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Needlestick injury prevention: Lessons learned from acute-care hospitals in Ontario

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Executive Summary

Needlestick injuries have been identified as an important modifiable risk factor associated with the transmission of blood-borne pathogens between patients and health-care workers.

A number of jurisdictions, including the province of Ontario, turned to regulation to accelerate the adoption of safety-engineered needles (SENs) for the prevention of needlestick injuries. Yet surveillance data available in work-related emergency department and workers' compensation claims records demonstrates that needlestick injuries have not declined substantially in Ontario.

Case studies were carried out in three acute-care hospitals in Ontario to help stakeholders understand why needlestick injuries continue to occur and what might challenge and support further progress in this area. Program documents were reviewed and interviews were carried out with staff across the three hospitals under study.

All three hospitals responded to the regulatory requirements with integrity, and all three experienced declines in needlestick injuries. Inconsistent processes and outcomes were evident across the three hospitals, which may have been due to variation in the types of SENs that had been integrated, each organization's readiness for change, and the implementation practices that were adopted.

During the initial implementation phase, some front-line workers developed strategies to avoid using SENs. A conflict existed between the values health-care workers placed on performance and patient care and the learning curve associated with the initial transition to SENs. Starting early to support a gradual and more comprehensive implementation process that was less susceptible to the effects of change fatigue appeared to be an important advantage.

Three main pathways for ongoing needlestick injury risk were captured in incident reports and interviews: injuries that occurred during a procedure; injuries that occurred during the activation of a device; and injuries that occurred during sharps disposal. The case reports emphasized that not all SENs were equally effective in reducing needlestick injuries. While front-line workers continued to note some practice issues with respect to the proper use of SENs, needlestick injury prevention was not identified as an important ongoing priority.

While further progress in reducing needlestick injuries is challenged by competing health and safety priorities, a renewed interested in this issue among front-line workers and health and safety professionals may improve outcomes. Opportunities to advance prevention efforts and further reduce needlestick injuries appear to be available.

1 Background

In the mid-1980s, an increased awareness of the potential health consequences of needlestick injuries in health care stimulated a number of advances in engineered controls through the development of safety-engineered needles (SENs) and other medical sharps. A number of jurisdictions, including the province of Ontario, turned to regulation to accelerate the adoption of SENs for the prevention of needlestick injuries in health-care organizations.

Ontario established regulation on needle safety in 2007 under the *Occupational Health and Safety Act,* which initially affected all hospitals in the province and, later, other workplaces through two amendments that were made to the regulatory standard in 2009 and 2010 (Government of Ontario, 2007).

Ontario's regulation was designed to provide flexibility at the organization level in the selection and implementation of SENs. A number of different types and brands of SENs are available, and are categorized as manual, passive and semi-automatic. Manual SENs require user activation. Passive SENs are fully automatic; the needle retracts automatically once an injection is complete. Semi-automatic SENs require some user activation; e.g. needles retract with the push of a button. Evidence supports the added value of passive or fully automatic SENs in terms of reducing needlestick injury risk (Tosini et al. 2010).

Across Ontario, needlestick injuries have declined; however, reductions have been less than expected and not substantial. It is important to reflect on some measure of success. British Columbia defined an indicator of success as a 50 per cent decline in the number of lost-time claims and health-care-only claims associated with needlestick injuries over a three-year period following regulatory change (WorkSafeBC, 2011).

Comparing the rate of needlestick injuries captured in Ontario workers' compensation claims in 2006 (the year prior to the regulation being established) to the rate in 2011 (three years following the regulation coming into effect), the hospital rate group saw a six per cent decline in needlestick injuries. However, needlestick injury rates in the hospital rate group have been declining gradually over time. Comparing the rate in 2004 to the rate in 2012, needlestick injuries have declined by 31 per cent. Greater declines have been observed in the nursing care rate group (long-term care homes), which saw a 67 per cent decline over this same time period. The trends parallel findings in other

jurisdictions, including British Columbia and the United States (WorkSafeBC, 2011; Jagger et al., 2008).

The impact of the regulatory standard and, more generally, a gradual system uptake of SENs in Ontario has been less than anticipated. The mandatory use of SENs was expected to have far-reaching benefits for both health-care workers and the wider community. It was anticipated that injury rates could be reduced by 80 to 90 per cent (*Safe Needles Save Lives Act*, 2006). Prior to the regulation on needle safety, a case study at Toronto East General Hospital reported an 80 per cent decline in needlestick injuries following the integration of SENs (Visser, 2006).

Important questions remain: Why have needlestick injuries not declined to a greater extent across Ontario, and what might challenge further progress?

There are a number of knowledge gaps around the impact and implementation of Ontario's regulation on needle safety.

Studies examining safer needle regulation in other jurisdictions have reported less-than-optimal outcomes, with no contextual information on reasons for continued issues with the use and implementation of these devices.

Other knowledge gaps include how safer needle regulation has influenced investments in safety technology, the organizational challenges associated with the implementation of SENs, why needlestick injuries continue to occur despite the availability of SENs, and where future investments should be made to further reduce injury risk.

2 The Ontario Needle Safety Study

In 2011, the Ontario Needle Safety Study was initiated to more closely examine implementation processes and outcomes in Ontario acute-care hospitals that had integrated SENs. Drawing on organizational change and implementation science theory, a qualitative case-study design was used to examine the implementation experience in three acute-care hospitals in Ontario. The three hospitals were randomly selected to participate from a list of hospitals in two regions in Ontario. Ethics approval was obtained from the University of Toronto, as well as from the three participating hospitals.

The fieldwork consisted of regular visits to each hospital site over the course of three of four months. During these site visits, interviews were carried out with staff and relevant program documents were reviewed to examine how each hospital responded to and managed the integration of the SENs regulatory requirements, to describe the consequences of integrating SENs, and to highlight remaining issues associated with the use and integration of SENs. Table A1 in Appendix A lists the topics addressed in the interviews and the corresponding groups of participants that provided information. Table A2 lists the types of documents reviewed.

A total of 30 individual interviews ranging from 30 minutes to two hours in length were carried out with organizational informants and front-line workers (registered nurses and registered practical nurses) across the three hospitals under study. Organizational informants were considered to be staff members who had a direct role in the selection and integration of SENs. Table 1 below provides details on respondent characteristics.

Table 1: Respondent characteristics

Primary informant category	**# respondents**
Registered nurse / registered practical nurse	17
Organizational informant	9
Clinical manager / supervisor	4
Health and safety role	
Occupational health and safety	4
Joint health and safety committee	11
Safer Needle Task Force	6
None of the above	9

Gender	
Female	22
Male	8
Time in current organization	
Less than 5 years	5
5-10 years	9
More than 10 years	16

The majority of interviews were audio-recorded and subsequently transcribed using the services of a transcriber. During this process, names of individuals or organizations were removed. Interview summaries were prepared for participants to review and to provide additional feedback.

A number of analysis approaches and tools were used to fulfill the requirements of a case-study approach and to accommodate the evaluation focus. A systematic data coding procedure helped navigate the data to support a within- and cross-case analysis. The initial focus was on preparing three descriptive case reports for each hospital under study. A thematic analysis was carried out to identify patterns and themes within and across the three cases.

3 Results

3.1 The case reports

Three detailed case reports were completed for each hospital (Appendix B). The case reports reflect what was learned from interviewing both front-line workers and organizational informants, and from reviewing organizational documents. The reports provide an overview of the strategies and processes used by each organization, and reveal perceptions and beliefs shared by both front-line staff and organizational informants about the overall implementation process. Each report ends with a review of how the organization was continuing to ensure that the use of SENs was supported and improved over time, and how the use of these safety devices had become integrated into practice. Appendix B presents the three descriptive case reports. A summary of the three hospitals that participated is presented below.

Hospital A was a large teaching hospital outside the Greater Toronto Area serving a large urban population. With respect to the timing of the transition to SENs, the move to SENs occurred after the regulation was announced in 2007. The timing of the implementation process meant that the organization had less than a year to convert to SENs.

Hospital B was a multi-site community hospital within the GTA. The move to SENs occurred before safer needle regulation was established in response to a workplace inspection order received in 2006. The integration of SENs was supported by health and safety staff and some front-line workers, but not initially by senior management. Despite some resistance initially, the organization ended up forming a partnership with its health and safety association and went beyond the requirements of the inspection order to integrate SENs in other areas.

Hospital C was a large teaching hospital within the GTA. A number of advances in the uptake of safety devices in the hospital dated back to 2003, five years before Ontario's regulation on needle safety took effect. At that time, there was new leadership in the occupational health and safety department. One of the goals of the new director was to address needlestick injuries at the hospital.

All three hospitals responded with integrity, integrating SENs across the hospital. Despite a number of similarities in the types of safety devices that were implemented

and very similar challenges faced during implementation, the implementation process was influenced by three very different organizational contexts.

Table 2 presents a summary of key findings across the three cases under study, including: a description of organizational characteristics; transition to safety needles; types of SENs introduced; use of external resources; perceived challenges and facilitators; outcomes of the transition; and activities in place to support the sustained integration of SENs.

It is important to note that the transition to SENs led to varied outcomes, with declines in needlestick injuries ranging from 37 to 80 per cent. It was challenging to accurately compare outcomes among the three hospitals studied. A comparison was attempted by taking the number of needlestick injuries reported the year prior to the transition and the number of needlestick injuries reported three years following the transition period to calculate a percentage relative decline. The complete case reports can be found in Appendix B.

The results draw on the three case reports (Appendix B). **Section 3.2** and **3.3** focuses on the cross-case comparison. **Section 3.2** focuses on program installation and initial implementation, examining conditions that challenged and supported the integration of SENs. **Section 3.3** focuses on the fully operational programs, examining the need for ongoing investment in needlestick injury prevention.

Table 2: Summary and comparison of the content from the three case reports

	Hospital A	**Hospital B**	**Hospital C**
Organizational characteristics	Large teaching hospital	Multi-site community hospital	Large teaching hospital
Transition to safety needles*	2007, in response to safer needle regulation	2006, in response to a workplace inspection order	2003-2005, voluntary transition
Types of SENs introduced	Mix of semi-automatic and manual safety needles	Mix of semi-automatic and manual safety needles	Mix of semi-automatic, manual and passive safety needles
Use of health & safety association resources	No	Yes	No (not available)
Challenges	• Physician resistance • Product hoarding • Safety features not used/removed • Accessing staff to deliver training • Working out exceptions • Non-functional safety • Financial approval	• Initial senior management resistance • Safety features not used/removed • Working out exceptions • Accessing staff to deliver training	• Safety features not used/removed • Sharps disposal bins not emptied • Accessing staff to deliver training
Key facilitators	• Product vendors • Existing processes and structures • Adapting to organizational constraints to deliver training • -Ongoing monitoring and improvement	• Product vendors • Labour inspection • Early transition/phased in approach • Needs assessment • Engagement with staff • Implementation champions • Internal communication / awareness	• Product vendors • Senior management support • Early transition • Internal communication/awareness • Implementation champions • Culture of safety • Ongoing monitoring and improvement
Relative decline in NSIs**	37%	57%	80%
Implementation policies and practices to support sustained integration	• Written policies and procedures • Ongoing monitoring of incidents • Resources available on intranet	• Written policies and procedures • Ongoing monitoring of incidents	• Written policies and procedures • Annual safety day • Annual review of exceptions • Ongoing monitoring of incidents

The transition to SENs represents the time during which the majority of SENs were integrated. **Relative decline in needlestick injuries (NSIs) is based on needlestick injuries during the year prior to the transition compared with NSIs three years following the year of the transition.

3.2 What challenged and supported the integration of SENs

Conditions that challenged implementation of safety-engineered needles

Despite the fact that the integration of SENs was for the health and safety of employees, it did not follow that all the devices were immediately accepted and used by front-line workers.

Device use and activation problems appeared to be an important issue at all three hospitals. Issues with non-safety needles being stored, safety needles not being used, or safety devices not being activated were strategies front-line workers used initially to avoid the new technology.

Change fatigue: An important theme in accounts of this initial resistance centred on the concept of change fatigue. The idea that 'nobody likes change' was often raised in interviews with both front-line staff and organizational informants.

One organizational informant felt that the initial resistance to SENs might not reflect feelings about their lack of value, but rather a general frustration with working in an environment that is constantly changing:

> Hospitals are going through so much change right now universally that people are almost resisting anything, I mean not just making an argument for the sake of arguing but people are fed [up], in the current state just get a little fed up with change so I think that's confounding what they really feel about the product or its safety. If it's something different it's a change and they don't want it.

The concept of 'change fatigue' has been studied previously and recently in relation to nursing practice. In the literature, change fatigue has been defined as "overwhelming feelings of stress, exhaustion and burnout associated with rapid and continuous change in the workplace" (McMillan and Perron, 2013, p. 1). Different types of changes in health care have been described as leading to change fatigue, including changes to nursing scope of practice, human resource allocation, and technology (Hansson, et al. 2008).

This issue of change fatigue would be particularly relevant to those organizations that transitioned to SENs in direct response to the regulation, which provided a 12-month period for compliance. This type of change can be labelled as episodic change or change that occurs during distinct time periods, that is motivated by external events, and that is often externally driven. Organizations that were not constrained by the effective date of the regulatory requirements could implement

smaller and more continuous proactive changes. This provided an opportunity to introduce SENs when no other major product changes were underway at the hospital and provided an opportunity to use more comprehensive implementation practices (e.g. awareness campaigns, needs assessments, multiple product evaluations).

Performance and productivity: Another important influence on how front-line workers responded to SENs was an apparent conflict between the changes imposed by the new SENs and the values shared by front-line workers towards performance and patient care.

While the requirement to use SENs was designed to protect staff from needlestick injuries, the initial transition had the unintended consequence of temporarily having a negative effect on performance and, from the perspective of front-line workers, their ability to get the job done.

Front-line workers reported that the more fine skill and experience they had working with a specific device, the more they were thrown off by even minor changes in equipment. The impact of product changes on performance was described well by one of the organizational informants:

> You're taking people who are used to for example holding a wing set in a certain way and applying it and they're now masters of that and now you're suddenly asking them to use something in a different way and anybody who draws blood for a living will balk against it.

Innovation-values fit: The connection between how front-line workers responded to the implementation of SENs and their values towards performance and patient quality of care is well aligned with the concept of 'innovation-values fit**'** **(**Klein and Sorra, 1996). Innovation-values fit refers to a fit between a new program or technology and the values of staff or the organization as a whole. It has been identified as an important organizational condition for optimal implementation (Klein and Sorra, 1996).

To some extent, the idea of moving to SENs was in line with shared values in protecting the health and safety of workers. As the adoption of SENs was for the health and safety of workers, its implementation was aligned with the priorities of the occupational health and safety staff. For front-line workers, the fit initially appeared to be less than optimal. When some SENs were difficult to work with, they may have been viewed as being in

direct conflict with the professional competency of front-line workers, motivating them to develop strategies to avoid using the new devices.

The learning curve: Reports of negative feedback about the design of SENs, resistance to the transition, and activation problems were often discussed in *retrospect*. In all three cases, the belief was that issues with SENs had either been resolved or staff had learned to adapt to the new technology.

The concept of a 'learning curve' often refers to an initial period of poor performance that decreases over time with experience. This notion of a learning curve was touched on by other staff when they described how initial challenges with the use of SENs had been resolved over time. For example, one organizational informant emphasized that 'pushback' was not because staff didn't value the protection the new devices provided; it was just a matter of getting used to the new feel of the device:

> One of our biggest users was our IV team and they know it's for their protection and they'd much rather have it, it's getting used to it, they're a little bit more awkward it's getting used to it, getting used to the feel of it and there's been no complaints, it was very little that pushback we had, it was a matter of the nurses just took it on and used it.

Knowledge and awareness of this period of adaptation is particularly important for interpreting and managing needlestick injuries associated with SENs. As reported in the case report for Hospital C, needlestick injuries actually increased for a period of time after SENs were implemented before overall rates of needlestick injuries declined substantially.

Conditions that facilitated implementation of safety-engineered needles

A number of implementation facilitators were described in each case report. This section is based on a cross-case comparison of the key implementation supports to examine more closely why they were valued and how they were used.

External support: The case reports emphasize the important role of product vendors as an external support to the implementation process. While different supports were used across the three cases, they included needs assessments, product suggestions, product evaluation, training, and follow-up consultation to address any product issues. The role of product vendors was particularly interesting as these types of supports would typically be provided by health and safety consultants.

The services provided by product vendors came with no cost implications and essentially served to transfer some of the workload off the organization. This form of external support may be essential for the implementation of large-scale innovations under a regulatory framework when human, financial and informational resources are strained.

Management support: Hospitals A and B demonstrated how lack of management support can challenge the implementation process. Hospital C was the only site that emphasized the support they received from management and identified it as a key facilitator in the implementation process. This hospital also reported fewer setbacks in getting specific SENs approved for purchase and use.

While strong senior management support may not have been necessary to initiate the transition to SENs under a regulatory framework, this form of support did appear to facilitate a smoother transition and provided the opportunity to adopt more advanced SENs that went beyond the minimum requirements for safety.

Implementation champion: The presence of an implementation champion was identified as a key support in the transition to SENs. A number of examples across the three cases demonstrated how health and safety staff were committed to ensuring SENs were integrated. For example, the health and safety director at Hospital A actively pursued measures to address ongoing needlestick injuries associated with the use of SENs by developing strategies to work with product vendors and accounting to get a more advanced safety needle approved.

Hospital B was unique in that a front-line worker became a champion of the implementation process, initially requesting support from the MOL to encourage the hospital to move to SENs and later serving as an active participant on the hospital's SENS task force. The presence of the champion at Hospital B may have been particularly important to the transition process because senior management support was limited during the initial implementation phase.

Implementation policies and practices: An important limitation associated with the implementation of an innovation under a regulatory framework is that the time period available to initiate a comprehensive implementation strategy is often limited.

Organizational informants at Hospitals B and C reported that the early transition to SENs was an important facilitator as it provided a means to more gradually phase in the new devices.

Training was identified as an important implementation support; however, setting aside time in the workday for staff to attend training was a common problem encountered across all the three cases. One informant emphasized how patient demands can prevent staff from attending group-based, face-to-face training sessions:

> So, for nursing it's hard to say well okay, let's all go there, all 20 staff let's just leave all of our patients and go in there for half an hour and so we kind of just try to get the educator involved, okay go to your in-service, I will kind of take care of your patients while you're there.

Another training strategy used at Hospitals B and C was a 'train-the-trainer' approach in which product vendors trained clinical practice leaders, educators or other select experienced staff, who then trained their co-workers. A number of issues were raised with respect to this approach.

As staff shifts are distributed across 24 hours, seven days a week, the 'train-the-trainer' approach means a large proportion of front-line staff may miss the training. What appeared to be instrumental in managing training challenges was the existing culture of staff interdependency. In all three cases, front-line staff reported learning how to use SENs from co-workers. While this may have been particularly helpful in ensuring staff received the training, a number of people recognized the limitations in relying entirely on co-worker support because of the potential for transferring 'bad habits'.

Training challenges stood out as one of the most important issues identified by both organizational informants and front-line workers and across all three cases. While comprehensive face-to-face training seemed to be valued most, it was also the most challenging to implement. It was recognized that the training challenges were not unique to the implementation of SENs. Providing comprehensive training to support the integration of other types of new technologies and practices was also challenged by the nature of health-care work demands and scheduling.

Organizational culture and context: An important contextual influence on the implementation process was the organization's existing occupational health and safety management system, including existing practices for introducing new health and safety equipment, promoting the use of new safety products and practices, and encouraging the reporting of injuries and near misses. The case report for Hospital C includes views shared by a number of informants about the organization's active efforts to demonstrate its commitment to employee safety and how this can influence front-line worker engagement with new health and safety innovations.

3.3 Examining the need for ongoing commitment to needlestick injury prevention

The previous section looked back to examine how the overall implementation process played out. This section focuses on what was learned about the post-implementation phase.

Why are needlestick injuries continuing to occur?

This study provided an opportunity to examine the ongoing risk of needlestick injuries since the transition to SENs.

Health-care workers were asked why they thought needlestick injuries continued to occur despite the availability of SENs. They were asked to think about a recent injury they personally experienced or observed in practice. Hospital C also had detailed incident reports available for review. The following three pathways were important sources of ongoing risk:

- **Patient action**: Injuries sometimes occurred before SENs were activated, during a procedure and as a result of patient action. In these situations, patients were described as being 'aggressive', 'combative', or 'not-cooperative'.

- **Sharps disposal**: Ongoing injury risk was linked to the improper disposal of sharps,, including the use of overfilled sharps disposal bins. Improper sharps disposal practices impose a risk of injury not only to the staff member disposing the needlestick, but also to other nurses and housekeeping staff working in the same area.

- **During activation:** In reference to ongoing needlestick injuries, front-line workers and managers emphasized the potential for needlestick injuries to occur not only prior to the activation of safety devices, but also during activation. The most common SEN used at all three sites had an active design, in which the safety cap had to be manually flipped over the needle. Other safety devices require the health-care worker to use a finger to slide forward a safety gauge to lock the safety cap in place.

A number of incidents described by front-line workers and informants emphasized that not all SENs are equally effective, easy to use, or able to eliminate needlestick injuries. There were accounts from front-line workers that emphasized the added value of semi-automatic and some passive SENs for their ease of activation and ability to protect

workers from injury immediately after use. During the product selection and evaluation process at Hospital C, it was reported that some of the devices available were more awkward to use. Hospital A had integrated a manual butterfly needle that was found to be so awkward to activate that staff were no longer using the safety component on the device.

To what do staff attribute the source of ongoing injury risk?

Capturing different perspectives on the source of ongoing injury risk may have important implications with respect to the support (or not) of future health and safety initiatives.

Explanations as to why needlestick injuries continue to occur and how they could be further prevented can be organized under two themes: the importance of staff compliance and ***"being more careful,"*** and the inevitability of injury as a consequence of the ***work environment***.

The following quote provides an example of how front-line workers attributed ongoing injury risk to individual action. In this case, the importance of **taking control over the situation** was emphasized:

> I tell nurses you are the one in control, you have the needle in your hand, make sure they stay still which means either you hold them still or you tie them down, get another nurse to hold them down because if they flinch, it's going in through him and you

In line with this focus on individual practice, another front-line worker described how risk of injury increases **when workers rush through a procedure**:

> There still are some needlestick injuries but they're small and a lot of times it seems like the person you know, have documented that they rushed so time seems to be a factor, so it's more individual kind of slowing down and taking their time to do the process...

A number of accounts emphasized that some injuries are unpredictable and that environmental influences, including workload and limitations in the design of SENs, can influence ongoing injury risk.

One of the front-line workers who had recently been injured attributed her injury to patient action. What was emphasized in her account was the unpredictable nature of interactions with patients and the challenges associated with anticipating how patients will react. Based on her assessment, she had determined that her patient was 'compliant' and 'coherent'. Her injury occurred during the second injection; the first injection gave no indication that the patient would resist.

What might impede sustained integration?

A number of relevant activities are described in the case reports that capture ongoing monitoring and adjusting in response to implementation challenges. All three hospitals under study had integrated SENs and had written policies and procedures in place. Following initial declines in needlestick injuries, Hospitals A and B reached a plateau. Hospital C had only a handful of needlestick injuries each year.

While a number of concerns were initially raised about the integration of SENs, no recent issues were brought forward for discussion with health and safety staff. All front-line workers and informants who were interviewed emphasized that, from their perspective, needlestick injury prevention was not an important ongoing priority. However, front-line workers across all three hospitals did describe a number of practice issues that they continued to observe with respect to the use and disposal of SENs.

Overall, ongoing activities to monitor and reinforce practices appeared to be more reactive in nature; action would be taken only when injuries notably increased.

In response to a recent study that found passive safety needles were most effective in reducing injuries (Tosini et al., 2010), organizational informants were asked about whether or not passive safety needles were considered during the selection process or whether they might be considered in the future. Hospital C was the one site that had adopted passive safety devices in select high-risk areas. Informants and front-line workers were hesitant and expressed some doubt about the increased use of passive safety needles.

What might challenge further progress?

The next section draws on the three case reports to examine how organizational conditions, external influences and shared beliefs may influence plans to invest in future needlestick prevention initiatives. These considerations are important for anticipating what types of challenges will be faced in motivating further progress in needlestick injury prevention in organizations that need to further reduce needlestick injuries.

Change valence: An important question in carrying out this work was whether ongoing efforts to address needlestick injury prevention are perceived to be needed, beneficial or worthwhile.

A number of front-line workers were not aware that needlestick injuries were continuing to occur. Among those who were aware, perspectives differed about whether or not ongoing injury risk was an important problem.

The following quote is from an organizational informant at Hospital A who felt that 100 needlestick injuries each year is low considering the size of the hospital:

> When you look at it, I think there's about 5-6,000 nurses across the [hospital sites] and 12,000 employees, when you look at that number that's pretty small, so it is quite low I think

It was not surprising, then, to learn that no staff requests had been recently made to the health and safety departments regarding improvements in this area. Staff are unlikely to make recommendations if they are unaware that needlestick injuries continue to occur or do not perceive them to be an important problem.

Perspectives also differed with respect to how ongoing injury risk should be managed. There was a shared belief that ongoing needlestick injuries were influenced not only by the nature of the safety devices, but also by individual adherence to safety precautions: one front-line worker emphasized "at the end of the day the issue isn't what the hospital has, the issue is how the staff uses it."

Some staff may have different perspectives on what is driving ongoing needlestick injuries and, thus, may also have different perspectives on the value of investments in more advanced safe needle technology to address ongoing needlestick injuries.

Another consideration is the availability of information on the nature and magnitude of the problem. For example, informants at Hospital B explained that no data was available to determine whether or not the plateau in needlestick injuries could be further reduced by investing in more advanced SENs. The organization was not routinely carrying out root-cause analyses.

Another important consideration is how front-line staff feel about the current stock of SENs and ongoing injury risk. Across all three cases, there was no collective push for the increased use of passive safety needles.

Health and safety staff are unlikely to invest significant effort in moving to more advanced safety needles if no feedback suggests more advanced safety devices would be of value. Organizational informants emphasized that front-line staff do not ask for upgrades to the safety devices currently in use.

Interviews with front-line workers who had recently been injured did present a very different perspective.

A number of front-line staff expressed positive views about the use of both semi-automatic and passive SENs, both in terms of the ease with which the safety could be activated and their ability to protect staff from injury.

One of the nurses brought two safety devices to the interview to visually demonstrate why semi-automatic safety devices are easier to activate. All front-line workers who participated in an interview and recently reported a needlestick injury expressed strong support for the use of passive SENs. The following quote is from a front-line worker who felt that a semi-automatic SEN could have prevented her injury:

> I got one needlestick injury since I've been here and it happened so fast, so quick... as I [was] going over with OCC health, I thought I did almost everything right...I think the best thing that I am always for, is to have one of those retractions, like the IV one we have, it goes in and then locks by itself, you don't have to take it out before you activate.

Another injured worker revealed that she had agreed to the interview because it gave her an opportunity to demonstrate how needlestick injuries can still happen with some types of SENs. She also felt strongly that semi-automatic and passive SENs could further reduce injury risk.

A theme that helped explain the varying perceptions about the importance of additional investment in needlestick injury prevention centred on being 'in the know.' Being 'in the know' was defined as having experience or information that a problem exists and the ability to see how it could be addressed. Injured workers drew on their experiences to reflect on how needlestick injuries could still occur and where improvements could be made to the design of SENs; however, as emphasized earlier, a number of front-line staff were unaware that needlestick injuries continued to be reported.

Information assessment: Accounts of ongoing implementation efforts were also related to the capacity for further change.

The most prevalent trade-off associated with the move to SENs was the added cost of these devices relative to conventional non-safety needles and syringes.

Front-line staff acknowledged the cost implications of moving to passive safety devices or even semi-automatic safety devices. The following quote is from a front-line worker at Hospital A, who was doubtful about further investments in more advanced safe needle technology:

> A retractable would be better it's a much higher cost and right now everybody is cutting so much that I can't imagine them bringing anything more in...

With knowledge of constrained budgets and the increased costs of more advanced SENs, staff may not advocate for change because they don't perceive change as feasible. One of the front-line workers was hesitant to even make recommendations:

> There are some concerns I have but I am not sure how they could be, I mean it's going to cost a lot more money to implement them.

This section has revealed what might influence future plans to invest in needlestick injury and sharps injury prevention initiatives. The next section will focus on some pragmatic implications and lessons learned from the three cases under study: information that can be used to support successful implementation and to identify feasible opportunities for making further progress in the prevention of needlestick injuries.

4 Implications and Lessons Learned

4.1 Facilitators and barriers associated with the implementation of SENs

An important strength of this study was the ability to draw pragmatic lessons learned about the implementation of SENs and how to further prevent needlestick injuries.

A number of implementation supports were perceived to have facilitated the integration of SENs, including:

- having senior management support
- starting the transition process early to allow for a phased-in approach
- getting product vendor help with implementation
- developing strategies to increase awareness about the integration of new devices and needlestick injury risk among front-line staff
- promoting ongoing communication among departments involved in facilitating the transition
- empowering 'implementation champions'
- initiating implementation practices that support the timely identification and management of product issues.

Implementation processes could have been improved in a number of areas.

While product vendor support was identified as a key facilitator to the transition process, it is important to also acknowledge the limitations in relying entirely on product vendors during the product selection and evaluation phase, considering their invested interest in the organization adopting one of their products.

An important challenge discussed by informants and front-line workers at all three sites was the delivery of adequate training to support the use of SENs. This issue appears to be important not just to the integration of SENs, but to all forms of health and safety training. Staff should receive adequate support and encouragement to attend training sessions. Greater accountability in training attendance also appears to be needed.

Reporting practices were also highlighted as a challenge in the case reports. Incident reports appeared to be the primary mechanism for the health and safety department to learn about and respond to ongoing issues. There would be value in raising a new awareness about current processes to report near misses or issues encountered with

the use of SENs. It will be important to communicate with staff why this information is important and how it can be used.

4.2 A need for ongoing commitment to needlestick injury prevention

It was apparent across all three hospitals that sharps injury prevention was not perceived to be a visible priority. While some efforts to address specific issues were discussed, front-line staff were rarely able to recount recent communications about needlestick injury prevention.

Staff may not necessarily forget how the safety devices work, but they may need to be reminded that needlestick injuries do still occur with the use of SENs and how these injuries can be prevented. Internal health and safety inspections may need to regularly focus on the use and activation of SENs.

An important activity that may help raise awareness is the use of existing communication forums (e.g., newsletters, posters, e-mails) to describe recent needlestick injuries and indicate how many needlestick injuries are reported to the occupational health department on a regular basis. A number of front-line workers were unaware that needlestick injuries continued to occur. If injury reporting is related to perceived risk, it could be that staff do not report all needlestick-related injuries because they consider them low risk. As a result, the injury reports reviewed by the health and safety department may not include potentially valuable information on the types of safety needles, circumstances and procedures associated with perceived low-risk needlestick injuries such as near misses and injuries with sterile needles. Other means to evaluate the burden of occupational exposures and injuries and the degree of under-reporting may be worth initiating. For example, an annual survey could be used to obtain anonymous data on injuries that occurred but were not reported.

Only one of the three hospitals under study had integrated truly passive safety needles in high-risk areas. The integration of passive safety needles could potentially make an important contribution to further reduce the risk of needlestick injuries.

There would also be value in increasing the use of root-cause analysis to examine the influences underlying ongoing injury risk. This could help determine what types of safety improvements may have the greatest impact on ongoing injuries.

4.3 Conclusion

Ontario's regulation on needle safety was designed to provide flexibility in the selection and implementation of SENs at the organizational level. The regulation's success relied heavily on the actions and conditions of regulated workplaces. This was demonstrated in the implementation experiences of the three hospitals under study. While all three complied with the regulatory requirements, they varied substantially in their implementation processes and outcomes. The case reports revealed a number of influences on how SENs were accepted and integrated into practice, including how the new devices aligned with professional values about performance and patient care in addition to broader organizational conditions. Implementation challenges required ongoing monitoring to ensure product issues were identified and addressed. As comprehensive implementation practices are integral to the success of regulatory change, greater awareness is needed about implementation best practices to support the successful integration of occupational health and safety interventions.

While further progress will be challenged by other competing health and safety priorities, a renewed interest in this injury issue among front-line workers and health and safety professionals may produce better outcomes. A number of opportunities appear to be available to advance prevention efforts to further reduce ongoing needlestick injuries.

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References

Government of Ontario. Ontario Regulation 474/07 Needle Safety. Government of Ontario 2007; Available from: http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_070474_e.htm

Hansson A, Vingard E, Arnetz BB, Anderzen I. Organizational change, health, and sick leave among health care employees: A longitudinal study measuring stress markers, individual, and work site factors. Work and Stress 2008;21(1):69-80.

Jagger J, Perry J, Gomaa A, Phillips EK. The impact of U.S. policies to protect healthcare workers from bloodborne pathogens: The critical role of safety-engineered devices. Journal of Infection and Public Health 2008;1(2):62-71.

Klein KJ, Sorra JS. The challenge of innovation implementation. Academy of Management Review 1996;21(4):1055-80.

McMillan K, Perron A. Nurses amidst change: The concept of change fatigue offers an alternative perspective on organizational change. Policy, Politics and Nursing Practice 2013;14(1):26-32.

Safe Needles Save Lives Act, 2006. Available from: Legislative Assembly of Ontario.

Tosini W, Ciotti C, Goyer F, Lolom I, L'Hériteau F, Abiteboul D, et al. Needlestick injury rates according to different types of safety-engineered devices: Results of a French multicenter study. Infection Control and Hospital Epidemiology 2010;31(4):402-7.

Visser L. Toronto hospital reduces sharps injuries by 80%, eliminates blood collection injuries. Healthcare Quarterly 2006;6(1):68-70.

WorkSafeBC. Regulation change: Safety engineered needles/sharps. 2011. Report No.: 17. Available from: http://www.worksafebc.com/regulation_and_policy/policy_practice_consultative_committee/meeting_calendar/Feb12/assets/effectivenessmeasurereportsQ411.pdf.

Appendix A

Table A1: Interview topics by employee category and theme

		Informants					Management/ Front-line Staff	
		Educator	Logistics/ Purchasing	Safer Needle Task Force	Joint Health and Safety Committee	Occupational Health and Safety	Unit Manager	Front-line Worker
Background	Current role	X	X	X	X	X	X	X
	Duration with hospital	X	X	X	X	X	X	X
	Role supporting transition							X
Transition History and Overall Impact	Status of transition to SENs	X	X	X	X	X	X	X
	Timing of transition	X	X	X	X	X	X	X
	Impact of regulation on transition			X		X		
	Types of SENs available	X		X		X	X	X
	Overall impact of transition			X		X		
	Ongoing injuries with SENs			X		X	X	X
	SENs integrated beyond regulatory requirements					X		
	Staff support of SENs prior to regulation				X			
	Cost impact		X					
Implementation Policies & Procedures	SENs implementation process			X		X	X	X
	Staff / committee involved in transition		X			X		
	Use of external resources		X	X		X		
	Process remove old stock		X					
	Available policies and procedures					X		
	Opportunities for staff to support transition						X	X
	Reporting practices					X		X

Table A1 Continued: Interview topics by employee category and theme

		Informants					Management/ Front-line Staff	
		Educator	**Logistics/ Purchasing**	**Safer Needle Task Force**	**Joint Health and Safety Committee**	**Occupational Health and Safety**	**Unit Manager**	**Front-line Worker**
Training	Level of training required	X						
	Perception of quality vendor designed training	X						
	Ongoing training	X			X	X	X	X
	Training / education received on SENs use							X
Ongoing Implementation	Ongoing monitoring of SENs use					X		X
	Ongoing SENs committee activities			X		X		
	Ongoing process integrate SENs			X		X	X	X
	Needlestick injury prevention as ongoing priority	X	X	X	X	X	X	X
	Ongoing review of NSI statistics				X	X		
	Current process for device selection	X				X		
	Reasons for ongoing integration of new safety devices	X				X		
Staff Response	Feedback from staff re use of SENs	X		X			X	
	Impact of SENs on injury risk	X					X	X
	SENs design preferences							X
	Feedback on SENs			X		X		X
	Importance of employee input							X
	Injury experience							X

Table A1 Continued: Interview topics by employee category and theme

		Educator	Logistics/ Purchasing	Safer Needle Task Force	Joint Health and Safety Committee	Occupational Health and Safety	Unit Manager	Front-line Worker
Implementation Issues	Availability of non-safety devices	X	X			X	X	X
	Reasons for inactive safety devices	X				X	X	X
	Contractual obligations		X					
	Barriers adoption of passive safety devices		X	X		X		
	Reasons ongoing injuries	X				X	X	X
Committees	History of committee development			X				
	Structure and function			X	X			
	Current priorities of committee				X			
	Previous / ongoing issues discussed re SENs				X			
	Recommendations made by the committee				X			
Other / Misc	Nature of MOL inspections re SEN use				X	X		
	Improvements in technology		X					
	External funding support		X					
Overall Experience	Overall implementation experience	X	X	X	X	X	X	X
	Barriers and facilitators to integration/training	X	X	X	X	X	X	X
	Recommendations for improvements in delivery and implementation of regulatory requirements	X	X	X	X	X	X	X

Document Review

Each site was asked for any relevant documents that would provide further background on the organization's implementation process. The three sites varied in the extent to which they had retained relevant documentation associated with the implementation process (Table A2). Across the three sites, 55 individual documents were reviewed for relevant information.

Table A2: Summary of Available Documentation by Case Site

Case A	Case B	Case C
Policies and procedures	Policies and procedures	Policies and procedures
Injury statistics	Injury statistics	Injury statistics
Newsletters	Newsletters	Newsletters
Training programs	E-mail correspondence	E-mail correspondence
Online educational resources	News reports	Training notices
Safety device evaluation results	Terms of reference of safety committee	Product announcements
	Task force meeting minutes	Safety posters
	Exemption request forms	Task force meeting minutes
	Employee survey results	Safety exemption forms
	Ministry of Labour orders	
	SENs cost comparison	

Appendix B

Case Report - Hospital A

The first hospital, Case A, was a large teaching hospital outside the Greater Toronto Area serving a large urban population. Prior to the transition, a number of structural changes had been made in the health and safety department, including the development of new positions and the combining of existing positions. It is important to note that, during the fieldwork, it was publicly announced that hundreds of jobs would be cut to manage a large budget shortfall at the hospital. Concerns about workload and staffing were raised during some of the interviews with organizational informants and front-line workers.

Implementation experience

Unlike the other two hospitals under study, the move to SENs occurred after the regulation was announced in 2007. An official news release outlining the organization's response to the regulation and plans for implementation was distributed to staff in January 2008 stating that the devices would be fully integrated by late summer. According to organizational informants, prior to the regulation being announced, neither staff nor their union representatives were actively pushing for the adoption of SENs. Thus the transition was almost entirely initiated by the regulatory requirements. The timing of the implementation process meant that the organization had less than a year to convert to SENs. A number of safety devices were implemented over this time period. The most frequently used SEN had a manual safety design; however, semi-automatic SENs were also implemented.

During the initial implementation process, organizational informants involved in leading the change process talked about getting 'push back' from key stakeholders groups. A number of organizational informants and front-line workers involved in the implementation process described physicians as being resistant to the use of safety needles. As one informant put it:

> I do think the doctors were probably one of the biggest, after the staff got used to them, the doctors were probably the biggest problem. I think they are a little more compliant, there's still some that aren't though. I don't know how you fix that.

An organizational informant attributed this initial resistance from physicians to a previous negative implementation experience. Before the transition to SENs was announced, the organization had attempted to switch the type of sutures being used for cost purposes. This resulted in significant internal conflict as physicians did not support the change and felt they had not been adequately consulted. The new sutures were never adopted. The health and safety staff attempted to meet with physicians at their division meeting to explain that the transition to

SENs was an occupational health and safety initiative that was required under the *Occupational Health and Safety Act* and not a strategy to lower costs for the hospital. However, a number of physicians did not attend, and it was reported that they continued to resist the changes.

This was not the only area of resistance described by organizational informants involved in the implementation process. As the regulation does not specify what types of safety devices should be used, organizational informants found it challenging to get approval from finance to integrate specific types of safety devices that were expected to be more effective but also more expensive. As an organizational informant explained:

> The regulation wasn't written really well because it gives people a big doorway to get out. If the doorway wasn't there I could force the hospital to change all of their shields... The hospital doesn't really want to change their shields because of the expense of changing them all. So, if the regulation is written in the right way we can use it actually to get [the safety devices], buy something that's more expensive.

The quote above highlights the absence of any wording in the current regulation that specifies what types of SENs should be implemented and shows how this can sometimes be a disadvantage. Under some circumstances, regulation can be used as a tool to justify investments that are supported by health and safety but resisted by senior management.

The organizational informants described a number of issues with the use of safety devices during the early implementation process. For example, safety caps were being physically removed from the devices or not activated before disposal. One of the informants elaborated on a number of practice issues that were encountered including product 'hoarding':

> The other issue that does occur and I am sure its occurred in many hospitals is some staff will try to steal, hoard the old needles and we have found here and there stashes of non-safety needles that staff were hiding.

'Stealing' needles was later explained in connection to 'exceptions'. When a safety needle could not be used for a specific procedure, non-safety needles would continue to be made available as an exception. This not only meant organizational informants found it difficult to approve and keep track of these exceptions, but also provided a means for some staff to avoid using the new safety technology. As a manager explained:

> The other issue or difficult issue is keeping people with exemptions right from going beyond the exemptions because we have no way of monitoring and keeping people who don't have exemptions from taking needles from the carts of people who do have exemptions.

A number of informants and front-line workers referred to a specific safety butterfly needle that, when implemented, actually resulted in an increase in needlestick injuries. One of the informants described how this device became a 'non-functional safety'. There were reports that

the safety mechanism was no longer being activated. Organizational informants acknowledged that the device did have some design issues, describing the safety component as “flimsy” and awkward to activate. The health and safety staff reported that their quarterly review of needlesticks and other incidents helped reveal that ongoing injuries were being reported with the use of this specific safety device.

The solution taken was to integrate an alternative safety butterfly needle with a semi-automatic safety mechanism—a device that could be activated with the press of a button. Organizational informants emphasized that the rollout of this particular device did not go well. While it took significant effort to convince administration that the added cost for a more advanced safety device would be worthwhile, the device was initially rejected by a large number of front-line staff. Organizational informants described a number of challenges getting it approved. The product vendor supplying the new product ended up having to negotiate with the finance department: needlestick injuries would be reduced to a certain point or the vendor would refund the difference in price. The idea was that reduced injuries would bring cost savings to the organization and, thus, justify the purchase of the more expensive device.

To implement this new safety butterfly needle, the organization followed the process used to integrate other SENs. The review and selection process was facilitated by an existing committee that had representation from clinical areas, infection control, occupational health, purchasing and finance. Unit managers from affected areas selected experienced staff to participate in product evaluations. Selected staff were then trained and given a personal supply of needles to work with over a one- to two-week period. They were then asked to comment on best practice, patient satisfaction, infection control and ease of use. The evaluation process was led by a representative from the product vendor, who presented the results back to the product selection and evaluation committee. In reference to the semi-automatic safety butterfly needle that was described earlier, one of the organizational informants explained that the product was very well accepted in the pilot evaluation but emphasized: “when we rolled it out it became a different issue.” This new device was resisted across the organization. As one organizational informant described, staff raised a number of issues:

> It wasn’t sort of one pocket of people that just don’t want change or things like that, it was so universal all over the hospital and the main issue was that they didn’t like the feel of it, they did not get flash back and sometimes it wouldn’t retract, sometimes they’d open the package and it would retract so that’s a waste of product, so things like that. They had quite a long list of I think it was about 10 things they weren’t happy with.

When the fieldwork was carried out, most of the product changes had been in place for three years—with the exception of a few devices, including the new safety butterfly needle discussed earlier. Despite a number of issues being brought forward during the initial implementation

process, organizational informants reported hearing very little from staff three years after the initial rollout. Interviews with front-line staff revealed some indifference about the safety devices that had been implemented:

> But now looking at it I talked to a few staff in the last couple of days and it's like second nature, it's like they don't even know the difference anymore. Even the people that kind of use them in the past they go, they don't dislike them, they don't like them.

The front-line staff interviewed at this site had a lot of positive things to say about the transition, particularly emphasizing how these devices have served to protect staff from needlestick injuries.

Implementation facilitators

Organizational informants were asked to describe what was important for addressing emerging issues and facilitating the implementation process. Front-line staff were also asked what helped them adapt to the new technology. Their reflections centred on the importance of external support, the use of existing organizational resources and processes, internal networks and communication, training accommodation and support, and strategies to re-evaluate and improve the integration process.

In terms of **external support**, organizational informants talked about the important contribution of product vendors. These representatives played a key role in helping the organization select from a variety of safety devices, carry out the product evaluation process, deliver training, and provide ongoing support when issues arose during implementation. One of the organizational informants described how thorough the product vendors were when troubles arose integrating a new safety device:

> So we contacted the company and they came back and they provided additional training, they went around to the units, they contacted a hospital in Toronto to see how it went with their implementation...so the company actually followed up with us numerous times...

Follow-up action that addressed ongoing problems helped the organization act on implementation issues. Strategies were used to monitor the use of safety devices that were not perceived to be that useful. The director of occupational health and safety did report that audits of sharps disposal bins were completed for the first two years but hadn't been done since. Auditing of disposal bins was described as a "very questionable practice" and not particularly helpful.

Not all external resources available to support implementation were perceived to be helpful or welcomed. One of the organizational informants described a rather negative experience when being offered assistance with the implementation process:

> No in fact we found that our community safety association called us up and told us they wanted to come in and tell us how to do it, we were already midway through our roll out and we said no, and they said well look, we have this document that we produced to do this and actually they were almost trying to bully us into coming in. And I found actually they were more of a stressor than anything else so I flatly refused them. You shouldn't really do that and the reason being they report back to [the WSIB] and the MOL that you're not being compliant...

This interaction highlighted how important it was for the organization to draw on their **existing processes** to facilitate the transition. Having an existing system in place to review and evaluate new medical devices was perceived as a facilitator by organizational informants. The organization did not want to start from scratch as it felt it already had a well-functioning product evaluation and selection process. As a representative from logistics pointed out, the organization introduces 75 to 100 new clinical products each year. The resistance may have also been heightened by the pressure of having to comply with the new regulatory standard by effective certain date, which gave them less than a year to transition to SENs. What seemed to be helpful were timely resources that could in effect transfer some of the workload off the organization. While a formal implementation guide was not utilized, the organization did appear to adopt some strategies that were aligned with some of the core implementation principles outlined in these guidance documents. For example, a sharps safety committee was established with select members from the JHSC to examine ongoing injuries and address any ongoing issues with new safety devices. This committee did not have a direct role in the product selection and evaluation process but played an important role in monitoring ongoing injuries.

Organizational informants, who were committed to transitioning to safer needle technology saw the **regulation** itself and the enforcement of the regulation as an important facilitator in helping staff in the occupational health and safety department succeed in getting SENs approved. For example, one organizational informant described his impression of regulation and inspections this way:

> So, it's moving in the right direction but regulations are helpful. I tell our MOL inspector who can be as much of a friend as a foe that often regulations help us out.

In retrospect, organizational informants talked a lot about the value of **engagement and awareness** during the early implementation process. One of the first steps in the implementation process was the formation of a steering committee with senior-level staff to raise awareness about the regulated changes and to obtain input on how to proceed. However,

it was also expressed that more engagement and input throughout the implementation process would have been helpful and could have avoided some of the setbacks encountered along the way. For example, one of the organizational informants identified the need for the health and safety department to better communicate with other departments in order to avoid conflict:

> The third very important person is the education coordinator ... I think because if you don't get the educators on board and control education and they push back to you, you're in trouble and initially with our initial roll out, we got a push back from them.

Another informant echoed the importance of **cross-departmental communication,** particularly between the purchasing staff and the educators:

> I think the biggest thing is good communication within the organization itself...I will maybe get a call from purchasing or I don't even get a call from purchasing and there's a new product coming on Monday. I don't know, educators don't know, staff doesn't know, but our purchasing knows for months.

What is raised in the quote above is not only lack of cross-departmental communication but also a need to improve communication with front-line staff. Organizational informants felt that this may have contributed to the problems encountered with the more recent safety butterfly needle that was implemented. Many of the clinical groups affected did not feel they were consulted. The issues encountered with the safety butterfly needle suggest that the initial product review and pilot testing process was not successful at picking up on unintended consequences associated with the new technology. One of the organizational informants emphasized that this process could be improved through better input from front-line users:

> I don't know if that's necessarily well decided as to who trials or trialed enough but I think that's such a huge component of it and on occasion you have non-clinicians making a decision about which clinical product we should use without that proper input and I think that comes back to bite us every now and then.

While internal networks and communication were perceived to be instrumental to a smooth implementation process, they were not identified as a strength but rather something that could be improved.

The final area that was identified as important to the implementation process was **training accommodation and support**. Informants reported that the organization had recognized from previous experiences that training needs to be adapted to accommodate the constraints involved in reaching a large number of staff across a multi-site hospital. Face-to-face training sessions delivered by the product vendor were perceived by organizational informants to work better than the 'train-the-trainer' approach. The 'train-the-trainer' approach was not perceived to be effective in accessing a large number of staff working over a 24-hour shift schedule. However, front-line staff also emphasized some of the limitations with the face-to-face training

sessions. One front-line worker described the conflict staff faced balancing work and training demands:

> So, for nursing it's hard to say well okay, let's all go there, all 20 staff let's just leave all of our patients and go in there for half an hour ... and so we kind of just try to get the educator involved to try to get, okay go to your in-service I will kind of take care of your patients while you're there.

In summary, this organization was confronted with the challenge of introducing SENs within a very short time frame, with minimal internal push for the transition, and having recently experienced a negative implementation outcome. The retrospective account of the implementation experience identifies a number of conflicts and challenges that were encountered. This section has revealed that a number of informants were able to identify conditions and supports that would have been helpful in facilitating a smooth implementation experience. What appears to have been important in working through the challenges was the ongoing monitoring activities and leadership from the occupational health and safety department to actively pursue solutions to identified problems.

Reaching full operation

When focusing on the current status of the transition to SENs, it was important to examine if the organizations under study had reached full operation; that is, SENs had been integrated into practice, efforts were made to go beyond the requirements of the regulatory standard, and processes to monitor and improve upon the existing needlestick prevention program were ongoing.

Hospital A did have policies and procedures related to medical sharps safety that not only focused on safety device use but also more broadly incorporated guidance on safe work practices. General education on needlestick injury prevention and management was part of corporate orientation and the half-day training program delivered every three years. The organization also had resources on the prevention of needlestick injuries available on their intranet. These included: short training videos on how to activate SENs; a written policy highlighting the organization's commitment to sharps injury prevention and specific responsibilities; and guidance on how to manage needlestick injuries. Both organizational informants and front-line workers talked about the limitations in reaching and engaging with staff to deliver training and education, acknowledging the limitations with electronic forms of communication. Organizational informants seemed to put more emphasis on lack of engagement among staff. From the position of the front-line worker, information overload and workload more generally were the problem.

In terms of ongoing monitoring activities, it was reported that the committee established to oversee the transition to SENs had not been disbanded but was no longer meeting on a regular basis. One of the main mechanisms by which the organization continued to monitor the safer needle program was through regular reviews of injury reports. The organization demonstrated commitment in the past to ensure that safer needle technology was functional. The health and safety staff had to be very persistent to convince administration to adopt more expensive passive safety butterfly needles when an increase in needlestick injuries was detected with the use of the original safety device. Furthermore, was after the negative feedback with the new safety butterfly needles, efforts were made to meet with staff in different areas and bring the product vendor in to provide additional training.

Front-line staff and organizational informants reported that needlestick injury prevention was not an ongoing priority in relation to other health and safety issues at the hospital. There was also the impression that the initial problems encountered with the safety devices (e.g., design issues, difficulties with activation) had been resolved or staff had just gotten used to them. However, despite the belief that most of the problems had been worked out, this did not mean that the devices were always used as intended or were able to always protect staff from injury. For example, one of the informants described ongoing 'misuse' of safety devices as not only being about the design of the device but also workload demands:

> You still find that people don't use the device correctly ... I don't know if it's a matter of education, I think it's more a matter of they're so busy at the time that they do something and they just forget to do it. Because workload has increased so much that people are just crazy busy and they don't always stop to do something that's correct.

One worker emphasized how important the proper use and timing of the activation is for the ability of these devices to protect staff from injury:

> I find that sometimes they don't retract them early enough and because it's an accordion thing the plastic is a little tough so if you don't retract it right away sometimes when you let go it might just swing around a bit just because of the nature of the plastic and what not and that's where people will get a needle poke because as it swings around they sometimes move their hand and by moving their hand they sometimes will [get a needlestick injury].

There was also a perception that practice issues were ongoing among physicians in particular, who from the initial implementation period were not perceived to be entirely committed to safer needle use. Percutaneous injuries associated with medical sharps other than hollow-bore needles were also considered to be an ongoing problem. One worker identified how sharps disposal practices in the operating room influence risk of injury to workers in other areas of the hospital:

> The sharps in the operating room, we have difficulty or problems sometimes with people leaving sharps on trays that go down to cafeterias and so somebody down there will end up cutting themselves because there [has] been a sharp left on a tray.

As described previously, the organization was continuing to monitor needlestick injuries. Between 2008 and 2011, needle-related injuries declined by 28 per cent across the hospital. There were 99 needlesticks in 2011, down from 137 in 2008 when the organization started its transition to safer needle technology. While the frequency of injury had decreased, the health and safety department had noted that the severity had not gone down, meaning that the number of lost-time claims had not declined over the past four years. Thus the impact of the transition had not benefited the organization in terms of reducing its lost-time claims associated with needlestick injuries. It was reported that no notable cost decrease was associated with the uptake of safety devices, despite a 28 per cent decline in overall frequency.

There didn't seem to be a great deal of concern about the fact that needlestick injuries were continuing to occur. One front-line worker described how having 100 injuries annually may not be considered an important priority considering the size of the hospital:

> When you look at it, I think there's about 5-6000 nurses across the [hospital sites] and 12,000 employees, when you look at that number that's pretty small, so it is quite low I think.

While some positive views were expressed about the increased use of passive safety devices to further reduce injuries, some apprehension still existed about this technology considering existing budget constraints at the hospital. Despite some frustration about the lack of progress with respect to lost-time claims, no specific plans were in place to further reduce needlestick injuries.

Case Report – Hospital B

The second hospital, Case B, was a multi-site community hospital in the Greater Toronto Area. The hospital was embarking on a large redevelopment project that would bring a number of improvements in the physical work environment. In terms of the structure of the health and safety system, all sites had their own health and safety unit led by a director of health and safety and supported by a health and safety analyst and specialist.

Implementation experience

With respect to the timing of the transition, the organization can be considered as an 'extrinsic early adopter'. To a large degree, the use of SENs was something that the health and safety department had been looking into for some time. For example, the hospital had already implemented a needleless IV system ten years earlier. The health and safety staff reported having difficulty initially getting other safety devices passed by administration due to cost constraints. One front-line worker recounted her interactions with the hospital administration before SENs were adopted. She explained how they attempted to demonstrate how the transition to SENs could result in reduced costs for the organization:

> To get the message across to administration here at that time was very, very difficult and I even put together cases, like in California where they had implemented them, how much money it actually saved using them. They were saying they cost too much money but they could save money because of the money that's spent on each needlestick injury and God forbid somebody gets AIDS or something that would cost the hospital. But it was a fight.

Aligned with the strategy used during the safer needle campaign, the argument for safety needles had to be broken down to dollars saved rather than injuries prevented. One front-line nurse, who at the time was an active member of the JHSC, continued to observe needlestick injuries on her unit and, when her recommendations to implement safety devices were ignored, she requested support from the Ministry of Labour (MOL). Due to elevated needlestick injuries in select areas, a MOL inspector ordered the organization to transition to SENs in three departments deemed to be high risk. This order was received in 2006. The organization initially resisted the order. A copy of the appeal listed a number of reasons why the organization did not feel the order was appropriate, including the fact that there was currently no legal requirement mandating the use of safety needles, the exclusive use of safety devices was not an industry standard, and very few hospitals had made a full conversion. At the time of the inspection, Ontario's regulation on needle safety had not yet been established under the *Occupational Health and Safety Act*. The decision to appeal the order did receive some negative media attention and, as one informant recalled, initiated further internal conflict between union and management. The organization did eventually withdraw its appeal.

In an effort to manage the conflict that arose, the hospital took a different approach and initiated a rather comprehensive safer needle program. In 2007, the hospital formed a 'Safety Workplace Partnership' with its health and safety association (Public Service Health and Safety Association), which was designed to enhance the workplace health and safety culture. As part of this partnership, a health and safety consultant was appointed to serve as an advisor to support the development of a safety engineered medical sharp (SEMS) task force. PSHSA provided the organization with a guidance document it had prepared to support the implementation of SENs.

The SEMS task force was guided by terms of reference that outlined a number of responsibilities, including the evaluation of the existing program, developing strategies to promote safety culture and awareness, making recommendations to senior management, reviewing the education and awareness program, and developing strategies to ensure that staff were using safety devices appropriately. A number of documented activities revealed that this committee was very active during the transition to SENs. The organization adopted a separate committee to oversee the implementation of safety needles rather than facilitate the selection using existing structures and processes to integrate other forms of medical technology.

The organization had to select and implement safety devices within a very tight time frame in the three areas that had been cited by the inspector. However, the hospital also chose to transition to SENs in other areas before the regulation took effect, which allowed for a more gradual transition process. The health and safety staff did find that most clinical groups were in support of the transition; however, there was some apprehension among physicians. One organizational informant emphasized that "it takes a little bit more persuasion with the doctors," and another said "it's only from the doctors where I get push back."

While organizational informants reported that front-line staff were generally in support of the adoption of SENs, some staff had difficulty getting used to the product changes. Organizational informants described how staff would remove the safety from the device. There were also documented discussions among the SEMS task force members during the initial transition about staff having difficulty seeing around the safety caps. Organizational informants recognized that safety device manipulation seemed to be connected to limitations in the design of the SENs that had been introduced:

> A lot of people still do that to this day because it's difficult for them to see sometimes, I mean the safety device is quite cumbersome on a lot of needles right? It's the big pink thing but it's easier for them to rip it off so that they can see as opposed to having it in their way when they are doing their work.

The hospital had transitioned to SENs five years prior to this study. When front-line workers were asked for their views on the safety devices currently in use, there was a lot of positive

feedback. Front-line workers tended to emphasize ways in which safety devices had reduced the potential for exposure during unpredictable situations:

> So, like when everything is everywhere because right now this patient's life is more important than anything that's happening, so if they are using it at least they're capped right? So, if they end up on the bed on the floor, somewhere there's so many people working in that vicinity and there is the risk of getting a needlestick injury from this patient, the [safety] caps really decrease the risk.

There was a sense that SENs had been integrated into practice and staff didn't really think about it anymore:

> I think it was definitely more complicated initially because of the learning but once it was implemented I think it would be hard to find any nurse out there now who doesn't like them. I haven't heard any complaints and the new nurses that are coming in are trained on them, that's how they are being trained you know, they don't have any other experience with them but yeah, I think right now, I think everybody is okay with them and the devices that we use.

It was particularly interesting to hear from nurses who were new to the field, including staff who had not been trained to use non-safety needles. One front-line nurse, who had just finished her training at the time of the transition, didn't understand why SENs were initially resisted:

> I don't see the benefits of complaining about something that's going to eliminate being stuck by a needle... of the things they teach you in school you know, you've got to make sure you don't do this ...I think one of the problems that I remember when I was on the floor is that people were complaining, when it was first rolling out you can't always have them, sometimes you had them, sometimes you didn't have them and that's what they were complaining about more.

Implementation facilitators

Despite the transition being particularly resource and time intensive, in retrospect, organizational informants felt that the overall process had gone smoothly and identified a number of supports that helped facilitate implementation. The **labour inspection order** was deemed to be instrumental for the early transition to SENs. While some informants emphasized that the occupational health and safety staff were making some progress with respect to prevention efforts to address needlestick injuries, there was doubt that the organization would have integrated SENs across the hospital before the regulation took effect had the MOL not been involved.

From the perspective of those involved in the implementation process, **starting early** and introducing SENs in phases was perceived to be an important facilitator. The initial focus was on priority high-risk areas. This resulted in mini projects that were found to be logistically more manageable. The initial transition to SENs in three select high-risk areas was perceived to be

advantageous as the changes could then be used as a model to demonstrate to staff how the new devices had been successfully integrated into practice: a means to obtain buy-in in other areas. The initial transition in response to the **MOL orders** established a process, generated some lessons learned and helped identify which devices would work in other areas.

What was particularly unique at this site was the use of a needs assessment during the initial planning stage. The needs assessment was facilitated by the main product vendor, who visited high-risk areas to observe what devices were in use and how they were being used. Based on this initial assessment, it made specific recommendations. This early engagement with staff may have also served to increase awareness around the hospital that product changes were pending. Another form of needs assessment was conducted by the SEMS task force after the initial transition to SENs in the high-risk areas was complete. Injury statistics were used to identify the next top priority areas to be targeted for product changes.

The implementation process seemed to have benefited from having **key staff in place who championed the change process,** including specific staff who had been selected to lead the transition and natural early leaders who were committed to addressing health and safety issues at the hospital. A staff member in the purchasing department was identified by other organizational informants as a committed leader, who was very supportive during the implementation process and provided timely access to product information and usage reports. The organization also appointed a lead for the implementation process who was described by a clinical manager as a “very positive person who believed in what we did, and was very proactive.” A front-line nurse, who was committed to addressing health and safety issues at the hospital, was also identified by a number of informants as a natural champion who was able to bring the perspective of the front-line worker to the change process.

A number of supports were identified that were more generally related to the importance of having strong **internal networks and communication** during the implementation process. During the early planning stage, getting staff to buy into the change process was discussed as a key priority. There were documented discussions among the SEMS task force about strategies that could be used to provide staff with information on the risks associated with needlestick injuries. One initiative led by the task force was the distribution of a questionnaire organization-wide to assess the culture of safety and to identify strengths and gaps in the current sharps injury prevention program.

Another form of engagement included efforts to work with physicians during the device selection process. When concerns arose about how the transition to SENs would impact specific procedures, the product vendors would meet with doctors to discuss what was working for other hospitals. Having a third party with product expertise involved in the exchange with physicians may have provided a means for physicians to feel more in control over the proposed changes.

It was also recognized that, although the transition to SENs was driven by a MOL order, sufficient internal support existed among specific groups within the organization that were willing to invest significant time and effort into the implementation of SENs. One informant explained how the adoption of safety needles was consistent with the values and goals of the OHS department and how the momentum was already there:

> They looked at safety [in] previous years but I think it was the cost at that time that they didn't go forward with it but ... OCC Health I believe pushed for safety. So, some of the ground work in terms of you know, policies and procedures and on the clinical [side] I think there was a bit of a momentum already starting so, it wasn't a brand new discussion.

Possibly as a result of the timing of the transition, the hospital was able to benefit from a number of **external supports,** including a partnership with its health and safety association and the use of an implementation guide that helped the task force evaluate its safer needle program and obtain some feedback from front-line staff. The organization was open to receiving both external guidance and resources to support the transition process. While this was the only hospital that reported working with representatives from a health and safety association during the initial implementation phase, it was actually the support received from the product vendor that was identified as the key external facilitator to the implementation process. The product vendor provided a number of services to support the implementation process, including product selection and evaluation, inventory review, training and auditing. These resources may have been particularly helpful for a smaller community hospital that had fewer staff available to facilitate the transition process.

The integration of the new technology was also facilitated in part by measures to ensure the safety devices were working and being used as intended. In 2008, close to the effective date of the regulation, the SEMS task force brought in the vendor that supplied the majority of SENs to conduct a final audit. At that time, non-safety devices were found on some units and there were reports that not all safety devices were being activated. The organization addressed this issue by having unit managers audit their areas to ensure that non-SENs were returned. The SEMS task force also undertook other activities to follow up on issues. For example, in response to reports that sharps disposal containers were installed too high, the task force initiated a survey to assess the location and height of sharps containers.

In summary, this organization faced the task of introducing SENs when little senior management support was initially available for the adoption of these devices. The organization overcame this challenge and was fully operational in the use of SENs prior to the regulatory standard coming into effect. A number of supports and conditions allowed this to happen. What stood out in the retrospective account of the implementation experience was the important influence of external supports, including the labour inspection order that initiated the transition, guidance received

from the health and safety association during the program installation phase, and the resource support from product vendors during the initial implementation phase. It is also important to acknowledge that initiating the transition well in advance of the regulatory standard gave the organization sufficient time to collaborate with external consultants to develop and implement a comprehensive implementation plan.

Reaching full operation

During the interviews, front-line workers and informants were given an opportunity to identify areas where the implementation process could have been improved or how current measures to support needlestick injury prevention could be enhanced. Front-line workers had a lot to share with respect to training. A number of staff recognized the value of comprehensive hands-on training provided directly by product experts (face-to-face) rather than using a 'train-the-trainer' approach. The ‘train-the-trainer’ approach was the primary training strategy used at this site during the transition to SENs. A representative from the product vendor would come in and provide training to the clinical practice leaders, who would then train front-line workers on their unit. A number of front-line staff either described the training provided as very brief or could not remember receiving any formal training. A number of front-line workers reported learning how to use SENs on their own:

> I don’t remember ever you know, having somebody come and say this is what we’re doing, this is how it’s supposed to be used, just kind of figured out how to do it on your own or ask the nurse how to use it

Another worker recalled notifications about information sessions, but emphasized that “most of us can’t attend.” On one hand, staff appreciated the idea of more comprehensive, face-to-face training; on the other hand, they acknowledged they had very little time to attend these types of training sessions. In terms of ongoing activities to ensure that SENs were used as intended, the only formal ongoing practice identified was the general education on needlestick injury prevention provided as part of employee orientation. When discussing ongoing practices to further reduce needlestick injuries, organizational informants had a number of ideas about what could be done next, including the review of the exceptions list, re-training, audits, and risk assessments following needlestick injuries. One of the organizational informants emphasized that he would jump on any new advances in SENs that would reduce the need for exceptions if those options were brought forward by a product vendor.

The organization had primarily integrated manual SENs. A number of staff talked about the advantages of semi-automatic or passive SENs for ease of use and injury prevention. One worker who recently had a needlestick injury using a safety device felt that her injury could have been prevented had a passive safety device been available. She emphasized how current

safety devices can't protect all injuries. Based on her incident, she believed quite strongly that a move to passive safety devices would make a difference:

> So even if it has the flip safety it's still going to poke you right? So, if the patient will move just you know, a little movement or there's resistance from the patient you will still poke yourself with that one and I talked to my manager there's one needle that's really good that is retractable, once you inject it and you pull it out there's no needle that will be exposed... I think the resistance is because of the budget and the retractable are really very, very safe, we just push once, there's no exposure of the needle, so how can you go wrong with that right.... But it's really, if they are after the safety of the nurses and all the providers, retractables are really the best, you will see dramatic results...

However, health and safety staff reported that they did not receive requests from staff to integrate more advanced safety devices. They felt there wasn't sufficient drive to propose this kind of change, considering the roadblocks that would be put up by administration due to the significant cost increases associated with more advanced SENs.

While organizational informants talked about the possibility of re-evaluating safety device exceptions, analyzing injury data to determine the potential value of passive safety devices and offering re-training, none of these activities had been integrated. Time constraints were identified as the main reason for the delay in initiating these activities, yet a lack of urgency seemed to be even more associated with not moving forward. The lack of urgency to invest in further activities to integrate these devices may have been influenced by the recent disbandment of the SEMS task force. As the organizational informants explained, the SEMS task force was disbanded due to low attendance and reports that no new issues were being brought forward. It may have also been due in part to a general sense that the time committed to initiating these activities may not make a difference in the end. One of the organizational informants expressed some doubt about the impact of conducting a regular review of current safety exceptions. Reviewing the need for conventional sharps or exceptions had been on the agenda for a number of months; however, it was believed that revisiting the list of exceptions would be very time consuming and would not likely result in any product changes.

Front-line staff and organizational informants also shared the view that practice issues had declined to a large extent and that front-line staff were committed to consistent and quality use of SENs. As one front-line worker put it:

> Everybody has kind of caught on that they have to go with the safety engineered...I haven't seen much bad practice.

Select reports from both front-line workers and organizational informants talked about continued areas of 'bad practice'. A representative from health and safety who routinely collected and analyzed injury data emphasized that, while usage had improved over time, issues and injuries

were still ongoing. Front-line staff were able to speak to the types of “bad practices” that were ongoing. For example, one front-line worker reported ongoing issues with one specific type of safety device used on her unit:

> I’ve noticed that some people, we use TB syringes to give vitamin k to the babies and I notice a lot of people don’t [activate]...

Another front-line worker reported observing more experienced staff continuing to avoid the use of SENs:

> I see a lot of the older nurses using the old school techniques on things that I personally would not be comfortable using but they’re used to it, even if it’s like instead of using the butterfly with the guided sleeve, they will use a needle top that doesn’t have the [safety component]

Issues were not limited to whether or not staff used safety devices; they also included how these safety devices were being activated. For example, one staff member (whose role was to support staff when they encountered difficult intravenous line insertions) had not picked up on any ongoing issues with the use of safety devices but had observed issues with the timing of activation:

> I still see some nurses they just, they will pull [the needle] out and then hit the button which is defeating the whole purpose...

The quote above refers to a safety device designed to be activated before the needle is withdrawn from the patient. Removing the device before it’s activated limits the potential for the device to reduce risk of injury when the needle is withdrawn.

Organizational informants reported regularly reviewing injury data with the SEMS task force and at the JHSC. A 'plateau' in needlestick injuries was described. Since 2007-2008, approximately 40 needlestick injuries are reported each year to the occupational health and safety department. There were 41 needlestick injuries reported in 2010-2011. Comparing the number of injuries in 2005-2006 to the average number reported over the period 2009-2012, there has been a 61 per cent decline in needlestick injuries following the transition to SENs.

In terms of whether or not ongoing injuries could have been prevented through further advances in safer needle technology, organizational informants explained that time constraints have prevented root-cause analyses from being carried out. Therefore, no information is currently available to determine whether ongoing injuries could have been reduced through advances in SEN technology or through safer work practices.

Case Report – Hospital C

The third hospital, Case C, was a large teaching hospital in the GTA. The hospital has been recognized for its progress in advancing working conditions and benefits for its employees. In terms of the structure of the health and safety management system, the hospital had a central health and safety department and a central JHSC. A number of smaller safety groups had formed in some areas of the hospital to conduct more detailed and regular inspections. The occupational health and safety staff were about to launch a mandatory online training program on musculoskeletal injuries and violence prevention.

Implementation experience

In terms of the timing of the transition to SENs, the hospital could be considered an 'intrinsic early adopter'. A number of advances in the uptake of safety devices dated back to 2003, five years before Ontario's regulation on needle safety took effect. At that time, there was new leadership in the occupational health and safety department. One of the goals of the new director was to address needlestick injuries at the hospital.

The transition to SENs seemed to be very gradual. In 2004, a new vacutainer safety blood collection set and needleless IV system were implemented. Over the next few years the organization implemented a mix of passive, semi-automatic and manual safety devices. Passive safety devices were implemented specifically in areas deemed to be high risk (e.g., emergency). The hospital also implemented a mix of manual and semi-automatic SENs. While the organization initiated its implementation process in 2003, it later adopted specific implementation strategies recommended in guidance documents to support the implementation of SENs. A Needlestick Task Force was formed in 2004 and its members represented multiple stakeholders across the organization, including purchasing, the union, education, infection prevention and control, occupational health, primary care, and physician groups. The task force was guided by a formal administrative manual that laid out specific responsibilities, including the ongoing review of injury statistics, prioritizing needs and making recommendations. While this taskforce was primarily responsible for overseeing the transition process, the JHSC was periodically updated on the status of the transition, ongoing needlestick injuries and the annual review of exceptions.

Organizational informants did not feel that Ontario's regulation on needle safety was an important driver for the hospital's decision to transition to SENs. Regulation did, however,

appear to influence the development of some formal aspects of the hospital's safer needle program. A few months prior to the effective date of the regulatory requirements, the organization finalized written policies formally stating the hospital's commitment to only use SENs, outlining specific responsibilities for workers, managers, occupational health and safety staff and the JHSC.

When informants and front-line workers talked retrospectively about the transition to SENs, they emphasized that the rollout was rather seamless. However, there were reports that some staff had difficulty adapting to the new technology. One informant, in describing this early transition experience, emphasized that negative feedback was often limited to specific devices and only temporary:

> Nobody likes change... they are a little bit more awkward, it's getting used to it, getting used to the feel of it and there's been no complains, it was very little push back we had, it was a matter of nurses just took it on and used it. If they were concerned about a device then they fight like crazy and we all go in and we meet with the company and figure out was the problem is.

The organization did act on problems encountered with the use of some SENs. For example, the Needlestick Task Force investigated a particular safety device that staff were not activating. Eventually this specific device was removed because staff found it awkward to work with. The hospital was not always able to select the SENs perceived to be the most user-friendly. For example, the hospital ended up selecting a particular device that was found to be more challenging to activate because the alternative option did not provide the necessary range of syringe sizes.

While front-line staff seemed to express support for the transition to SENs, the health and safety department was aware that compliance with device use was an issue during the initial transition:

> They just weren't using it, they just would give their injection and not, some of our things like the BD ones they have the thing hanging off the side so you give the injection and then you're supposed to go like this and it closes over the needle and they weren't using that, they were just throwing it in a sharps container without putting on the safety device.

Issues with device activation were initially monitored through audits of disposal bins carried out by the product vendors. The organization did report using this information to target reminders about SEN use. In some cases, the product vendor would be brought in to address any issues or deliver further training. Issues with SENs use encountered during the initial implementation phase were not attributed to any specific groups.

Implementation facilitators

A number of supports were in place to help facilitate what organizational informants described as a 'seamless rollout'. These supports were related to the timing of the transition, readiness for change or implementation climate, communication and engagement, external facilitators, and monitoring and acting upon implementation issues.

The organization's decision to adopt safety needles before regulation took effect was perceived to have benefited the overall implementation process. As one organizational informant explained, **starting early** allowed the organization to ensure that adequate implementation measures were in place:

> A lot of hospitals were rushing at the time of the legislation; they had to change over everything whereas we had already been doing it for 4 years at that point... it was like every 6 months we would do something new and then once we got that one up and running we could move on, what do we need to do next...it was a slow process as we went through it.

Organizational informants emphasized that a number of internal conditions in place created an environment that was receptive to change. As reviewed earlier, the move to adopt SENs was championed by a **new leader in the health and safety department**. **Senior management support** was also perceived to be essential for supporting the early adoption of SENs despite the associated cost increase. Health and safety staff didn't have to fight for change:

> We have a strong senior leadership team and they're very good. Anything that is going to protect our staff especially from blood and body fluids, with HIV potential and all these things, they do it. We've never had an issue with it.

Another informant currently on the JHSC echoed this strong support from senior management, emphasizing how it not only supported the move to SENs but also may have provided a strong message to staff about the hospital's commitment to safety:

> I think it has to also come from the top down, front-line staff have to see that this is an expectation of not only their manager, their APN, but the director, see I think if you look at the global organization we have had for a long time senior management safety walk arounds, so the message on safety .. and [that] we don't want our employees hurt comes from above downward and I think in some organizations if they don't have that, the staff, they don't value it so they take the shortcuts, they do all these things because the value of a safe working environment has to be there.

In addition to emphasizing the important role of senior management support, the quote above also addresses the importance of **communicating** with front-line staff. The organization did initiate some activities to communicate with staff and raise awareness. Sending a clear message to staff about the importance of health and safety seemed to be an important principal

shared by health and safety staff. One informant described how the strategy used by the organization to roll out SENs was designed to convey an important message to staff about the organization's commitment to safety:

> Having the supplies there, like turnover day was turnover day you know, like it wasn't oh well, we're getting them to you next week or we ran out so we went back to the old stuff, that hasn't happened and if people are doing that then you're not going to, if I say to you this is the new device and it's safe ... and then I turn around and say, we're not getting them in for another 6 weeks, I am not giving you the right message...

To ensure that staff were sufficiently prepared and informed about the proposed changes, a 'poster build-up' was initiated prior to the rollout of SENs to notify staff, highlight the purpose of the transition and outline key advantages associated with the move to SENs. **Training** was also identified as an important component of the implementation process. The organization used two training strategies to reach the maximum number of staff. Group-based training led by a representative from the product vendor was used to deliver face-to-face training. A train-the-trainer approach was used to ensure product experts were available on each unit to staff who were unable to attend the training sessions.

Despite this dual training strategy, reaching staff was emphasized by a number of informants as an important challenge. While the product vendors d counts of staff who attended the training sessions, training coverage was not officially documented with the train-the-trainer approach. One informant described this form of training as a "hit or miss":

> Reaching everyone, it's not that easy, you only reach a percentage of the full time staff on a regular basis and you have to come in [during] evenings and nights to reach everyone plus the challenges are probably weekend and casual staff, it's just impossible to reach everyone... I haven't been that specific, like okay, here's all the nurses that attended and here whose missed, I didn't do any of that, it's just hit or miss you know?

Despite these challenges, the organization did value the training support provided by the product vendors. Front-line workers who were able to attend the training sessions valued the opportunity to get hands-on experience with the SENs before the devices were integrated:

> In-services are usually like the company that [is] supplying the product, will come in with one of their specialty agents or whatever you call them, and they would have in-services, so they would have little, I don't know what you call them, out in the community, like a workshop kind of thing, where they would have all the different devices and they would show you how to use them, and then they would take questions and they would, explain why they were changing to the new devices, the reason for safety and all this stuff, and then actually give you hands on [experience] using them before they actually come into the hospital for use, so that you're already familiar with the [devices].

Organizational informants also emphasized the importance of **engagement** with front-line users during the device selection process. The organization had an already-established product evaluation committee that recruited small subgroups of high-end users to oversee product changes. In line with recommendations for the selection of SENs, product evaluations were carried out considering multiple product options. Trials were designed to obtain input from end users using a standardized questionnaire. Some of the design features that were evaluated included ease of activation, timing of activation, whether the device could be reused after activation, and whether any issues with needlestick injuries or near misses arose when using the device. There were a number of documented examples of how front-line users provided input into the device evaluation and selection process.

Ongoing **surveillance** was described as one strategy used to identify and address issues with SENs. The hospital's health and safety staff were perceived by outsiders as being very active in monitoring and managing occupational health and safety issues:

> I think we have an excellent occupational health department that makes a big difference for sure... The safety specialists are fantastic, on the ball, they're right there, any concerns you have they're right on them to get them dealt with right away. So, I am sure that, has a big impact ... if your occupational health department is where they should be.

The hospital had recently focused on ongoing injuries associated with the disposal of sharps. When health and safety staff investigated these incidents further, they attributed the problem to overfilled sharps disposal bins and believed the underlying issue was confusion or lack of ownership over who should be replacing the containers. To address reoccurring problems with sharps disposal practices, a number of posters, e-mails and newsletters were distributed. The hospital periodically circulated a newsletter specifically focusing on the health and safety of employees. The newsletter was often used as a means to communicate with staff about SENs.

In terms of **external support**, the hospital did not have an opportunity to benefit from the services provided by their health and safety association to support the implementation of SENs because the hospital had transitioned to safety needles voluntarily many years before the safety association's guidance document was available. The organization did emphasize the importance of having the product vendors deliver training. It was reported that the product vendors were available 24/7 and were able to come in to provide re-training if any issues arose with the SENs that had been implemented.

This organization can be considered a leader in initiating efforts to prevent needlestick injuries because it made a voluntary commitment to adopt SENs several years before the regulatory standard was established. The implementation experience was described as a relatively smooth process. While a number of supports were described in the section, what stands out in the

retrospective account of the implementation experience is the important influence of **internal conditions and supports,** including a strong safety culture, senior management support and strong leadership in the occupational health and safety department. These internal supports helped drive efforts to invest in more advanced passive safety needles.

Reaching full operation

A number of informants and front-line workers shared the view that the use of SENs had become integrated into practice and that few, if any, injuries continued to occur. The front-line workers and informants interviewed had a lot of very positive things to say about the current use of SENs, and they acknowledged the impact of the change on employee safety. In stark contrast to reports during the early transition process that safety needles were awkward to use and took some time getting used to, one front-line worker emphasized that safety needles can be easier to use:

> There's no risk of you driving yourself or anyone around you, but as to the ease of use ... it's no different than it was 20 years ago, other than the fact that the safety measures a lot easier than it was before.

Organizational informants did emphasize that all hazards are considered a priority; however, due to the significant decrease in needlestick and other sharps-related injuries, there was less focus on this injury issue. Following the transition to SENs, there was evidence that needlestick injury prevention did continue to be a topic reviewed periodically by the JHSC. While existing policies did not make any commitments to annually review new safety technology for better design alternatives, there was evidence that the hospital's exception list had been reviewed annually. Organizational informants reported that advances in the design of SENs have decreased the need for exceptions. Other than ongoing reviews of incidents, no activities were in place to formally monitor the use of SENs beyond the ongoing review of incident reports. As there had not been any recent audits, any issues with the use of SENs would have only been noticed by the health and safety staff if problems were identified from reported needlestick injuries.

A few recent events described by staff suggested a need for ongoing measures to monitor the use and availability of SENs. One informant reported that a member of the JHSC had recently brought to the committee a non-safety needle that was found on her unit. It was reported that the needle must have been brought in by another source because the organization no longer supplied that device. One of the participants brought a non-safety needle to the interview. She reported having talked with a co-worker about it and was going to follow up to see if something more up-to-date was available. The organization's written policies and procedures around the use of SENs identified one of the responsibilities of front-line workers was to report unsafe acts and hazards and to keep and report any defective products. An organizational informant did

report that staff can use an online process to report issues with SENs and other medical technology. This process did not seem to be well understood by other staff who were interviewed. One of the organizational informants reported that the organization does not have any ongoing formal activities to collect information from staff who encounter issues with safety devices. One front-line worker who had an issue with a safety device expressed come confusion about how these types of issues should be reported:

> I know that there's an incident report you could fill out but I don't know whether that's just for near misses or like something happened and that's when you have to report because this device failed...

Few proactive activities were described for continuing to ensure that SENs have been integrated into practice. The organization did provide general re-education on needlestick injury prevention during its annual safety day.

Despite recent issues with incidents involving sharps disposal bins, some staff had not heard or seen anything lately about needlestick injury prevention. One informant who described the absence of any focus on needlestick injury prevention felt that further communication that reminded staff to be cautious may not be necessary:

> I think the main huge thing they are pushing for is hand hygiene first... I don't see the needlestick injury as a huge thing it's more blood transfusion error now, they want to make sure that's done properly, so I have seen those in email blasts, not a lot of, to be honest in the years that I have spent here I haven't heard of 'oh watch out for a needlestick injury thing', like posters or signs, or email blasts about it because people know to just watch out as a nurse you need to be cautious...

In terms of the progress in reducing needlestick injuries, between 2003 and 2011, needlestick injuries declined by 85 Per cent. In 2011, there were 16 needlestick injuries, down from 106 in 2003. Overall, lost-time claims decreased over this time period, not only for needlestick injuries, but for other injuries as well. It is important to note that the organization did not observe immediate gains from the transition to SENs. In fact, injuries occurring during a procedure actually doubled between 2003 and 2006. The organization was periodically observing upward trends. One of the organizational informants attributed this, in part, to influxes in new medical residents. The decision to focus on other health and safety priorities seemed to be supported by the substantial reduction in needlestick injuries and positive views shared by front-line staff towards the current use of SENs.