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Behaviors to Prevent Needle Stick Injury Among Nursing Students : A Systematic Literature Review

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Abstract

The highest incidence of accidents and safety issues among nursing students during clinical practice is needle stick injury (NSI). Various efforts have been made to develop behaviors that prevent such incidents. This study is a literature review adapted from the Arskey and O'Malley framework. The Prisma-Scr flowchart was used to display the literature search flow. Articles for this study were searched using five search engines: PubMed, Sage, Wiley, Scopus, and ScienceDirect. The keywords used for literature search were occupational injury OR accidental AND needlestick injury AND nursing student AND program. The inclusion criteria used were publication between 2013 and 2023, articles in English, and a focus on preventing needle stick injuries among nursing students. The review results showed that there were 25 potentially relevant articles, and 10 articles met the selection criteria. The articles were from several different countries, and 10 articles that met the criteria used quantitative and qualitative designs. This review revealed three themes, namely the incidence of needle stick injuries among nursing students, nursing students' understanding of preventing NSI, and efforts to prevent NSI. NSI incidents still occur among nursing students who conduct clinical practice in hospitals. Nursing students' understanding of preventing NSI is obtained through education from academic institutions and hospitals. Efforts to improve knowledge, attitudes, and behaviors to prevent NSI are carried out through education, training, the use of safe needles, and communication.

INTRODUCTION

Needle stick injury (NSI) is a mechanical pathogen hazard that poses a threat to nurses at work. The main exposure to pathogen hazards for healthcare workers is NSI. This threat is also experienced by nursing students who practice using needles in clinical settings (Lucas, Ruan et al., 2020).

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The incidence of NSI among nursing students and nurses in both developed and developing countries remains high. Based on research from various countries, the incidence of NSI among nursing students is 9.4-61.9%, while NSI experienced by students practicing in clinical settings is as high as 4.9 times/year (Johnson et al., 2023).

The prevalence of NSI is such that nearly two-thirds of students experience at least one NSI exposure (Saleh et al., 2023). Most injuries (71.9%) occur during medication preparation and administration. The main cause of NSI reported by nursing students was the reinsertion of needles (59%) (Al Qadire et al., 2021). Another study of nursing students reported 35% NSI and 63% did not report needle stick injuries (Xu et al., 2022). Nursing students who experienced NSI (more than three times in the past year) reported lower rates of all domains of needle stick injuries compared to other groups (Mean = 1.5, SD = 1.1; Mean = 19.5, SD = 1.1; Mean = 9.5, SD = 1.1, respectively) (Tuncer et al., 2024). This indicates that there has been a decrease in the incidence of NSI from year to year as students perform injections in clinical practice settings, but NSI incidents still occur among students.

Data on nursing students conducting clinical practice in hospitals consists of Diploma 3 students, Diploma 4 students, Bachelor's Program students, Nursing Professional Program students, and Master's Program nursing students. The incidence of NSI among these students is still relatively high, especially since some students do not report NSI incidents, thus requiring efforts to prevent these incidents. (WHO, 2018).

The impact of NSI includes physical, psychological, social, and economic effects. The American Nurses Association (2002) states that the main factor causing the transmission of infectious diseases is HIV. The psychological impact of NSI includes anxiety, insomnia, depression, loss of appetite, and post-traumatic stress (Xujun et al., 2015). This will also have an impact on social problems.

Efforts to prevent NSI are an implementation of the control/supervision function of managers in ensuring the achievement of nursing service quality indicators. This is also one of the hospital accreditation indicators and part of the fifth patient safety goal (Kwanzaa et al., 2020). Based on research conducted in several countries on efforts to prevent NSI incidents, which internationally refer to the Bloodborne Pathogens Standard, Title 29 Code of Federal Regulations, Part 1910.1030 and the Occupational Safety and Health Association (OSHA), Injection for Safety WHO, the Registered Nurse Association, and various occupational safety and health guidelines (Clarke & Leh, 2023).

The purpose of this literature review is to provide the latest scientific evidence related to efforts to prevent NSI among nursing students. This literature review is expected to be useful for broadening knowledge and understanding the importance of efforts to prevent NSI.

MATERIALS AND METHOD

This study used a literature review method by adapting the Arskey and O'Malley framework for the literature review stage and the Prisma-Scr Checklist for the literature source selection method. The article search in this study used five search engines, namely PubMed, Sage, Wiley, Scopus, and ScienceDirect. The keywords used for literature search were occupational injury OR accident AND safety AND nursing student AND needle stick injury. The inclusion criteria used were publication between 2010 and 2023, articles in English, and a focus on needle stick injury prevention behavior in nursing students.

There were 25 potentially relevant articles, and 10 articles met the selection criteria. Articles from several countries, 10 articles that met the criteria used qualitative and quantitative designs. The inclusion criteria used were published between 2013 and 2023, articles in English, focusing on efforts to prevent needle stick injuries in nursing students. The review included: 1) identification of review questions; 2) identification of relevant articles; 3) article selection; 4) compiling, summarizing, and reporting results (data presentation) (Arksey & O'Malley, 2005).
Identification of review questions

In developing the topic focus and literature search strategy for formulating literature review questions, researchers applied the Population, Intervention, Comparison, Outcome, and Study Design (PICOS) framework.

Table 1. Framework PICOS

P (Population)	**I (Intervention)**	**Comparison**	**Outcome**	**S (Study Design)**
Student nurse *Nurse* *Nursing student*	*Occupational Accidents* *Needle stick injury*			*Any artical related*

Identification of relevant articles
In identifying relevant literature articles, the author determined the inclusion and exclusion criteria. The inclusion and exclusion criteria are as follows:

Table 2. Inclusion Criteria Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
a. Articles discussing efforts to prevent needle stick injuries b. Articles published between 2010 and 2023 c. Articles in English d. Complete and accessible articles	a. Opinion papers b. Populations other than nurses

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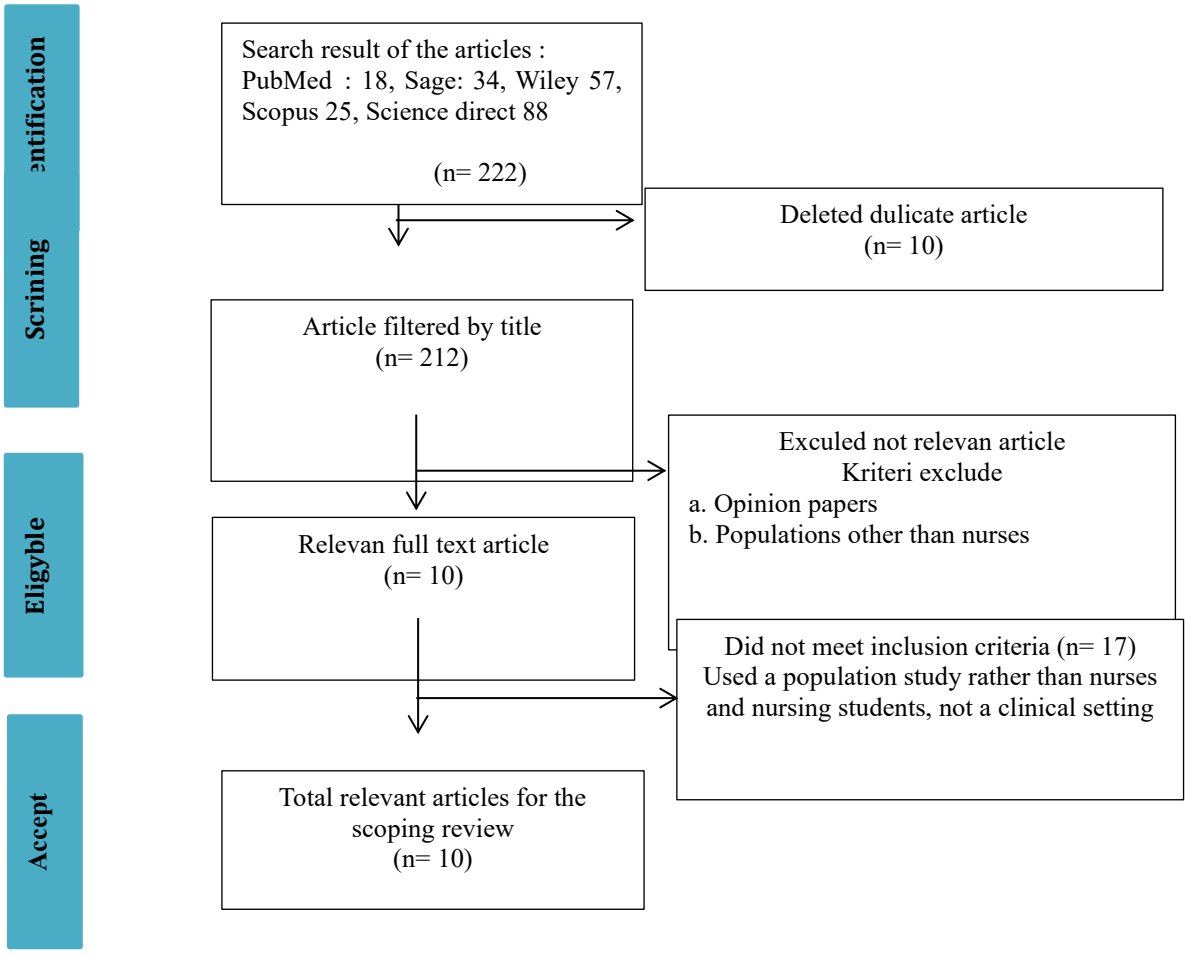

Table. 3 Charting Data

No	Research Title/Author/Year	Country	Objective	Research Type	Desain Study	Population, Sample, Research Instrument	Result
	Occupational Health Cognizance: Needle stick injuries among student nurses Rakhi Mishra a,* , Suresh K. Sharma a , Puneet K. Gupta b , Pratima Gupta b , C. Vasantha Kalyani (2021)	India	This study was conducted to determine the relationship between OH assessment and NSi responsibility.	Quantitative	Corelation, cross sectional	312 Student Nurses using structured, selfadministered questionnaire	The overall prevalence of occupational hazard with needlestick Injuries (NSIs) was 25%. Lack of concentration (55%), performing activities in a hurry (50%) recapping of needle (45%) and not participating in training (39%) were the major attributing components for NSIs.

No	Research Title/Author/Year	Country	Objective	Research Type	Desain Study	Population, Sample, Research Instrument	Result
							Behavioural factors (28%) were one of the chief components leading to NSIs The factors that were significantly associated with NSIs include Academic year (P = 0.000), source of information (p = 0.018) and immunization Status (p = 0.000). Conclusion: NSIs may give deadly infectious diseases. Hence, strong reporting and recording system must be implemented.
	Factors contributing to needle stick injuries among new registered nurses at a hospital in Trinidad Caimete Smith Kwanzaa, Keshmer Clarke, Christine Ramlal, Rabindranath Singh, Oscar Noel Ocho* (2020)	Trinidad .	s a quantitative, descriptive study	cross-sectional	Registered nurses (N Z 120) with less than three years' experience. Data collected using a 26-item questionnaire among newly registered nurses. Data were analyzed descriptively and inferentially using (SPSS) version 20		Hasil: : Most of the nurses between the ages 20e30 years (49.7%), were female (73.4%), had 2 to < .01), having updated policies (r Z .404, p < .01) and the appropriate use of resources (r. Z 805, p < .01). Conclusion: There are a number of factors that contribute to NSIs among newly registered nurses which are personal as well as structural. Avoidable

No	Research Title/Author/Year	Country	Objective	Research Type	Desain Study	Population, Sample, Research Instrument	Result
							practices such as non-adherence to standard precautions while using hypodermic needles contributed to NSIs. Mandatory training and evaluation of nurses' knowledge and attitude regarding safety practices should be examined..
	Risk analysis of needle stick and sharp object injuries among health care workers in a tertiary care hospital (Saudi Arabia) Ziad A. Memish, Abdullah M. Assiri *, Mervat M. Eldalatony 1 , Hanan M. Hathout 2 , Hend Alzoman, Monabae Undaya (2013)	Arab Saudi	To study different risk factors associated with needle stick injury among health care workers of a tertiary care hospital in Saudi Arabia..	Quantitaive	Retrospective study involving all reported cases of needle stick and sharp object injury among health care workers		During the study period, 477 needle stick and sharp object injuries were reported with peak incidence (13.84%) during 2009. Distribution of needle stick and sharp object injuries according to the location of their occurrence clarified that patient room/ward was the most common place of occurrence of NSSIs 150/477, followed by emergency department 82/477, then the intensive and critical care units 70/477. The study presented that nurses were encountered as the most affected job category and

No	Research Title/Author/Year	Country	Objective	Research Type	Desain Study	Population, Sample, Research Instrument	Result
							use of items is the most common activity associated with the incidents. Most of the incidents were caused by needles with disposable needle and hands were the most affected body parts. Conclusion: Needle stick and sharp object injuries represent a major occupational challenge to health care workers. Prevention should be based on different working lines including immunization, education of health care workers and proper engineering control measures. [a] 2013 Ministry of Health, Saudi Arabia. Published by Elsevier Ltd
	Evaluating the Effectiveness of a Continuing Education Program for Prevention of Occupational Exposure to Needle Stick Injuries in Nursing Staff Based on	Iran	This study aims to determine the effectiveness of continuing education on NSI.	Quantitative	eksperimental	120 nurses	Hasil: The mean score for knowledge in the experimental group improved significantly from 8.32 ± 2.17 to 13.98 ± 1.2 ($p < 0.05$). The experimental group of 24

No	Research Title/Author/Year	Country	Objective	Research Type	Desain Study	Population, Sample, Research Instrument	Result
	Kirkpatrick's Model Author links open overlay panelMostafa Bijani Ph.D. a, Khatereh Rostami Ph. D. b, Marzieh Momennasab Ph.D. c, Shahrzad Yektatalab Ph.D (2020)d						nurses (40%) were exposed to needle stick injury before education, but this number was reduced to 9 (15%) after intervention. The chi-square test showed a significant difference (P = 0.013). However in the experimental group, 15 nurses (25%) were exposed to blood and body fluids before intervention, but again it was reduced to 6 (10%) after education. The chi-square test showed a significant difference (P = 0.002).
	Occupational safety training and education for needlestick injuries among nursing students in China: Intervention study Wan-Xia Yao a,c , Yi-Lun Wu b , Biao Yang d , Lu-Ying Zhang e, ∗, Cong Yao f, ∗∗, Cai-Hui Huang g , Yao-Rong Qian h (2013)	Cina	To confirm the effect of occupational safety training and education programs (OSTEP) on needlestick injuries (NSIs) among nursing students in China	Quantitative		Compare the rates and the nature of NSIs before and after OSTEP among the nursing students in China. Firstly, questionnaires were delivered to 248 randomly selected nursing students from seven training hospitals to obtain basic information concerning relevant occupational NSIs. Then regular intervention measures through OSTEP	The rate of NSIs among these nursing students was relatively high before the OSTEP in China (average, 4.65 events/nurse). However, it decreased rapidly to 0.16 events/nurse average after the OSTEP. Occupational safety awareness and behavior in handling NSIs was improved in China. There was a significant difference in the

No	Research Title/Author/Year	Country	Objective	Research Type	Desain Study	Population, Sample, Research Instrument	Result
						on 246 nursing students had been introduced for four years. And the resultant information concerning relevant occupational NSIs was obtained afterwards. Finally, the data analysis was performed using SPSS software, version	results of Chi-square value (Pb0.005). Conclusions: NSIs are common in nursing students in China. The OSTEP can reduce NSIs and change practical behavior markedly among nursing students in China. We should perform OSTEP on nurse students before and during the clinical practice. We must also provide effective preventive measures to reduce this kind of problem in future
	Needle Stick Injuries and their Related Safety Measures among Nurses in a University Hospital, Shiraz, Iran Mehdi Jahangiri 1 , Akbar Rostamabadi 2,3 , Naser Hoboubi 3,*, Neda Tadayon 3 , Ali Soleimani 3 (2016)	Iran	To determine the prevalence and factors related to needle stick injuries (NSIs) and to assess related safety measures among a sample of Iranian nurses	Quantitative	cross-sectional	Population: a random sample of 168 registered active nurses was selected from different wards of one of the hospitals of Shiraz University of Medical Sciences (SUMS). Data were collected by an anonymous questionnaire and a checklist based observational method among the 168 registered active nurses.	Hollow-bore needles were the most common devices involved in the injuries (85.5%). The majority of NSIs occurred in the morning shift (57.8%) and the most common activity leading to NSIs was recapping needles (41.4%). The rate of underreporting NSIs was 60.2% and the major reasons for not reporting

No	Research Title/Author/Year	Country	Objective	Research Type	Desain Study	Population, Sample, Research Instrument	Result
							the NSIs were heavy clinical schedule (46.7%) and perception of low risk of infection (37.7%). A statistically significant relationship was found between the occurrence of NSIs and sex, hours worked/ week, and frequency of shifts/month.
	Incidence, knowledge, attitude and practice toward needle stick injury among nursing students in Saudi Arabia Khalid Al-Mugheed1 *, Sally Mohammed Farghaly2 , Nadiah A. Baghdadi2 , Islam Oweidat3 and Majdi M. Alzoubi (2023)	Arab Saudi	determine the prevalence of needle stick injuries and (2) measure the level of knowledge, attitude and practice among nursing students about needle stick injurie	Quantitative	Phenomenology	Three hundred participants undergraduate nursing students at a private college in Saudi Arabia were included,	The majority, 65.1%, reported one incidence in the last year, while (24.4%) 15 students reported two incident of needle stick injuries. Recapping was the most prevalent (74.1%) Although the student's showed good knowledge and positive attitudes in NSI, the students reported a low level of needle stick practice. Raising awareness among nursing students and conducting continuing education related to sharp devices and safety and how to write an incident reporting is

No	Research Title/Author/Year	Country	Objective	Research Type	Desain Study	Population, Sample, Research Instrument	Result
							highly recommended
	Needlestick and Sharps Injuries Among Nursing Students in Nanjing, China (2020)	Swedia	determine the prevalence of needle stick injuries and (2) measure the level of knowledge, attitude and practice among nursing students about needle stick injuries	Qualitative	Fenomenologi	12 nursing student	Good knowledge and positive attitudes in NSI, the students reported a low level of needle stick practice. Raising awareness among nursing students and conducting continuing education related to sharp devices and safety and how to write an incident reporting is highly recommended
	Prevalence, emotional and follow-up burden of insulin injection-related needle-stick injuries among clinical nurses in Shaanxi Province, west of China: A cross-sectional study Meng Li, Lanting Huo, Fenjing Du, Wuping Li, Huali Zhang, Bingyin Shi (2022)	Cina	s to investigate the prevalence, emotional and follow-up burden of insulin injection-related needle-stick injuries among clinical nurses		Cross-sectional study	5389 nurses were recruited from 45 hospitals in Shaanxi, China, from November 2018 to July 2019. Participants were administrated with a questionnaire specifically developed for this study	The mayority good knowledge and positive attitudes in NSI, the students reported a low level of needle stick practice. Raising awareness among nursing students and conducting continuing education related to sharp devices and safety and how to write an incident reporting is highly recommended

No	Research Title/Author/Year	Country	Objective	Research Type	Desain Study	Population, Sample, Research Instrument	Result
	Nursing Students' Occupational Health and Safety Problems in Surgical Clinical Practice Semra Eyi https://orcid.org/0000-0003-0680-1063 semra_il@yahoo.com and İbrahim Eyi (2020)	Turki	to gather information about occupational accidents, occupational diseases, and problems related to OHS	survey	descriptive design that used a self-administered questionnaire	140 students descriptive design that used a self-administered questionnaire	The study indicated that almost all of the students' OHS knowledge and awareness level were low, were exposed to contact with blood and body fluids as most dangerous situations, have difficulties in the provision of personnel protective equipment (PPE), were subjected to verbal assault, and experienced anxiety and irritability. They encountered dangerous situations applying treatment in the clinic, preparing drugs, following vital signs, giving general care, and during the intervention in the emergency room, and experienced back pain, headache, increased tendency to sleep, fatigue, and forearm, wrist, hand, and finger injuries

RESULTS & DISCUSSION

Based on the results of reviewing 10 articles that were relevant to the objectives of the literature review, the following findings were obtained

Incidence of Accidents and Work Safety

The incidence of NSI among nurses and nursing students in several countries ranged from 9.4% to 61.9%, with 65% of students experiencing needle stick injuries (Gok Metin & Yildiz, 2023) Several countries have data on the conditions when NSI occurred in nursing students, while data on NSI incidents among students are not available in educational institutions in Indonesia. Research on NSI among students in China found an NSI incidence of 17%, with 55% of incidents occurring when students were not accompanied by nurses (Xujun et al., 2015). (Memish et al., 2013) also found that 39.5-96.24% of incidents among nursing students in various countries were not reported. To assess the magnitude of the NSI problem, researchers distributed questionnaires to 18 nursing educational institutions in Indonesia among 871 clinical-stage students (May 2015). The results showed that the average incidence of Near Miss Incidents (NMIs) of NSI was 32.3%, while 19.1% experienced NSI (unintended incidents/UI). Only students who reported incidents. Of the 18 respondents who experienced NSI, 77.8% were regular students. The causes of NSI were carelessness (50%) and being pricked by a new needle (88.9%). At the time of the NSI, most respondents were unaccompanied (77.8%). Only 33.3% of respondents reported to the clinical supervisor (5.6%) and ward nurse (27.8%). Most respondents (55.6%) who experienced NSI only cleaned the wound with water, and some did not take any action (3.3%) after NSI. (Jahangiri et al., 2016)

Nursing students' understanding of occupational safety and health related to NSI incidents (education, training, safe needle use, communication)

Understanding of NSI prevention can be demonstrated through knowledge and behavior in maintaining occupational safety and health. Knowledge is an internal factor that encourages NSI prevention behavior (Kwanzaa et al., 2020). The role of clinical supervisors for nursing students is to have good characteristics. These characteristics are inherent in every supervisory role, whether as a role model, educator, evaluator, mentor, or facilitator. Based on the results of a literature review, researchers identified five characteristics that support clinical supervisors in carrying out their role as supervisors of nursing students. These characteristics are the ability to evaluate, professionalism, good interpersonal relationships, the ability to teach, and a good attitude (Clarke & Leh, 2023). Education is one of the strategies to prevent and reduce NSI among nurses and nursing students. Education programs can reduce the incidence of NSI, increase self-reporting, and reduce the frequency of NSI (Yao et al., 2013). A study in China conducted pre- and post-tests on an education program, and the results showed an increase in reporting by nursing students. In Saudi Arabia, education is a priority in several institutions to prevent and reduce infections. Through education programs, knowledge about NSI is increased and infections are reduced. (Al-Mugheed et al., 2023)

Training can be used as an effective strategy in reducing infections caused by NSI. Training and education correlate with commonality on topics such as infection risk and safe practices when performing certain self-protection procedures. This is reinforced by a study in Germany that explains the most common activities contributing to NSI, such as blood sampling (33%), and that after training there was an increase in knowledge (Chakabva & Khan, 2023).

Efforts to prevent NSI

Efforts to prevent NSI are carried out through the supervisory/control functions of managers. In this case, nursing managers are responsible for ensuring the achievement of nursing service quality indicators. One of the indicators that managers must meet according to the American Nurses Association (ANA) is freedom from the risk of nosocomial infections (Arksey & O'Malley, 2005), which are now better known as HAIs, one of which is freedom from NSI. Efforts to prevent NSI are one of the hospital accreditation indicators and part of the fifth patient safety goal (Clarke & Leh, 2023). Joint Commission International, Hospital

Accreditation Commission must be controlled organizationally. These efforts are not only aimed at patients but also focused on nurses as nursing care providers, visitors, and nursing students. Every nurse in the practice setting can serve as a role model for nursing students by demonstrating good behavior in preventing CJS and working according to SPO. NSI prevention behavior is carried out to achieve PPI goals in hospitals and also in hospital accreditation standards. However, some students said that it was not easy to find good role models in the ward. The implementation of SOPs requires the support of managers and the participation of students. The full involvement of students in nursing care can support the provision of health services (Amirmahani et al., 2023). The learning model for shaping individual behavior in maintaining safety uses an integrated individual, group, and organizational approach between institutions and practice/clinical settings.

The environment is important in this OSTEP learning model because it emphasizes that individuals learn through the process of observing their environment, but this observation does not directly influence individual behavior due to the existence of expectations and incentives that can motivate individuals to behave. (Yao et al., 2013) This model is designed to strengthen the intrinsic and extrinsic factors that influence behavior (knowledge, attitudes, and behavioral intentions) at each stage of learning so that students can protect themselves from various hazards and risks, particularly preventing NSI. (Hanson et al., 2012) The process of shaping the behavior of nursing students is certainly assisted by clinical supervisors and fellow nurses at the student's practice location, who serve as learning resources and role models during the student's practice. Individual knowledge improvement for nursing students is achieved by providing re-education to students. Meanwhile, the group approach is carried out through peers/fellow students and mentors, as well as role modeling from clinical mentors who have been trained in NSI safety prevention. The organizational approach includes safety training activities, program contracts, and program follow-ups in the treatment room in the form of safety orientation and the provision of facilities to support NSI prevention, such as safe syringes and the availability of used syringe disposal boxes (safety boxes and sharp containers). (Hanson et al., 2012)

CONCLUSION

NSI incidents still occur among nursing students conducting clinical practice in hospitals. Nursing students' understanding of how to prevent NSI incidents is gained through education from academic institutions and hospitals. Efforts to improve knowledge, attitudes, and behaviors to prevent NSI are carried out through education, training, the use of safe needles, and communication.

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