



A Review on Hospital Prescription Errors in Asia

*^a Ralph Benedict Andres, ^b Elouiz Marie Castillon, ^c Victor Nathaniel Dandan, ^d Jhean Sarabosing, ^e Miguel Raja Padama, ^f Erwin Faller**

^{a,b,c,d,e,f} Pharmacy Department, San Pedro College, 12C Guzman Street Davao City Philippines

ABSTRACT

The most frequent kind of medical mistakes are prescription errors, which can be harmful, especially for young children. Although they seldom result in death, they can have an impact on patient safety and healthcare quality. They can happen in both general practice and hospitals. A definition of a clinically significant prescribing error states that it occurs when there is an unintentionally significant decrease in the likelihood that a treatment will be timely and effective or an increase in the risk of harm relative to generally accepted practice. The importance of the pharmacist in reducing the potential harm brought on by prescription errors has been highlighted by various studies. Among drug errors, prescription mistakes and defects are common issues. Although they seldom result in death, they can have an impact on patient safety and healthcare quality. They can happen in both general practice and hospitals. A prescription error can be caused by choosing the wrong drug, the wrong dosage, the wrong method of administration, the wrong frequency or duration of treatment, as well as by inappropriate or mistaken prescribing with regard to the patient's particulars or concurrent therapies. It might also be brought on by an inadequate evaluation of any potential harm brought on by a particular treatment. The criteria define a clinically important prescribing error as an unintentional significant decrease in the likelihood that a treatment will be timely and effective or an increase in the risk of harm relative to generally accepted practice. In order to discuss the interventions used to address the problem of hospital prescription errors in Asia and the outcomes of the said interventions to reduce future prescription errors to occur 1 JHPSM – Journal of Health Promotion and Service Management Vol.1, No.1, 2022 and develop medication error identification systems in the hospital setting, the authors of this article have gathered various studies, articles, journals, and other primary and secondary sources and compiled, synthesized, and summarized them.

Keywords: illegible writing skills, prescription error, side effects

1. Main text

1.1 Introduction

Prescription errors are common in healthcare settings. They may lead to ineffective healthcare delivery, endangering the wellbeing of the patients. The first step in making an effort to prevent such errors is understanding their nature and potential causes. We checked for prescription errors during a random audit of prescriptions obtained from the service dispensary of a tertiary care hospital. ^[1] The pharmacist is solely to blame for any errors that result from incorrect actions or decisions when prescribing medications. By utilizing technology that can automatically review the prescription, these problems can be avoided. Adverse effects and prescription errors in the emergency room can be decreased by using computer technology. When prescribing a medicine, common errors include choosing the incorrect dosage, frequency, and administration route ^[11, 15]. Yearly, 7,000 people die as a result of these mistakes in the US reported in 2006 ^[12]. Some errors in prescribing medication have a lot of reasons including penmanship, geriatric patients, emergency department, abbreviations, and chemotherapy patients. In the Philippines, doctors are notorious for having poor penmanship, which contributes to prescription errors due to their illegible handwriting and challenging abbreviations for the patient to understand. These errors may impair patient therapy a lower the standard of patient care. Doctors illegible writing skills are evident from these kinds of problems and leads patients to cost more. ^[13, 14] The elderly are more likely than others to make pharmaceutical mistakes since they often take more medication. Geriatric people are frequently given excessive prescriptions by doctors, which results in polypharmacy and severe drug reactions. Over 550 patients were reportedly experiencing catastrophic repercussions, according to reports in the UK. ^[16, 18] Mistakes made by doctors when giving chemotherapy to patients are happening more frequently, and some of the patients are at higher risk for consequences. According to data from the United States from 2016 there are about 500 deaths a year. ^[17] The question of how frequently children should take medications for other diseases has not been resolved, despite the fact that there are numerous medications for adults and other diseases. ^[19] In emergency rooms and with pediatric patients, medication mistakes are frequent (EDs). These errors may lead to lengthy hospital stays, unnecessary diagnostic procedures, medical procedures, and even death. ^[31] In community pharmacies, mistakes can still occur despite having the same problems as hospital prescriptions delivered to in-patients, such as the incorrect dose, double prescription, and wrong route. ^[20] Medication errors are avoidable occurrences that can happen at any time while a patient is taking medication. The prevalence of them in healthcare systems has been linked to a higher risk of morbidity and mortality. Research has been done on a number of approaches, including various pharmacy-based interventions, to reduce their incidence. Education initiatives are a significant pharmacy-led strategy that seem to produce favourable results. ^[38]

1.2 Methods

A review of the literature using the terms hospital pharmacy, Asia, prescription error, pediatric, geriatric, medication, and intervention was done using published reviews, systematic reviews, and journals from Google Scholar and other search engines. In order to ascertain the prevalence of prescription errors in hospital pharmacies located in Asia as well as learn about various interventions used to lessen the likelihood that these types of errors will occur, the authors of these academic papers had reviewed the aforementioned literature.

The study, which was randomized and controlled, was conducted in a pediatric tertiary care facility. Randomly, preprinted, formatted order sheets or the usual blank order sheets were used in two study groups that lasted for 18 days each. The demographic, clinical, and therapeutic information was gathered from all patient charts from this period by two medical students and entered into a database. ^[31]

1.3 Table

1.3.1 Identification of Prescription Errors in Hospital setting in Asia

Author/s	Method of Identification	Results
1. Mohan P, Sharma AK, Panwar SS. (2014)	In the study, prescription errors are classified into these categories: Type A- Errors that might have major consequences for the patient Type B- Errors creating significant inconvenience by requiring a pharmacist to call the physician in order to deliver the drug.	22.4% of the mistakes were determined as Type B error on the prescriptions
2. Lingam, I., Clago, H., Nanduri, V. (2012)	Data was collected from the pediatric ward between 2010 to 2011. Prescriptions were examined in determining if the drug was appropriate for the condition, Criteria of determining are overdosage, metamizole prescriptions, inappropriate drug therapy, poor antimalarial therapy and inappropriate IV fluids.	Between 2010 and 2011, there were significantly fewer metamizole prescriptions (8.7% to 3.0%), unsuitable pharmaceuticals (10.4% to 8.3%), and poor antimalarial treatment (2.7% to 1.7%), with a small decrease in pharmaceutical overdoses (4.5% to 4.1%).
3. Ahmed, T., Iqbal, Q., Minhas, M., Rauf, A., Mehmood, S.	The study was cross-sectional as well as retrospective in design. 263 patient treatment charts were evaluated by pharmacists which includes WHO parameters for 1. Patient related information, 2. Errors Related to Prescriber's Information, 3. Errors Related to Drug Information, and 4. Miscellaneous	This indicates a number of dispensing issues, including incorrect dosages, medication administration, medication abuse, and medication interactions.
4. Calligaris, L., Panzera, A., Arcoldo, L., Londero, C., Quittrin, R., Troncon, M.G., Brusaferrero, S.	The survey was done by eight doctors and two pharmacists who evaluated the clinical records of inpatients from medical, surgical, or intensive care units.	In 298 individuals, 408 antibiotic prescriptions were discovered. According to the statistics, 23.9% of prescriptions were illegible and 29.9% were incomplete. In atypical medicine prescriptions, legibility and completeness are improved
5. Harrison, R., Cohen, A.W.S., Walton, M.	Two reviewers examined and validated the titles and abstracts of papers published between 1990 and 2014. The qualifying criteria were applied to full-text publications. Design, technique, and major results data were gathered and summarized.	From 33 papers, four interrelated safety and quality problems emerged: (i) the risk of patient infection during health services, (ii) medication errors/use, (iii) the efficacy and availability of perinatal and maternal care, and (iv) the overall quality of healthcare services.
6. Chandrasekar, D. Anas M, Athira BM, Muhamed M.P, Mohan, M.P. Hridya GR, Habeeba K. K	In phase 1, each error was examined, studied, and classified during a three-month period, and phase 2 involved presenting the errors to medical professionals and teaching them about medication errors through pamphlets, newsletters, and one-on-one counselling.	In phase 1, there were 154 mistakes out of 110 patients, but in phase 2, there were 101 errors out of 103 patients (p value 0.05).
7. Rinke, M.L., MD; Bundy, D.G. MD; Velasquez, C.A. MD; Rao, S. MD; Zerhouni, Y. MD; Lobner, K.	The inclusion criteria for relevant studies were peer-reviewed primary data in any language evaluating an intervention to avoid medication errors in children.	There were a total of 63 studies. Only 1% of studies were conducted in community hospitals, 11% in ambulatory populations, 10% reported preventable adverse prescription events, 10% looked into administering errors, 3% looked into

MLIS; Blanck, J. F. MLIS; Miller, M.R. MD		dispensing errors, and none published cost-effectiveness data, indicating persistent research gaps.
8. Nguyen, N.V.T., Nguyen, T., Pham,S.T., Nguyen, T.H.	DRP information sheets: The sheets described particular medications for each case of DRPs and provided instructions for resolving each type of DRP.	Pharmacist-led interventions decreased the proportion of prescriptions containing DRPs from 88.8% to 74.9% (p0.001). Increase prescribing safety, effectiveness, and appropriateness, clinical pharmacists should be involved in regulating outpatient prescriptions in clinical practice.
9. Sultana, F., Rahman, A., Paul, T.R. Md., Sarwar, S. Md. Islam, A.U., Rashid, M.	Errors in the drafting of prescriptions: <ul style="list-style-type: none"> • a lack of medication information • Using an erroneous abbreviation • Handwriting that is illegible • Errors in the decision-making process/decision errors • Interaction of drugs • Duplication of therapy 	The prescribing practices observed in this study were determined to be unsatisfactory, as evidenced by polypharmacy and antibiotic overuse.
10. Sethuraman, U. MD, Kannikeswaran, N. MD, Murray, K. P. PharmD, Zidan M.A. PhD, Chamberlain, J.M. MD	A prospective study of outpatient medicine prescriptions 5 months before and after the deployment of CPOE with EMAS was done.	In terms of detecting prescription errors, CPOE with EMAS had a sensitivity of 45.1% (95% CI = 40.8% to 49.6%) and a specificity of 57% (95% CI = 55.6% to 58.5%).
11. Zhang Y., Zerafa, N.M., Monalto S.P.A. (2020)	Comparing the handwriting of doctors in different years and medical students undergoing a three-year clinical training program.	Although the majority of third-year students made more mistakes than more experienced writers, errors in prescribing drugs don't just affect how they write; they also depend on a number of other characteristics.
12. Sapkota S., Pudasaini, N., Singh, C., Sagar G.C.	Prescription errors in geriatric patients.	Furthermore, given that many prescriptions are written by junior doctors, unsuitable prescriptions may also result in mistakes.
13. Saad, A., Der- Nigoghossian, C.A., Njeim, R., Sakr, R., Salameh, P., Massoud, M. (2016)	Medications errors in chemotherapy patients.	Data shows, doctors prescribed chemotherapy medications to patients who were receiving multiple chemotherapy agents without providing dose, frequency, or duration information, even the sequence in administering the agents.
14. Poudel RS, Piryani RM, Shrestha S, Prajapati A, Adhikari B. (2015)	Outpatient prescription errors.	According to data, the majority of errors in outpatient prescriptions include frequency and dosing, which can lead to either an overdose or underdose of the medication.
15. De Silva, K. I. M., Parakramawansa, K. P. R. C., Sudeshika, S. H. T., Gunawardhana, C. B., Sakeena, M. H. F. (2015).	Two pharmacies in Sri Lanka's Aluthgama and Kandy cities were used to gather a sample of 200 handwritten.	However, more than 75% of the prescriptions contained the prescriber's information, excluding the registration number.
16. Rathish, D., Bahini, S., Sivakumar, T., Thiranagama, T., Abarajithan, T., Wijerathne, B., Siribaddana, S. (2016)	A cross-sectional study was carried out. The WHO anatomical, therapeutic chemical categorization system was used to classify drugs. To assess readability, completeness, and pDDIs, a three-point Likert scale, a checklist, and the Medscape online drug interaction checker were employed.	There were a thousand prescriptions collected. The majority (99.8%) were handwritten and came from the private sector.
17. Pasco, PM., Caro, R., Cruz C., Dando N., Isip- Tan IT., Panganiban L.,	To obtain the required number of charts, systematic sampling was performed from the master list of admissions.	Prescription, compliance, and administration problems were the most often identified types of errors.

Pascua L., Ricalde R., Sison, A. (2017)		
18. Shahrzad, S., Khan, T.M., Hong, Y.H., Ming, L.C., Wong, T.W. (2015)	The literature on MEs in Southeast Asian nations was comprehensively evaluated in December 2014 using Embase, Medline, Pubmed, ProQuest Central, and the CINAHL.	Among the eleven of the seventeen studies that were measured and analyzed the following were discovered, administration mistakes, four measured prescription errors, three measured preparation errors, three measured dispensing errors, and two measured transcription errors.

1.3.2 Interventions used in improving Prescription error identification

Author/s	Intervention used	Results
1. Velo G.P., Minuz P. (2009)	Use of computerized system, prescription chart, educational and system approaches	On the other hand, systemic and educational techniques reduce errors by advising doctors to create clear and readable prescriptions.
2. Colpaert, K., Claus, B., Somers, A. (2006)	Using of paper base-unit (PB-U) vs. computerized-unit (C-U)	When compared to PB-U, C-U had four times less pharmaceutical prescription errors.
3. Cerio, A.A.P., Mallare, N.A.L.B., Tolentino, R.M.S. (2015)	Comparing prescriptions from various hospital departments that were by medical professionals from both private and public hospitals.	Demonstrates that the majority of prescription errors involve acronyms, numerals, and symbols, and that these errors vary between public and private hospitals
4. Bizovi, K.E., Beckley, B.E., McDade, M.C., Adams, A.L., Lowe, R.A., Zechnich, A.D. Hedges, J.R. (2002)	Computer systems can reduce prescription errors.	Indeed, using computers can help patients receive better care by reducing prescription errors and the need for pharmacist verification of prescriptions.
5. Lavan, A.H., Gallagher, P. F., O'Mahony, D. (2016)	Reducing prescribing errors in geriatric patients	It has been demonstrated that by informing the doctor about the error, prescription errors can be decreased
6. D'Errico S., Zanon, M., Radaelli, D. Padovano, M., Santurro, A., Scapetti, M., Frati, P., Fineschi, V. (2021)	Improve safety of pediatrics from prescribing errors	To increase pediatric safety and elevate patient care, the healthcare system must look into each pediatric pharmaceutical consequence including the dose, frequency, and route of administration.
7. Sae-lim, N., & Lertvipapath, P. (2014 - 2017)	Pre-printed historical medication prescriptions	However, pre-printed historical medication prescription systems still produce some major errors, and minor errors that are distinct from those of hand-written prescriptions.
8. Yong, T. Y., Lau, S. Y., Li, J. Y., Hakendorf, P., & Thompson, C. H. (2012).	200 consecutive patients admitted through the AAU over the course of a month had their prescription records and admission documents retrospectively evaluated.	The medication charts and the assessment the researchers made brought immense changes to the prescriptions errors that were recorded prior to the intervention.
9. Karki, N., Kandel, K., Prasad, P. (2021).	Within the Internal Medicine division of Lumbini Medical College, a five-month cross-sectional research was carried out.	Implementing a program of collaboration between medical experts, clinical pharmacologists, and hospital management will successfully lower the likelihood of errors.
10. Mondal, S., Banerjee, M., Mandal, S., Mallick, A., Das, N., Basu, B., Ghosh, R. (2022).	In accordance with the WHO's POCQI model, a quality improvement team was formed in four plan-do-study-act (PDSA) cycles lasting more than six weeks each (including physician and nurse training, signatures and countersignature of corresponding healthcare personnel, computer-generated prescriptions, and newly designed software-generated prescriptions), and results in the post-intervention phase (three months) were compared.	The percentage of medication errors in new-borns was dramatically reduced by the use of PDSA cycles to implement change ideas.

11. Joly-Mischlich, T., Maltais, S., Tétu, A., Delorme, M. N., Boilard, B., Pavic, M. (2021)	Putting in place a new computerized prescription order input system	The CPOE method revealed a potential risk reduction of 51% when compared to paper-based prescriptions.
12. De Castro, C. J. F., Decena, K. E. F., Rebosura, K. J. U., German, J. D. (2021)	Proposed Medication Report System	Reducing the elements that may cause prescription mistakes through the charts presented, as well as creating a route that can reduce the need for unnecessary repetition of procedures such as physical transfer of medication reports and receipt encoding.
13. Vaishshali, G. R., Gupta, A. (2022).	Badges and wristbands are used to track a patient's location. A code on a wristband allows a doctor to access patient records when it is scanned. The agony of switching records is eliminated by this useful feature of a wearable tracking system.	It allows patients to receive more effective care and less medication errors due to the wearable tracking system.
14. Mahini, S. (2022)	"Expert System" A data framework that portrays the sum and intricacy of the persistently developing clinical and drug information in a usable manner and capabilities as a "advance notice framework" in case of conceivable medication connections can then economically uphold the nature of the medication solution and accordingly guarantee further developed drug wellbeing.	Because of this framework it can track the drug-drug interactions that may lead to possible side effects that may endanger the patient.
15. Eran Kozler, MD; Dennis Scolnik, MB, ChB, DCH; Alison MacPherson, PhD; David Rauchwerger, MD; Gideon Koren, MD (2005)	Using a Preprinted Order Sheet to Reduce Prescription Errors in a Pediatric Emergency Department	Particularly in the Emergency Department, using preprinted structured order forms reduces medication errors among pediatric patients.
16. Benjamin C. Grasso, M.D., Robert Genest, R.Ph., Constance W. Jordan, M.S.N., A.N.P., David W. Bates, M.D., M.Sc (2003)	Implemented the use of a Preprinted Order Sheet in a Pediatric Emergency Department to Reduce Prescription Errors	Using a review team with the traditional self-reporting method at a state mental hospital assists in the early discovery of numerous medication errors.
17. Ainara Campino, Maria Cruz Lopez-Herrera, Ion Lopez-de-Heredia, Adolf Valls-i-Soler (2009)	A medication error reduction educational technique in a neonatal intensive care unit.	A planned preventative educational intervention for health workers in a local NICU resulted in a decrease in medication errors, possibly as a result of the adoption of a patient safety culture.
18. Yogini Hariprasad Jani, MSc, Maisoon Abdullah Ghaleb, PhD, Stephen D. Marks, FRCPCH, Judith Cope, MSc, Nick Barber, PhD, Ian Chi Kei Wong, PhD (2008)	In a Pediatric Renal Outpatient Clinic, electronic prescribing reduced prescribing errors.	Errors relating to prescription completeness were significantly reduced by EP, and errors relating to legibility were completely eliminated.
19. Michael Eisenhut, Blanche Sun, Sarah Skinner (2011)	In order to reduce Prescription Errors in Pediatric Patients a Prescriber Assessment and Feedback was put into action.	Prescription errors in pediatric patients can be decreased with an intervention that combines a thorough, multifaceted assessment and thorough feedback from a pharmacist.
20. Kevin M Sullivan, Sanghee Suh, Heather Monk, John Chuo (2012)	In NICU, personalized performance feedback lowered narcotic prescription mistakes.	Some types of prescribing errors can be decreased with an efficient system for communicating errors.

21. Bryony Dean Franklin, Kara O'Grady, Parastou Donyai, Ann Jacklin, Nick Barber (2007)	The effect of a closed-loop electronic prescribing and administration system on prescribing and administration errors, as well as staff time.	A closed-loop computerized prescription, dispense, and barcode patient identification system reduced prescribing mistakes and MAEs while also improving patient identity verification before administration.
22. Myriam Jaam, Lina Mohammad Naserallah, Tarteel Ali Hussain, Shane Ashley, Pawluk(2021)	To prevent pharmaceutical mistakes, pharmacist-led educational interventions are offered to healthcare practitioners.	When paired with printed handouts summarizing the session's material, giving prescribers posters or pocket-sized flashcards, and receiving an individual written or electronic report concerning their prescription mistakes, the educational intervention was shown to be most effective.
23. YaoChena, Xingdong Wub, Zhiyi Huang, Wanlong Lina, Yunsong Lia, Jianhui Yang, JiaLi (2019)	A medication error monitoring system was evaluated in order to reduce the occurrence of medication errors in a clinical setting.	The Medication Error Monitoring System successfully monitors medication error data, reducing the frequency of reported medication errors.
24. Eduardo R. Armada MD, PhD, Elena Villamañán PD, PhD, Esteban López-de-Sá MD, Sandra Rosillo MD, Juan RamónRey-Blas MD, Maria LuisaTestillano PDb, RodolfoÁlvarez-Sala MD, PhD, JoséLópez-Sendón MD, PhD (2014)	In the cardiac intensive care unit, computerized physician order entry is used.	The implementation of computerized physician order entry in the cardiac critical care unit reduced PEs in a safe and effective way, and it was highly appreciated by professionals around the country.
25. Yang J, Liao Y, Lin W, Wu W. (2019)	Prescription reviewing systems were used by pharmacists to intercept prescribing mistakes, in which prescriptions with errors were forwarded to a specific computer and recorded by another pharmacist, and the frequency of overall prescribing errors and severe errors was then computed.	There were 534 prescription mistakes in all, with an error rate of 0.34%
26. Vu, TX., Thi Huong, QB., (2019)	This study included medical data from patients aged 65 and over who were hospitalized to one of the study departments between September 1st and December 30th, 2015 (before intervention phase, phase 1) and March 1st and June 30th, 2016 (post intervention phase, phase 2). (after intervention phase, phase 2).	The first phase of the study discovered that PIM prescriptions were widespread among hospitalized older individuals, with 34.1% of patients having PIM prescriptions.

2. Conclusion

ICU computerization, which includes medication order entry, has significantly reduced the frequency and severity of medication errors. Most prescription errors and mistakes can be prevented. Intervention strategies must be predominantly centered on education and the establishment of a safe and collaborative working environment in order to strengthen defense mechanisms and lessen harm to the patient. Healthcare professionals become more aware of risk due in large part to systems-oriented interventions. Reducing complexity, enhancing knowledge and training, and implementing strict feedback control and monitoring systems are all highly advised. Detailed data on the benefits of interventions meant to lessen the harm brought on by prescription errors and prescribing errors are needed but are currently lacking. An organized preventive educational program for healthcare professionals was put into place in a nearby NICU, and it may have reduced the rate of medication errors by promoting a culture of patient safety. In the emergency room, the use of preprinted structured order forms significantly lowers medication errors among pediatric patients. With an intervention that manages to combine a comprehensive, multifaceted assessment and thorough responses from a pharmacist, prescription problems in pediatric patients can be reduced. The educational intervention had been discovered to be most effective when it was coupled with printed handouts that condense the information covered in the session, when it was given to prescribers in the form of posters or pocket-sized flashcards, and when healthcare professionals obtained an individual written or computer-based report regarding their medication errors. Furthermore, it was revealed that educational sessions that were repeated were more effective than ones that were only held once.

2.1 ACKNOWLEDGEMENT

This study would not be possible without the help of our corresponding author, Dr. Erwin M. Faller, RPh, MSPharm, FRIPharm, PhD for his guidance and support in attending the concerns of the authors for the success of this study.

2.2 CONFLICT OF INTEREST

There is no declared conflict of interest.

References:

1. Mohan P, Sharma AK, Panwar SS. Identification and quantification of prescription errors. *Medical Journal Armed Forces India*. 2014;70(2):149-153. doi:10.1016/j.mjafi.2014.01.002
2. Lingam I, Clago H, Nanduri V. Sustainable change: prescribing practice in a rural hospital of a developing nation (South east asia). *Archives of Disease in Childhood*. 2012;97(Suppl 1):A49-A49. doi:10.1136/archdischild-2012-301885.121
3. DR-Tanzeel Ahmed Randhawa 糖及 - researchgate. <https://www.researchgate.net/profile/Dr-Tanzeel-Ahmed-Randhawa-tangji-2>. Accessed December 5, 2022.
4. Calligaris L, Panzera A, Arnoldo L, et al. Errors and omissions in hospital prescriptions: a survey of prescription writing in a hospital. *BMC Clin Pharmacol*. 2009;9(1):9. doi:10.1186/1472-6904-9-9
5. Harrison R, Cohen AWS, Walton M. Patient safety and quality of care in developing countries in Southeast Asia: a systematic literature review. *Int J Qual Health Care*. 2015;27(4):240-254. doi:10.1093/intqhc/mzv041
6. Chandrasehkar D, M A, Bm A, et al. Pharmaceutical care plan and pharmacist intervention against medication errors in geriatric patients. *Asian Journal of Pharmaceutical and Health Sciences*. 2018;8(1). Accessed December 5, 2022. <https://ajphs.com/article/2018/8/1/1846-1852>
7. Rinke ML, Bundy DG, Velasquez CA, et al. Interventions to reduce pediatric medication errors: a systematic review. *Pediatrics*. 2014;134(2):338-360. doi:10.1542/peds.2013-3531
8. Nguyen NA, Nguyen T, Pham ST, Nguyen TH. Pharmacist-led interventions to reduce drug-related problems in prescribing for Vietnamese outpatients. *Pharm Sci Asia*. 2022;49(1):106-113. doi:10.29090/psa.2022.01.21.096
9. Sultana F, Rahman A, Paul TR, Sarwar MS, Islam MAU, Rashid M. Prescribing pattern and prescription errors: a study at a tertiary care hospital of Bangladesh. *Bangla Pharma J*. 2015;18(1):20-24. doi:10.3329/bpj.v18i1.23509
10. Sethuraman U, Kannikeswaran N, Murray KP, Zidan MA, Chamberlain JM. Prescription errors before and after introduction of electronic medication alert system in a pediatric emergency department. Meisel Z, ed. *Acad Emerg Med*. 2015;22(6):714-719. doi:10.1111/acem.12678
11. Velo GP, Minuz P. Medication errors: prescribing faults and prescription errors. *British Journal of Clinical Pharmacology*. 2009;67(6):624-628. doi:10.1111/j.1365-2125.2009.03425.x
12. Colpaert K, Claus B, Somers A, Vandewoude K, Robays H, Decruyenaere J. Impact of computerized physician order entry on medication prescription errors in the intensive care unit: a controlled cross-sectional trial. *Crit Care*. 2006;10(1):R21. doi:10.1186/cc3983
13. Cerio AAP, Mallare NALB, Tolentino RMS. Assessment of the legibility of the handwriting in medical prescriptions of doctors from public and private hospitals in quezon city, philippines. *Procedia Manufacturing*. 2015;3:90-97. doi:10.1016/j.promfg.2015.07.112
14. Zhang Y, Zerafa NM, Montalto SPA. Student and doctors' handwriting on a pre-set prescription. *Malta Medical Journal*. 2020;32(3):31-43. Accessed December 5, 2022. <https://www.mmsjournals.org/index.php/mmj/article/view/325>
15. Bizovi KE. The effect of computer-assisted prescription writing on emergency department prescription errors. *Academic Emergency Medicine*. 2002;9(11):1168-1175. doi:10.1197/aemj.9.11.1168
16. And prescription error in elderly: A retrospective study of inpatient ... https://www.researchgate.net/profile/Sujata-Sapkota/publication/280315716_Drug_prescribing_pattern_and_prescription_error_in_elderly_A_retrospective_study_of_inpatient_record/inks/55b2201508aec0e5f4314737/Drug-prescribing-pattern-and-prescription-error-in-elderly-A-retrospective-study-of-inpatient-record.pdf. Accessed December 5, 2022.
17. Saad A, Der-Nigoghossian CA, Njeim R, Sakr R, Salameh P, Massoud M. Prescription errors with chemotherapy: quality improvement through standardized order templates. *Asian Pacific Journal of Cancer Prevention*. 2016;17(4):2329-2336. Accessed December 5, 2022. http://journal.waocp.org/article_32398.html

18. Lavan AH, Gallagher PF, O'Mahony D. Methods to reduce prescribing errors in elderly patients with multimorbidity. *Clin Interv Aging*. 2016;11:857-866. doi:10.2147/CIA.S80280
19. D'Errico S, Zanon M, Radaelli D, et al. Medication errors in pediatrics: proposals to improve the quality and safety of care through clinical risk management. *Front Med (Lausanne)*. 2022;8:814100. doi:10.3389/fmed.2021.814100
20. Poudel RS, Piryani RM, Shrestha S, Prajapati A, Adhikari B. Prescription errors and pharmacist intervention at outpatient pharmacy of Chitwan Medical College. *Journal of Chitwan Medical College*. 2015;5(2):20-24. Accessed December 5, 2022. <https://www.jcmc.com.np/jcmc/index.php/jcmc/article/view/921>
21. De Silva K, Parakramawansa K, Sudeshika S, Gunawardhana CB, Sakeena M. Investigation of medication errors: a prescription survey from sri lanka. *Trop J Pharm Res*. 2015;14(11):2115. doi:10.4314/tjpr.v14i11.23
22. Rathish D, Bahini S, Sivakumar T, et al. Drug utilization, prescription errors and potential drug-drug interactions: an experience in rural Sri Lanka. *BMC Pharmacol Toxicol*. 2016;17(1):27. doi:10.1186/s40360-016-0071-z
23. Anti-arthritis activity of solvent extracts of the bulbs of crinum pedunculatum R.Br. *Pharmaceutical Sciences Asia | PSA*. <https://pharmacy.mahidol.ac.th/journal/>. Accessed December 5, 2022.
24. Yong TY, Lau SY, Li JY, Hakendorf P, Thompson CH. Medication prescription among elderly patients admitted through an acute assessment unit: Medication prescription and elderly patients. *Geriatrics & Gerontology International*. 2012;12(1):93-101. doi:10.1111/j.1447-0594.2011.00737.x
25. Karki N, Kandel K, Prasad P. Assessment of prescription errors in the Internal Medicine Department of a tertiary care hospital in Nepal: A cross-sectional study. *Journal of Lumbini Medical College*. <https://jlmc.edu.np/index.php/JLMC/article/view/414>. Accessed December 5, 2022.
26. Ghosh S, Ray S, Ghosh TN. Glucose 6 phosphate dehydrogenase deficiency in unexplained neonatal hyperbilirubinemia – A study in neonatal care unit of a tertiary care hospital. *Bangladesh J Med Sci*. 2022;21(3):669-674. doi:10.3329/bjms.v21i3.59583
27. Joly-Mischlich T, Maltais S, Tétu A, Delorme MN, Boilard B, Pavic M. Application of the Failure Mode and Effects Analysis (Fmea) to identify vulnerabilities and opportunities for improvement prior to implementing a computerized prescription order entry (Cpoe) system in a university hospital oncology clinic. *J Oncol Pharm Pract*. Published online November 9, 2021:107815522110532. doi:10.1177/10781552211053253
28. de Castro CJ, Decena KE, Rebosura KJ, German JD. MedReS: A Charged Medication Report System for a General Hospital in the Philippines.
29. Vaishalli GR, Gupta A. Role of technology & importance in tracking healthcare services. *AJAST*. 2022;06(01):24-27. doi:10.38177/ajast.2022.6104
30. Mahini S. Expert –system: a web-based system for patient specific drug interaction testing. *South Asian Res J App Med Sci*. 2022;4(2):7-9. doi:10.36346/sarjams.2022.v04i02.001
31. Kozer E, Scolnik D, MacPherson A, Rauchwerger D, Koren G. Using a preprinted order sheet to reduce prescription errors in a pediatric emergency department: a randomized, controlled trial. *Pediatrics*. 2005;116(6):1299-1302. doi:10.1542/peds.2004-2016
32. Grasso BC, Genest R, Jordan CW, Bates DW. Use of chart and record reviews to detect medication errors in a state psychiatric hospital. *PS*. 2003;54(5):677-681. doi:10.1176/appi.ps.54.5.67
33. Campino A, Lopez-Herrera MC, Lopez-de-Heredia I, Valls-i-Soler A. Medication errors in a neonatal intensive care unit. Influence of observation on the error rate. *Acta Paediatrica*. 2008;97(11):1591-1594. doi:10.1111/j.1651-2227.2008.00982.x
34. Jani YH, Ghaleb MA, Marks SD, Cope J, Barber N, Wong ICK. Electronic prescribing reduced prescribing errors in a pediatric renal outpatient clinic. *The Journal of Pediatrics*. 2008;152(2):214-218. doi:10.1016/j.jpeds.2007.09.046
35. Eisenhut M, Sun B, Skinner S. Reducing prescribing errors in paediatric patients by assessment and feedback targeted at prescribers. *ISRN Pediatrics*. 2011;2011:1-5. doi:10.5402/2011/545681
36. Sullivan KM, Suh S, Monk H, Chuo J. Personalised performance feedback reduces narcotic prescription errors in a NICU. *BMJ Qual Saf*. 2013;22(3):256-262. doi:10.1136/bmjqs-2012-001089
37. Franklin BD, O'Grady K, Donyai P, Jacklin A, Barber N. The impact of a closed-loop electronic prescribing and administration system on prescribing errors, administration errors and staff time: a before-and-after study. *Quality and Safety in Health Care*. 2007;16(4):279-284. doi:10.1136/qshc.2006.019497
38. Jaam M, Naserallah LM, Hussain TA, Pawluk SA. Pharmacist-led educational interventions provided to healthcare providers to reduce medication errors: A systematic review and meta-analysis. Vaismoradi M, ed. *PLoS ONE*. 2021;16(6):e0253588. doi:10.1371/journal.pone.0253588

39. Chen Y, Wu X, Huang Z, et al. Evaluation of a medication error monitoring system to reduce the incidence of medication errors in a clinical setting. *Research in Social and Administrative Pharmacy*. 2019;15(7):883-888. doi:10.1016/j.sapharm.2019.02.006
40. Armada ER, Villamañán E, López-de-Sá E, et al. Computerized physician order entry in the cardiac intensive care unit: Effects on prescription errors and workflow conditions. *Journal of Critical Care*. 2014;29(2):188-193. doi:10.1016/j.jcrc.2013.10.016
41. Yang J hui, Liao Y fang, Lin W bin, Wu W. Prescribing errors in electronic prescriptions for outpatients intercepted by pharmacists and the impact of prescribing workload on error rate in a Chinese tertiary-care women and children's hospital. *BMC Health Serv Res*. 2019;19(1):1013. doi:10.1186/s12913-019-4843-1
42. Pasco PMD, Caro RM, Cruz CL, et al. Prevalence of medication errors in admitted patients at the philippine general hospital. *Acta Med Philipp*. 2017;51(2). doi:10.47895/amp.v51i2.577
43. Salmasi S, Khan TM, Hong YH, Ming LC, Wong TW. Medication errors in the southeast asian countries: a systematic review. Fuh JL, ed. *PLoS ONE*. 2015;10(9):e0136545. doi:10.1371/journal.pone.0136545
44. Xuan Vu T, Bui Thi Huong Q. The effect of the pharmacist's intervention on potentially inappropriate medication use in older adults using the 2015 beers criteria. *Pharm Sci Asia*. 2019;46(1):54-61. doi:10.29090/psa.2019.01.017.0023
45. Sakuma M, Ida H, Nakamura T, et al. Adverse drug events and medication errors in Japanese paediatric inpatients: a retrospective cohort study. *BMJ Qual Saf*. 2014;23(10):830-837. doi:10.1136/bmjqs-2013-002658
46. Moutaouakkil Y, El Allali Z, Serragui S, et al. Medication errors: a prospective study in mohamed v military teaching hospital, rabat, morocco. *JCMPhR*. 2022;3(2):104-110. doi:10.20473/jcmphr.v3i02.38704
47. Khoo TB, Tan JW, Ng HP, Choo CM, bt Abdul Shukor INC, Teh SH. Paediatric in-patient prescribing errors in Malaysia: a cross-sectional multicentre study. *Int J Clin Pharm*. 2017;39(3):551-559. doi:10.1007/s11096-017-0463-1
48. Limpawattana P. Potentially inappropriate prescribing of Thai older adults in an internal medicine outpatient clinic of a tertiary care hospital. *Afr J Pharm Pharmacol*. 2013;7(34):2417-2422. doi:10.5897/AJPP2012.2952
49. Arumugam S, Prakash S, Azhakath S, Abraham L, Prakashan L, Anaparakkal A. Interventional study based on prescription errors in the inpatient units of a tertiary care hospital in calicut. *IJOPP*. 2019;12(4):229-233. doi:10.5530/ijopp.12.4.49
50. Vaziri S, Fakouri F, Mirzaei M, Afsharian M, Azizi M, Arab-Zozani M. Prevalence of medical errors in Iran: a systematic review and meta-analysis. *BMC Health Serv Res*. 2019;19(1):622. doi:10.1186/s12913-019-4464-8