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PRESCRIPTION AUDIT IN OUTPATIENT DEPARTMENTS OF A TERTIARY CARE TEACHING HOSPITAL: A CROSS-SECTIONAL STUDY

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ABSTRACT

Title: Prescription audit in outpatient departments of a tertiary care teaching hospital: A cross-sectional study. **Background:** Standards of medical treatment can be assessed by prescription audit, because it is based on documented evidences to support diagnosis, treatment and utilization of hospital resources. Effective prescription audit is important for health professionals and for society so present study was planning to evaluate prescribing patterns of various outpatient departments of a tertiary care teaching hospital. **Method**: A prospective observational study was carried out from November 2014 to October 2015 in out-patient departments of a tertiary care teaching hospital. Prescriptions were collected randomly from central pharmacy store and analyzed for average number of drug, proportion of drugs prescribed by generic name, fixed dug combination, drugs from essential drug list, completeness of prescription and drug-drug interaction. **Result**: Total 1035 prescriptions were analyzed. Most of the prescriptions were from medicine 18.55%, psychiatry 10.72% and orthopedic 8.50% departments. 11.11% prescriptions were for cardiovascular diseases followed by 6.57% for dermatology and 6.18% for diabetes mellitus. Diagnosis, dose, dosage form, route of administration, duration of therapy were missing in majority of prescriptions. Drug name with abbreviation was found in 42.78% prescriptions and 45.41% prescriptions were illegible. Total 4604 drugs were prescribed with average 4.47 drugs per prescription. 75.10% drugs were prescribed by generic name; 86.42% drugs were from national essential medicine list 2011; 26.76% prescriptions has one antimicrobial agent and 11.72% fixed dose combinations were prescribed. Multivitamin 29.75% was the most commonly prescribed drug followed by famotidine 26.95% and chlorpheniramine 22.02%. Out of 1035 prescriptions, 228 drug-drug interactions were found in 189 (18.3%) prescriptions. **Conclusion:** This study found majority prescriptions with incomplete information and poly pharmacy in current prescribing practice.

KEYWORDS: Prescription audit, Polypharmacy, Rational use of drug.

INTRODUCTION

Medical audit is a systematic critical analysis of quality of medical care that includes procedures used for diagnosis and treatment, the use of resources, the resulting outcome and quality of life of the patients.[1] Prescription audit is a part of medical audit[2] and defined as the scrutiny of the system involve in prescribing, documenting, transcribing, dispensing, administering of medicines and monitoring of therapy. Quality of medical care can be assessed by prescription audit. The prescription is an important transaction between the doctor and the patient[3] and should be written clearly so that it can easily communicate between pharmacist and patient.[4] Prescribing errors occur if doctor writes the prescription without consideration of patient's clinical status, age, weight, co-morbid condition. Uses of abbreviations and illegible hand-writing can also lead to medication errors and ultimately irrational use of medicines. It can lead to unsafe treatment, exacerbation of disease, economic burden on the patients with serious consequences for patients in increased adverse drug events, accelerating rates of antimicrobial resistance, drug – drug interaction and waste of scarce health resources.[5]

Some earlier published studies have shown the poly-pharmacy (average number of drugs per prescription: ≥3), increased use of fixed dose combinations (26.87 to 97.91%), less number of prescriptions with generic names (20.99 to 41.42%), lacking in use of drugs from

essential drug list (36.92 to 67.54%) and most common use of non steroidal anti-inflammatory drugs (NSAIDs) and multivitamins.[5,6,7,8] Many prescription audit studies have been conducted in specific department. Prescription audit in diverse setting are scarce. The present prescription audit was designed for outpatient departments of a tertiary care teaching hospital to provide an insight regarding the use and requirement of medicines as per the disease burden as well as completeness of prescription.

MATERIAL AND METHODS

The present prospective observational cross sectional study was started after approval from Institutional Review Board (IRB) of our institute and permission for consent waiver was taken from IRB and study was registered in clinical trial Registry of India with CTRI No. CTRI/2016/09/007287. It was carried out for prescriptions from various outpatient departments (O.P.D.) of Sir Takhtsinhji General Hospital, a tertiary care teaching hospital, Bhavnagar over a period of 1 year from November, 2014 to October, 2015. Data were collected by visiting central drug dispensing window once a week during O.P.D. hours. New or follow up outdoor cases from the patients visiting various departments were randomly collected. Photographs or photocopies of prescriptions were taken for a record purpose. Different days of week were selected to get the prescriptions from different units of the departments. All the data collected as a part of this study were kept strictly confidential and used for the purpose of this study only. Prescriptions were numbered and all the necessary information was filled in to the case record form. Demographic data, details of doctor, diagnosis, drug's name, it's dose, dosage form, route and frequency of administration, total number of drugs in prescription, drug by generic or brand name, number of antimicrobial agent in prescription, number of drugs from national and WHO essential medicine list, number of fixed dose drug combination and use of abbreviation in the prescription were collected and analyzed.

Statistical analysis and outcome measures

All the data were complied in to Microsoft Office Excel 2010. Descriptive statistic was used and data were presented in percentages. Proportion of common diseases; missing information in various elements of prescription; WHO core prescribing indicators like average number of drug per prescription, percentage of drugs prescribed by generic name or brand name, percentage of drug prescribed from WHO and National List of Essential Medicine (India), percentage of prescriptions with an antimicrobial agent, percentage of prescribed fixed dose drug combination (FDC) and percentage of prescriptions with injection; use of abbreviations and proportion of prescription with illegible writing and drug-drug interactions were calculated. All the prescribed drugs were entered in to the software medscape drug interaction checker and evaluated for possible drug-drug interaction. They were categorized in to pharmacokinetic, pharmacodynamic and both types of interaction.

RESULTS

Total 1050 prescriptions were randomly collected and 15 prescriptions were discarded due to non readability. 1035 prescriptions were analyzed for outcome measures. Demographic details of prescriptions collected for audit are shown in Table1.

Maximum number of prescriptions were from medicine 192 (18.55%) department followed by psychiatry 111 (10.72%), orthopedics 88 (8.50%), pediatric 78 (7.53%), pulmonary medicine 78 (7.53%), dermatology 72 (6.95%), obstetrics and gynecology 62(5.99%), surgery 62 (5.99%), otorhinolaryngology 56 (5.41%), general 46 (4.44%), emergency 16 (1.54%), dentistry 15(1.44%), ophthalmology 13(1.25%), trauma centre 07 (0.67%) and ART centre 01 (0.09%). OPD was not mentioned in 47 (4.54%) prescriptions**.** 91 (8.79%) patient visited multiple outpatient departments. In 493 (47.63%) prescriptions, diagnosis was not written. Disease pattern according to physiological system is shown in table 2.

In superscription, doctor's details, registration number, cell number and email id were not mentioned in any of the prescription. In inscription 826 (79.8%) prescriptions, 1970 (42.8%) drugs were written with abbreviation name. Signature of doctor was missing in 784 (75.7%) prescriptions (Table 3). Total 4604 drugs were prescribed in 1035 prescriptions. Average number of drugs per prescription was 4.47 (95% CI: 4.35 - 4.61). 03 (0.28%) prescriptions were without the drugs whereas more than two drugs were prescribed in 883 (85.3%) prescriptions (Figure 1).

Out of 4604 prescribed drugs, 3458 (75.10%) drugs were prescribed by generic name and 1146 (24.89%) drugs by brand name. Total 2985 (64.83%) and 3979 (86.42%) drugs were prescribed from WHO and National Essential Medicine lists 2011, respectively.[9] As shown in table 4, the most common drugs prescribed were multivitamin 308 (29.75%) followed by famotidine 279 (26.95%), chlorpheniramine maleate 228 (22.02%), paracetamol 225 (21.73%) and omeprazole 186 (17.97%). Total 540 (11.72%) fixed dose combinations were prescribed. The common fixed dose combinations were multivitamins (57.03%), deriphylline (13.33%), ferrous sulfate + folic acid (2.40%), salbutamol + ipratropium bromide (1.66%). In 277 (26.76%) prescriptions, antimicrobial agents were prescribed. 228 (82.3%) and 49 (17.7%) prescriptions contain one and more than one antimicrobial agents, respectively. Average number of antimicrobial agent per prescription was 0.31 (95% CI: 0.28- 0.3). Of all 4604 drugs, 4245 (92.20%) drugs were prescribed as oral formulations, 273 (5.92%) topical, 60 (1.30%) inhalation and 26 (0.56%) injections were prescribed. Most common oral formulation were tablets 3935 (85.46%) and capsule 275 (5.97%); from topical formulation cream 131(2.84%) and ointment 25 (0.54%);

from inhalation route 24 (0.52%) meter dose inhaler were prescribed. In 189 prescriptions; 228 drug- drug interactions were detected. 36 (3.5%) prescriptions were having more than two drug- drug interactions. Out of 228 drug-drug interactions, 188 (82.5%), 26 (11.4%) and 14 (6.1%) were of pharmacodynamic, pharmacokinetic and both types, respectively. Aspirin- enalapril, aspirin-metoprolol, enalapril – glipizide were three common drug-drug pair for possible interaction.

Table 1: Demographic data of study cases

1	**Age group**	
	Below 12 years	105 (10.14)
	13-60 years	772 (74.58)
	Above 60 years	148 (14.29)
	Age not written	10 (0.96)
2	**Gender**	
	Male	448 (43.28)
	Female	587 (56.71)
3	**Domicile**	
	Rural	382 (36.9)
	Urban	637 (61.5)
	Address not mentioned	16 (1.54)
4	**Total cases – 1035**	
	New cases	477 (46.08)
	Follow Up cases	558 (53.91)

Data are expressed as total number (%).

Table 2: Diagnosis wise distribution of prescription

S.N.	ICD	Diagnosis- physiological system wise	Number of Prescription (%)
1	-----	Not Written	493 (47.63)
2	I00-I99	Cardiovascular System	115 (11.11)
3	L00-L99	Skin and subcutaneous tissue	68 (6.57)
4	E00-E99	Endocrine	64 (6.18)
5	-----	Multiple diagnosis	60 (5.79)
6	J00-J99	Respiratory system	58 (5.60)
7	R00-99	Unspecified	50 (4.83)
8	O00-O99	Obstetrics & Gynecology	49 (4.73)
9	F01-99	Mental and behavior disorder	32 (3.09)
10	M00-99	Musculoskeletal System	19 (1.83)
11	G00-99	Central Nervous System	15 (1.44)
12	K00-K99	Digestive System	12 (1.15)

ICD- International Classification of Disease, Source: World Health Organization. ICD-10, 1994.

Table 3: Elements of prescription

Prescription elements	Prescription details	Present No. (%)	Absent No. (%)
Superscription	**Doctor's details:**		
	Name	852 (82.3)	183 (17.7)
	Designation	856 (82.7)	179 (17.3)
	Registration number	00	1035 (100)
	Address	983 (95)	52 (5)
	Phone number	00	1035 (100)
	E-mail id	00	1035 (100)
	Patient's details:		
	Name	1035 (100)	00
	Age	1025 (99)	10 (1)
	Gender	1035 (100)	00
	Address	1019 (98.5)	16 (1.5)
	Phone number	00	00
	Prescription date	1013 (97.87)	22 (2.12)
	Diagnosis	542 (52.4)	493 (47.6)

	℞	52 (5.02)	983 (94.97)
Inscription	Drug name	4604 (100)	00
	Dosage form	4604 (100)	00
	Dose	2211 (48.02)	2393 (51.97)
	Unit	160 (3.47)	4444 (96.52)
	Frequency of administration	4319 (93.80)	285 (6.19)
	Drug name with abbreviation	1970 (42.78)	2634 (57.21)
	Legible writing	556 (53.71)	470 (45.41)
	Drug name with capital letters	00	1035 (100)
Subscription	Instruction to pharmacist	18 (1.73)	1017 (98.26)
Transcription	Duration of therapy	1014 (97.97)	21 (2.02)
	Patient education	187 (18.06)	848 (81.93)
	Follow up	147 (14.20)	888 (85.79)
	Signature of doctor	251 (24.25)	784 (75.74)

Table 4: Commonly prescribed drugs

S.N.	Drug Name	ATC code	Number (%)
1	Multivitamin	A11AA01	308 (29.75)
2	Famotidine	A02BA03	279 (26.95)
3	Chlorpheniramine maleate	R06AK	228 (22.02)
4	Paracetamol	N02BE01	225 (21.73)
5	Omeprazole	A02BC01	186 (17.97)
6	Folic acid	B03BB01	182 (17.58)
7	Calcium	A12A	174 (16.81)
8	Atorvastatin	C10AA05	142 (13.71)
9	Diclofenac sodium	M01AB05	134 (12.94)
10	Aspirin	B01AC06	132 (12.75)
11	Ibuprofen	R02AX02	116 (11.20)
12	Ferrous Sulphate	B03AA07	104 (10.04)
13	Enalapril	C09AA02	104 (10.04)
14	Isosorbide dinitrate	C01DA08	91 (8.79)
15	Alprazolam	N05BA12	87 (8.40)
16	Metformin	A10BA02	81(7.82)
17	Amlodipine	C08CA01	79 (7.63)
18	Deriphyline	R03DA	72 (6.95)
19	Ciprofloxacin	J01MA02	71 (6.85)
20	Azithomycin	J01FA10	60 (5.79)

ATC- Anatomical Therapeutic Classification [WHO –ATC classification, 2003].

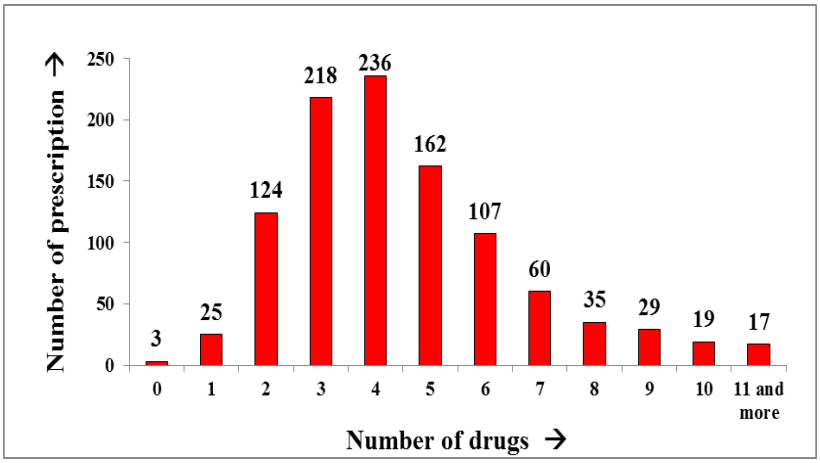

Figure 1: Number of drugs wise prescription count

DISCUSSION

The present study evaluated the prescriptions from all the outpatient departments of a tertiary care hospital to provide insight regarding morbidity, completeness of prescriptions, commonly prescribed medicines and related issues. In present study, prescriptions were randomly collected from hospital pharmacy. Prescriptions from all the out-patient departments were included in analysis. Maximum prescriptions were from medicine department (18.5%) that may be due to more numbers of patients visiting to this OPD. In 47.6% prescriptions, diagnosis was not written. That restricted us to provide a comment on overall morbidity pattern. However, it was written in (52.4 %) of prescriptions that was higher than the studies conducted by (34%) Shelat PR *et al.*, 2015 and (22.2%) Rishi RK *et al.*, 2003.[7, 10] It was lower than the study by (97%) Siddharth V *et al.*, 2014.[11] Cardiovascular system (11.1%) was the most common physiological system affected followed by dermatology (6.6%) and endocrine (6.2%). Out of 192 prescriptions from medicine departments, 115 (59.9%) and 64 (33.3%) prescriptions were for hypertension or coronary artery disease and diabetes mellitus, respectively. This shows high prevalence of life style diseases in our hospital. Along with pharmacotherapy such patients should be advised to manage themselves with non-pharmacological measures and they should be educated for life style modifications.

In 17.7%, 17.3% and 100% prescriptions, doctor's name, designation and registration number were missing respectively; that was higher than the study by Sharif SI *et al.*, 2008.[12] Registration number of doctor was also missing in all the prescriptions in Shelat PR *et al.*, 2015 and Siddharth V *et al.*, 2014 studies.[7,11] As per Code of Ethics Regulations, 2002 by Medical Council of India (MCI), New Delhi, a physician shall write his name and designation in full along with registration particulars in his prescription letter head. However, in Government hospital; where the patient load is heavy, the name of the prescribing doctor must be written below his / her signature.[13] In present study, signature of doctor was missing in 75.7% prescriptions. Prescription is a written medico legal document and it must have all the details. In present study, age and gender of patient were written in 99 and 100% prescriptions and that was missing in all the prescriptions in Shelat PR *et al.*, 2015 study. Age and gender are important factors for deciding the dose. In case of rare mistake with the dose, pharmacist may cross check it with doctor if age and gender is written in the prescription. In 52%, 96.52% and 6.19% prescriptions, doses, unit of doses and frequency of administration respectively were not written. 42.8% drug names were written with abbreviation whereas 45.4% prescriptions were with illegible writing. All these missing information, use of abbreviation and illegible writing may lead to medication errors.[14] Kuo GM *et al.*, 2008; reported that 70% prescribing errors observed by family physicians in United States America (USA);[15] whereas study conducted at West England reported 43.8% prescriptions with one or more prescribing errors.[16] To avoid medication errors, Ministry of Health and Family Welfare, India made it mandatory to write the medicines in a CAPITAL letters and with a legible writing. Not to follow the code of ethics regulations and MCI norms; is considered as a professional misconduct and liable for a disciplinary action.[13]

Average number of drug per prescription was 4.47 in our study was higher than the WHO standard (1.3-2.2).[17] It was almost similar (4.4) with the studies of Bandyopadhyay D *et al.*, 2014 and (4.2) of Afroj A *et al.*, 2012, higher than (2.2) Khan IN *et al.*, 2014; (2.85) Potharaju HR *et al.*, 2016, (3.78) Afsan M *et al.*, 2012[5, 18, 19, 20, 21] and lesser than (8.8) Kaur B *et al.*, 2013.[6] 883 (85.3%) prescriptions were containing two and more than two drugs that indicate the higher prevalence of poly-pharmacy in our hospital. Poly-pharmacy should always be discouraged because it masks the diagnostic capacity of doctors and doctors may develop; unknowingly habit of writing multiple drugs. Moreover, it increases chances of drug-drug interactions, adverse drug reaction and patient non-compliance.[6, 22] Thus, it increases burden on health care system. Percentage of drug prescribed by generic name in the present study of our hospital was higher; as compared to other Indian studies (75.1% vs. 1.42-20.99%; Mohanty B *et al.*, 2010; 1.42%, Siddharth V *et al.*, 2014; 1.63%, Afroj A *et al.*, 2012; 3.79%, Kaur B *et al.*, 2013; 4.16%, Khan IN *et al.*, 2014; 14.54% and Bandyopadhyay D *et al.*, 2014 20.99%).

[8,11,18,6,19,5] This might be because of vigorous campaign by MCI, New Delhi and might also due to prescription audit round carried at our institution which promotes the writing of drugs by generic name in prescriptions. Prescribing practices by generic name may reduce the chances of dispensing medication errors; make the therapy cheaper and rational.[6] Moreover in the teaching hospitals and institutions, textbooks, scientific journals and research publications, medicines are always mentioned by generic names.[23] In teaching institutions, prescriptions with generic name can improve the understanding of medical students for pharmacotherapy. Encouraging prescriptions by generic names is always recommended by various national and international bodies including MCI to promote rational use of drugs.[24,13] If a drug is prescribed by generic name, it also helps the pharmacist in keeping limited drug stock. This practice will help to check the luring practices if offered by some of the pharmaceutical companies to the practitioner for promoting their costlier brands. Implementation of this practice of prescribing by generic names requires a great motivation to the prescribers and strong regulatory intervention.[24] In present study, 86.6% prescribed drugs were from the National List of Essential Medicine, 2011; quite higher than other Indian studies like Afroj A. *et al.*, 2012 (53.25%), Kaur B *et al.*, 2013 (36.92%) and Khan IN *et al.*, 2014 (66.72%).[18, 6, 19] Prescriptions from the essential medicine list promote the

rational use of drugs, helps to follow the standard treatment guideline and decrease the economical burden to the patient and community. In present study, 11.72% fixed dose combinations (FDCs) were prescribed that is much lower than 97.9%, Kaur B *et al.*, 2013.[6] The WHO Model list of Essential Medicines for adults contains 27 FDCs and WHO Model list for children contains 12 FDCs whereas, 24 FDCs are included in the National list of Essential Medicines of India, 2015. Commercially many FDCs are available in the market and they are widely prescribed. The estimated number of FDC in India is over 6000 and at present does not have the exact database of currently available FDCs in the market, their sale turnover and utilization pattern. The existence of unlimited brands of FDCs with different permutations and combinations leads to confusion rather than guiding the prescribing doctor.[25] In present study, commonly prescribed FDCs like multivitamins (57.07%) and deriphylline (theophylline + etophylline; 13.33%) were from essential list of medicines. Various combinations of vitamins are prescribed as the nutritional supplements. However, a deficiency of these vitamins may not be present in each and every patient. Also the doses of different vitamins in the FDC are not as per the recommended therapeutic doses. Drug Controller General of India, (DCGI) New Delhi, has banned use of FDC of vitamin B_1, vitamin B_6 and vitamin B_{12} for human use as it has no therapeutic advantage over individual vitamin.[26] Although, multivitamin combinations are included in National and Gujarat State Essential Medicine List but should not be used unless there is a definite indication for the same. Before prescribing any FDC, clinician must evaluate its rationality, as use of irrational FDC and inappropriate or excessive use of FDCs may lead to increased incidence of several adverse reactions. In present study, 26.76% prescriptions were with antimicrobial agents as seen with Bandyoypadhyay D *et al.*, 2014 (28.9%).[5] It was lower than Mohanty BK *et al.*, 2010 (57.26%) and Shelat PR *et al.*, 2015 (53.26%).[8,7] As per the World Medicines Situation by WHO 2004, rate of prescriptions with antibiotics was more than 70% in 1999 in India.[27] Issues of antimicrobial resistance, its awareness among clinician and using hospital antibiotic policy might have reduced the unnecessary use of antibiotics. Commonly prescribed drugs were multivitamins 308 (29.75%), famotidine 279 (26.95%), chlorpheniramine maleate 228 (22.02%), paracetamol 225 (21.73%), omeprazole 186 (17.97%). In other study, commonly prescribed drugs were omeprazole (14.9%), vitamin B complex (13.5%) and paracetamol (11.2%).[28] In study by Pavin M *et al.*, 2003, the most common prescribed drugs were multivitamins (11%)[29] Other studies have also reported NSAIDs, proton pump inhibitors, H_2 receptor blockers, multivitamin and iron supplements as commonly prescribed medicines.[18,6,8] This pattern of drug prescribing shows a more use of drugs providing symptomatic relief rather the definitive treatment. Irrational use of these medicines as an adjuvant or nutritional supplement promotes poly-pharmacy, increases cost of therapy and chances of drug-drug interaction. Clinician should be made aware to these issues and should be asked not to use these medicines very frequently unless indicated.

In present study, aspirin-enalapril, aspirin-metoprolol and enalapril-glipizide were common drug pairs causing drug-drug interactions. According to Kothari N *et al.*, 2014 aspirin-atenolol, aspirin-enalapril and metformin-hydrochlorthiazide were the common drug pairs causing pharmacodynamic antagonistic interaction.[30] Aspirin by inhibiting prostaglandin synthesis; blunts the vasodilating and natriuretic effects of prostaglandins, leads to blunting of an antihypertensive effect of enalapril. Moreover, both drugs increase serum potassium level that may worsen the condition especially in elderly patients. Similarly, aspirin blunts the antihypertensive effect of metoprolol and both drugs cause hyperkalemia.[31] There is also a documented pharmacokinetic interaction resulting into an increased peak plasma salicylate concentration by metoprolol.[32] Enalapril increases the hypoglycemic effect of glipizide may be by increasing insulin sensitivity in type 2 diabetes mellitus.[33, 34, 35] These drugs are commonly prescribed in elderly patients. Clinician should keep such drug interaction in mind and be vigilant to find out therapeutic failure or any adverse effects resulting due to pharmacodynamic drug-drug interactions.[31]

In conclusion, more prevalence of life style diseases, incomplete prescriptions and polypharmacy were noted in present study. Multivitamin, famotidine, chlorpheniramine maleate, paracetamol and omeprazole are the commonly prescribed medicines in out-patient departments of our hospital. Less use of antibiotics and parenteral formulations; high numbers of prescriptions with generic name and from essential medicine list indicates strength of prescribing habits of our clinicians. However, they must be made aware regarding use of drug abbreviation and missing information; legible prescription and potential drug-drug interactions to avoid medication errors and other problems. The analyzed data from our tertiary care hospital shows a prescribing habit of our clinicians across the institution. It cannot be generalized to other clinical settings.

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