Taibah University

Journal of Taibah University Medical Sciences

www.sciencedirect.com

Original Article

A retrospective analysis of near-miss incidents at a tertiary care teaching hospital in Riyadh, KSA

Sajjan Iqbal Memon, MSc

Department of Health Administration, King Saud University Riyadh KSA

الملخص

أهداف البحث: إنشاء نظام إبلاغ خال من الأخطاء يعزز سلامة المرضى والثقافةالتنظيمية. تبحث هذه الدراسة في انتشار نظام الإبلاغ عن الحوادث الوشيكة من قبل المتخصصين في الرعاية الصحية في قسم الجراحة العامة.
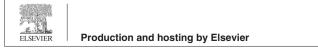
طرق البحث: أجريت هذه الدراسة الإستعادية القائمة على الملاحظة في مستشفى تعليمي للرعاية الثالثية في الرياض، المملكة العربية السعودية. تم الحصول على عينة من٢٥٣ سجلا طبيا للمرضى الثانويين من يناير ٢٠١٨ الى ديسمبر ٢٠٢٠ من خلال نظام داتكس للإبلاغ عن الأخطاء الوشيكة ونظام الابلاغ عن تباين الحدوث. استندت البيانات الديموغرافية المتغيرة للمرضى المسجلين الى فئاتهم العمرية من ١٨ الى ٨٠ عاما، طول الإقامة، تاريخ الدخول، والأدوية الموصوفة لأكثر من أربعة أيام، وخضعوا لتداخلات جراحية. تم توثيق الحالات بعد وقوع الحوادث الوشيكة باستخدام تقنية أخذ العينات المناسبة.

النتائج: الانتشار الملحوظ في الفئات الرئيسية الوشيكة التي حدثت فيها أخطاء طبية كانت ٢٤٨ (٩٨٫٢٪)، انتهاك مكان العمل٠٢ (٠٫٨٪)، الآخرين ٠١ (٠٫٤٪)، والفئات- الفرعية: الوصفات ٢٢٧ (٨٩٫٧٪)، صرف الأدوية ١٦ (٦٫٣٪)، جرعة خاطئة/القوة ١١٨ (٤٦٫٦٪)، ذكور ١٢٣ (٤٨٫٦٪)، اناث ١٣٠ (٥١٫٤٪). كان المتوسط والانحراف المعياري للفئة العمرية من المرضى (١٫٩٤±٠٫٨٨٠) والجنسية الديموغرافية (١٫١٦±٠٫٣٦٦).

الاستنتاجات: يتم التعرف على الأخطاء الوشيكة الحدوث كأهداف أساسية في أدوات التحسين المستمر للجودة للتخفيف من حوادث ما قبل الجراحة في المستشفى. يمكن ان تتحدى هذه النتائج التقدم في تقنيات تحسين الإرشادات المتعلقة بالامتثال والتواصل الفعال لتحسين سلامة المرضى قبل الجراحة.

الكلمات المفتاحية: داتكس؛ نظام الإبلاغ عن الحوادث؛ الأخطاء الطبية؛ وشيك؛ الجراحة العامة.

Abstract

Objective: This study seeks to establish an error-free reporting system that enhances patient safety and organisational culture. It investigates the prevalence of near-miss incident reporting systems by healthcare professionals in the General Surgery Department.

Methods: This retrospective observational study was conducted at a tertiary care teaching hospital in Riyadh, KSA. A sample of 253 medical records, ranging from January 2018 to December 2020, belonging to secondary patients was obtained using the near-miss Datix reporting and occurrence variance reporting system. The demographic variable data of registered patients were based on their age group (18—80 years), length of stay, date of admission, medication prescribed for more than four days, and whether they underwent surgical interventions. The cases were documented after the occurrence of a near-miss incident using a convenience sampling technique.

Results: In terms of prevalence in the near-miss main categories, medical errors were 248 (98.2%), workplace violations were two (0.80%), and others was one (0.40%). The number of incidence in the subcategories were: prescribing, 227 (89.7%); dispensing, 16 (6.30%) wrong dose/strength, 118 (46.6%), male, 123 (48.6%), and female, 130 (51.4%). The mean age and S.D. of patients was 1.94 ± 0.88 years and the demographic nationality as 1.16 ± 0.37. The one-sample t-test value for the main categories was −235 (*p*-value < 0.001).

Conclusion: Near-misses are recognised as essential targets for continuous quality improvement tools to mitigate preoperative incidents in hospitals. These findings can benefit the advancement of techniques for improving

E-mail: sajjan.memon@yahoo.com

Peer review under responsibility of Taibah University.

ELSEVIER | **Production and hosting by Elsevier**

guidelines related to compliance and effective communication to improve the preoperative safety of patients.

Introduction

Near-miss incidents can have serious safety-related consequences on patients which can be avoided by preventing the occurrence of specific outcomes.[1] Near-misses are associated with adverse effects in the healthcare organisation, known as soft calls.[2,3] The World Health Organization (WHO) has urged health institutions to improve by regularly tracking near-misses; however, measures to address this concern remain limited, and are emerging in health institutions only gradually.[4,5] The goal is to raise awareness of healthcare risks and to encourage the analysis of near-misses; therefore, corrective steps are necessary to prevent possible adverse events from causing harm.[5] Consequently, organisations are required to ensure that all workers are qualified, diligent, and mindful of safety.[6]

In terms of surgery, out of the 234 million operations performed each year, it is estimated that about 7 million patients experience adverse accidents, of which 1 million die.[6] Related literature emphasises the need for near-misses to become an integral part of the quality and risk management systems.[7] Previous studies have advised awareness among healthcare institutions to improve their performance based on the lessons learnt from near-misses due to their recurrence rate; near-miss events can allow more learning opportunities than adverse events and medical errors.[7,8]

A recent systematic review discovered 26 terms that are applied in the classification of medication errors.[9] A qualitative survey from KSA reported that just under one-fifth of primary care prescriptions contained errors, from which only small marginal groups were considered serious.[10] A single hospital case−control study over a period of four years revealed that there was an almost two times increase in the risk of mortality associated with adverse events, of which 1% was due to medication errors.[11] A cross-sectional study conducted with 427 specialists, including doctors, nurses, and anaesthetists, evidenced other problems in the operating theatre. Similarly, near-misses were experienced by about 38% of the healthcare professionals in relation to patient documentation, and 60% due to an arrangement of the patient for the surgical procedure; moreover, approximately 81% of the cases were related to the site or side of the operation.[12]

Various studies have shown that medical negligence can cause death or disability, which is a significant concern for healthcare professionals and policymakers.[7,9,13] Healthcare services in KSA are handled with high priority by the Ministry of Health. According to the WHO, KSA's healthcare system ranks 26th worldwide. The provision of quality healthcare is a multidimensional phenomenon, and improvement of quality has always been an essential part of primary health programmes.[4] This is especially true for low-and middle-income countries, regardless of the increasing use of medications.[5] However, according to a Brazilian study, adverse surgical incidents in Latin America range from 3.5% to 16.4% and have been considered avoidable.[22] Thereby, developing an effective solution for tackling adverse events is a broad organisational responsibility that must include strategies for defining, predicting, and communicating possible adverse events to all the concerned parties.

Thus, this study investigates standard near-miss incident reporting systems among healthcare professionals (nurses and allied medical staff) in the General Surgery Department.

Materials and Methods

Study design and setting

This observational retrospective study was based on the medical records of secondary patients from January 2018 to December 2020. Data were collected from the Department of General Surgery of a tertiary care teaching hospital in Riyadh. A multidisciplinary hospital that provided care to approximately 1600 surgical specialty patients was documented during a given period. Two independent reviewers collected the secondary data: one of the reviewers was a specialist from the Quality and Risk Management Department, and the second was a researcher who reviewed the secondary data through retrospective charts. Intended for patient safety, this hospital employs Datix and the incident reporting matrix system. The risk management programme was implemented throughout the organisation in 2013.

The near-miss occurrence variance report records from the Datix software were documented in the Excel table, followed by the analysis. Patient data and clinical indicators that did not meet the inclusion criteria were excluded. Moreover, incomplete medical files and missing data were withdrawn during the data-collection stage. Yadav et al.[13] stated that the Datix application had been used broadly by staff members, including clinicians, as more than 80% were statutorily trained by the National Health Service in the UK to report different clinical incidents.

Sampling and population

The sample consisted of 253 registered hospital files. The study sample was based on the respective data of admissions and inpatient treatment records, documented after the occurrence of medical errors corresponding to the incidence and categories of near-miss records.

In the inclusion criteria, the demographic variable data of registered patients were based on their age group (18−80 years), length of stay, date of admission, medication prescribed for more than four days, and whether they had undergone surgical interventions diagnosed with known comorbidities (such as hypertension and diabetes). Medical files were extracted from the General Surgery Department using the non-probability convenience sampling technique. Additionally, incomplete documents lacking hospitalised

medical records and irrelevant demographic data related to other subspecialised departments were excluded.

Statistical analysis

Patient medical records were imported from Microsoft Excel and DATIX (incident reporting and risk management software), and then data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 21.0 (IBM Corporation, NY, USA). Descriptive statistics were used for patient demographics as standard deviations and calculated means (e.g. numbers and percentages). One-sample t-test was used to compare the means for three independent categorical variables (near-miss main category, near-miss subcategory, and coding). Patient data were documented and analysed after near-misses followed by inpatient treatment episodes, and a *p*-value <0.05 was considered statistically significant.

Results

Table 1 presents the patient demographics. The total number of patients registered was 253. The number of female patients was 130 (51.0?%). The number of male patients was 123 (48.6%). In terms of nationality distribution, most patients were Saudi (n = 213, 84.2%) due to their higher number of primary care registries. Moreover, the non-Saudi population (n = 40, 15.8%) consisted of people from various nationalities. The highest number of medical records was for the group aged 20−40 years old (n = 95, 37.5%). This was followed by those aged 41−60 years old (n = 87, 34.4%), 61−80 years old (n = 61, 24.1%), and 80 years and above (n = 10, 4.00?%).

Table 2 shows clinical indicators illustrating near-miss records, which comprised three categories. In terms of the near-miss main categories, there were 248 (98.0%) medical errors, 2 (0.80?%) workplace violations and implementation of care, and 1 (0.40?%) other/miscellaneous variables. Moreover, the values for the near-miss subcategories were as follows: prescribing, 227 (89.7%); infection control, 16 (6.30?%); storage condition, 3 (1.20?%); medical stock, 1 (0.40?%); and problems faced by the patients and their family members, 4 (1.60?%). The category with coding variables consisted of the following: wrong dose/strength, 118 (46.6%); duplication therapy, 69 (27.3%); contraindicated

Table 1: Patient demographics.

Demographics	(n = 253)	%	Descriptive Statistics Mean ± SD
Gender			
Male	123	48.6	
Female	130	51.4	
Nationality			1.16 ± 0.37
Saudi	213	84.2	
Non- Saudi	40	15.8	
Age Group			1.94 ± 0.88
20−40 years	95	37.5	
41−60 years	87	34.4	
61−80 years	61	24.1	
≥81 years	10	4.00?	

Table 2: Clinical indicators.

	n	%	Mean ± SD
Near-miss Categories			
Medical errors	248	98.0	1.04 ± 0.72
Workplace violations	2	0.80	
Implementation of care	2	0.80	
Other factors/ miscellaneous	1	0.40	
Total	253	100	
Near-miss Subcategories			
Prescribing	227	89.7	1.20 ± 0.747
Infection control	16	6.30	
Storage condition	3	1.20	
Medical stock	1	0.40	
	4	1.60	
Problem faced by patient/ family	2	0.80	
Miscellaneous	0	0.00	
Total	253	100	
Coding Variables			
Wrong dose/strength	118	46.6	2.80 ± 2.73
Duplication therapy	69	27.3	
Contraindicated drug	7	2.80	
Wrong label	3	1.20	
Wrong medication	16	6.30	
Wound or infection	4	1.60	
Prescribing wrong quantity	4	1.60	
Prescribing wrong frequency	3	1.20	
Storage condition	24	9.50	
Uncategorized	5	02	
Total	253	100	

drug, 7 (2.80?%); wrong label, 3 (1.20?%); wrong medication, 16 (6.30?%); wound or infection and prescribing wrong quantity, 4 (1.60?%); prescribing wrong frequency, 3 (1.20?%); storage condition, 24 (9.50?%); and uncategorized drugs, 5 (2.00?%). As per the descriptive statistics, the mean and standard deviation scores for the near-miss main categories, subcategories, and coding variables were 1.04 ± 0.72, 1.20 ± 0.75, and 2.8 ± 2.73, respectively.

*Workplace Violation** The violations resulting from hazardous working conditions or employee negligence.[19]

*Implementation of care** Communication issues between the providers and patients or their family members, and failure to review medical records.[19]

*Prescribing incorrect quantity** When the amount of medicine that should be taken at a specific time is inaccurate.[9]

*Prescribing incorrect frequency** When the suggested frequency of taking a medication differs from the current evidence-based therapy standards.[9]

*Medical stock ** A dispensing error caused by expired or contaminated drugs causing potential harm and adverse effects in patients.[9]

Table 3 shows the results of the one-sample t-test, which was employed in this study to compare the means of the three independent variables in the datasets. The t-test value for near-miss main categories was −235, near-miss subcategories was −81.9, and coding was −13.0; the degree of freedom was 252 for all three variables. The independent variables (near-

Table 3: Results of the one-sample t-test.

	Test Value = 5.05				95% Confidence Interval of the Difference	
	T	df	Sig. (two-tailed)	Mean Difference	Lower	Upper
Near-miss categories	−234.530	252	<0.001[a]	−4.014	−4.05	−3.98
Near-miss subcategories	−81.915	252	<0.001[a]	−3.848	−3.94	−3.76
Coding	−13.033	252	<0.001[a]	−2.240	−2.58	−1.90

[a] Significant at the 95% confidence level.

miss categories, near-miss subcategories, and coding) showed highly significant results at $p < 0.001$ (two-tailed). The confidence interval was set at 95%. Moreover, the standard deviation of the two variables was less than one, which indicated that there was not much deviation in the dataset. In contrast, for coding, the value of SD was 2.70, which showed that there was considerable variation in the dataset, and the values of the dataset were not closer to the mean values.

Discussion

This study results show that near-miss incidents occur because of medication errors and errors in electronic medical records, which occur approximately 98% of the time, as per the frequency table. Other factors, including workplace violence and nursing implementation, are not responsible for near-misses, but medication errors rank the highest in this regard. The mistakes in healthcare can be understood better by Reason's Swiss cheese model of human error.[16] The cases of near-misses might increase because the nurses are reluctant to discuss the errors with their peers and feel hesitant to report these errors to the hospital management for follow-up. Consequently, neither the person nor the system can potentially be rectified.[13] The findings of the current study are supported by the study of Härkänen et al.[17] in which safety is considered an essential factor of quality in emergency care. The occurrence of near-misses in patients and their occupational safety were evaluated based on the process and structure of care.

The current research is consistent in terms of risk assessment. Analysis of the procedure of administering medications in teaching hospitals demonstrates that 43.9% of near-misses are identified from system failures associated with the management of organisational processes, occurring due to task overload, lack of healthcare worker routines, and ongoing education. Further, 41.4% near-misses are related to problems in human resources, such as information and skill discrepancies and lack of care, and 12.6% are related to the lack of necessities related to the physical and material structure.[13−15] Correspondingly, Jeffs et al.[18] found that one way to reduce the rate of medication errors, near-misses, and safety incidents is to offer ongoing education. Lisby et al.[9] examined the significance of further education and training in developing staff knowledge and skills. Therefore, the care equipment must be of high quality and tested at the beginning of every shift.

The present study has very few inpatient data variables that consider workplace violations and interventions for care. These shortcomings are substantial and still impact near-misses. Jeffs et al.[19] revealed that the administration process of medications comprised 43.9% of the system's failure related to the management of organisational processes, excessive work overload, ongoing education, and absence of routines. In the incidents of near-misses, approximately 41.4% of the cases were related to human resources with skill and knowledge deficits and lack of attention. Speroni et al.[20] identified that for the achievement of quality, a care-centred approach is essential for families and patients, which is a critical dimension in the healthcare system.

The significance of maintaining effective communication between various departments is evidenced by detection of near-misses among nursing management staff. These results are supported by the results of Lisby et al.'s study,[9] which found that near-misses associated with surgical interventions were caused by diagnostic errors. The study found that approximately 10.3% of the cases were near-misses because of inadequate medical competence. Examining the health of the patients properly with superior scientific knowledge makes it possible to reduce unnecessary preparation for surgery and erroneous diagnoses. Ruddy et al.[15] conducted a study in which 427 professionals, including doctors, anaesthetists, and nurses demonstrated that many problems occur in the operating theatre in which approximately 38% of the near-misses are experienced by healthcare professionals that are related to the identification of patients and about 60% to the preparation of patients, and 81% related to the site of operations.

Samsiah et al.[21] assessed that the use of tubular devices enhanced the risk of incidents occurring, and advised preventing such incidents by taking particular care. Moreover, blood transfusions have also been carried out unsafely, which has been linked with transfusion reactions, transfer of infection, increase in postoperative mortality and morbidity, and the risk of immunosuppression; therefore, this aspect also requires more attention from professionals.

It has been recognised that there is significant learning at work, which is compulsory for systematising the monitoring process of near-miss incidents resulting from healthcare practices. It is a challenge for different healthcare managers to enhance the commissions of risk management, include

healthcare professionals in the active search for latent failures, and sensitise them towards transforming their attitudes. Furthermore, it focuses on the implementation of good practices for system promotion with systematic resilience, which contributes to quality care and excellence.[19]

This study has a few limitations. Time constraints, limited resources, and small sample sizes are some of the most significant barriers. The occurrence and type of near-miss data may vary from hospital to hospital in the region. As a major limitation, near-miss incidents were not classified based on their immediate action plans or simple corrective measures taken by the organisation for eradication.

Conclusion

The prevalence of medical errors was high. This study found that voluntary incident reporting offered essential and comprehensive information about perioperative problems in patient safety. Shortcomings were estimated in the communication process. Moreover, organisational lapses were identified as essential targets for mitigating perioperative incidents in the hospital. Thus, these findings could challenge the advancement of techniques to improve the guidelines related to compliance and effective communication so that the perioperative safety of patients could be enriched.

Based on the findings of the study, it is understood that the curriculum for the undergraduate nursing programme and clinical practice can help nurses assess, classify, and develop strategies for minimising the number of actual errors and near-misses due to lack of communication. Moreover, while providing ongoing classes towards education on medical errors and safety reduction, nursing practice should include topics related to time management and enhanced reporting systems, compliance with rights, avoiding evasion of mistakes in a hurry, double-checking, and being supportive and kind to one another.

Source of funding

Conflict of interest

The author has no conflict of interest to declare.

Ethical approval

This study was approved by the Ethics Committee of the College of Applied Medical Science at King Saud University, Riyadh, KSA, dated 10/02/2020 (CAMS 0020-55/56); administrative approval from the hospital was obtained prior to data collection.

Acknowledgment

References

1. van der Schaaf TW. *Medical applications of industrial safety science*; 2002. pp. 205−206.
2. Bates DW, Cullen DJ, Laird N, Petersen LA, Small SD, Servi D, et al. Incidence of adverse drug events and potential adverse drug events: implications for prevention. **JAMA 1995 Jul 5**; 274(1): 29−34.
3. Heget JR, Bagian JP, Lee CZ, Gosbee JW. System innovation: veterans health administration national center for patient safety. **Joint Comm J Qual Improv 2002 Dec 1**; 28(12): 660−665. https://doi.org/10.1016/s1070-3241(02)28071-2.
4. Almalki M, FitzGerald G, Clark M. Health care system in Saudi Arabia: an overview. **East Mediterr Health J 2011**; 17(10): 784−793. https://doi.org/10.26719/2011.17.10.784. 2011.
5. McElroy LM, Woods DM, Yanes AF, Skaro AI, Daud A, Curtis T, et al. Applying the WHO conceptual framework for the international classification for patient safety to a surgical population. **Int J Qual Health Care 2016 Apr 1**; 28(2): 166−174. https://doi.org/10.1093/intqhc/mzw001.
6. Safety WP, World Health Organization. *WHO guidelines for safe surgery: 2009: safe surgery saves lives*. World Health Organization; 2009.
7. Erickson SM, Wolcott J, Corrigan JM, Aspden P, editors. *Patient safety: achieving a new standard for care*; 2003.
8. Henneman EA, Gawlinski A. A "near-miss" model for describing the nurse's role in the recovery of medical errors. **J Prof Nurs 2004 May 1**; 20(3): 196−201. https://doi.org/10.1016/j.profnurs.2004.04.006.
9. Lisby M, Nielsen LP, Brock B, Mainz J. How are medication errors defined? A systematic literature review of definitions and characteristics. **Int J Qual Health Care 2010 Dec 1**; 22(6): 507−518. https://doi.org/10.1093/intqhc/mzq059.
10. Khoja T, Neyaz Y, Quresh NA, Mogzoub MA, Haycox A, Walley T. Medication errors in primary care in Riyadh city, Saudi Arabia. **East Mediterr Health J 2011**; 17(2): 156−159. 2011.
11. Claesson CB, Burman K, Nilsson JL, Vinge E. Prescription errors detected by Swedish pharmacists. **Int J Pharm Pract 1995 Jul**; 3(3): 151−156.
12. Haugen AS, Murugesh S, Haaverstad R, Eide GE, Søfteland E. A survey of surgical team members' perceptions of near misses and attitudes towards Time Out protocols. **BMC Surg 2013 Dec**; 13(1): 1−8. https://doi.org/10.1186/1471-2482-13-46.
13. Yadav M, Rastogi P. A study of medical negligence cases decided by the district consumer courts of Delhi. **J Indian Acad Forensic Med 2015**; 37(1): 50−55.
14. Silva AE, Cassiani SH. Prospective risk analysis of the anti-infective medication administration process. **Rev Latino-Am Enferm 2013 Feb**; 21(SPE): 233−241. https://doi.org/10.1590/s0104-11692013000700029.
15. Ruddy RM, Chamberlain JM, Mahajan PV, Funai T, O'Connell KJ, Blumberg S, et al. Pediatric emergency care applied research network. Near misses and unsafe conditions reported in a pediatric emergency research network. **BMJ Open 2015 Sep 1**; 5(9). https://doi.org/10.1136/bmjopen-2014-007541.
16. Sánchez AD. Medication errors in a Spanish community pharmacy: nature, frequency and potential causes. **Int J Clin Pharm 2013 Apr 1**; 35(2): 185−189. https://doi.org/10.1007/s11096-012-9741-0.
17. Härkänen M, Turunen H, Saano S, Vehviläinen-Julkunen K. Medication errors: what hospital reports reveal about staff views. **Nurs Manag 2013 Mar 1**; 19(10). https://doi.org/10.7748/nm2013.03.19.10.32.e1010.
18. Jeffs L, Berta W, Lingard L, Baker GR. Learning from near misses: from quick fixes to closing off the Swiss-cheese holes.

BMJ Qual Saf 2012 Apr 1; 21(4): 287−294. https://doi.org/10.1136/bmjqs-2011-000256.

19. Jeffs L, Rose D, Macrae C, Maione M, Macmillan KM. What near misses tell us about risk and safety in mental health care. **J Psychiatr Ment Health Nurs 2012 Jun**; 19(5): 430−437. https://doi.org/10.1111/j.1365-2850.2011.01812.x.

20. Speroni KG, Fisher J, Dennis M, Daniel M. What causes near-misses and how are they mitigated? **Plast Surg Nurs 2014 Jul 1**; 34(3): 114−119. https://doi.org/10.1097/PSN.0000000000000058.

21. Samsiah A, Othman N, Jamshed S, Hassali MA, Wan-Mohaina WM. Medication errors reported to the national medication error reporting system in Malaysia: a 4-year retrospective review (2009 to 2012). **Eur J Clin Pharmacol 2016 Dec 1**; 72(12): 1515−1524. https://doi.org/10.1007/s00228-016-2126-x.

22. Mendes W, Pavão AL, Martins M, Moura MD, Travassos C. The feature of preventable adverse events in hospitals in the State of Rio de Janeiro, Brazil. **Mag Braz Med Assoc 2013 Oct**; 59(5): 421−428. https://doi.org/10.1016/j.ramb.2013.03.002.