

Assessment of Prescription Medications for Indoor Patients and Effect of Interventions in a Medical College Hospital

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ABSTRACT

Introduction: Bharati Vidyapeeth University Medical College Hospital and Research Centre in Pune, India has been a pioneer institute with 831 beds, with learned faculty, residents, and trained nursing and supportive staff. Top management decided to further improve quality and safety in patient care and accordingly felt the need to acquire accreditation under the banner of National Accreditation Board for Hospitals and Healthcare Providers (NABH). As a first step toward this, a quality assurance department was established and entrusted with the task to identify areas needing improvement. “Prescription profile of medications” was identified as one of the core areas needing improvement as medication errors are mostly due to faulty prescriptions. The aim of this study was to measure the compliance of indoor patient prescriptions towards standard guidelines. **Methods:** Top management of the hospital envisaged that preparing for NABH accreditations would be one of the tools for improving patient safety and quality. Hence, in addition to a quality assurance department, a separate department of clinical pharmacy and pharmacovigilance was also established, specifically to take care of medication safety, including prescription profile. Interventions were designed based on observations in the preintervention phase. Interventions included regular monitoring of prescriptions, medication safety, and repeated training sessions for physicians by the department of clinical pharmacy and quality assurance. **Results:** Compliance by physicians regarding most of the components of prescriptions showed improvement. There has been a substantial reduction in medication errors (in patient days). **Conclusion:** The improvement in compliance of components of prescriptions and reduction in medication errors was attributable to applied interventions.

Keywords: components of prescription, medication errors, medical college hospital, patient safety

INTRODUCTION

Globally, medication errors contribute substantially to adverse events including death. A recent study revealed that more than 250,000 people in the United States die every year due to medical errors, and these are the third-leading cause of death after heart disease and cancer.^[1] A prescription is a medication order given by physicians to a patient. Improperly written prescription lead to medication errors. Organizations like the Medical Council of India,^[2] World Health Organization,^[3] and Ministry of Health^[4] have issued guidelines pertaining to minimum ideal parameters of prescriptions solely emphasizing quality in prescriptions. According to National

Accreditation Board for Hospitals and Healthcare Providers (NABH) guidelines,^[5] the ideal prescription for a patient shall have the following: name with permanent registration number, age, weight, height of the patient, diagnosis, date, name of the drug in capital letters,^[5,6] dose, route, approved abbreviations, frequency of administration with special instructions related to food and drug interactions and allergy. Signature, name, date, time (SNDT) and registration details of the privileged physicians are a must. Prescription and administration records are required to be at a uniform location in the patient's case file. Only approved abbreviations should be used in all medication orders.^[7]

Table 1.—Succession of initiation of qualitative intervention measures

No.	Interventions	Aimed at
Designing Policies & Structure		
1.	Formulation of policy and a standard operating procedures on prescription writing.	Streamlining the process.
2.	Listing of approved abbreviations used in prescriptions as per the Institute for Safe Medication Practices standard.	Sharing the usage of standard abbreviations in medical case sheets to avoid medication errors.
3.	Designing a uniform drug formulary.	An official list giving details of medicines only which can be prescribed in the hospital.
4.	Designing a prescription policy of high-risk drugs.	Ensuring double check by clinicians while prescribing.
5.	Nominating a professor of pharmacology and recruitment of clinical pharmacists to assist a quality assurance department in medication safety.	Close monitoring of processes and detection of medication errors.
6.	Creation of a department of clinical pharmacy and pharmacovigilance.	Strengthening the work done by clinical pharmacists in a more professional way.
7.	Allowing interns of the College of Pharmacy (Pharm-D) to work under the department of clinical pharmacy and pharmacovigilance.	Providing training and seeking their assistance in prescription audits.
Process of Implementation		
8.	Implementation of policy and standard operating procedure on prescription writing through: <ol style="list-style-type: none"> Induction training Frequent ongoing training sessions for faculty and residents in small groups and individualized. 	Creating awareness and making them adopt ideal prescription norms.
9.	Constitution of a drug and therapeutic committee.	Fastening the implementation of aspects of medication safety.
10.	Preparation of a standardized medication chart as per NABH norms.	Writing the medication orders at uniform location by physicians and administration notes by nurses.
11.	Display of posters on medication errors prevention and prescription writing in all patient care areas.	Strengthening the awareness.
12.	Strict implementation of prescription of narcotic drugs as per NABH guidelines.	Strengthening the process, its accountability and patient safety.
13.	Formulation of a drug–drug interaction and food–drug interaction list and imparting training to physicians.	Highlighting their importance in prescription writing.
Monitoring & Auditing		
14.	Implementation of a monthly prescription audit.	Monitoring the process and analyzing gaps for improvement and sharing in a drug and therapeutic committee.
15.	Empowerment of nurses in reporting medication errors.	Early reporting and better vigilance.
16.	Identifying and nominating a quality representative–clinician from each department and giving them a checklist.	Improvement of monitoring process and its reporting.
17.	Using quality tools for analysis of data.	In-depth analysis of problem areas.

NABH, National Accreditation Board for Hospitals and Healthcare Providers

The study aim was to measure and improve the compliance of indoor patient prescriptions toward standard guidelines. The objectives were to measure compliance of indoor patient prescriptions toward standard guidelines before the interventions, to measure compliance of indoor patient prescriptions toward standard guidelines after the interventions, and to compare the results of pre and postinterventions.

MATERIAL AND METHODS

Study Design

This was an interventional study using both retrospective and prospective approach. The study was conducted in Bharati Vidyapeeth Medical College Hospital and Research Centre, Pune, India. The study population was composed of representative samples of medication charts of in-hospital patients of all the specialties collected through daily visits to health care areas. The study was

conducted from January 2016 to March 2019. Year-wise analysis was carried out, and divided into the following phases:

1. Preintervention Phase (January 2016 to March 2017)
2. Intervention Phase (April 2017 to March 2018)
3. Post Intervention Analytical Phase (April 2018 to March 2019)

The ‘Intervention Phase’ was a continuous quality improvements process.

Interventions

Based on the observations and data of the preintervention phase, intervention measures as initiated in succession are given in Table 1. There were three groups of interventions: designing policies and structure, process of implementation, and monitoring and auditing.

The variables chosen for measuring medication prescriptions for inpatients were physicians’ signature,

Table 2.—Analysis of baseline observations using a why-why quality tool

WHY-1	Why prescription was erroneous?	Awareness was not present among physicians.
WHY-2	Why awareness was not present among physicians?	No protocol was present in hospital.
WHY-3	Why protocol was not present in hospital?	Management was not serious to have a quality assurance department in hospital.
WHY-4	Why management was not serious about having a quality assurance department in hospital?	Because medical college priority was given to other aspects rather than quality.

name of prescribed drug in capitals, use of approved abbreviations and dosage, route and frequency of drug. Same variables were used for analysis of both preintervention and postintervention phases. Before initiation of interventions, a quality tool namely a why-why analysis was also carried out (Table 2).

Sampling Technique and Size

The sampling technique was adopted from the relevant content of the Annexure to NABH standards.^[8] A minimum sample size of 377 and maximum 1050 inpatients per month were included for study purposes during all 3 phases. A total of 254,082 patient days were mapped (preintervention results pertained to 69,394 patient days and postintervention results pertained to 184,688 patient days). All adult inpatients were eligible for inclusion. Exclusion criteria included day care patients, patients who died immediately after admission, and patients leaving against medical advice in the emergency department.

Because this is a quality improvement project that involved analysis of available data and no intervention with human beings, ethical clearance was not warranted.

Statistical and Quality Tools

Data were entered in Microsoft Excel (2010). Online Interactive χ^2 tests (<http://quantpsy.org/chisq/chisq.htm>) were used for analysis and presentations.

Baseline observations of preintervention phase were analyzed using the why-why tool.

RESULTS

Some of the preintervention observations were qualitative based on our perceptions. These are as follows:

1. There was no mechanism for assessment of awareness of hospital staff regarding ideal or standard prescription writing.

2. There was no structured mechanism for capturing medication errors, hence could not be quantified.
3. Prescriptions were illegible and written in a cursory manner without following the guidelines.
4. Nurses were copying the physicians' orders and putting them in nursing notes leading to transcription errors.
5. Mismatching of timing of orders written by physicians and drug administration by nurses.

The data of preintervention phase and postintervention phase were collected, collated, and compiled for comparison and given in Table 3. All parameters where preintervention and postintervention were available showed statistically significant improvement. During preintervention phase the highest compliance rate (73.3%) was in terms of the route, dosage and frequency of drug; whereas compliance of doctors SNDT showed statistically significant improvement from 4% in 2016 to 95% 2019. There was no documentation about history of allergy and double signature in high-risk medications.

Change in compliance rate of SNDT during intervention is given in Table 4. It reveals a statistically significant increase from 73% in 2017, to 95% in 2019 ($\chi^2 = 104.81$ and p value = 0.0001). Table 4 shows improvements in compliance during intervention phase on writing drug names in capital letters. It improved from 83% in 2017 to 93.7 % in 2019 ($\chi^2 = 23.444$ and $p = 0.0001$). Also Table 4 depicts that there were year-wise nonsignificant fluctuations in the annual mean of percentage of medication charts with error-prone abbreviation: 17.8% in 2017 which reduced to 7.2% in 2018. However, it again rose to 10.4%. Table 4 shows that there has been a statistically significant reduction in medication errors per patient days from 3.38 in 2017 to 1.69 in 2019 ($\chi^2 = 7.747$, $p = 0.020$). Medication errors were identified initially by quality assurance team but with the introduction of department of clinical pharmacy and pharmacovigi-

Table 3.—Comparison of components of prescription with pre and post intervention phases

No.	Parameters	Preintervention Data (%) - 2016	Postintervention Data (%) - 2019	χ^2	p
1.	Physicians sign, name, date and time on prescription.	4.0	95.0	21.34	< 0.001
2.	Drug names in capital letters and legibility.	24.0	97.7	11.01	< 0.001
3.	Use of unapproved abbreviations	36.0	10.4	16.98	< 0.001
4.	Route, dosage, and frequency of drug.	73.3	98.4	6.76	< 0.001
5.	Inclusion of history of allergy	Nil	96.6	NA	NA
6.	Double signatures in high-risk prescriptions.	Nil	83.8	NA	NA

NA, not applicable

Table 4.—Improvement in various indicators during study period

No.	Indicator	2017	2018	2019	χ^2	<i>p</i>
1.	Annual mean percentage of prescriptions with SNTD of doctors at Bharati Hospital.	73	91	95	104.811	0.0001
2.	Annual mean percentage of prescriptions with drug names in capital letters by doctors at Bharati Hospital.	83.0	96.6	97.7	23.444	0.0001
3.	Annual mean percentage of medication charts with error-prone abbreviations at Bharati Hospital.	17.8	7.2	10.4	1.887	0.1696
4.	Annual mean percentage of prescriptions with SNTD of doctors at Bharati Hospital.	3.38	2.46	1.97	7.747	0.020

SNTD: sign, name, date, and time

lance, the monitoring and vigilance in capturing the errors improved.

DISCUSSION

Analysis of data collated during preintervention and postintervention phases was done very discretely. Table 3 gives comparative profile from start of the journey and latest position. The differences are glaring, which are results of combined effects of all interventions. The changes in parameters during postintervention phase are given in Table 4. The SNTD is very important. A prescription serves as a legal document. This component improved gradually over the years from 73% in 2017 to 95% in 2019 and was found to be statistically significant. Regular monitoring by clinical pharmacists along with training and retraining of physicians contributed significantly to the improvement.^[9] Its effect was also evident in Table 4, which brought out that annual mean of percentage of drug names in capital letters showed gradual improvement from 83% in 2016–17 to 97.7% in 2018–19. Along with capital-letter use, error-prone abbreviations are major contributors to medication errors.

Studies done on providing education on prescription writing,^[10] using a module interns used from a World Health Organization guide^[11] and a study of time to teach basic and regulatory aspects of art of prescription writing for better physician-patient safety^[12] highlighted the importance of training; although the comparative results are not available.

There has been a gradual improvement in reduction of medication errors (per patient days) from 3.38 in 2017 to 1.69 in 2019, which is statistically significant as evidenced in Table 4. It is again attributed to training and involvement of clinical pharmacists in monitoring these errors. Similar studies conducted in teaching hospitals in Western Nepal^[13] also highlighted the importance of training in improving prescription writing. Dubey et al^[14] also showed that training of physicians contributes to reduction in medication errors. Although Crane and Crane^[15] mentioned a system approach and technological innovations involving a Hospital Management Information System support, it is difficult to introduce this concept in a medical college hospital. However, the importance and involvement of clinical pharmacologist and clinical pharmacist in reducing medication errors has also been reported by

Desai et al^[16] Schneider et al^[17] who compared legibility of physicians' handwriting with that of laymen. Clinical pharmacologists and pharmacists are qualified and trained to do such analysis during their graduation studies as a part of their curriculum. Here our study is different from them. The role of repeated training is difficult to measure. Pre and post-evaluations of training invariably show improvements. But measuring its contribution is a slightly intricate process. Although we did not attempt it, we acknowledge that it was a tremendously supporting mechanism.

Prescription evaluation was undertaken only for inpatients. Many indicators were not captured before initiation, hence ideal comparison between preintervention and postintervention was difficult. The results may not be applicable to corporate and small hospitals.

CONCLUSION

Initiation of interventions in succession has contributed to significant improvement in all the components of prescriptions. The study showed that periodic evaluation and plugging of gaps through frequent and repeated training can effectively lead to reduction in medication errors. Involvement of the clinical pharmacist and their team resulted in better outcomes of medication safety. Preparation of a standardized medication chart as a part of patient case sheet has resulted in uniformity of prescription of medications.

The study validates the robustness in implementation of the processes and their sustainability by adopting a policy statement to include these aspects during induction of health personnel in the organization and then periodic monitoring.

The study also forms a basis for future research on safe and quality use of medications. As a measure of continual improvement, the prescription audits on a daily basis and its analysis on a monthly basis have been added into the system.

Recommendations

1. A standardized medication chart should be used by physicians and nurses in all hospitals.
2. Involvement of clinical pharmacist and Pharm-D interns of have proven benefits in reducing medication errors and recommended to be used in tertiary care hospitals for taking care of medication safety aspects.

3. The result of prescription audits should be shared with stakeholders in drug and therapeutic committee and quality assurance committee meetings.
4. Hospital should have drug formulary and its adherence should be considered important component in writing treatment plan.
5. Hospital must create awareness of physicians and paramedical staff through frequent training sessions on prescription writing, documentation of high-risk medication, and narcotic and drug–drug interaction.
6. Empowering nurses in reporting medication errors will prevent serious adverse drug events.

References

1. Makary MA, Daniel M. Medical error: the third leading cause of death in the US. *BMJ*. 2016;353:i2139.
2. Medical Council of India. Ideal Prescription norms. Available at: <http://www.delhimedicalcouncil.org/pdf/modalprescription.pdf>. Accessed May 10, 2019.
3. De Vries TP, Henning RH, Hogerzeil HV, Fresle DA. Guide to good prescribing: a practical manual. World Health Organization; 1994.
4. The Times of India. PTI, 11 June 2015. 23 Apr. 2016. Available at: <http://timesofindia.indiatimes.com/india/Health-ministry-to-ask-Physicians-to-writeprescriptions-in-capital-letters/articleshow/47630826.cms>. Accessed December 11, 2019.
5. Guidebook for Accreditation Standards for Hospitals. 4th ed. National Accreditation Board of Hospital and Healthcare Providers. Management of Medications. December 2015.
6. Lyons R, Payne C, McCabe M, Fielder C. Legibility of physicians' handwriting: quantitative comparative study. *BMJ*. 1998;317:863–864.
7. Institute For Safe Medication Practices (ISMP) drug list. Available at: <https://www.ismp.org/>. Accessed February 28, 2018.
8. NABH. Annexure to NABH Standards for hospitals. 4th ed. December 2015:78.
9. American Society of Health-System Pharmacists (ASHP). The guidelines on the prevention of medication errors in hospitals. 268–277.
10. Ajemigbitse AA, Omole MK, Erhun WO. Effect of providing feedback and prescribing education on prescription writing: An intervention study. *AnnAfrod*. 2016;15:1.
11. Venkatesan M, Dongre AR, Ganapathy K. Evaluation of skill-based training program on rational drug treatment for medical interns. *J Family Med Prim Care*. 2017;6:832.
12. Imran M, Doshi C, Kharadi D. Time to teach basic and regulatory aspects of art of prescription writing for better physicians-patient safety and keeping communication accessible and straight. *Daru*. 2020;28:25–32.
13. Chapagain K, Paranjape BD, Lama G. Prescribing skills of first and second year MBBS students of a teaching hospital. *JNMA J Nepal Med Assoc*. 2016;55:72–75.
14. Dubey AK, Palaian S, Shankar PR, et al. Introduction to medication errors and the error prevention initiatives in a teaching hospital in Western Nepal. *Pak J Pharm Sci*. 2006;19:244–251.
15. Crane J, Crane FG. Preventing medication errors in hospitals through a systems approach and technological innovation: a prescription for 2010. *Hosp Top*. 2006;84:3–8.
16. Desai MK, Panchal JR, Shah S, Iyer G. Evaluation of impact of teaching clinical pharmacology and rational therapeutics to medical undergraduates and interns. *Int J Appl Basic Med Res*. 2016;6:205.
17. Schneider KA, Murray CW, Shadduck RD, Meyers DG. Legibility of physicians' handwriting is as good (or bad) as everyone else's. *Qual Saf Health Care*. 2006;15:445.