Drug Utilization Study In Intensive Coronary Care Unit of A Tertiary Care Teaching Hospital

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Abstracts: Background: Critically ill patients are admitted in Intensive coronary care unit. The intensive coronary care unit (ICCU) is a setting where a large number of drugs are administered to patients. Information on drug utilization in intensive coronary care units (ICUs) are lacking in India. Objectives: To identify pattern of drug use and suggest measures. Methods: Prospective drug utilization study was conducted in patients admitted in ICCU for six months. Data was collected in previously prepared case record form. Data was recorded from the admission of patient in ICCU to discharge from ICCU. Analysis was done by using drug use indicators, age and sex wise distribution, morbidity pattern of disease, frequency of drug use, cost of drug therapy and length of stay. Data analysed using Microsoft Excel. Total 605 cases were analysed. Results and Interpretation: Mean ± SD[6] of age of all patients being admitted in ICCU is 57.05 ± 11.92 years. Most frequent morbidity found is myocardial infarction. Average number of drugs per encounter is 14.85. Percentage of encounters with an antibiotic and injection prescribed is 27.44% and 98.68% respectively. 34.46% drugs are prescribed by generic name and 43.75% drugs were prescribed from WHO essential drug list. Most commonly prescribed drug is Tablet Aspirin. Frequent injections used are promethazine, heparin, hydrocortisone, buprenorphine, streptokinase, metoprolol, Pentazocin and frusemide. Average drug cost per encounter is 867.84 Rs. 65.38% cost is spent on fibrinolytics. Conclusion: Average number of drugs per encounter is high it should be kept low whenever possible. From all drugs prescribed 42.66% drugs were parenteral. Percentage of drug prescribed by generic name is less. Drugs should be prescribed by generic name. Cost of drugs spend by patient is high. Antibiotics are less frequently prescribed. The mortality rate is low. Essential drug list for ICCU should be prepared. Seminar or group discussion can be done with health professionals working in ICCU to discuss drug utilization pattern for further improving prescribing pattern [Patel B et al NJIRM 2012; 3(4) : 28-33]

Key Words: Intensive Coronary Care Unit, Streptokinase, Myocardial Infarction, Drug Utilization study

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Introduction: Patients are admitted in ICCU are critically ill cardiac patients. It is important to know the drug utilization pattern in these patients. By drug utilization study in ICCU we can know about morbidity pattern in ICCU, frequency of drug usage and from these which drug are essential drugs that are required for the patients admitted in ICCU. Patients admitted in ICCU with cardiovascular disease are 10% of total admission with cardiovascular disease in medicine department. There were over 29.8 million persons suffering from cardiovascular disease during 2003. As estimated 1.5 million people died of cardiovascular disease every year[1].

Drug utilization study defined by WHO as, "The marketing, distribution, prescription and use of drugs in a society, with special emphasis on the resulting medical, social and economic consequences." Drug utilization pattern needs to be evaluated from time to time; so as to increase therapeutic efficiency and decrease the adverse effects[2]. This type of study can measure the effect of informational and regulatory measures, price policy, and overuse, under use or misuse of single drug or therapeutic classes. Drug utilization study can define areas for further investigation on efficacy and safety of drug therapy[3].

International agencies like World Health Organization and International Network for Rational Use of Drugs have applied themselves to evolve standard drug use indicators [4]. These are highly standardized, do not need national adaptation, and are recommended for inclusion in any drug use study using indicators. Such measures or indicators will allow health planners, managers and researchers to make basic

comparisons between situations in different areas or at different times. Also when an intervention is undertaken to improve aspects of drug use, the indicators can be used to measure impact[5]. Similar study has not been done in this tertiary care hospital earlier in ICCU. So to identify pattern of drug use and suggest measures we have done drug utilization study in ICCU.

Material and Methods: The present study was conducted at intensive coronary care unit of tertiary care teaching hospital Jamnagar. Prior permission of the medical superintendent of hospital, institutional ethical committee and Head of medicine department was obtained for conducting the study.

Prospective drug utilization study has been carried out for 6 month duration from January 2006 to June 2006. From the 623 patients 605 were included in study matching inclusion criteria. Patients included in study were of all age and of either sex admitted in Intensive Coronary Care Unit with cardiovascular disease only and having other disease with cardiovascular disease. Patients, in whom final diagnosis is not made, no treatment written on case paper, contain drug belonging to ayurved or other disciplines of medicine as main drug were excluded. Pilot study was done to assess feasibility of study.

Data of patients matching inclusion criteria were only recorded. Data were recorded from the admission of patient in ICCU to discharge from ICCU. Data like name, age, sex, diagnosis, ongoing treatments were recorded in previously prepared case record form. The data were analysed using Microsoft Excel.

Analysis was done for age and sex wise distribution, morbidity pattern of disease, patient outcome, prescribing frequency of drugs, Length of ICCU stay and total cost of drug therapy. This form then analysed as per drug use indicators: average number of drugs per encounter, percentage of drugs prescribed by generic name, percentage of encounters with an antibiotic prescribed, percentage of encounters with an injection

prescribed, percentage of drugs prescribed from essential drug list or formulary, average drug cost per encounter, percentage of drug cost spent on antibiotics, percentage of drug cost spent on injections, percentage of drug cost spent on fibrinolytics[5]. The cost is calculated according to the price recorded in government medical store of G. G. Hospital for the drugs which are available in the hospital while for other drugs cost is calculated according to minimum price of that drug in Indian Drug Review September-October 2005.

Result: The number of male patients admitted in ICCU is 431 (71.24%), number of female patients admitted in ICCU is 174 (28.76%) of the total encounters surveyed. 32.73% of the total encounters surveyed are of age group 51-60 years and 24.63% of the total encounters surveyed are of age group 61-70 years. This can be explained by the fact that cardiovascular diseases are most commonly found in older patients. Mean ± SD [6] of age of all patients being admitted in ICCU is 57.05 ± 11.92 years. The average numbers of drugs per encounter is 14.85.

Most frequent morbidity found is myocardial infarction. Next in line are unstable angina, decompensated congestive cardiac failure, acute left ventricular failure, syncope, ventricular fibrillation and stable angina in decreasing order (figure 1). Most commonly found symptoms are retrosternal chest pain, perspiration and breathlessness.

FIGURE-1. MORBIDITY PATTERN OF CARDIOVASCULAR DISEASE IN ICCU (SEX WISE DISTRIBUTION)
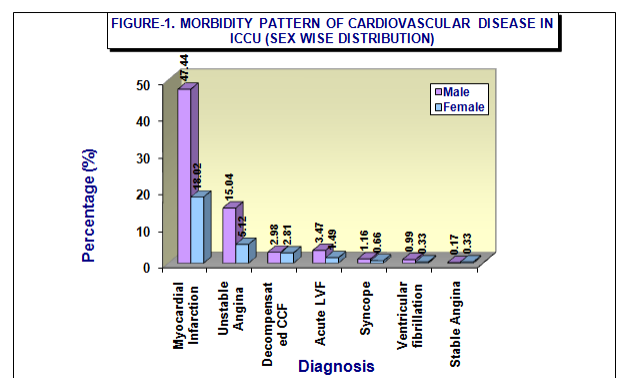
Percentage of encounters with an antibiotic prescribed is 27.44%. Most common indications

for antibiotic use are urinary tract infections in 21%, intraabdominal infections in 15%. Antibiotic use is empirical. The most frequent antibiotic used is inj. cefotaxime (20.70%). The next in line are inj. ceftriaxone (14.39%), inj. ampicillin (12.98%), inj. ciprofloxacin (11.93%). Percentage of encounters with an injection prescribed is 98.68%. The majority of encounters prescribed 4 to 8 injections. (figure 2).

FIGURE-2. TOTAL NUMBER OF INJECTIONS PER ENCOUNTER
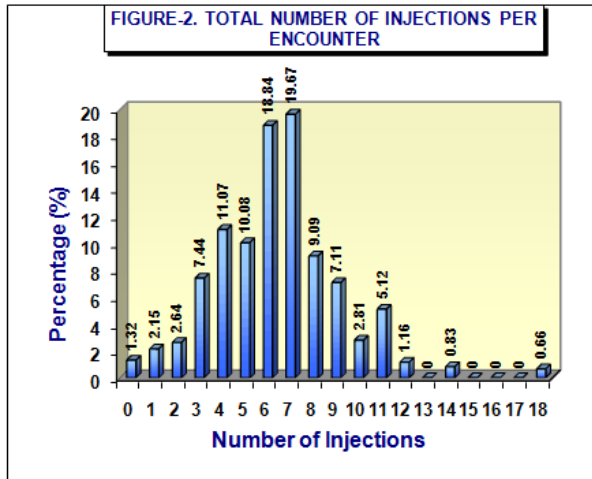
The most frequent injections used are promethazin and heparin. The next in line are hydrocortisone,buprenorphine,streptokinase,meto prolol, pentazocin ,frusemide. 34.46% drugs are prescribed by generic name and 43.75% drugs were prescribed from WHO essential drug list (EDL).

Most commonly prescribed drug is tab. aspirin (97.36%). Next in line are tab. nitroglycerine (88.60%), tab. diazepam (85.79%), tab. clopidogrel (81.82%), tab. famotidine (77.36%), inj. Promethazine (74.88%), inj. heparin (68.10%), liq. milk of magnesia + liq. paraffin (67.93%), tab. isosorbide dinitrate (59.01%), inj. hydrocortisone (50.08%), inj. buprenorphine (49.75%), tab. metoprolol (49.42%), inj. streptokinase (48.26%), inj. metoprolol (46.94%) and tab. enalapril (42.98%) (figure 3).

FIGURE-3. Frequency of drug use (15 MOST COMMONLY USED DRUGS)

■ Tab. Aspirin ■ Tab. Nitroglycerine
■ Tab. Diazepam ■ Tab. Clopidogrel
■ Tab. Famotidine ■ Inj. Promethazine
■ Inj. Heparin ■ Liq. Milk of magnesia + Liq paraffin
■ Tab. Isosorbite dinitrate ■ Inj. Hydrocortisone
■ Inj. Buprenorphine ■ Tab. Metoprolol
■ Inj. Streptokinase ■ Inj. Metoprolol
■ Tab. Enalapril
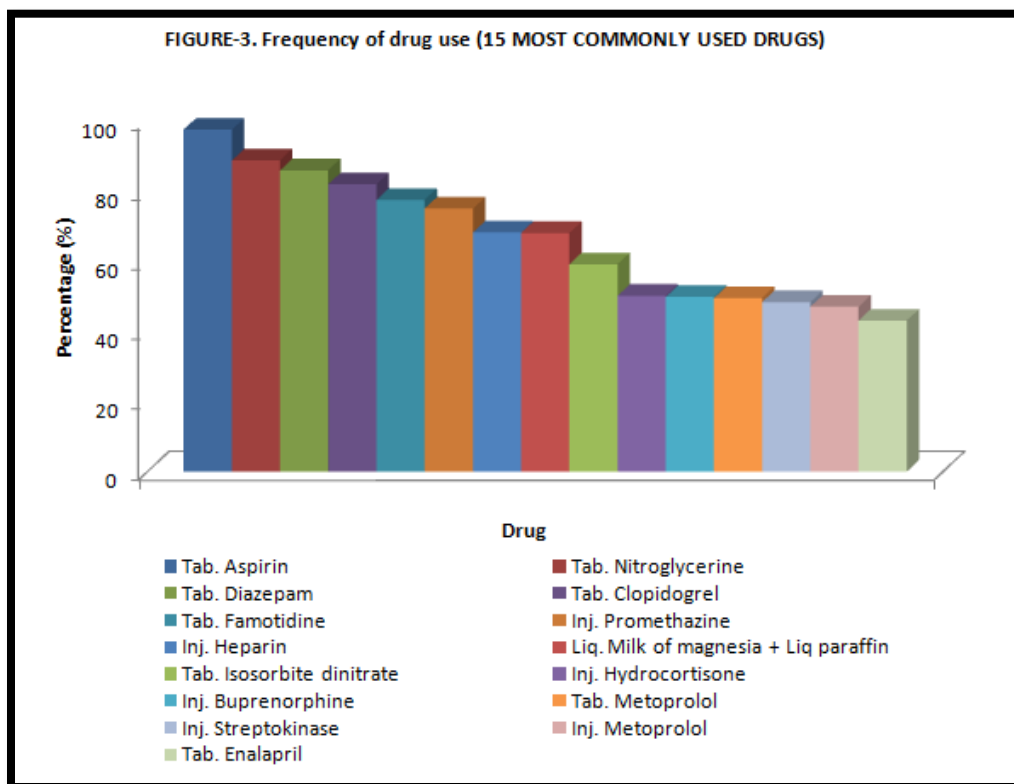
Fixed dose combinations used are nebuliser ipratropium bromide + salbutamol (2.15%) for Severe bronchial asthma, metformine + glimeperide (0.55%) for diabetes mellitus, Amoxycillin + Clavulinic acid (0.83%) for respiratory tract infections, metformine + pioglitazone (0.55%), for diabetes mellitus, liquid milk of magnesia + liquid paraffin for constipation (67.93%). Mean ± SD of length of stay in ICCU of all patients being admitted in ICCU is 3.07 ± 1.39 days. The mortality rate is 7.77% Table 1 shows total cost of drug therapy for the duration of prescription. Average drug cost per encounter is Rs. 867.84. 6.96% of the total cost is spent on the antibiotics, 90.53% cost is spent on injections, 65.38% cost spent on fibrinolytics. Cost of drugs per patient for Myocardial infarction is Rs. 1069, for unstable angina is Rs. 858, for Decompensated CCF Rs. 726. 67% cost was spend by patient and 33% cost spend by hospital.

Table 1: Total cost of drug therapy for the duration of prescription

Sr. No.	Cost of drugs (Rs.)	Percentage (%)
1.	<500	42.81
2.	500-1000	29.59
3.	1000-1500	13.90
4.	>1500	13.72

Discussion: In our study, Mean ± SD of age of all patients being admitted in ICCU is 57.05 ± 11.92 years. It is comparable to 57.5 ± 19.40 years found in prospective utilization study in intensive care unit by Moran JL et al[7]. In our study, Mean ± SD of age of male is 55.88 ± 12.02 years and female patients 59.98 ± 11.28 years is comparable to one study[8].
Percentage of encounters with an antibiotic prescribed is 27.44% (n=605). Study of intensive care unit utilization in a teaching hospital in Nepal done by Shankar PR et al[9] percentage of encounters with an antibiotic prescribed was 57.5%. In one study in ICU 95% of patients were prescribed some antibiotic[10]. In our study the most frequent antibiotic used is inj. cefotaxime (20.70%).In a study of Prescribing Pattern of

Antimicrobial Agents in Medicine Intensive Care Unit, cefotaxime was the most commonly used antibiotic by 32% patients[11]. In our study antibiotic use is less compared to other study. Indiscriminate and inadequate use of antibiotic can lead to resistance. In our study there is less antibiotic use only when it is needed it is prescribed. Monitoring of antimicrobial use and knowledge of prescription habits are some of the strategies recommended to contain resistance to antimicrobials in hospitalized patients[11].

The average number of drugs per encounter is 14.85 it is comparable to 12.1 found in a study of medication utilization in medical ICU by Smythe MA et al[12].The average number of drugs should be kept as low as possible to minimize the risk of drug interactions, development of bacterial resistance and hospital costs[13].

Percentage of encounters with an injection prescribed is 98.68% .The majority of encounters prescribed 4 to 8 injections. Patients admitted in ICCU are serious and they need fast action. So more no of parenteral drugs are prescribed. Study of drug utilization in a general intensive care unit done by Buchanan N et al[14] parenteral drugs accounted for 52.8% of the total drugs, in our study it is 42.66%.

In our study only 34.46% drugs were prescribed by generic name. Increasing generic prescribing would rationalize the use and reduce the cost of drugs[15]. Mean ± SD of length of stay in ICCU of all patients being admitted in ICCU is 3.07 ± 1.39 days is comparable to 3.2 ± 2.7 days found in study of myocardial infarction patients in coronary care unit[16].
Because myocardial infarction and unstable angina is most common morbidity in our study so most common drug used is aspirin, nitroglycerine, clopidogrel, isosorbide dinitrate, buprenorphine, streptokinase and metoprolol, diazepam. Inj. Promethazine was used as antiemetic more frequently than metoclopramide. It is not preferred antiemetic. As analgesics buprenorphine or pentazocin was prescribed. Pentazocin will

increase cardiac work so it should be avoided in coronary ischemia and myocardial infarction[17].

In our study thrombolytic was given to 292 (73.73%) out of 396 patients of myocardial infarction. Percentage of drug cost spent on fibrinolytics is 65.38% of the total cost. Cost of streptokinase is high so streptokinase should be supplied in the hospital.

In our study, most commonly prescribed drug is tab. aspirin (97.36%). Next in line are tab. nitroglycerine (88.60%), tab. diazepam (85.79%), tab. clopidogrel (81.82%), tab. famotidine (77.36%), inj. promethazine (74.88%), inj. heparin (68.10%), liq. milk of magnesia + liq. paraffin (67.93%), tab. isosorbide dinitrate (59.01%), inj. hydrocortisone (50.08%), inj. buprenorphine (49.75%), tab. metoprolol (49.42%), inj. streptokinase (48.26%), inj. metoprolol (46.94%) and tab. enalapril (42.98%). In study of myocardial infarction by Venturini F et al[18] 47.8% received thrombolytic therapy, during the first day of hospitalization 63.9% of patients received aspirin, 83.3% received nitrates, 24.8% received beta-blockers, and 77.1% received heparin therapy. In a study[19] of myocardial infarction patients in coronary care unit (CCU) treatment given was Beta Blockers in 33 (55.0%), Intravenous nitrates in 36 (60.0%), GP IIb/IIIa inhibitors in 7 (11.7%), diuretics in 30 (50.0%), Heparin in 47 (78.3%), Inotropic agents in 13 (21.7%) and thrombolytics in 9 (15.0%) patients.

Injections are used more in intensive coronary care unit to give rapid relief to the patients with critical illness. In our study 90.53% of cost was spent on injections. In our study average drug cost per encounter is Rs. 867.84 and only 6.96% of the total cost was spent on the antibiotics. In a study of drug utilization in ICU the cost analysis of the antibiotics and the total drugs prescribed at admission revealed that patients were prescribed drugs and antibiotics worth nearly Rs. 2725 per patient and Rs. 1995 per patient, respectively, and antibiotic costs accounted for 71% of the total drug expenditure[10].

The drug cost should also be mentioned in the medical literature, drug advertisement and should also be asked from medical representative and wherever possible a cheapest brand should be prescribed.

Conclusion: Patients with cardiovascular diseases admitted to ICCU are having Male: Female ratio of 2.48:1. 32.73% of the total encounters surveyed are of age group 51-60 years. Most common morbidity is myocardial infarction. Length of stay in ICCU is 3.07 ± 1.39 days. Percentage of drugs prescribed generic name is less. Average number of drugs per encounter is high. From all drugs prescribed 42.66% drugs are parenteral. Fixed dose combinations are less commonly prescribed. Most commonly prescribed drugs are aspirin, nitroglycerine, diazepam, clopidogrel, famotidine, promethazine, heparin, liquid milk of magnesia + liquid paraffin, isosorbide dinitrate, hydrocortisone, buprenorphine, metoprolol streptokinase, enalapril. Pentazocin is used as analgesics but it increases cardiac work so it should not be prescribed. Cost burden for antibiotics is less. Cost burden for drugs to the patient is high. The mortality rate is low.

Similar drug utilization study should be done in ICCU from time to time to know drug use pattern. Longitudinal surveillance of ICCU drug use should be carried out. Essential drug list for ICCU should be prepared. Drugs should be prescribed by generic name. Seminar or group discussion can be done with health professionals working in ICCU to discuss drug utilization pattern for further improving prescribing pattern.

References:
1. Park K. Epidemiology of chronic non-communicable diseases and conditions. In: Park's text-book of preventive and social medicine. 20th ed. Jabalpur: Banarsidas Bhanot. 2009:316.
2. Krishnaswamy K. Dinesh Kumar B, Radhaiah G; A drug survey- percepts and practices. Eur J Clin Pharmacol. 1985; 29: 363-70.

3. 4th report of WHO expert committee: The use of essential drug, WHO TRS 796. World Health Organization; 1990.

4. Maini Rajiv,Verma KK, Biswas NR et al. Drug utilization study in Dermatology in a tertiary hospital in Delhi .Ind J Physiol Pharmacol 2002; 46: 107-10.

5. WHO how to investigate drug use in health facilities: selected drug use indicators. Geneva: World Health Organization; 1993. (WHO/DAP/93.1).

6. Mahajan BK. Methods in biostatistics for medical students and research workers. New Delhi: Jaypee Brothers. 2006.

7. Moran JL, Peisach AR, Soloman PJ, Martin J. Cost calculation and prediction in adult intensive care: a ground up utilization study. Anaesth Intensive Care. 2004 Dec; 32:787-97.

8. Toh CC ,Low L P, Khoo O T,.Intensive care of acute myocardial infarction in coronary care unit. Singapore Med J. 1970 march;11(1):38-45.

9. 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. 2005 Apr-Jun; 3:130-7.

10. Williams A, Mathai A, and Phillips A Antibiotic prescription patterns at admission into a tertiary level intensive care unit in Northern India.J Pharm Bioallied Sci. 2011 Oct-Dec; 3(4): 531–536.

11. Badar V A, Navale S B. Study of Prescribing Pattern of Antimicrobial Agents in medicine Intensive Care Unit of a Teaching Hospital in Central India. JAPI . 2012 april; 60:20-23.

12. 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.

13. Stratton CW [4th], Ratner H, Johnston PE, Schaffner W. Focused microbiological surveillance by specific hospital unit: practical application and clinical utility. Clin Ther. 1993; 15 suppl A: 12-20.

14. Buchanan N, Cane RD. Drug utilization in a general intensive care unit. Intens care med.1978; 4:75-7.

15. Quick JD, Hogerzeil HV, Velasquez G, Rago L. Twenty-five years of essential medicines. Bull: WHO 2002; 80: 913-14.

16. Selles M, Datino T, Bueno H. Coronary care unit admission of very old patients with acute myocardial infarction. Heart. 2006; 92:549-50.

17. Tripathi K D. Opioid analgesics and antagonists. In: Essentials of medical pharmacology. New Delhi: Jaypee Brothers. 2008.

18. Venturini F, Romero M, Tognomi G. Acute myocardial infarction treatment in 58 Italian hospitals: A drug utilization survey. Ann Pharmacother.1995; 29:1100-05.

19. Selles M, Datino T, Bueno H. Coronary care unit admission of very old patients with acute myocardial infarction. Heart. 2006; 92:549-50.