

CROSS-SECTIONAL STUDY ON THE ATTITUDE AND PERCEPTION OF HEALTHCARE PRACTITIONERS TOWARDS MEDICATION ERRORS IN A NIGERIAN TERTIARY HOSPITAL

BOLANLE STEPHEN OLADOKUN¹, OLADIRAN BONIFACE OLADOKUN² AND AKINNIYI AKINBIYI AJE^{3*}

¹Pharmacy Department, University College Hospital, Ibadan, Nigeria

²Department of Biochemistry and Molecular Biology, Obafemi Awolowo University, Ile-Ife, Nigeria

³Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, University of Ibadan, Ibadan, Nigeria

Published online: 16 Nov 2022

To cite this article: OLADOKUN, B. S., OLADOKUN, O. B. & AJE, A. A. (2022) Cross-sectional study on the attitude and perception of healthcare practitioners towards medication errors in a Nigerian tertiary hospital, *Malaysian Journal of Pharmaceutical Sciences*, 20(2): 15–26, <https://doi.org/10.21315/mjps2022.20.2.2>

To link to this article: <https://doi.org/10.21315/mjps2022.20.2.2>

ABSTRACT

This study was carried out to evaluate the attitude and perception of healthcare professionals towards medication errors. A cross-sectional study was carried out using a semi-structured questionnaire administered to nurses, pharmacists and physicians at the University College Hospital of Ibadan, Nigeria. Data were analysed with descriptive and inferential statistics. Most of the study participants, 444 (55.5%) and 472 (59.0%) had excellent attitudes and perceptions of medication errors, respectively. Most of the healthcare practitioners (89.1% nurses, 71.8% pharmacists and 66.7% physicians) disagreed with the statement that medication errors are unavoidable and are merely expected daily mistakes. It was observed that 35.5%, 37.6% and 66.7% of the nurses and pharmacists, and physicians, respectively, agreed with the statement that persons responsible for medication errors should be liable for legal actions. Suggestions made by the healthcare professionals on measures to prevent medication errors included recruitment of new staff to increase staff strength (32.8%), training on medication errors (21.4%) and legible handwriting of prescribers (9.4%). The prevalence of unreported medication errors by the study participants was 24.9%. Reasons for not reporting medication error committed included that it was trivial and had no adverse effect on the patient (32.3%), excess workload (26.9%) and fear of reprimand (17.7%). The healthcare professionals displayed excellent attitudes and perceptions of medication errors. An increase in staff strength and training on medication errors were major measures suggested by the study participants to prevent medication errors.

Keywords: Medication errors, Healthcare professionals, Attitude and perception, Hospital pharmacists, Cross-sectional study

*Corresponding author: aje123@gmail.com

INTRODUCTION

The complete procedure of medication prescription, transcription, dispensing and administration involves a combined effort from members of the healthcare professionals (Alomari *et al.* 2018). Medications are the most frequently utilised interventions for patients (Jember *et al.* 2018). However, the medication errors associated with this are a cause for concern as it affects the quality of care received by patients.

The National Coordinating Council for Medication Error Reporting and Prevention (NCC MERP) in 2015 stated that avoidable events of medication error are associated with the practice, healthcare products, methods and systems, which comprise prescription, medication order requests, medication labelling, administration and so on. Consequently, nurses, pharmacists and physicians, who are involved in these procedures, can commit medication errors while discharging their duties to patients (Aronson 2009).

The downsides of medication errors include unwanted medication reactions, medication interactions, lack of medication efficacy, inadequate patient medication adherence, patients' poor quality of life, needless hospital admissions and deaths (World Health Organization 2016). In the United States, avoidable medication errors impact over seven million patients at a cost of almost USD21 billion yearly across all care settings (Lahue *et al.* 2012).

Many reasons have been put forward to explain the unwillingness of some healthcare practitioners to report medication errors. This includes dread of rebuke, legal implication, inadequate time, lack of clarity on the incidents to report, the possibility of incriminating others and no feedback and proof that the data was cherished for system upgrade (Aronson 2004; Lehmann *et al.* 2007; Hutchinson *et al.* 2015; Abstoss *et al.* 2011; Jember *et al.* 2018). Adequate reporting of medication errors is vital to assess procedural flaws in organisations, and plain, nonpenal distribution of information is essential for system education (Apold, Daniels and Sonneborn 2006).

Patient safety improvement is a priority in healthcare and lots of efforts have been committed to better evaluate and reduce medication-associated harm (Abstoss *et al.* 2011). Reporting medication errors improves patient safety (Gaal, Verstappen and Wensing 2010). A proper understanding of the perception of healthcare professionals to medication errors is critical to proffering solutions to reduce medication errors (Alomari *et al.* 2018; Kim *et al.* 2011). This study sought to find out the attitude and perception of healthcare practitioners (nurses, pharmacists and physicians) in a Nigerian tertiary hospital towards medication errors.

METHODS

Study Design, Setting and Population

A cross-sectional study using an appropriately designed semi-structured questionnaire administered to all consenting nurses, pharmacists and physicians at the University College Hospital of Ibadan, Nigeria.

The 950-bed hospital is the premier healthcare facility in Nigeria, founded in 1957 and located in Ibadan. The University College Hospital, a tertiary hospital with facilities for both undergraduate and postgraduate medical training across many specialities, serves as a referral centre for patients in southwestern Nigeria.

Consented nurses, pharmacists and physicians were recruited for the study. Intern nurses, house officers and intern pharmacists were excluded from the study, as they were still undergoing the mandatory one-year tutelage sequel to the completion of their undergraduate degrees in medical school.

Sample Size Determination

The sample size was determined using the Yamane (1967) sample size formula which gave a minimum sample size of 267 physicians, 85 pharmacists and 333 nurses, after making provision for 10% non-response.

Design and Validation of Data Collection Instrument

The semi-structured questionnaire used as the research tool was designed after an extensive literature search on the subject matter (Sanghera, Franklin and Dhillon, 2007; Aronson 2009; Gardner and Rich 2014; NCC MERP 2015; Samsiah *et al.* 2016; Alomari *et al.* 2018). Section A contains questions addressing the demographic characteristics of study participants. Section B contains questions on the definition of medication errors, with options provided for the participants to choose from, as well as participants' perceptions of medication errors. Section C addressed participants' attitudes towards medication errors as well as preventive measures for medication errors.

The questionnaire was evaluated by two faculties in the Department of Clinical Pharmacy and Pharmacy Administration, Faculty of Pharmacy, University of Ibadan, Nigeria, who are experts in clinical pharmacy, for content validity. Face validity was done by pretesting the questionnaire to 15 nurses, five pharmacists and 12 physicians; data from face validity was not included in the data analysed for the study. Adjustments, such as sentence reconstruction for better understanding by study participants, were made to the data collection tool based on content validity.

The questions on knowledge had dichotomous ('Yes' and 'No') answers and contained options for the definition of medication errors; with an option being the most accurate. Each correct response was assigned a point. The questions on participants' attitude towards medication errors had Likert scale options: strongly agree, agree, indifferent, disagree or strongly disagree, which was assigned 5, 4, 3, 2 and 1 point, respectively. Negatively worded questions were reversed using the statistical analysis software used. Questions on participants' perception of medication errors had dichotomous options ('Yes' and 'No'). Correct options were assigned 1 point while incorrect options had 0 point. The total score for participants' attitudes was based on the summation of the scores for the options selected. Participants' attitudes towards medication errors had a maximum obtainable score of 35 since there were seven questions and perception had a maximum obtainable score of 11 since there were 11 questions. The scores were converted into percentages by dividing the obtained scores by the maximum obtainable score and multiplying them by 100. The percentage scores were categorised into poor (below 50%), fair (50%–69.9%), good (70%–89.9%) and excellent (90%–100%).

Data Collection Procedure

The questionnaire was administered to study participants in the different wards and units for one month. Participants were approached and the questionnaire was administered after explaining the study to them and securing their verbal consent to participate in the study.

Data Analysis

Data were analysed using SPSS version 20 for Windows. Descriptive statistics like frequency counts, percentages, 50th percentile, means and standard deviation were used to summarise data. Mann-Whitney U test was used to compare the difference in the participants' attitudes and perception of medication errors between gender and educational qualification. Kruskal Wallis test was used to compare the difference in the participants' attitudes and perception of medication errors between different participants' work experiences.

Ethical Approval

Approval for the research protocol was approved by the joint University of Ibadan and University College Hospital Ethics Committee (approval number: UI/UCH/20/0067) prior to the commencement of the research.

RESULTS

A majority, 597 (74.6%), of the study participants were females. Detailed demographic characteristics of the study participants are shown in Table 1. A total of 327 (73.0%) nurses, 60 (70.6%) pharmacists and 222 (83.1%) physicians chose the most accurate option to define medication errors. While all the study participants agreed that medication errors can cause devastating harm, 346 (43.3%) perceived that the main cause of medication errors is the lack of knowledge of health workers. Most of the study participants, 472 (59.0%), had an excellent perception of medication errors (Table 2).

Table 1: Demographic characteristics of the study participants.

Variables		Nurses	Pharmacists	Physicians	Total
Age (years old)	20–29	20 (4.5)	0 (0)	9 (3.4)	29 (3.6)
	30–39	53 (11.8)	25 (29.4)	101 (38.0)	179 (22.4)
	≥ 40	375 (83.7)	60 (70.6)	156 (58.6)	591 (74.0)
Gender	Female	445 (99.3)	53 (62.4)	99 (37.1)	597 (74.6)
	Male	3 (0.7)	32 (37.6)	168 (62.9)	203 (25.4)
Work experience (years)	1–5	90 (20.1)	49 (57.6)	134 (50.2)	273 (34.1)
	6–10	234 (52.2)	21 (24.7)	106 (39.7)	361 (45.1)
	> 10	124 (27.7)	15 (17.6)	27 (10.1)	166 (20.8)
Educational qualification	First degree	353 (78.8)	52 (61.2)	175 (65.5)	580 (72.5)
	Postgraduate	95 (21.2)	33 (38.8)	92 (34.5)	220 (27.5)

Table 2: Perception of study participants to medication errors.

Variables	Frequency (%) of correct responses			
	Nurses (n = 448)	Pharmacists (n = 85)	Physicians (n = 267)	Total (n = 800)
Medication errors can cause devastating harms	448 (100.0)	85 (100.0)	267 (100.0)	800 (100.0)
Medication errors can result from system deficiencies only	306 (68.3)	65 (76.5)	203 (76.0)	574 (71.8)
Medication errors can only be committed by pharmacists	444 (99.1)	81 (95.3)	242 (90.6)	767 (95.9)
Medication errors can be committed by all health workers	420 (93.8)	81 (95.3)	249 (93.3)	750 (93.8)
Patients cannot commit medication errors	378 (84.4)	73 (85.9)	169 (63.3)	620 (77.5)
Medication errors arise from prescribing and administering drugs only	285 (63.6)	51 (60.0)	195 (73.0)	531 (66.4)
Medication errors can arise from compounding and labelling of drugs	364 (81.3)	68 (80.0)	249 (93.3)	681 (85.1)
Failure to give proper advice can cause medication error	403 (90.0)	77 (90.6)	242 (90.6)	722 (90.3)
It may occur due to patient's faults	381 (85.0)	65 (76.5)	144 (53.9)	590 (73.8)
Medication error cannot result from casual attitudes of health workers	313 (69.9)	73 (85.9)	115 (43.1)	501 (62.6)
The main cause of medication error is lack of knowledge of health workers	223 (49.8)	44 (51.8)	79 (29.6)	346 (43.3)
Mean perception score (Maximum obtainable score is 11)	8.85 ± 1.41	8.98 ± 2.07	8.07 ± 1.28	8.60 ± 1.50
Perception category				
Poor (< 50%)	0 (0)	4 (4.7)	0 (0)	4 (0.5)
Fair (50%–69.9%)	26 (5.8)	8 (9.4)	0 (0)	34 (4.3)
Good (70%–89.9%)	113 (25.2)	17 (20.0)	160 (59.9)	290 (36.3)
Excellent (90%–100%)	309 (69.0)	56 (65.9)	107 (40.1)	472 (59.0)

Most of the healthcare practitioners (89.1% nurses, 71.8% pharmacists and 66.7% physicians) disagreed with the statement that medication errors are unavoidable and are merely expected daily mistakes, but the majority (95.3% nurses, 100% pharmacists and 90.6 physicians) strongly agreed that medication errors are preventable. A majority, 35.7% and 38.8% of the nurses and pharmacists, respectively, were indifferent to the statement that persons responsible for medication errors should be liable for legal actions, while most of the physicians (66.7%) agreed with the statement. The majority of the study participants, 444 (55.5%), had an excellent attitude towards medication errors (Table 3).

Table 3: Study participants' attitude to medication errors.

Variables	Nurses (n = 448)				Pharmacists (n = 85)				Physicians (n = 267)			
	AG	ID	DA	FP	AG	ID	DA	FP	AG	ID	DA	FP
Medication errors are significant to healthcare delivery	446 (99.6)	0 (0)	2 (0.4)	SA	85 (100.0)	0 (0)	0 (0)	SA	249 (93.3)	18 (6.7)	0 (0)	SA
Medication errors are unavoidable	7 (1.6)	42 (9.3)	399 (89.1)	D	24 (28.2)	0 (0)	61 (71.8)	D	89 (33.3)	0 (0)	178 (66.7)	D
Medication errors are merely expected daily mistakes	42 (9.4)	23 (5.1)	383 (85.5)	D	0 (0)	8 (9.4)	77 (90.6)	D	25 (9.4)	36 (13.5)	206 (77.2)	D
Medication errors are preventable	427 (95.3)	0 (0)	21 (4.7)	SA	85 (100.0)	0 (0)	0 (0)	SA	242 (90.6)	25 (9.4)	0 (0)	SA
Prevention of medication errors is beneficial to our healthcare system	446 (99.6)	1 (0.2)	1 (0.2)	SA	85 (100.0)	0 (0)	0 (0)	SA	248 (92.0)	19 (7.1)	0 (0)	SA
A medication error can be considered a trivial accident	48 (10.7)	64 (14.3)	336 (75.0)	D	24 (28.2)	17 (20.0)	44 (51.8)	D	19 (7.1)	0 (0)	248 (92.9)	D
Persons responsible for medication error should be liable for legal actions	159 (35.5)	160 (35.7)	129 (28.8)	ID	32 (37.6)	33 (38.8)	20 (23.5)	ID	178 (66.7)	70 (26.2)	19 (7.1)	A
Nurses	29.24 ± 3.73		28.64 ± 2.18		27.42 ± 1.73		28.57 ± 3.16					
Mean attitude score (Maximum obtainable score is 35)												
Attitude category												
Poor (< 50%)	1 (0.2)		0 (0)	0 (0)			1 (0.1)					
Fair (50%–69.9%)	37 (8.3)		4 (4.7)	18 (6.7)			59 (7.4)					
Good (70%–89.9%)	104 (23.3)		40 (47.1)	151 (56.6)			295 (36.9)					
Excellent (90%–100%)	305 (68.2)		41 (48.2)	98 (36.7)			444 (55.5)					

Notes: AG = Strongly agree + Agree; ID = Indifferent; DA = Disagree + Strongly disagree; FP = 50th Percentile; A = Agree; D = Disagree

The prevalence of unreported medication errors by the study participants was 24.9%. One hundred and eight (24.1%) nurses, 23 (27.1%) pharmacists and 68 (25.5%) physicians making a total of 199 (24.9%) study participants reported that they committed medication errors in the past without reporting. Only 130 (65.3%) of 199 study participants who reported committing medication errors in the past gave reasons for not reporting. The most recurring reason for not reporting medication error committed given by 42 (32.3%) was that it was trivial and had no adverse effect on the patient.

Another prominent reason for not reporting medication errors according to 35 (26.9%) participants is excess workload robbing them of the time for proper reporting of medication errors committed in the line of duty. The fear of reprimand and consequences as well as plausible deniability in pinning the responsibility of medication errors on specific personnel 23 (17.7%). Illegible handwriting and poor communication were the reason offered by 23 (17.7%), while 4 (3.1%) noted that the mistake was later corrected. Also, 1 (0.8%) failed to report for fear of a negative image or bad reputation and 2 (1.5%) reported not being aware of the mistake until it was noticed.

Table 4 shows suggestions made by healthcare professionals on the measure to prevent medication errors. As much as 32.8% suggested an increase in staff strength, 21.4% training on medication errors and 9.4% legible handwriting of prescribers. Educational qualification significantly influenced participants' perception of medication errors, with participants having postgraduate qualifications scoring higher. The results (first degree versus postgraduate degree) showed mean rank of 210.61 versus 276.09 ($p < 0.001$) for nurses, 47.87 versus 35.33 ($p = 0.020$) for pharmacists and 123.67 versus 153.65 ($p = 0.002$) for physicians. Details on the comparison of the influence of participants' educational qualifications, gender and work experience on their attitude and perception of medication errors were presented in Table 5.

Table 4: Medication error preventive measures suggested by study participants.

Suggestions	Nurses (n = 448)	Pharmacists (n = 85)	Physicians (n = 267)	Total (n = 800)
	Frequency (%)			
Increase the number of staff	95 (21.2)	29 (34.1)	138 (51.7)	262 (32.8)
Training on medication errors	98 (21.9)	4 (4.7)	69 (25.8)	171 (21.4)
Double checking by other personnel before administering/dispensing medications	86 (19.2)	4 (4.7)	0 (0)	90 (11.3)
Legible handwriting of prescribers	75 (16.7)	0 (0)	0 (0)	75 (9.4)
Deploy ICT more effectively	21 (4.7)	9 (10.6)	0 (0)	30 (3.8)
Proper documentation of prescriptions	25 (5.6)	0 (0)	0 (0)	25 (3.1)
Proper labelling of drug containers	23 (5.1)	0 (0)	0 (0)	23 (2.9)
Good communication skills	0 (0)	9 (10.6)	9 (3.4)	19 (2.4)
Proper reporting of medication errors to avoid future recurrence	0 (0)	4 (4.7)	13 (4.9)	17 (2.1)
Adequate patient education	1 (0.2)	0 (0)	3 (1.1)	4 (0.5)

Table 5: Comparison of participants' educational qualification, gender and work experience with their attitude and perception to medication errors.

Variables	Nurses		Pharmacists		Physicians		
	Mean rank	p-value	Mean rank	p-value	Mean rank	p-value	
Educational qualification	Attitude						
	First degree	226.26	0.575 ^a	42.09	0.664 ^a	136.71	0.412 ^a
	Postgraduate degree	217.97		44.44		128.84	
Perception	First degree	210.61	< 0.001 ^{a,c}	47.87	0.020 ^{a,c}	123.67	0.001 ^{a,c}
	Postgraduate degree	276.09		35.33		153.65	
Gender	Attitude						
	Female	284.17	0.417 ^a	47.72	0.021 ^{a,c}	159.01	< 0.001 ^{a,c}
	Male	224.10		35.19		119.26	
	Perception						
	Female	224.28	0.656 ^a	37.49	0.007 ^{a,c}	141.48	0.183 ^a
	Male	256.50		52.13		129.59	
Years of work experience	Attitude						
	1–5	182.97	< 0.001 ^{b,c}	41.53	0.127 ^b	130.42	< 0.001 ^{b,c}
	6–10	286.82		47.60		152.01	
	> 10	137.03		41.37		81.06	
	Perception						
	1–5	165.04	< 0.001 ^{b,c}	47.53	0.608 ^b	131.27	< 0.001 ^{b,c}
	6–10	256.62		37.67		116.72	
	> 10	207.04		35.67		215.39	

Notes: ^aMann-Whitney U; ^bKruskal Wallis; ^cStatistically significant

DISCUSSION

The healthcare professionals in the study population displayed excellent attitudes and perceptions towards medication errors. Educational qualification, gender and work experience influenced the attitude and perception of healthcare professionals towards medication errors. Preventive measures proffered for medication errors by the study participants include increasing staff strength and training healthcare professionals on medication errors.

One-third of nurses and pharmacists, and two-thirds of physicians in this study agreed that those responsible for medication errors should be liable for legal actions. While medication errors are better prevented, the attitude to their occurrence is key to addressing them adequately. A punitive attitude towards medication errors might lead to nonreporting of medication errors to avoid being made a scapegoat. However, it is important that medication errors committed by healthcare professionals be reported, as this will help to chart a meaningful course towards addressing them to prevent their recurrence. Halbesleben and colleagues (2008) stated that self-reporting of medication errors is essential to evaluate the impact of medication errors.

While almost all the participants from the three healthcare professionals studied agreed that medication errors are preventable and did not consider them merely expected daily mistakes, 10.7% of nurses (with another 14.3% being indecisive), 28.2% pharmacists and 7.1% of physicians still considered medication error as a trivial accident. Medication errors are not trivial, as it has been documented to adversely affect patients, who are on the receiving end. Medication errors may elongate hospital stays or even lead to death (Jember *et al.* 2018), and it may compromise both the quality and steadiness of patient care (Zelege, Chanie and Woldie 2014). Extra effort must be made to formulate strategies to minimise medication errors.

Only about one-quarter of the study participants reported that they made unreported medication errors in the past. Reasons for not reporting medication errors included considering it trivial, excess workload, fear of reprimand and illegible handwriting. A perception that a medication error is mild is a factor that affects medication error reporting attitude (Sanghera, Franklin and Dhillon 2007). Several studies showed that fear of being accused may debar some healthcare professionals from reporting medication errors (Joolae *et al.* 2011; Kim *et al.* 2011; Almutary and Lewis 2012). Health institutions should develop positive culture towards medication error reporting and operate a non-disciplinary system to encourage reporting (Beasley, Escoto and Karsh 2004; Boyle *et al.* 2011; Samsiah *et al.* 2016).

The study participants noted that training on medication errors is a major preventive measure for medication errors. It is important to expose healthcare professionals to training on medication errors. Such training should help them to review medication errors committed to avoid their recurrence (DaRosa and Pugh 2012; D'Angelo *et al.* 2015; Gardner and Rich 2014; Gardner *et al.* 2015).

About one-half of the nurses and pharmacists and two-thirds of the physicians erroneously perceived that lack of knowledge is the main cause of medication errors. It is important to correct this perception. While lack of knowledge could be a possible reason for medication errors, it is not the main cause. Healthcare practitioners undergo robust training and acquire knowledge. However, they require deliberate guidance from mentors to translate knowledge learned into practice in the healthcare delivery space.

The possibility of response bias based on the use of a questionnaire as the research tool is a limitation of this study.

CONCLUSION

The study participants displayed excellent attitudes and perceptions towards medication errors. Recruitment of new staff to increase staff strength and training on medication errors were major measures suggested by the study participants to prevent medication errors. Participants' educational qualifications, gender and work experience significantly influenced the attitude and perception of the healthcare professionals towards medication errors.

ACKNOWLEDGEMENTS

The authors acknowledge the nurses, pharmacists and physicians at the University College Hospital, Nigeria, who participated in the study, despite their busy schedules.

REFERENCES

- ABSTOSS, K. M., SHAW, B. E., OWENS, T. A., JUNO, J. L., COMMISKEY, E. L. & NIEDNER, M. F. (2011) Increasing medication error reporting rates while reducing harm through simultaneous cultural and system-level interventions in an intensive care unit, *BMJ Quality and Safety*, 20(11): 914–922. <https://doi.org/10.1136/bmjqs.2010.047233>
- ALMUTARY, H. H. & LEWIS, P. A. (2012) Nurses' willingness to report medication administration errors in Saudi Arabia, *Quality Management in Healthcare*, 21(3): 119–126.
- ALOMARI, A., WILSON, V., SOLMAN, A., BAJOREK, B. & TINSLEY, P. (2018) Pediatric nurses' perceptions of medication safety and medication error: A mixed methods study, *Comprehensive Child and Adolescent Nursing*, 41(2): 94–110. <https://doi.org/10.1080/24694193.2017.1323977>
- APOLD, J., DANIELS, T. & SONNEBORN, M. (2006) Promoting collaboration and transparency in patient safety, *The Joint Commission Journal on Quality and Patient Safety*, 32(12): 672–675. [https://doi.org/10.1016/s1553-7250\(06\)32088-0](https://doi.org/10.1016/s1553-7250(06)32088-0)
- ARONSON, J. K. (2004) Medication errors resulting from the confusion of drug names, *Expert Opinion on Drug Safety*, 3(3): 167–172. <https://doi.org/10.1517/14740338.3.3.167>
- ARONSON, J. K. (2009) Medication errors: Definitions and classification, *British Journal of Clinical Pharmacology*, 67(6): 599–604.
- BEASLEY, J. W., ESCOTO, K. H. & KARSH, B. T. (2004) Design elements for a primary care medical error reporting system, *Wisconsin Medical Journal*, 103(1): 56–59.
- BOYLE, T. A., MAHAFFEY, T., MACKINNON, N. J., DEAL, H., HALLSTROM, L. K. & MORGAN, H. (2011) Determinants of medication incident reporting, recovery, and learning in community pharmacies: A conceptual model, *Research on Social and Administrative Pharmacy*, 7(1): 93–107.

D'ANGELO, A. L. D., LAW, K. E., COHEN, E. R., GREENBERG, J. A., KWAN, C., GREENBERG, C. *et al.* (2015) The use of error analysis to assess resident performance, *Surgery*, 158(5): 1408–1414. <https://doi.org/10.1016/j.surg.2015.04.010>

DAROSA, D. A. & PUGH, C. M. (2012) Error training: Missing link in surgical education. *Surgery*, 151(2): 139–145. <https://doi.org/10.1016/j.surg.2011.08.008>

GAAL, S., VERSTAPPEN, W. & WENSING, M. (2010) Patient safety in primary care: A survey of general practitioners in the Netherlands, *BMC Health Service Research*, 21(10): 21. <https://doi.org/10.1186/1472-6963-10-21>

GARDNER, A. & RICH, M. (2014) Error management training and simulation education, *The Clinical Teacher*, 11(7): 537–540. <https://doi.org/10.1111/tct.12217>

GARDNER, A. K., ABDELFATTAH, K., WIERSCH, J., AHMED, R. A. & WILLIS, R. E. (2015) Embracing errors in simulation-based training: The effect of error training on retention and transfer of central venous catheter skills, *Journal of Surgical Education*, 72(6): e158–e162. <https://doi.org/10.1016/j.jsurg.2015.08.002>

HALBESLEBEN, J. R. B., WAKEFIELD, B.J., WAKEFIELD, D. S. & COOPER, L. B. (2008) Nurse burnout and patient safety outcomes nurse safety perception versus reporting behavior, *Western Journal of Nursing Research*, 30(5): 560–577.

HUTCHINSON, A. M., SALES, A. E., BROTTTO, V. & BUCKNALL, T. K. (2015) Implementation of an audit with feedback knowledge translation intervention to promote medication error reporting in health care: A protocol, *Implementation Science*, 10(1). <https://doi.org/10.1186/s13012-015-0260-y>

JEMBER, A., HAILU, M., MESSELE, A., DEMEKE, T. & HASSEN, M. (2018) Proportion of medication error reporting and associated factors among nurses: A cross sectional study, *BMC Nursing*, 17: 9. <https://doi.org/10.1186/s12912-018-0280-4>

JOOLAEE, S., HAJIBABAEI, F., PEYROVI, H., HAGHANI, H. & BAHRANI, N. (2011) The relationship between incidence and report of medication errors and working conditions, *International Nursing Review*, 58(1): 37–44.

KIM, K. S., KWON, S. H., KIM, J. A. & CHO, S. (2011) Nurses' perceptions of medication errors and their contributing factors in South Korea, *Journal of Nursing Management*, 19(3): 346–353. <https://doi.org/10.1111/j.1365-2834.2011.01249.x>

LAHUE, B. J., PYENSON, B., IWASAKI, K., BLUMEN, H. E., FORRAY, S. & ROTHSCHILD, J. M. (2012) National burden of preventable adverse drug events associated with inpatient injectable medications: Healthcare and medical professional liability costs, *American Health and Drug Benefits*, 5(7): 1–10

LEHMANN, D. F., PAGE, N., KIRSCHMAN, K., SEDORE, A., GUHARROY, R., MEDICIS, J. *et al.* (2007) Every error a treasure: Improving medication use with a nonpunitive reporting system, *The Joint Commission Journal on Quality and Patient Safety*, 33(7): 401–407. [https://doi.org/10.1016/s1553-7250\(07\)33046-8](https://doi.org/10.1016/s1553-7250(07)33046-8)

NATIONAL COORDINATING COUNCIL FOR MEDICATION ERROR REPORTING AND PREVENTION (NCC MERP) (2015) What is a medication error? National Coordinating Council for Medication Error Reporting and Prevention, New York. <https://www.nccmerp.org/about-medication-errors>

SAMSIAH, A., OTHMAN, N., JAMSHED, S. & HASSALI, M. A. (2016) Perceptions and attitudes towards medication error reporting in primary care clinics: A qualitative study in Malaysia, *PLoS ONE*, 11(12): e0166114. <https://doi.org/10.1371/journal.pone.0166114>

SANGHERA, I. S., FRANKLIN, B. D. & DHILLON, S. (2007) The attitudes and beliefs of healthcare professionals on the causes and reporting of medication errors in a UK intensive care unit, *Anaesthesia*, 62(1): 53–61.

WORLD HEALTH ORGANIZATION (2016) Medication errors: Technical series on safer primary care. http://www.who.int/patientsafety/topics/primary-care/technical_series/en/

ZELEKE, A., CHANIE, T. & WOLDIE, M. (2014) Medication prescribing errors and associated factors at the pediatric wards of Dessie referral hospital, Northeast Ethiopia, *International Archives of Medicine*, 7(1): 18.