ORIGINAL RESEARCH

Nurses' Intentions, Awareness and Barriers in Reporting Adverse Events: A Cross-Sectional Survey in Tertiary Hospitals in China

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Purpose: This study explored nurses' intentions, awareness and barriers in reporting adverse events in tertiary hospitals in China. We also analyzed its associated factors to increase the chance to evaluate preventable errors, enhance care delivery, and improve patient outcomes.

Patients and Methods: A cluster sampling method was used to recruit 1382 nurses from two tertiary hospitals in Chenzhou and Handan City. An online structured questionnaire was used to collect data, which included general information questionnaire (eight questions), reporting awareness questionnaire (eight items with scores ranging from 0 to 8), reporting intention questionnaire (15 items with scores ranging from 0 to 15), and reporting barriers questionnaire (22 items with scores ranging from 22 to 110).

Results: We received 1565 completed questionnaires from 1734 potential participants (a response rate of 90.25%), with 1382 valid questionnaires, yielding an effective rate of 88.31%. The scores of reporting awareness, reporting intention, and reporting barriers in adverse events for nurses in tertiary hospitals were 8 (1), 15 (0), and 83.04 (±12.21) out of 110, respectively. Reporting awareness and barriers to adverse events were positively correlated with nurses' intention to report adverse events (r_s = 0.237 and 0.361, respectively; $P < 0.001$). Regression analyses showed that reporting awareness and barriers in adverse events and professional title influenced nurses' intention to report adverse events ($P < 0.05$) in tertiary hospitals.

Conclusion: Nurses in tertiary hospitals have a strong intention to report adverse events. The higher the reporting awareness of adverse events or the fewer perceived reporting barriers, the stronger the nurses' intention to report. Hospital managers should deliver patient safety education and training for nurses, to increase their reporting awareness and decrease their perceived reporting barriers, improve their intention to report adverse events.

Keywords: nurse, adverse events, patient safety, safety culture

Introduction

Failure to ensure patient safety is a major issue in the delivery of health services, affecting patients in health-care institutions in developed and developing countries.[1] According to the World Health Organization (WHO), approximately 134 million adverse events and 2.6 million related deaths occur in low- and middle-income countries each year as a result of unsafe care.[2] Approximately 210, 000 to 444, 000 people die in the United States each year as a result of preventable medical care events.[3] The health-care costs associated with preventable medical errors are as high as $17.1 billion.[4] In China, 72.5% of medical malpractice claims in tertiary hospitals involve medical errors, with an average payment of $31,430.[5] It was estimated that 86.5% of the health-care providers had taken part in an adverse event in Poland.[6] Although patient safety risks are unavoidable in the medical process, research shows that nearly half the adverse events are preventable.[7]

An adverse event is an injury, or a negative outcome related to medical management (eg, erroneous or careless diagnosis or treatment, incorrect medications, wrong-site procedures, communication errors), in contrast to complications

of disease,[8] which is a leading threat to patient safety and quality of care in hospitals because of their high incidence and harm to patients.[9] WHO launched an action to eliminate preventable harm in healthcare in 2019.[10] Preventable adverse event is an adverse event caused by an error or other type of systems or equipment failure.[11] A meta-analysis revealed that the prevalence for preventable adverse events was 6%, and 12% of preventable adverse events were severe or led to death.[12] Most patient safety events involve nurses, and more than half occur in wards.[13] Adverse events in nursing are any nursing-related events such as patient falls, wandering, injuries, suicides, bed sores, medication errors, and nursing-related hospital infections.[14] Clinical evidence shows that more than 50% of nurses have experienced an adverse event,[15,16] which not only increases patient mortality and costs[17] but also has a negative impact on nurses' physical and mental well-being.[18] Murphy et al estimated the annual economic cost of nurse-sensitive adverse events to be $92.26 million for the Irish health service.[19]

Monitoring and learning from adverse events in healthcare can improve patient safety by lowering the likelihood of errors. Consequently, many countries have implemented adverse event reporting systems and conducted studies on patient safety culture, technical reporting, and guidelines.[20] The National Institute for Health Research's Patient Safety 2030 report states that reporting patient safety incidents and learning from sharing experience are critical to maintaining and improving patient safety.[21] Frontline staff adverse events reporting is a useful, individual-centered method that could provide opportunities for caregivers to learn from and inform appropriate action. Furthermore, reporting allows healthcare providers to share responsibility with managers and promotes corrective action.[22] In 2017, China's National Patient Safety Reporting and Learning System was launched online. It promotes patient safety by encouraging health-care providers to report errors and learn from errors on mobile internet and big data platforms.[13]

The reporting and management of adverse events in nursing is an important measure to ensure quality of care.[23] Despite government, hospital, and community efforts to improve the reporting rate of adverse events, the number of documented adverse events remains significantly lower than the actual incidence.[24–26] Understanding nurses' reporting intentions, awareness, and barriers in adverse events is critical for clinical nursing managers to initiate quality improvement programs.[27] Tertiary hospitals play a leading role in maintaining health-care safety. However, little is known about nurses' intentions to report adverse events at tertiary hospitals, and it is unclear what factors influence their intentions. This study explored nurses' intentions, awareness and barriers in reporting adverse events in tertiary hospitals in China, as well as the factors associated with them. This was done to provide an opportunity to learn from errors, lay the foundation for reducing the occurrence of preventable adverse events and for in-service education and training of nurses.

Materials and Methods

Study Design

This study used a cross-sectional design and employed an online questionnaire to survey nurses from two tertiary hospitals.

Participants

A cluster sample of nurses was recruited from a public tertiary hospital in Chenzhou City, Hunan Province (1200 beds) and a public tertiary hospital in Handan City, Hebei Province (1988 beds). Registered nurses with at least one year of work experience who provided direct nursing care met the inclusion criteria. We excluded nurse managers and nurses who did not work in clinical wards (eg, medical technology department, supply room, health examination center, planned immunization room, hospital administrative department) as well as on-the-job training nurses and interns. As of April 2020, the two surveyed hospitals employ a total of 1, 997 registered nurses. Among them, 1, 734 nurses met the inclusion criteria.

Operational Definitions

Adverse events are defined as unintended injuries or complications that are caused by healthcare management, rather than patients' underlying disease.[28]

Preventable adverse events also known as avoidable adverse events, are those that are caused directly by failing to follow recognized standards, evidence-based procedures, or guidelines at the individual or system level.[11]

Adverse events in nursing are any nursing-related events (eg, falls, wandering, injuries, suicides, bed sores, and nursing-related hospital infections) caused by inadequate monitoring, unobserved signs of early complications, medical errors, incorrect nursing interventions, lack of communication and incomplete over-reporting of patients.[29]

Reporting intention describes a nurse's desire or willingness to complete an adverse event reporting by filling the reporting forms, reporting to the superior, or discussing with colleagues.[30]

Reporting awareness refers to nurses' knowledge and understanding of adverse event reports; for example, if they know how or where to report adverse events?[31]

Survey Tools
General Information Questionnaire
It includes eight questions of basic information: department, gender, age (years), work experience (years), education level, professional title, job post, and employment status.

Reporting Awareness Questionnaire
The questionnaire was originally developed by Vincent[32] in the UK and modified by Tian et al[30] in China to assess nurses' reporting awareness of adverse events. It consists of eight items and is scored on a dichotomous scale, with "no" or "don't know" scoring 0, "yes" scoring 1, and a total score of 0 to 8. The higher the score, the higher is the level of reporting awareness. In the final study population, the Cronbach's α coefficient for this questionnaire was 0.758.

Reporting Intention Questionnaire
This questionnaire was designed by Throckmorton[33] in 2007 based on a literature review and translated by Tian et al[30] to evaluate nurses' intention to report five categories of adverse events of varying severity (potential vulnerability, no harm caused, causing minor harm but no treatment required, causing moderate harm, causing severe harm, or even death). Every category included three types of reporting (filling the reporting forms, reporting to the superior, or discussing with colleagues). Each type was assessed by a dichotomous scale, with "no" or "unclear" scoring 0 and "yes" scoring 1, for a total score of 0 to 15, with higher scores indicating a higher intention to report adverse events. In the final study population, Cronbach's α coefficient for this questionnaire was 0.858.

Reporting Barriers Questionnaire
This questionnaire was revised by Australian scholar Evans[34] and translated into Chinese by Tian et al[30] to evaluate health-care providers' self-perceived barriers to reporting adverse events, as in clinical departments. It consists of 22 items and is divided into three dimensions: barriers to reporting culture, reporting procedures, and perceptions of reporting benefits. It applies a 5-point Likert scale (1 = *strongly agree*, 5 = *strongly disagree*). The total score ranged from 22 to 110, with higher scores indicating that nurses perceived fewer barriers to reporting. In the final study population, Cronbach's α coefficient for this questionnaire was 0.917.

Data Collection
The questionnaire was edited by the first author via the Questionnaire Star platform (https://www.wjx.cn, Changsha Ranxing Science and Technology, Shanghai, China), and a link/QR code was generated after another researcher checked the questionnaire content, item, and response options. A pilot test was conducted in five nurses from the nursing department to ensure that the questionnaire content was correct. A formal online survey was conducted from April 11 to April 25, 2020. The researchers contacted the director of nursing department and obtained informed consent from each hospital. At the regular meeting of the head nurses, the director of the nursing department described the benefits of the research and issued the survey task. Each ward's head nurse assisted in sending the questionnaire link and QR code to the WeChat group. The potential participants clicked the link/QR of the questionnaire and filled it after they read and signed the informed consent form. The "Back to Previous" button in the Questionnaire Star platform allowed respondents to examine and edit their responses. Each WetChat or IP address is only permitted to respond once. In

this study, the questionnaire links were distributed to 1734 potential participant, among which, first survey page visitors were 1708 (view rate 98.50%), unique visitors who agreed to participate were 1646 (participation rate 96.37%), participants who finished the survey were 1565 (completion rate 95.08%). Removing 183 invalid questionnaires with missing items or regular responses or those taking less than 150 seconds or more than 60 minutes, a total of 1382 valid questionnaires were obtained, with an effective rate (ratio of valid questionnaires/the total collected questionnaires) of 88.31%.

Ethical Considerations

This online survey is completely anonymous and voluntary. The informed consent form was presented on the first page of the questionnaire, which described the purpose of the study, process, potential benefits and risks for nurses, the number of items (53 items) and length of time (about 10 minutes). An electronic version of the informed consent form was obtained prior to filling out the questionnaire. The collected data did not include any identifiable information about the nurses (eg, name, ID number). The data was stored on the first author's personal computer and was only accessible to the researcher with a password. This study was approved by the Institutional Review Board of the Affiliated Hospital of Xiangnan University (registration number: KY-2020000801). This study followed the ethical criteria outlined in the Helsinki Declaration of 1995 (revised in Edinburgh in 2000). Respondents who complete the survey will receive a gift worth roughly 2 yuan (equivalent to 0.2786 $).

Data Analysis

Data were analyzed using SPSS 25.0 statistical software (IBM Corp., Armonk, NY, USA). Frequencies and percentages were used to describe the categorical variables. For non-normally distributed continuous variables, the median and interquartile range were used to describe the data, and univariate analysis was performed using Mann–Whitney U and Kruskal–Wallis H-tests for comparisons. Means and standard deviations (Mean±SD) were used to describe normally distributed continuous variables, and statistical analyses were performed using two independent sample t-tests and analyses of variance, with LSD methods applied for further comparisons between groups. Spearman analysis was used to analyze the association between the reporting awareness, reporting barriers, and reporting intention scores. Stepwise multiple regression analyses were performed to explore the relevant factors of nurses' reporting intentions regarding adverse events. Significance was set at $P < 0.05$.

Results
General Characteristics of the Sample

The participants were 1282 (92.76%) women and 100 (7.24%) men. The respondents ranged in age from 21 to 58 years (mean age = 33.29 ± 7.41 years). More than half (n = 785, 56.80%) had an associate degree, 368 (26.63%) had a bachelor's degree or above, and 16.57% (n = 229) had a secondary technical degree. Four-hundred forty-nine nurses (32.49%) had 1–4 years of work experience, 446 (32.27%) had 5–10 years, and the rest (n = 487, 35.24%) had worked for more than 10 years. About 70% (n = 954, 69.03%) had a junior professional title, followed by nurses with an intermediate professional title (n = 337, 24.38%), and only 6.58% (n = 91) had senior professional titles. Most (n = 1224, 88.57%) were clinical front-line nurses, and 158 (11.43%) were clinical front-line head nurses. About one-quarter (26.98%, n = 373) were employed permanently, 68.31% (n = 944) were on contract, and 4.70% (n = 65) were employed by other forms (eg, secondment).

The Scores of Nurses' Reporting Awareness, Intention, Barriers in Adverse Events

Nurses' reporting awareness scores for adverse events ranged from 1 to 8, and the median score was 8 (1). The total score of reporting intention ranged from 0 to 15, with a median of 15 (0). For nurses' reporting intention by severity of adverse events, see Table 1. Besides, the total score of reporting barriers was 83.04 (± 12.21). The average scores of the three dimensions in the perceptions of reporting benefits, reporting procedure, and reporting culture were 4.07 (± 0.70), 3.74 (± 0.81), and 3.65 (± 0.82), respectively.

Table 1 Nurses' Reporting Intention by Severity of Adverse Events (N = 1382)

Adverse Events	Completed the Reporting Forms		Reported to One's Superior		Discussed with Colleagues	
	n	%	n	%	n	%
Potential vulnerability	1210	87.55	1326	95.95	1354	97.97
No harm caused	1215	87.92	1300	94.06	1330	96.24
Causing minor harm but no treatment required	1275	92.26	1333	96.45	1342	97.11
Causing moderate harm	1353	97.90	1367	98.91	1352	97.83
Causing severe harm or death	1356	98.12	1365	98.77	1339	96.89

Factors Associated with Nurses' Reporting Awareness, Intention, Barriers in Adverse Event

The factors associated with nurses' reporting awareness, intention in adverse events are shown in Table 2. Table 3 describes the differences in reporting barriers scores with participants' demographic characteristics.

Table 2 Comparison of Reporting Awareness and Reporting Intention Scores of Respondents with Different Characteristics (N = 1382)

Variables	n	Reporting Awareness			Reporting Intentions		
		Mean Rank	Z/H	P	Mean Rank	Z/H value	P
Gender			0.454	0.650		0.420	0.675
Female	1282	692.74			692.42		
Male	100	675.63			679.73		
Age/years			29.654	<0.001		11.259	0.004
21–30	651	638.26			719.19		
31–40	509	723.06			664.29		
≥ 41	222	775.28			672.69		
Work experience (years)			33.509	<0.001		10.693	0.005
1–4	449	620.31			725.40		
5–10	446	690.74			688.09		
> 10	487	757.84			663.36		
Education level			13.577	0.001		6.336	0.042
Secondary technical	229	687.89			647.54		
Associate degree	785	665.26			701.90		
Bachelor degree or above	368	749.71			696.67		
Professional title			46.814	<0.001		16.454	< 0.001
Junior	954	652.76			711.98		
Intermediate	337	746.57			637.79		

(*Continued*)

Table 2 (Continued).

Variables	n	Reporting Awareness			Reporting Intentions		
		Mean Rank	Z/H	P	Mean Rank	Z/H value	P
Senior	91	893.68			675.68		
Job post			7.479	<0.001		0.667	0.505
Clinical front-line nurses	1224	665.25			693.38		
Clinical front-line head nurses	158	894.85			676.95		
Employment status			23.299	<0.001		7.695	0.021
Permanent (formal)	373	756.84			655.84		
Contractual	944	675.14			705.12		
Other	65	554.08			698.27		

Table 3 Differences in Reporting Barriers Scores with Participants' Demographic Characteristics (N = 1382)

Variables		Scores	t/F	P
Gender	Female	82.97 ± 12.14	0.806	0.420
	Male	83.99 ± 13.16		
Age/years	21–30	84.68 ± 12.30	12.033	< 0.001
	31–40	81.21 ± 12.51		
	≥ 41	82.45 ± 10.57		
Work experience (years)	1–4	85.35 ± 11.93	12.042	< 0.001
	5–10	82.02 ± 12.81		
	>10	81.85 ± 11.62		
Education level	Secondary technical	82.68 ± 10.30	1.812	0.164
	Associate degree	83.57 ± 12.45		
	Bachelor degree or above	82.15 ± 12.77		
Professional title	Junior	83.68 ± 12.38	4.493	0.011
	Intermediate	81.39 ± 12.04		
	Senior	82.45 ± 10.50		
Job post	Clinical front-line nurses	82.85 ± 12.32	1.631	0.103
	Clinical front-line head nurses	84.53 ± 11.29		
Employment status	Permanent (formal)	81.59 ± 11.48	3.972	0.019
	Contractual	83.49 ± 12.47		
	Other	84.80 ± 12.02		

Table 4 Stepwise Regression Analysis of Factors Influencing Registered Nurses' Intention to Report Adverse Events (N = 1382)

Dependent Variable	Independent Variables	β	SE	β'	t	P
Reporting intention in adverse events	Constant	8.641	0.407		21.253	<0.001
	Total reporting barrier score	0.040	0.004	0.274	10.697	<0.001
	Total reporting awareness Score	0.377	0.046	0.212	8.253	<0.001
	Professional title	−0.236	0.073	−0.081	3.214	0.001

Note: F = 81.522, $P < 0.001$, $R^2 = 0.151$.

Relationships Between Reporting Awareness, Reporting Barriers, and Reporting Intention Scores

The reporting intention scores were weakly positively correlated with the reporting awareness scores (r_s=0.237, $P < 0.001$) as well as the total scores of reporting barriers (r_s=0.361, $P < 0.001$), the scores of reporting culture (r_s=0.392, $P < 0.001$), and the scores of the perceptions of reporting benefits (r_s=0.341, $P < 0.001$).

Factors Influencing Nurses' Intention to Report Adverse Events

Seven variables—age, working experience, education level, professional title, employment status, reporting awareness, and reporting barriers—were included in the regression analysis. Stepwise regression analysis was performed at α-in and α-out of 0.05 and 0.10, respectively. The results of multiple regression analysis are shown in Table 4.

Discussion

This study found that nurses in tertiary hospitals have self-reported high levels of awareness and intention to report adverse events, which is better than previously reported by Chegini et al[35] and Chiang et al.[36] Many countries have tried to implement patient safety education programs and ensure the quality of patient care.[37,38] Similarly, the Chinese National Health Commission[39] also emphasized the importance of adverse event reporting and issued a series of policies on how to improve the adverse event reporting system and encourage nurses to actively report adverse events. Besides, tertiary hospitals have made considerable efforts in medical quality and patient safety issues, such as simplifying the reporting process of adverse events, initiating non-penalties and rewards, and strengthening training on the adverse event reporting process and reporting system.[40] Consistent with previous studies,[41,42] we also found that the more serious the adverse event, the more willing nurses were to fill out the reporting form. This may be because adverse events that cause serious harm are frequently too complex for nurses to handle on their own, necessitating formal reporting for systematic ameliorating actions and multidisciplinary teamwork to decrease undesirable effects.[43]

Nurses in this study reported high scores of perceived reporting barriers to adverse events, better than previous studies by Tang et al.[44] With the advent of the era of smart healthcare, the web-based reporting management system and cloud technology have become widely applied in a variety of hospitals, which allows health-care providers' anonymous and voluntary reporting.[45] Among the three dimensions, the perceptions of reporting benefits gained the highest score, while the reporting culture scored the lowest. This finding is similar to those of Han et al[46] and Woo et al,[47] who revealed that nurses were unconfident in the policy on non-punitive responses to adverse events and considered punishment as the leading barrier they were unwilling to report. Encouraging reporting efforts may require some cultural change. It is important that all health-care organizations consider mistakes as a valuable learning opportunity to improve patient safety rather than as a personal failure.

The results showed that nurses' reporting awareness of adverse events increased with age, length of employment, and level of professional title. This coincides with the findings of Biresaw et al,[48] which may be because older nurses with high professional title tend to have more work experience and a better perception of patient safety.[49] This study found that formal nurses had a higher reporting awareness of adverse events than nurses in other employment forms. Perhaps, this is due to the fact that 90% of the formal nurses in this study had worked for more than ten years and may have received more patient safety training, resulting in increased reporting awareness. The reporting awareness of adverse

events among undergraduate or higher degree nurses was higher than that of secondary technical and associate degree nurses, which is consistent with the results of Brasaite et al.[50] This finding could be because respondents with high education qualifications might take some courses directly or indirectly related to patient safety or might better perceive patient safety as a result of reform of nursing higher education. Besides, head nurses are more aware of adverse event reporting than clinical front-line nurses. As leaders, they have a responsibility to ensure patient safety.

Young nurses (21–30 years old) with short clinical working experience (<4 years) and junior professional title perceived fewest reporting barriers and had highest reporting intentions, similar to the survey conducted by Jang et al.[51] This could be related to the fact that junior nurses who have less work experience are more likely to seek assistance from nursing managers or colleagues owing to their unfamiliarity with health-care processes as well as a lack of clinical experience in dealing with adverse events independently. Adversely, older and more experienced nurses have more clinical experience and are more confident in their competence to manage adverse events.[52] Consistent with the findings of Chegini et al,[35] nurses with an associate, bachelor's, or higher degree had stronger intention to report intention than secondary technical nurses. Besides, formal nurses perceived most reporting barriers and self-reported lowest intentions. This finding was supported by a prior study by Khachien et al,[53] which revealed that the general perception of nurses with contract employment was significantly lower than that of the formal workforce in terms of disclosure of patient safety incidents. This study suggests hospital managers need to promote the behavioral intentions of older, longer working experience, and formal nurses with secondary technical degree to develop volunteer reporting.

The higher the nurses' reporting awareness, the stronger their reporting intention, which is consistent with the findings of previous studies.[54] According to the knowledge, attitudes, and practices model, knowledge is the premise and foundation of behavioral intention; that is, adequate knowledge promotes attitudes/beliefs and thus drives reporting practice/behaviors.[55] Nurses' reporting awareness of adverse event and their knowledge of the reporting systems and processes are prerequisites for developing reporting intentions and behaviors.

In addition, the score of barriers to reporting adverse events was significantly and positively correlated with reporting intention; that is, the more the nurses perceived barriers to reporting, the less their reporting intention. Of these, reporting culture had the greatest impact on nurses' intention to report adverse events, consistent with the findings of Yang et al[56] and Toren et al.[57] Previous studies have pointed out that fear of discrimination and punishment is the main reason why nurses do not volunteer to report adverse events.[58,59] Similar to Lee et al,[60] we also found that the perceptions of reporting benefits influences nurses' reporting intentions. However, unlike the findings of Mansouri et al,[61] the reporting procedure in this study did not correlate significantly with reporting intention, which may be related to the simplified reporting process of adverse events and easier accessibility of reporting systems in recent years.

Although univariate analysis showed that nurses' self-reported intention to experience adverse events was related to age, work experience, education level, and employment status, multiple regression analyses revealed no statistical significance. We assume that there may be multiple collinearity between these factors and professional titles. The findings show that hospital managers could enhance the reporting rate by raising nurses' reporting awareness and removing reporting barriers.

Limitations

Although multiple influencing factors were included in this study, the low explanatory variance suggests that many factors still have an impact on nurses' intention to report adverse events that have not been addressed. Future research should incorporate psychological, social, and environmental factors to further explore the factors that influence reporting intentions. The respondents were from only two tertiary hospitals, which may limit the generalizability of the results. Future studies need to expand the sampling scope. Furthermore, despite being anonymous, respondents may have provided more socially acceptable responses, which may explain the high scores for reporting awareness and reporting intention. This study used a cross-sectional design, which makes it difficult to infer causality. Qualitative designs could be used to learn more about how nurses' perceptions affect how they report adverse events, and prospective studies should be used to make the results more reliable.

Conclusion

The results showed that nurses had a relatively positive intention to report adverse events and their reporting intention increased with the severity of adverse events; however, awareness of proactive reporting of adverse events with potential vulnerability or no apparent harm could be enhanced. Nurses' professional titles, perceived reporting barriers, and reporting awareness were the main factors that influenced their reporting intentions. Hospital managers need to strengthen professional education and training for nurses who perceive high reporting barriers or have poor reporting awareness, as well as further improve the web-based anonymous reporting system and create a non-punitive culture to encourage nurses to report adverse events.

Ethical Approval

This study was approved by the ethics review committee of the Affiliated Hospital of Xiangnan University (no. KY–202008001).

Disclosure

The authors report no conflicts of interest in this work.

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