Introduction

Patients admitted to hospitalized Critical Care Units (CCUs) are always administered with several medications and are frequently subjected to a prolonged treatment regimen due to their serious and multiple medical problems. Investigations in critical care units have revealed that probable drug interactions may occur in 44.3 to 95 percent of patients. However, studies on their clinical value are sparse and limited. According to studies, there is an increasing proportion of drug interactions in the ICU and the dosage of medications used, the duration of stay in the ICU and the types of drugs used are the most crucial factors that have contributed to drug-drug interactions. The risk of drug-drug interactions grows not only with the number of drugs used, but also with the number of medical practitioners that treat the same patient. The older age of patients in critical care units is another risk factor that complicates the treatment process. It has been found that potential drug interactions are widespread in critical care unit patients, with the majority of them having a significant cost and clinical impact.

Need for the study

Patients admitted to the intensive care unit (ICU) have severe and life-threatening illnesses, and the majority of them have multiple comorbidities. Patients receiving intensive care, immunocompromised patients, patients with complex clinical conditions requiring a large number of prescription drugs with a long duration of hospital stay, and an increase in healthcare costs are all risk factors that contribute to the occurrence of potential drug–drug interactions (pDDIs). As a result, it is critical to screen every patient's medication for the presence or absence of DIs. pDDIs are one of the avoidable drug-related problems that can lead to serious adverse events or therapeutic failure. Drug interactions screening software can be effectively used to identify a wide range of potential drug–drug interactions. Proper patient monitoring is critical for minimizing and preventing potential drug–drug interactions this issue is still poorly addressed in developing countries like India.

Materials and Methods

The present study was a prospective interventional study conducted over nine months in all the critical care units of a tertiary care teaching hospital. The hospital consists of 07 critical care units which includes intensive care unit (ICU)18 beds, Medical critical care unit (MICU) 16 beds, Pediatric intensive care unit (PICU) 12 beds, Surgery intensive care unit (SICU) 14 beds, Respiratory intensive care unit (RICU) 10 beds and Neonatal intensive care unit (NICU) with 16 beds. Patients of either gender admitted to critical care units of the hospital and receiving more than one medication were included in the study. The patient discharged against medical advice , patients who stays less than 24hrs from the time of admission and patients on other systems of medicine like Ayurveda, siddha and unani were excluded from the study. A suitable data collection form was developed and patient enrolled were assessed for the presence of drug - drug interactions and identified interactions were communicated with the concerned clinician and suitable management strategy was adopted to prevent or stop the interaction and the outcomes of the interventions made were gathered and document with suitable data collection form. Each of the identified drug - drug interactions was classified based on mechanism into pharmacodynamics interaction, pharmacokinetics interaction and its severity was assessed using drug interactions severity scale. All the enrolled patients were grouped according to their age, gender, ICU, presence of comorbidities and number of medications prescribed, and their respective percentage values were calculated. Patients who experienced potential and actual drug-drug interactions were categorized and analysed separately. Incidence of the Potential and actual DDIs was calculated by using the following equation. Potential and Actual drug-drug interactions was calculated by using the formula. The identified drug interactions were grouped into pharmacokinetics and dynamics based upon their mechanism. Their respective percentage values were calculated. Severity of potential drug-drug interactions was categorized as minor, moderate, major and contraindicated interactions and their respective percentage values were calculated. The rate of acceptance of interventions was categorized into accepted and not accepted, and their respective percentage values were calculated.

Results & Discussion

Total 650 Patients treatment chart was reviewed for potential drug-drug interactions and fallowed for the actual drug-drug interactions as well. Majority of the study population was belonged to the age group of 60-69 years (20.3%), followed by 0-9 years (17.8%) and 50-59 years (16.3%) and the least number of the study population was 10-18 years (3.6%). In the Total patients included in the study,54.4%(n=356) was males. Total of 520 patients had one or more comorbidities. The most common comorbidities condition observed in the included study population was Type 2 Diabetic mellitus, Hypertension, Ischemic heart diseases, Chronic obstructive pulmonary diseases. In the study population, Majority 46.3 were receiving 6-10 drugs. Majority of the study patients received multiple medication due to their multiple comorbidities or the diseases condition. It is also fact that the patients with multiple diseases condition require several medications. In the overall population admitted to the critical care units, Total of 650 patients were included in the study as per the inclusion and exclusion criteria. Among the 650-study population, Total of 781 drug-drug interactions were identified. In those 781 drug-drug interactions,705 was potential drug- drug interaction and 76 was actual drug-drug interactions.

Out of 650 study population, 365 patients were identified to have at least one potential drug-drug interactions giving the incidence rate of 56.1% (Figure 1). Total of 705 potential drug-drug interactions was identified from 365 patients. The patients those who are admitted to the coronary care unit are at a high risk for the development of potential drug-drug interactions. More number of prescribed drugs for several disease conditions are also one of the main risk for the occurrence of potential drug-drug interactions. In the overall population, maximum number of patients was admitted to Medicine Intensive care units MICU (n=153) followed by ICCU (136) and CCU (n=110). Among the study population, 94,78 and 76 potential drug-drug interaction was identified respectively. The incidence of potential drug- drug interaction was identified high in CCU's (69.0%) followed by MICU (61.4%), ICCU (57.3%) and SICU (56.8%). The CCU admitted patients have multiple comorbidities for which the several number of drugs was prescribed. Compared to other intensive care units patients in CCU's was prescribed with more number of drugs. The common diseases conditions found in the CCU's was Coronary artery disease, Hypertension, Diabetic mellitus, Myocardial infarction and stroke.

Summary & Conclusion

In thus study, the rate of incidence of potential and actual drug-drug interaction was identified to be 56.1% and 6.9% respectively. The potential 66.0% and actual 7.6% drug-drug interaction was found to be more predominant in male compared to females. In the present study, majority of the potential drug-drug interaction is identified in MICU 61.4% (n=195) and majority of the actual drug-drug interaction is identified in SICU 13.7% (n=10). Majority of potential drug-drug interaction mechanism was pharmacodynamic interactions 401(56.8) and same on actual drug-drug interaction mechanism was pharmacodynamic interactions 47(61.8%). According severity scale most of the potential and actual drug-drug interaction belongs to moderate 357(50.6%) and 39(51.3%) respectively. Almost 93.9% (n=662) of potential and 76 of actual drug-drug interaction was communicated with the health care professionals and physicians. Among those 68% (n=452) potential drug interactions was accepted and 32% (n=210) potential drug-drug interactions was not accepted by the Health care professionals and physicians and in actual drug-drug interaction all intervention was accepted by the health care professionals and therapy was changed. In this study, management strategy was made by monitoring of reactions such as alteration in potassium levels (n=194), monitor ECG level (n=142), monitor glucose level (n=93), monitor PT/INR (n=117) and other such as drugs alters the effect of other drugs (n=159) were identified in the potential drug-drug interactions and avoid or stop usage of drug 29 (38.1%), Increase the time interval between the administration of drugs 47 (61.8%) made as a management in actual drug-drug interactions. The incidence of potential drug-drug interaction was high. Factors such as age, diseases condition, comorbidities and polypharmacy are main key factors for the occurrence of potential and actual drug-drug interactions and the elderly and patients prescribed with six to ten drug are made caution and warranted to minimize or prevent the potential and actual drug-drug interaction in critical care Units.

Acknowledgement & References

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