

BMJ Open Nurses' experiences of patient safety incidents in Korea: a cross-sectional study

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ABSTRACT

Objectives The aim of this study was to investigate the scope and severity of the second victim problem among nurses by examining the experiences and effects of patient safety incidents (PSIs) on them.

Participants/setting 492 nurses who had experienced PSIs and provide direct care in South Korean medical institutions.

Design A cross-sectional study with anonymous online self-report questionnaires was conducted to nurses in order to examine the experiences and effects of PSIs. Scales measuring post-traumatic stress disorder (PTSD) and post-traumatic embitterment disorder (PTED) were used for a more quantitative examination of the effects of PSIs. A χ^2 test was administered to find any difference in responses to difficulties due to PSIs between the direct and indirect experience of PSIs. Furthermore, linear regression analysis was conducted to investigate the factors related to scores on the PTSD and PTED scales.

Results A statistically significant difference was observed for participants who reported having experienced sleeping disorders, with those with direct experience showing 42.4% sleeping disorders and indirect experience at 21.0%. Also, there was a statistically significant difference between the 34.3% with direct experience and the 22.1% with indirect experience regarding having considered duty or job changes (resignation). Regression analysis showed total PTSD scores for indirect experience at 11.97 points (95% CI: -17.31 to -6.63), lower than direct experience. Moreover, those who thought the medical error was not involved in PSI had a total PTED score 4.39 points (95% CI: -7.23 to -1.55) lower than those who thought it was involved.

Conclusions A considerable number of nurses experienced psychological difficulties due to PSIs at levels that could interfere with their work. The effect of PSIs on nurses with direct experience of PSIs was greater compared with those with indirect experience. There need to be psychological support programmes for nurses to alleviate the negative effects of PSIs.

INTRODUCTION

Medical personnel who experience emotional pain due to unanticipated adverse events, medical errors and patient-related injuries are referred to as 'second victims'.¹ These second victims experience psychological

Strengths and limitations of this study

- This study examined the experiences and effects of patient safety incidents (PSIs) on nurses who had experienced PSIs and provide direct care in South Korean medical institutions through a questionnaire.
- We determined the Korean nurses' PSI experiences and impacts in various aspects, including post-traumatic stress disorder (PTSD) and post-traumatic embitterment disorder (PTED) scales.
- An analysis was conducted to determine whether there was a difference in responses to difficulties due to PSIs by direct versus indirect experiences.
- We examined the factors related to the PTSD and PTED scores by a linear regression analysis.
- Further researches that designed to compensate for limitation, such as self-selection and representativeness, are needed.

pain, fear, decreased confidence, guilt, rage, exhaustion and despair after patient safety incidents (PSIs),^{2 3} and such symptoms are interpreted as indicators of post-traumatic stress disorder (PTSD).⁴ If the experiences of second victims are not adequately treated, it can increase the likelihood of other errors due to fatigue, depression and/or reduced sympathy.^{5 6} It also leads to job changes and absences, negatively affecting the medical institution⁷ and efforts and approach to support second victims are required.

Since the term 'second victim' appeared in 2000,⁸ numerous studies have been conducted especially in the USA to investigate the second victim phenomenon and methods to support second victims. Discussions have continued in order to understand the prevalence and symptoms of second victims as well as to plan coping strategies and support programmes.^{2 3 9} Moreover, institutions such as the Institute for Healthcare Improvement and The Joint Commission have developed that provide guidelines to support second victims,^{10 11} and individual medical institutions have also implemented

support programmes for second victims.¹¹² Such activities are gradually spreading throughout the USA and some countries in Europe.⁶¹²⁻¹⁴

In South Korea, the *Patient Safety Act* was enacted in 2016 to establish the Korea Patient Safety Reporting and Learning System, building a foundation to systematically manage patient safety problems at the national level.¹⁵ However, the focus remains on cause analysis and error prevention in PSIs, with relatively limited perception and research on counselling and supporting second victims.^{16 17} A recent study by Lee¹⁵ showed that second victims who experience PSIs in South Korea undergo various emotional reactions such as confusion, guilt and depression, while also experiencing behavioural changes such as insomnia, avoidance and considering a job change, similar to findings in another previous study.³ A study by Kim *et al*¹⁸ also showed that the effects of PSIs as perceived by Korean nurses were similar to those observed in a study in the USA.⁷ This implies that the second victim phenomenon manifests similarly regardless of culture. Therefore, considering a study that has shown that all medical personnel are potential PSI or error victims and that almost half of the medical personnel have had the experience of the second victimisation at least once in their clinical career,¹⁹ the second victim phenomenon cannot be overlooked further, in South Korea as well.

A large number of patients are assigned to each South Korean nurse, and nurses have to provide various nursing services, such as the administration of medication and aid, within a set time. This environment occasionally affects nurses in a negative manner, which leads to exhaustion, disappointment and despair at being unable to provide adequate treatment to patients.²⁰ This is also known to be the greatest factor leading nurses to consider changing jobs.²¹ In this context, further difficulties will be added if a second victim problem occurs to the nurse. Thus, it is necessary to understand the nurses' experience as second victims and to find ways of providing them with emotional support.

To this end, this study determined the Korean nurses' PSI experiences and impacts in various aspect, including PTSD and post-traumatic embitterment disorder (PTED) scales.

METHODS

This was a cross-sectional study within the overall project of examining the PSI experiences of the general public, physicians and nurses, and this study focused on the results of anonymous self-report online questionnaires administered to nurses. All participants were notified of the purpose and process of this study and only those who agreed to participate conducted this survey. Each participant received a 4500 won (about US\$3.7) coffee coupon.

Questionnaire development and content

The questionnaire was developed and composed to enable comparison with the PSI experiences of the

general public.²² Questionnaire items were developed by referencing literature on the types and characteristics of PSIs²³⁻²⁵ and previous studies on second victims.^{3 26} The draft questionnaire was developed based on repeated discussions held among the entire research team (including two physicians and three nurses who have abundant research experience on patient safety). The questionnaire items and expressions were then refined based on the opinions of a nursing professor, the president of the Korean Intern Resident Association and the Chief Executive Officer (CEO) of a patient safety Non-Governmental Organization (NGO). Furthermore, we conducted cognitive debriefing with three nurses to determine if there were any difficult or confusing parts in the survey questions or phrases.

The final questionnaire items can be classified as follows: (1) PSI characteristics; (2) the effects of PSI; (3) experience of disclosure of PSI and (4) sociodemographic items. This study focused on the (1) PSI characteristics and (2) the effects of PSI. In further detail, (1) PSI characteristics included covered type of PSI experience (direct or indirect), elapsed time since the most memorable PSI, type of the most memorable PSI (diagnosis-related, patient care-related, etc), level of harm caused by the most memorable PSI and opinion on medical error relatedness of the most memorable PSI. In (2) the effects of PSI, the effects of PSI and the difficulties caused by the most memorable PSI were examined in categories of 'sleep disorder'; 'eating disorder'; 'nausea, dyspnoea, cold sweats or stiffness in similar situations'; 'vigilance in similar situations' and 'consideration of duty or job changes'. Additionally, the PTSD and PTED scales were used for a more quantitative examination of the effects of PSIs. For (4) sociodemographic items, the participants' sex, age and elapsed time since license acquisition were collected. The full questionnaire can be found in the supplemental information (see online supplemental file 1).

PTSD and PTED scales

PTSD²⁷ and PTED²⁸ scales used in previous studies were adopted. The PTSD scale, designed to measure the past and present effects of trauma, is composed of 30 items. Responses for the PTSD scale were defined as follows: 1 point for 'strongly disagree', 2 points for 'disagree', 3 points for 'slightly disagree', 4 points for 'slightly agree', 5 points for 'agree' and 6 points for 'strongly agree'. The PTED scale, on exceptionally negative incidents in life, is composed of 19 items, used after modifying them to check the effects of the participants' most memorable PSI. Responses on the PTED scale were defined as follows: 1 point for 'strongly disagree', 2 points for 'disagree', 3 points for 'slightly disagree', 4 points for 'agree' and 5 points for 'strongly agree'.

Participants and questionnaire administration

Participants were nurses who had experienced PSIs and provide direct care in hospitals. The sample size of this study was determined in consideration of the study budget and

the sample size of similar preceding studies.^{22–25} Because this study focused on the analysis of current status rather than hypothesis testing, we did not set up parameters to determine sample size, such as effect size, alpha error and beta error. Furthermore, the sampling error was not available because the non-probability sampling method was used, but it was intended to overcome the representativeness problem by recruiting as many participants as possible.

Online self-assessment questionnaires were administered over approximately 2 months, from April 2019 to May 2019. Since nurses may be unfamiliar with terminology related to patient safety, definitions of such terms, including *patient safety*, *medical error*, *adverse event* and *patient safety incident*, were provided prior to the survey.^{23 29 30} The survey was promoted via online blog posts and word-of-mouth among colleagues, and participants were gathered through snowball sampling. Participants were blocked from responding to the questionnaire more than once from the same IP address, to prevent possible repeated participation in the survey.

Analysis

First, the sociodemographic factors and experienced PSI characteristics were examined through a frequency analysis. A X^2 test was conducted to determine whether there was a difference in responses on difficulties due to PSIs by direct versus indirect experiences. To analyse the results of the PTSD and PTED scales, total scores derived by aggregating the item responses for each scale were used for analysis. The range of total scores of the PTSD and PTED was from 30 to 180 and from 19 to 95, respectively. A linear regression analysis was conducted to examine the factors related to the PTSD and PTED scores, which were used as dependent variables. Sociodemographic factors (sex, age and career stage), type of PSI experience (direct and indirect), level of harm, elapsed time since PSI and opinion on medical error relatedness of the PSI (Yes, No, I do not know) were included as independent variables. Participants who had experienced PSIs both, directly and indirectly, were classified under direct experience.

Microsoft Excel 2007 was used to organise data, and all data analysis was conducted with Stata/SE V.13.1 (StataCorp, Texas, USA). Results were deemed statistically significant at a p value <0.05 .

Patient and public involvement

Patients or the public were not involved in the study design.

RESULTS

Sociodemographic characteristics

A total of 492 nurses responded to the survey (table 1). The absolute majority of the participants were female (470, 95.5%). The largest number of participants were in their 30s (244, 49.6%) in terms of age, with the greatest number having acquired their license between 10 and 20 years previously (183, 37.2%), followed by 5 to <10 years (173, 35.2%) and <5 years (112, 22.7%).

Table 1 Sociodemographic information

Variables	Frequency	%
Sex		
Male	22	4.5
Female	470	95.5
Age group		
20s	195	39.6
30s	244	49.6
40s	40	8.1
≥ 50	13	2.7
Career after license acquisition		
<5 years	112	22.7
5 to <10 years	173	35.2
10 to <20 years	183	37.2
≥ 20 years	24	4.9
Total	492	100.0

Characteristics of PSI experiences

A total of 492 nurses provided responses regarding the characteristics of their PSI experiences. In total, 297 nurses (60.4%) responded that they had directly experienced PSIs, while 195 (39.6%) had indirectly experienced them, through seeing or hearing of a coworker's incident. The largest number of memorable PSIs had occurred within 1 to <5 years (205, 41.7%). For types of memorable PSIs (multiple responses possible), most were related to transfusion or intravenous injections (334, 67.9%), followed by PSIs related to patient care (269, 54.7%) and PSIs related to surgical procedure or treatment (104, 21.1%). Most PSIs were unharmed, according to 219 responses (44.5%), while incidents that resulted in permanent disability and in death were 23 (4.7%) and 41 (8.3%), respectively. A total of 297 participants (60.4%) believed that there had been medical error involved in the PSI, while 119 (24.2%) and 76 (15.4%) believed that medical error was not present and was uncertain, respectively (table 2).

Difficulties following direct and indirect experience of PSIs

Examining difficulties due to PSIs based on experience type, a statistically significant difference was observed, as 42.4% of those with direct experience but only 21.0% with indirect experience responded that they had experienced sleeping disorder due to the PSI. 33.3% of nurses with direct experience and 18.5% with indirect experience claimed to have experienced eating disorders. Statistically significant differences were also observed in experience of symptoms of nausea, dyspnoea, cold sweats or body tension when exposed to a similar situation, affecting 31.3% with direct experience and 21.5% with indirect experience. The difference between the 34.3% with direct experience who had considered changing duties or job (resignation) compared with the 21.1% with indirect experience who had was also found to be statistically significant (table 3).



Table 2 Characteristics of PSIs experienced by research participants

Item	Frequency	%
PSI experience		
Direct experience	115	23.4
Indirect experience via seeing or hearing an incident experienced by a coworker at the same medical institution	195	39.6
Both direct and indirect experiences	182	37
Elapsed time since PSI		
<1 month	35	7.1
1 to <6 months	68	13.8
6 months to <1 year	65	13.2
1 to <5 years	205	41.7
≥5 years	119	24.2
Types of memorable PSIs (multiple responses)		
PSIs related to diagnosis (misdiagnosis, delayed diagnosis, etc)	63	12.8
PSIs related to transfusion or intravenous injection (drug and transfusion complications, etc)	334	67.9
PSIs related to patient care (occurrence of falls, pressure ulcers, suicides, etc)	269	54.7
PSIs related to surgical procedure or treatment (postendoscopy enterobrosia, etc)	104	21.1
PSIs related to infections (surgical site infections, catheter-associated urinary tract infection, etc)	87	17.7
Other PSIs	26	5.3
PSI level of harm		
No harm	219	44.5
<1 month required for harm recovery	138	28
1 to <6 months required for harm recovery	50	10.2
≥6 months required for harm recovery	21	4.3
Resulted in permanent disability	23	4.7
Death	41	8.3
Medical error relatedness of PSIs		
Yes	297	60.4
No	119	24.2
I do not know	76	15.4
Total	492	100

PSIs, patient safety incidents.

PTSD-related and PTED-related factors

Linear regression results to find factors related to total PTSD and PTED scores of survey participants can be found in table 4. PTSD scores were around 12.98 points (95% CI: -25.68 to -0.29) lower for females compared with males, and 11.73 points (95% CI: 3.50 to 19.97) higher for nurses in their 30s and 13.60 points (95% CI: 1.58 to 25.63) higher for those in their 40s or older compared with nurses in their

20s. Furthermore, total PTSD score was 11.97 points (-17.31 to -6.63) lower for indirect experience compared with direct experience, and tended to decrease with increased elapsed time since the PSI. Finally, total PTSD score was 10.20 points (95% CI: -16.52 to -3.88) lower for nurses who did not believe that there had been a medical error compared with those who did.

PTED showed similar trends to PTSD scores were around 6.51 points (95% CI: -12.21 to -0.81) lower for women than men, increased with age and decreased with time elapsed since PSI. Additionally, PTED scores were 4.39 points (95% CI: -7.23 to -1.55) lower for those who did not think that there had been a medical error compared with those who did.

DISCUSSION

In this study, a questionnaire was administered to nurses who had experienced PSIs to investigate the impacts of PSIs, the difference in difficulties resulting from PSIs between direct and indirect experience and factors related to post-PSI experience of PTSD and PTED. The characteristics of and difficulties resulting from PSIs experienced by 492 nurses were explored and the effects of incidents examined from various perspectives using the scores and factors affecting PTSD and PTED. While there have been previous studies in South Korea that examined the experiences of medical personnel who experienced error,¹⁷ the coping process of medical personnel after experiencing PSIs²⁶ and nurses' two-dimensional and three-dimensional experiences of PSIs,¹⁸ almost no studies have been conducted on the topic of this study, that is, measuring factors relating to post-trauma and the difference between direct and indirect experience on the effects of PSI from various angles. A notably significant aspect of this study is that it verifies the need for support for nurses who experience PSIs and establishes base data and factors that can be considered when developing and implementing such support programmes.

In this study, the most memorable type of PSI according to nurses was PSI related to transfusion or intravenous injection (67.9%), followed by PSI related to patient care, such as the occurrence of falls and pressure ulcers. According to the Korea Patient Safety Reporting and Learning System, falling followed by medication error was reported to be the most frequent PSI by type, and in medication error reports, nurses appeared the most frequently under related personnel.³¹ Despite the need to focus while administering medication given its potentially dangerous nature, interruption and disturbances during its measurement and administration are common due to inhibitors such as receiving telephone calls, patient and guardian reception and communication with other health and medical personnel.²⁰ Previous research reports that the risk of medication error increases due to such disturbances,³² and that such medication error negatively affect nurses personally and professionally.^{4,33} There is a necessity to reduce the negative effects of such PSIs

Table 3 Difficulties following direct and indirect experience of PSIs

Categories	Direct (N=297)		Indirect (N=195)		P value	95% CI for difference	
	n	%	n	%		Lower (%)	Upper (%)
Experienced sleep disorders	126	42.4	41	21.0	<0.001	13.4	29.4
Experienced eating disorders	99	33.3	36	18.5	<0.001	7.2	22.5
Experienced symptoms of nausea, dyspnoea, cold sweats or body tension when exposed to a similar situation	93	31.3	42	21.5	0.017	2.0	17.6
Hypervigilance towards a similar situation	120	40.4	68	34.9	0.217	-3.2	14.2
Considered changing duties or job (resignation)	102	34.3	43	22.1	0.003	4.4	20.2

PSIs, patient safety incidents.

by recognising the common PSI experiences of nurses, analysing their causes and re-educating nurses based on the results.³³

In all, 60.4% of the nurses who participated in this study had experienced PSIs. They can be seen to have frequent exposure to PSIs, as they are generally the medical

Table 4 Regression analysis of factors related to PTSD and PTED instrument scores

Factors	PTSD			PTED		
	Coefficient	95% CI		Coefficient	95% CI	
		Lower	Upper		Lower	Upper
Gender						
Male	Ref			Ref		
Female	-12.98	-25.68	-0.29	-6.51	-12.21	-0.81
Age group						
20s	Ref			Ref		
30s	11.73	3.50	19.97	5.83	2.13	9.52
≥40s	13.60	1.58	25.63	9.70	4.30	15.10
Career						
<5	Ref			Ref		
5-10	5.18	-2.69	13.05	2.16	-1.37	5.70
≥10	-4.64	-15.15	5.87	-3.08	-7.80	1.64
Level of harm						
<1 month	Ref			Ref		
≥1 month	5.18	-2.38	12.74	4.77	1.38	8.17
Permanent disability or death	-3.64	-11.50	4.23	-0.97	-4.50	2.56
Experience of PSIs						
Direct experience	Ref			Ref		
Indirect experience	-11.97	-17.31	-6.63	-1.48	-3.88	0.92
Elapsed time since PSIs						
<6 months	Ref			Ref		
6 months to <5 years	-7.64	-14.42	-0.86	-5.12	-8.17	-2.08
≥5 years	-11.02	-19.60	-2.44	-6.64	-10.49	-2.79
Medical error relatedness of PSIs						
Yes	Ref			Ref		
No	-10.20	-16.52	-3.88	-4.39	-7.23	-1.55
I do not know	-4.70	-12.08	2.68	-3.81	-7.12	-0.49

PSIs, patient safety incidents; PTED, post-traumatic embitterment disorder; PTSD, post-traumatic stress disorder.



professionals who work most closely with patients.³⁴ Harrison *et al*³⁵ also found that nurses report more negative emotions after a medical error, and this result was attributed to the nursing culture and the fact that nurses are in direct contact with the patients. In this regard, difficulties due to direct and indirect PSI experiences were examined separately in this study, and statistically significant differences between those with direct and indirect experience were seen for a sleep disorder, eating disorder, symptoms such as nausea and dyspnoea when exposed to a similar situation, and consideration of job or duty changes. There was a difference between direct and indirect experience on PTSD and PTED scale scores as well, with the PTSD scores for those with indirect experience being statistically significantly 11.97 points lower than for those with direct experience. As such, it was found that nurses who directly experience PSIs are affected to a greater degree in terms of psychological and physical symptoms as well as consideration of job changes. This is similar to the findings of Van Gerven *et al*³⁶ in which medical personnel who had experienced a PSI in the past 6 months showed higher problematic medication use, burnout risk and intention to change jobs compared with those who had not. In another study, physicians who had experienced an adverse event or a near miss were reported to have lower confidence, sleep disorder and tension regarding the occurrence of PSIs.³⁷ Sleep disorder and symptoms of nausea, dyspnoea and body tension in particular directly influence patient safety, as they may cause additional PSIs.³⁸ Therefore, psychological and administrative support must be provided to nurses exposed to PSIs, to minimise the negative effects on the psychological state of nurses and, by extension, on patient safety; in particular, nurses who directly experienced the incident should be prioritised for support and aid.

PTSD and PTED scores tended to significantly decrease as more time passed after a PSI. However, existing studies indicate that second victims actively try to overcome trauma after its occurrence and that such efforts may heal the wound but leave a scar.^{2 26} In a study by Vanhaecht *et al*³⁹ symptoms such as hypervigilance, flashbacks, shame and doubts about one's knowledge and skill continued for >6 months in some cases. Such results can be interpreted to mean that while postincident trauma and frustration fade with time, they are not completely resolved and that the type of difficulties varies across the stages. Thus, temporal factors such as whether it is immediately after the incident, medium-term or long-term must be considered in developing second victim support programmes,²⁶ and second victims must be managed so that such aid is seamlessly provided.

Existing research shows increased emotional difficulty when there is a possibility of medical malpractice,⁴⁰ which was also seen in this study, as PTSD and PTED scores were found to be higher when there was a belief that medical error was present. On this note, a qualitative study on second victims expressed the need for institution-level support relating to medical malpractice and administrative processes that could result from PSIs.²⁶ Scott *et al*¹ also

proposed that long-term support and risk management directions should also be provided during legal proceedings stemming from PSIs if necessary. Medical malpractice cases are on the rise in South Korea, and nurses face increased risk of being involved in medical malpractice as their scope of work has expanded with the revisions to the *Medical Service Act*. As such, administrative and legal support, in addition to psychological support, should be provided if necessary.

The limitations of this study are as follows. First, this was a cross-sectional study on the PSI experiences and difficulties of the participants, and we promoted participants through online blog posts and snowball sampling. Therefore, it is limited in its ability to assess change over time. According to existing research on the coping process of second victims, their experiences of PSIs and their impacts must be studied longitudinally as they undergo change over time.^{2 26} Also, many of the study participants were female and younger nurses. In particular, with fewer male participants, the interpretation of gender comparisons should be careful, and further research that is designed to compensate for limitation is needed. Second, in this study, we did not identify the participants' work setting. According to Lewis *et al* characteristics of the work unit such as the overall environment of the nursing unit, nurse manager and so on were important to nurses' experiences of PSIs,⁴¹ further research that includes the characteristics of the nursing unit is needed. Third, as participants were asked about their most memorable PSI, the possibility of recall bias regarding the characteristics and difficulties of their PSI experiences in their responses should be kept in mind when interpreting the data. Besides, follow-up studies should identify and analyse in detail the number and range of PSIs experienced by nurses. Fourth, the response rate was not obtained due to the methodological limitations of the anonymous self-report online survey. Accordingly, information on the characteristics of those who refused to participate in the survey was not collected to ensure the anonymity of the participants. This limitation may restrict the representativeness of this study, but this study sought to overcome this problem by taking as many nurses as possible into the survey.

Despite the above limitations, a major source of the significance of this study is that it analysed the impacts of PSI experiences of nurses and the factors related to subsequent trauma from various angles. It showed that nurses who experienced PSIs face difficulties such as sleep disorder, eating disorder and nausea and dyspnoea in similar situations, an impact that was more prominent in nurses who directly experienced PSIs. Furthermore, the examination of PTSD-related and PTED-related factors for PSIs revealed their differential relation to direct and indirect experiences, elapsed time and the presence of medical error. Second victim support programmes that can provide realistic help to nurses who have experienced PSIs must be developed, reflecting the results of this study. Moreover, to fully support second victims there need to be efforts to create a broader patient safety culture, with the active participation of the government and medical institutions.

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