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Hospital Safety Climate, Psychosocial Risk Factors and Needlestick Injuries in Japan

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Abstract: To investigate the interactions between safety climate, psychosocial issues and Needlestick and Sharps Injuries (NSI), a cross-sectional study was undertaken among nurses at a university teaching hospital in Japan (89% response rate). NSI were correlated with various aspects of hospital safety climate including supporting one another at work, the protection of staff against blood-borne diseases being a high management priority, managers doing their part to protect staff from blood-borne disease, having unsafe work practices corrected by supervisors, having the opportunity to use safety equipment to protect against blood-borne disease exposures, having an uncluttered work area, and having minimal conflict within their department. In conclusion, this study has demonstrated the importance of hospital safety climate in Japanese health care practice, particularly its relationship with NSI. Although the provision of safer devices remains critical in preventing injuries, ensuring a positive safety climate will also be essential in meeting these important challenges for nurses' occupational health.

Key words: Needlestick and sharps injuries, Safety climate, Risk, Prevalence, Japan, Nurse

Introduction

Needlestick and Sharps Injuries (NSI) represent an important workplace issue in contemporary health care. They form part of a broader area known as Percutaneous Exposure Incidents (PEI), a term referring to cutaneaous exposures and mucous membrane exposures to blood and serum[1)]. Although NSI are regularly experienced by Health Care Workers (HCW) of all disciplines, they are known to be especially common in the nursing profession[2)], including student nurses[3)]. In one Australian study for example[4)], NSI as a cause of injury among nurses was exceeded only by musculoskeletal injuries. In a study of Chinese nurses[5)], almost all had experienced at least one NSI in their professional lifetime. Among non-hospital based nurses in the United States (US) the prevalence of NSI has been demonstrated at 9% in a given year[6)].

Experiencing an NSI at work can be traumatic for HCW, although its long-term sequelae varies. Injuries from contaminated devices for example, represent a key vector for the transmission of blood-borne diseases between patients and HCW, and vice versa. The risk to hospital staff is not evenly distributed either, with previous research from Taiwan finding that 65% of all possible seroconversions would occur among nurses[7)]. Acute blood-borne infections and seroconversion following an NSI has been reported among HCW in various countries.

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The seroconversion rate for Hepatitis C Virus (HCV) in a Japanese hospital, for example, was previously shown to be 3%[8], while a study from Turkey[9] revealed that approximately 8% of nurses surveyed were already carrying this disease.

In recent years, psychosocial and organizational factors have been increasingly associated with NSI risk across a variety of studies. Factors can include high mental pressure, time pressure, feeling fatigued after work, inadequate staffing levels, and many others[10–12]. In Japan psychosocial risk factors have been associated with NSI among medical residents[13] and hospital nurses[10]. Organizational climate has important repercussions for nurses' occupational health outcomes[14], with safety climate having been shown to affect nurses' compliance with universal precautions[15]. Although the dimensions of safety climate have been studied in Japanese HCW to some extent[16], research has mostly focussed on patient safety[17], rather than NSI.

Safety climate itself represents a complicated area to investigate in occupational health, however, as many different factors are known to influence it[18]. Common features of safety climate are known to exist[19], and as a result, various safety climate scales have been developed and examined[20–22]. Safety climate research with respect to NSI was somewhat simplified in the year 2000, when Gershon and colleagues devised a brief 20-item *Hospital Safety Climate Scale* (HSCS)[23], incorporating 6 dimensions of safety climate based on their previous research. The validity and reliability of the HSCS as an indicator of safety climate in health care settings has been recently demonstrated[24]. Given that Japanese HCW are known to suffer from NSI[25] and that they also incur some unique, culturally-specific NSI risks[26], it was considered necessary to investigate interactions between hospital safety climate, psychosocial factors and NSI within a Japanese setting by using a modified and translated version of the HSCS.

Methods

This study involved an anonymous cross-sectional survey of all nurses from a large, university teaching hospital in central Japan. Ethical approval was obtained from a hospital ethics committee prior to the study being undertaken. Our survey instrument was based on Gershon and colleagues' aforementioned *Hospital Safety Climate Scale*[23]. All 20 questions from this scale were initially translated into Japanese by a bilingual medical professional. An expert panel of nursing and medical professionals then assessed the Japanese version for accuracy, clarity and readability. Minor changes were made where appropriate, after which time the questionnaire was back-translated into English by a bilingual Japanese nurse and assessed against the original document. Similar to the original HSCS, our Japanese version used Likert-scale answers[27], although the five categories of 'Strongly Disagree', 'Disagree', 'No Opinion', 'Agree' or 'Strongly Agree' were reduced to four by omitting the middle response. This step was deemed particularly necessary as cultural differences are known to affect responses to Likert Scale questions[28], with Japanese and Chinese students being previously shown to cluster their answers around the midpoint[29]. Other sections of the HSCS were also amended for cultural reasons. Questions from the original HSCS which focused on HIV, for example, were changed to the more generic category of 'Blood-Borne Diseases', due to a proportionately lower prevalence of HIV in Japan.

Fifteen questions relating to psychosocial risk factors were also included in our survey tool, all of which were based on previous research in this field[30–32]. Questions focussed on work support, mental pressure, time pressure, work responsibility and many others. NSI questions were based on similar research previously conducted across a variety of countries[33–35]. Questions focussed on the type of device which caused the injury, the number of times nurses had received such an injury in the previous 12-month, whether the item had been used on a patient prior to injury and whether nurses had officially reported to management any NSI they sustained. Additional questions focussed on demographic and workplace items, such as age, gender, weekly working hours and length of employment as a nurse. As with the HSCS, all questions were translated and assessed by an expert panel of nursing and medical professionals, before being back-translated and assessed against the original document.

Questionnaires were distributed in late 2008 and collected within a 2-wk period. Informed consent was implied by the voluntary completion and return of questionnaires. All data was entered into a spreadsheet and analysed by statistical software (JMP, Version 8). Statistical analysis included prevalence rates for Likert-scale responses to the HSCS, as well as NSI sustained, cause of injury and reporting behaviour following the incident. To facilitate statistical analysis, HSCS items were collapsed into dichotomous (agree/disagree) responses. Chi-squared analysis was then undertaken to examine potential relationships between the dimension of HSCS and NSI devices.

Results

A total of 1,027 questionnaires were distributed, although 31 nurses were on leave at the time of our study, leaving 996 for inclusion. Among them, 882 question-

naires were returned, giving a response rate of 88.6%. Eighteen incomplete questionnaires were then excluded, leaving 864 for the final analysis. Most nurses (93.9%) were female, with an average age of 32 yr (SD 9.1 yr). Females were on average, slightly older than the males (32 versus 29 yr). Their average working week comprised 42 h, with an average nursing career of 4 yr. Almost all (92.3%) were registered nurses, and around half (49.6%) worked rotating day and night shifts. Around half (49.6%) had received the full three-course Hepatitis B (HB) vaccination regimen, 28.0% had been vaccinated once or twice, while the remaining 22.4% reported having received no HB vaccinations at all.

Likert scale responses to individual safety climate questions are displayed in Fig. 1. Most nurses (94%) strongly agreed that disposable gloves were readily available in their work area. Around three-quarters also strongly agreed that a copy of the hospital health and safety manual was available in their unit (77%) and that protection of workers from blood-borne diseases was a high priority with management (75%). Over half of all nurses (58%) agreed that there was minimal conflict in their department. Around 27% disagreed that they usually have so much work to do that they cannot follow Universal Precautions, while 8% strongly disagreed with the statement that staff had the opportunity to be trained to use Personal Protective Equipment (PPE) to protect themselves from blood-borne disease exposures. The Cronbach's alpha score for all safety climate questions was 0.906, indicating a high internal consistency. Likert scale responses to the psychosocial risk factors questions are displayed in Fig. 2. Over half the nurses (56%) strongly agreed with the statement that there was too much responsibility in their job. Slightly less (41%) reported that they experienced too much mental pressure at their workplace. Over half (62%) disagreed with the statement that there was not enough teamwork in their department while 39% strongly disagreed that their daily work was too boring or tedious. The Cronbach's alpha score for all psychosocial factor questions was 0.887, indicating a high internal consistency.

The most common types of NSI sustained in the previous 12-month period were due to ampoules or vials (being responsible for 29% of the total), followed by hollow bore needles (15%) and insulin syringes (9%). Ampoules or vials were the most likely to have been unused prior to injury (87%), followed by hollow bore needles and insulin syringes. Most of the NSI sustained from IV kits (93%) involved unused items. The prior usage status of butterfly needles was unknown in the majority of cases. The most common cause of single injury in the current study (90%) was due to IV kits, followed by glass items (75%) or insulin syringes (71%). Around half (48%) of all ampoule or vial NSI involved 2 to 3 injuries. Only 10% of all NSI due to IV kits involved 2 to 3 injuries. The most common cause of multiple NSI among nurses, that is sustaining 4 or more injuries over the past 12-month, was related to the use of surgical tools (14%) and ampoules or vials (13%). Refer to Table 1. Regarding the action which caused the nurse's NSI, over half (59%) involved opening an ampoule or vial, 9% were sustained when uncapping a needle, 7% due to recapping, 7% due to other reasons and 6% were caused by handling a broken ampoule or vial. Only 25.5% of nurses had always reported to management any NSI they sustained, with 64.1% never reporting it and 10.4% reporting it sometimes. The most common reason was that the item was unused (57%). Thirteen percent did not know they had to report it, 5% were too busy to report it and 4% were too embarrassed at their mistake. Interestingly, 2% felt they were 'not unlucky enough to get a disease'.

Chi-squared analysis revealed various statistically-significant relationships between the HSCS and the type of NSI device which caused injury. Relationships with all devices were analysed, except for lumbar punch kits and razors, due to low response rates for these particular items. NSI due to butterfly needles was related to staff supporting one another at work (p=0.014). NSI due to blood collection tubes was correlated with three HSCS questions, namely the protection of staff against blood-borne disease exposures being a high management priority (p=0.008), managers doing their part to protect staff from blood-borne disease exposures (p=0.024) and unsafe work practices being corrected by supervisors (p=0.043). NSI from surgical tools was correlated with having a clean work area (p=0.030). NSI from suture needles was statistically correlated with managers doing their part to protect staff from blood-borne disease exposures (p=0.002), having the opportunity to be trained to use safety equipment to protect against blood-borne disease exposures (p=0.026), having a clean work area (p<0.001), having an uncluttered work area (p<0.001) and having minimal conflict within their department (p=0.007). The category 'Other Items' was related to having an uncluttered work area (p=0.007). Refer to Table 2.

Discussion

The nurses in our current study exhibited many demographic attributes similar to those in some recent national investigations[36, 37]. Results from our current study offer an interesting insight into the safety climate of Japanese hospitals. Most nurses strongly agreed that disposable gloves were readily available in their work area, approximately three-quarters strongly agreed that a copy

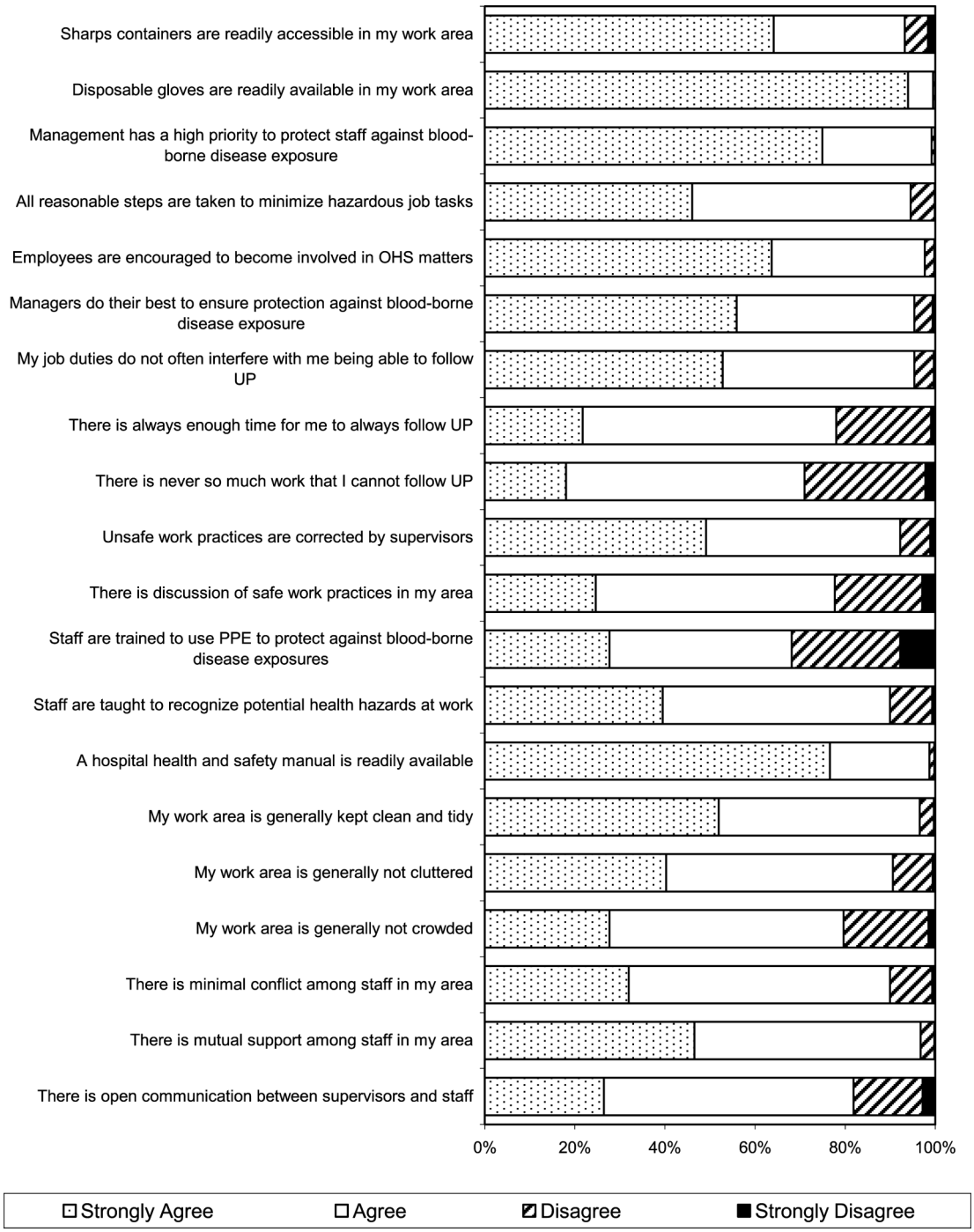

Fig. 1. Likert scale responses to Hospital Safety Climate Scale questions.

Note: Displayed as the proportion of all responses for each question, Hospital Safety Climate Scale translated and adapted from Gershon *et al*[23], UP = Universal Precautions, OHS = Occupational Health and Safety, Cronbach's alpha score = 0.906.

of the health and safety manual was available in their unit and that protection of workers from blood-borne diseases was a high priority with management. These findings are similar to the original HSCS study conducted by Gershon and colleagues in 2000[23], where 94% reported that disposable gloves were readily available, 95% agreed that a health and safety manual was available and 85% agreed that protection from HIV was a high priority with management. The internal consistency of our Japanese HSCS and psychosocial factor questions was demonstrated with high Cronbach's alpha scores; scores that were even higher than some previous research using different safety cli-

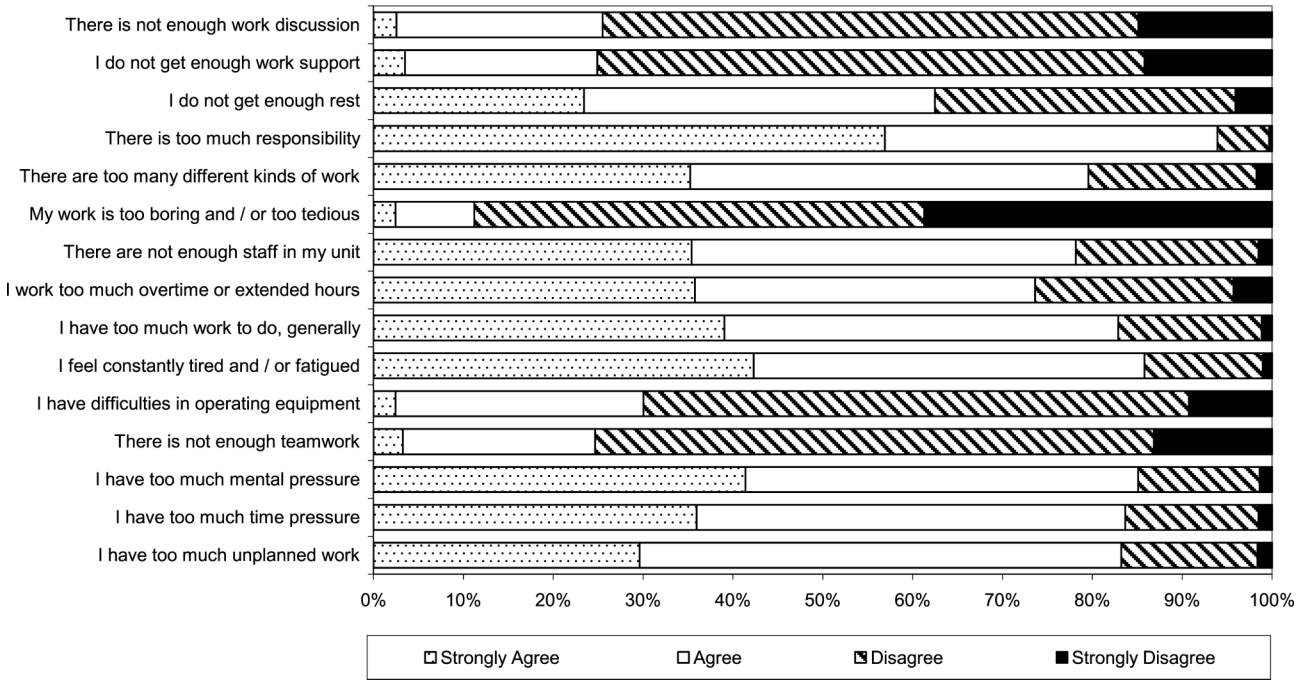

Fig. 2. Likert scale responses to psychosocial risk factor questions.
Note: Displayed as the proportion of all responses for each question, Psychosocial factor questions adapted from previous studies[10, 30–32, 77, 78], Cronbach's alpha score = 0.887

Table 1. Needlestick and sharps injuries by causative device, number of injuries and prior usage status

	Number of Injuries*			Prior Usage Status*		
Causative Device	Only 1	2 or 3	4 or More	Yes	No	Not Sure
IV Kit	90%	10%	0%	2%	93%	5%
Other Item	75%	17%	8%	7%	80%	13%
Insulin Syringe	71%	29%	0%	16%	79%	5%
Glass Item	71%	21%	7%	6%	87%	6%
Suture Needle	67%	27%	6%	13%	82%	5%
Blood Collection Tube	59%	41%	0%	11%	85%	4%
Butterfly Needle	58%	42%	0%	9%	86%	5%
Hollow Bore Needle	57%	37%	6%	9%	88%	3%
Surgical Tool	57%	29%	14%	11%	86%	3%
Ampoule/Vial	39%	48%	13%	9%	87%	4%

*As a proportion of each total.

mate scales in health care[38]. Cronbach's alpha scores for the original English-language version of the HSCS by Gershon and colleagues were between 0.71 and 0.84[23]. Given that our questionnaire was originally adapted from another language, it is important to keep cross-cultural differences in mind when comparing the results of different studies. Although international research conducted across a variety of countries has suggested that workplace stressors, ways of coping and levels of physical and mental health may be similar[39], the accurate translation and interpretation of results is always essential, as Japanese are known to respond differently to questionnaires translated from English[40].

When considering responses to the psychosocial factors questions, over half the nurses strongly agreed with the statement that there was too much responsibility in their job, while slightly fewer reported that they experienced too much mental pressure at work. Mental stress is an important issue in contemporary occupational health and one that has been receiving increasing attention in Japan during recent years. Potentially high rates of psychosocial stresses suggested in the current study are supported by previous research which found that depressive symptoms affected around 28% of Japanese medical resi-

dents[41]. Another study of medical residents also found that depressive symptoms were associated with NSI events[13], while a Korean investigation revealed that HCW who had sustained an NSI experienced higher scores of depression and anxiety[42]. In the US, 15% of non hospital-based nurses reported being very adversely affected by environmental conditions at their workplace, with understaffing and feeling unappreciated being the most troubling[6]. Such findings help shed light on psychosocial risk factors as an increasing challenge for HCW in the new millennium[43], and for these reasons, it is becoming increasingly clear that more attention needs to be directed towards holistic stress reduction techniques in the workplace.

Regarding NSI themselves, the most common causative devices revealed in the current study were ampoules or vials, followed by hollow bore needles and insulin syringes. These findings are somewhat consistent with other NSI research conducted in Japan. An analysis of *Exposure Prevention Information Network* (EPINet) data between 1996 and 1998 for example[44], found that syringes and butterfly needles were the most common causative device, similar to a later study of EPINet data between 1997 and 2004[25]. Another Japanese study conducted in 2004 also found that ampoules or vials, hollow bore needles and insulin needles were common causes of NSI[10]. Similar to Japan, research from Turkey[9], Australia[35], Singapore[45], Taiwan[33], Saudi Arabia[46] and Korea[12] has indicated that disposable syringes and medication ampoules continue to present NSI risks for HCW. Butterfly needles were also a reasonably common cause of NSI in the current study, although this is not surprising, because butterfly needles are used much more frequently for blood drawing and IV infusion in Japan, than in other countries such as the US[44]. Although it has been previously reported that the injury rate for injection pens is considerably higher than for disposable syringes[47], we did not investigate this particular item in our current study.

Regarding prior usage status, ampoules or vials were the most likely to have been unused prior to injury. This finding is similar to previous research conducted among Taiwanese HCW[33]. Most of the NSI sustained from IV kits involved unused items, which is contrary to some earlier Japanese EPINet information[44]. The prior usage status of butterfly needles was unknown in the majority of cases during the current study. The most common cause of single injuries among our Japanese nurses were NSI due to IV kits, followed by other items, glass items or insulin syringes. Around half of all ampoule or vial NSI involved two to three injuries. The most common cause of multiple NSI among nurses, was related to the use of surgical tools. The finding that surgery was a common cause of repeated NSI is consistent with previous reports[48], with an Iranian study further demonstrating that suturing was one of the most common causes of exposures[49]. Opening an ampoule or vial was a common cause of NSI in the current study, although uncapping and recapping needles also contributed. The recapping of used needles remains a contentious issue in health care, and although it is becoming rarer in most countries, the practice has not altogether disappeared. In Egypt, for example, Talaat *et al.*[50] reported that two-handed recapping was the most common behaviour associated with NSI, similar to a Taiwanese investigation[33]; while in Turkey[51] and China[52] it was the second most common cause. In a study from sub-Saharan Africa, HCW who recapped needles 'most of the time' incurred an almost two-fold higher NSI risk[53].

Only one-quarter of nurses in the current study had always reported to management any NSI they sustained. The main reasons for not reporting their NSI was that the item was unused. This result is similar to some previous research conducted in Taiwan[34], where around one-third of injured HCW did not report their NSI as the item was unused. Interestingly, a small proportion of nurses who sustained an NSI did not report their injury because they felt they were 'not unlucky enough to get a disease'. This finding is similar to some previous research conducted in Taiwan[34], where 5% of injured HCW felt that they were not so unfortunate as to contract a disease. Whatever their rationale may be, the underreporting of NSI remains a serious issue for infection control managers and NSI researchers, given that underreporting rates have been previously documented at 85% in Taiwan[34] and 49% in the United Kingdom (UK)[54]. A literature review of online databases in the UK also found that the NSI underreporting rate may be as high as ten-fold[55].

An examination of HSCS responses by NSI device revealed some interesting correlations. These issues raise a broader question regarding the value of a positive work environment for staff in Japan, as elsewhere. Although the rationale and general principles for improving a worker's emotional climate were recognised early on in occupational health[56], further work still needs to be undertaken with a more specific focus on NSI. In this regard it has already been suggested that further research should now be considered with regard to the specific psychological consequences of NSI in HCW[42]. Although the complicity of psychosocial risk factors is now well-known in occupational health, it appears that this issue had been studied among Asian nurses until 2004[57]. Given that the vast majority of nurses in the current study were female, it is also important to recognise the unique issues faced by women workers[58]. The Japanese nursing workforce remains predominately female, and the unique health

Table 2. Statistical relationships between Hospital Safety Climate Scale and needlestick and sharps injuries

	Hospital Safety Climate Scale Questions																			
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Ampoule/Vial	0.272	0.260	0.388	0.139	0.080	0.452	0.941	0.330	0.810	0.180	0.725	0.405	0.237	0.862	0.613	0.913	0.401	0.881	0.096	0.348
Hollow Bore Needle	0.116	0.693	0.213	0.079	0.093	0.243	0.654	0.435	0.807	0.361	0.497	0.718	0.585	0.316	0.341	0.631	0.278	0.195	0.249	0.640
Insulin Syringe	0.440	0.803	0.858	0.301	0.650	0.979	0.156	0.637	0.561	0.363	0.996	0.432	0.377	0.177	0.457	0.245	0.758	0.949	0.409	0.166
IV Kit	0.788	0.788	0.389	0.490	0.598	0.292	0.389	0.690	0.574	0.435	0.725	0.273	0.107	0.389	0.598	0.788	0.435	0.236	0.690	0.788
Butterfly Needle	0.659	0.424	0.098	0.679	0.921	0.091	0.394	0.214	0.229	0.516	0.152	0.176	0.735	0.310	0.679	0.276	0.929	0.392	**0.014***	0.089
Blood Collection Tube	0.450	0.394	**0.008***	0.117	0.263	**0.024***	0.145	0.336	0.220	**0.043***	0.450	0.816	0.748	0.309	0.174	0.880	0.054	0.202	0.413	0.267
Glass Item	0.289	0.333	0.725	0.539	0.586	0.813	0.293	0.415	0.647	0.125	0.651	0.686	0.109	0.420	0.586	0.380	0.917	0.950	0.835	0.917
Blood Glucose Tester	0.155	0.494	0.427	0.494	0.494	0.809	0.571	0.646	0.190	0.214	0.733	0.552	0.290	0.571	0.494	0.214	0.526	0.053	0.549	0.072
Surgical Tool	0.646	0.646	0.233	0.190	0.358	0.224	0.680	0.414	0.323	0.103	0.086	0.105	0.212	0.478	**0.030***	0.387	0.136	0.782	0.675	0.105
Suture Needle	0.931	0.502	0.096	0.123	0.192	**0.002***	0.162	0.094	0.274	0.503	0.699	**0.026***	0.284	0.071	**<0.001***	**<0.001***	0.308	**0.007***	0.066	0.536
Other Item	0.920	0.061	0.670	0.377	0.578	0.231	0.595	0.736	0.665	0.240	0.795	0.092	0.756	0.670	0.135	**0.007***	0.301	0.240	0.756	0.469

Note: Hospital Safety Climate Scale translated and adapted from Gershon *et al.*[23] (A: Sharp containers are readily accessible in my work area, B: Disposable gloves are readily available in my work area, C: The protection of workers from occupational exposure to blood-borne diseases is a high priority with management where I work, D: On my unit, all reasonable steps are taken to minimize hazardous job tasks and procedures, E: Employees are encouraged to become involved in safety and health matters, F: Managers on my unit do their part to ensure employees' protection from occupational exposure to blood-borne diseases, G: My job duties do not often interfere with my being able to follow Universal Precautions, H: I have enough time in my work to always follow Universal Precautions, I: I usually do not have too much to do so that I can always follow Universal Precautions, J: On my unit, unsafe work practices are corrected by supervisors, K: My supervisor often discusses safe work practices with me, L: I had the opportunity to be trained to use Personal Protective Equipment (PPE) so that I can protect myself against blood-borne disease exposures, M: Employees are taught to be aware of and to recognize potential health hazards at work, N: On my unit, a copy of the hospital safety manual is available, O: My work area is kept clean, P: My work area is not cluttered, Q: My work area is not crowded, R: There is minimal conflict within my department, S: The members of my unit support one another, T: On my unit, there is open communication between supervisors and staff)[23], $*p<0.05$.

needs of this demographic should be considered. The smaller size of women when compared to men, for example, needs to be carefully considered when working positions and movements are planned[59]. The complicity of female reproductive health complaints represents another issue in the potential management of psychosocial risk factors[60]. There are also country-specific NSI issues that should be considered when planning preventive strategies. Japanese employees are known to work long hours[61], for example, and long working hours have been shown to be a risk factor for NSI in some studies[62]. At least part of any potential NSI management strategy will need to consider these issues.

As we pass through our first decade of the 21th century, and despite considerable attention and resources being dedicated to its prevention, NSI and other percutaneous injuries remain common in health care[51]. While the use of safer devices is no doubt important, many other factors also affect NSI rates. Workplace issues may contribute to risk, with hospital profitability for example being inversely related to blood and body fluid exposure in some studies[63], as too, duration into shift[64] and month of the year[65]. Understaffing may be a risk factor for occupationally-related HCV[66]. Undesirable organizational factors, broadly, are often correlated with increased injury risk in health care[67], and for NSI specifically, staffing levels and organizational climate are known to be important. At its broadest level, mental health status is known to be an important predictor of occupational accidents in Japanese hospitals[68], while personality and behaviour has also been shown to have a relationship with occupational blood exposure in France[69]. Prevention of NSI by the use of safer devices therefore, remains very important and must always be considered in primary management strategies.

When considering the reduction and prevention of NSI within hospital environments, the most direct way to reduce injuries is to make devices safer[70]. Various investigations have already shown that using safer devices can help reduce injuries in this manner. A previous study in Scotland for example[71], reported that over half of all injuries might have been prevented via the use of safety devices. In a US hospital, the introduction in safety-engineered devices was also correlated with an overall decrease in percutaneous injuries[72]. Furthermore, in a recent Taiwanese study, educational intervention was shown to reduce the incidence of NSI and increase the reporting rate among student nurses[73]. Checklists to aid in the prevention of NSI are important and have already been trialled in Japan. In 2006 for example, Yoshikawa *et al.*[74] designed an ergonomic checklist for training in the prevention of NSI. Aside from safer systems and devices, the collection of accurate data is known to represent another essential component for reducing NSI[75], and for these reasons, the regular epidemiological investigation of these issues must continue within health care facilities. Continued epidemiological surveillance is also very important for understanding where, when and how NSI are occurring. EPINet for example, was introduced to Japan during the 1990s[76], and has since been providing a wealth of data on NSI within Japanese hospitals.

The design and use of culturally-appropriate survey tools to investigate NSI and safety climate remains a contentious issue when conducting cross-cultural research. The safety climate phase of our current study used a Japanese translated version of Gershon and colleagues' HSCS[23], for a variety of reasons. Firstly, the basic instrument in English has already been shown to have sufficient reliability and validity as an indicator of employee perceptions of safety within their institution[24]. Secondly, the HSCS tool itself is simple and convenient to administer, containing only 20 questions in a simple Likert scale format. This makes it more straightforward to understand and complete. Our Japanese-language version was specifically designed and tested during the pilot phase for ease of understanding and ease of completion. The high proportion of staff who 'strongly agreed' that disposable gloves were readily available (a known fact), suggests that our HSCS questionnaire was logical, well-understood and truthfully answered. Questions relating to psychosocial factors were adapted from common elements revealed in a variety of international studies[30–32], research which suggests that there is probably a core group of psychosocial risk factors common around the world. Some previous Japanese studies have also investigated these issues[77, 78], leading us to adopt a core group of 15 questions which were translated and subsequently used. No method will ever be perfect for all cultures and languages, however, and it is important to recognise the limitations of using translated instruments.

Conclusions

Overall, this study suggests that hospital safety climate represents an important influence in Japanese health care practice. Not all safety climate factors were related to NSI however, and similarly, not all NSI devices were associated with all aspects of safety climate. These findings indicate, therefore, that NSI and safety climate interactions are both complicated and multifaceted in Japanese health care environments. Various limitations of the current study include generalizability due to the inclusion of only one hospital, the cross-sectional nature of data collection which made it difficult to establish causal links, the difficulty in conducting more advanced data analysis, and fact that many different types of safety climate ques-

tionnaire exist. On the other hand our investigation benefited from many strengths, including a large sample size, high response rate, high internal validity, as well as the practicality of employing a questionnaire known to be useful in the health care field. Although the provision of safer devices remains critical in preventing injuries, ensuring a positive safety climate will also be essential in meeting these important challenges for nurses' occupational health in Japan, as elsewhere.

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