> “...You feel more safe as a nurse, so I have to say that it’s a great tool to have.

HUMBER RIVER HOSPITAL is one of Canada's largest community acute care hospitals, serving a population of more than 850,000 people in the northwest Greater Toronto Area.

The multi-site hospital currently operates out of its Wilson Avenue acute care site and Finch and Church Street reactivation care centres with a total of 722 beds, just over 3,800 employees, approximately 700 physicians and over 1,000 volunteers.

Affiliated with the University of Toronto and Queen's University, Humber River Hospital is North America's first fully digital hospital. Part of Humber River Hospital's digital infrastructure includes completely automated laboratory services, robots sorting and mixing medications, electronic health records, tracking systems for patients undergoing surgery that update families through their cellphones and patient computer bedside terminals – all varieties of technologies that automate information, eliminate paper and provide a connected experience for patients, staff and families.

Humber River Hospital was awarded Accreditation with Exemplary Standing in 2018 and since its opening in 2015 has received numerous awards and accolades for technological advancements and innovation (www.hrh.ca).

Violence Prevention: Technology-Enabled Therapeutic Intervention

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WHAT WE LEARNED:

1. Engaging staff, patients and families in this unique digital and technology-enriched environment has been critical for the successful implementation, evaluation and modification of the violence prevention electronic flagging system.
2. The patient and family education pamphlet served as an excellent tool to communicate the message that the electronic signage outside the patient room means that therapeutic interventions are in place to provide patients with the potential for violence with the safest and highest quality care possible.
3. In a fully digital environment, policies and procedures to support ongoing safety with regard to violence prevention require that robust downtime procedures are established.

Abstract

Background: Nurses are disproportionately prone to experience incidents of violent victimization. Despite the vast literature on violence in healthcare settings, few studies have identified effective violence prevention interventions.

Aim: The aim of the study was to explore the experiences of nurses regarding the implementation of technology-based violence prevention interventions.

Methods: Qualitative data were collected through semi-structured focus groups and interviews with 11 nurses at Humber River Hospital. Interviews were audiotaped, transcribed and subjected to a content analysis to identify core themes from the data.

Results: Three themes were identified: reassurance of safety, an increase in proactive measures and limitations of technology. Nurses held positive perceptions of the impact of technology-based interventions on violent incidents. The interventions were regarded as effective for the detection of potentially violent patients as well as for providing assistance from security staff when a violent incident occurs or appears imminent. However, nurses also acknowledged that patient-related violence was "unavoidable" and that technology cannot fully prevent violence from occurring.

Conclusion: The findings from this study support the replication of these interventions in other healthcare facilities. Engaging staff, patients and families in this unique digital and technology-enriched environment has been critical for the successful implementation of the violence prevention electronic flagging system. Patient and family education and communication were essential for addressing concerns related to "labelling."

Recent estimates suggest that in Canada, over one-quarter of incidents of violent victimization occurred in the victim's place of work (Perreault 2015). Given the crisis-oriented nature of hospital care, healthcare workers disproportionately experience workplace violence (Perreault 2015). Nurses often interact with patients and family members under stressful situations, which can increase the risk of violence (Koller 2016). One study revealed that as many as a third of

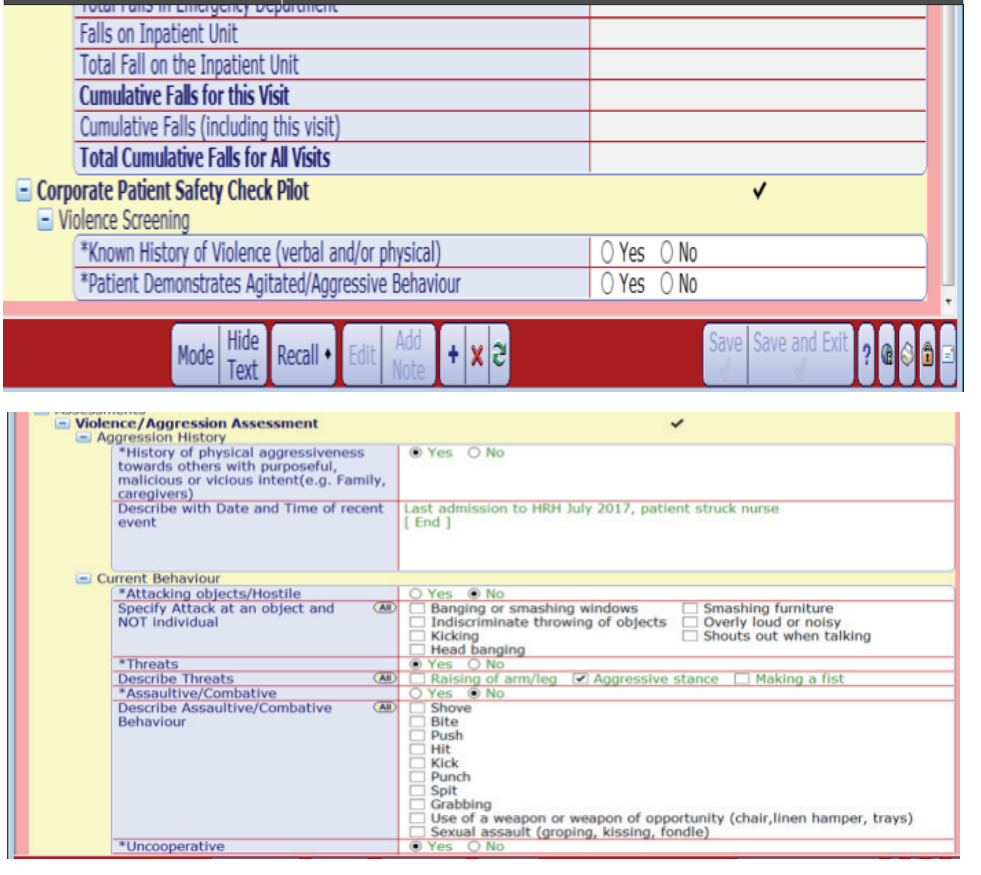
Canadian nurses reported being confronted by physical violence from patients and nearly half of Canadian nurses reported experiencing emotional abuse (Shields & Wilkins 2009).

Violent incidents in hospitals can take many forms, including physical violence, such as hitting and biting; non-physical violence, such as ridicule and verbal threats; and sexual violence (Duncan et al. 2016). Many cases of workplace violence go unreported because nurses become desensitized and accept violence as "part of the job" (Stevenson et al. 2015). Yet numerous studies have pointed out that there are major consequences of workplace violence (Gerberich et al. 2004; Lanctôt and Guay 2014; Park et al. 2015). In a systematic review, Lanctôt and Guay (2014) identified consequences of workplace violence among healthcare workers, including physical trauma, such as bruises and lacerations, as well as torn clothing and broken eyeglasses, and psychological consequences, such as changes in mood and cognition, anxiety and burnout. Many healthcare workers also reported that the violence had affected their life outside of work, and healthcare workers who experienced workplace violence took more sick leave and thought about quitting more than workers who had not experienced violence (Lanctôt and Guay 2014). Unfortunately, 2.3% of victims also reported that the violence they experienced had resulted in permanent disability (Lanctôt and Guay 2014).

The prevention and control of workplace violence are a top priority for Humber River Hospital (HRH), and major steps have been taken in accordance with *Ontario's Occupational Health and Safety Act* (1990) to "take every precaution reasonable in the circumstances for the protection of a worker." HRH has implemented a comprehensive violence prevention program encompassing annual violence risk assessments, specific de-escalation training, stakeholder engagement through the Joint Health and Safety Committee as well as patients and families, statistical review of events, public posters regarding zero tolerance and a personal safety response system. One additional proactive initiative is the electronic flagging system, which communicates the risk of violent or aggressive behaviour to healthcare staff for patients who have previously displayed violent behaviour. The flagging system, which is fully integrated into HRH's digital infrastructure, involves the use of standardized symbols that can be seen in the patient's medical record as well as on the digital signage next to the door of the patient's room (Figure 1 and Figure 2). One of the key advantages of the system at HRH is the use of digital signage over traditional paper-based signage as data automatically update once the information is added to the patient's medical record. The system also uses minimalist symbols, which avoids visual clutter and does not disclose more information on a patient than is needed, while still supporting workers' "right to know" about potential dangers. The flagging system is also able to alert all staff, including maintenance workers and volunteers who do not have access to patients' charts, of any known risks before they enter a patient's room.

Organizations may experience challenges identifying such patients openly, a controversy organizations have to manage to mitigate the perception of "labelling patients" while maintaining confidentiality.

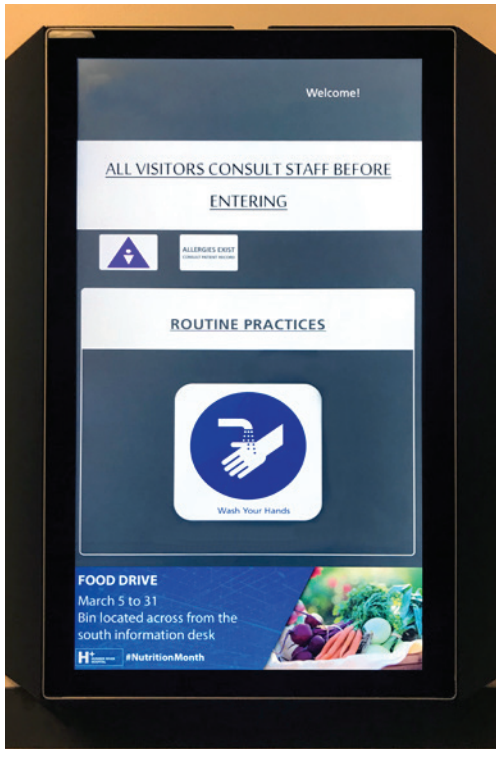
Figure 1. Flagging system.



Electronic flag

As this electronic flagging system was never intended to label patients but rather to provide caution that strategies to support patients are in place, leaders, staff members, patients and families supported the development of education pamphlets entitled "Contributing to a Safer Hospital Workplace: It's Everyone's Responsibility." This pamphlet includes an explanation of the automated signage outside a patient room, as well as assurances that the signage will not affect the quality of care patients will receive.

FIGURE 2. Digital Signage outside patient rooms.



HRH has also implemented the personal safety response system (PSRS), known informally as the "panic alarm button," a wearable technology with a silent panic button (Figure 3). The device is located on the back of the employee's badge and when pressed sends an SOS distress signal to summon immediate assistance from security staff. The device is also equipped with a real-time locating system (RTLS), "indoor GPS" allowing hospital security to be automatically informed of the staff's location within the hospital premises. The advantage of the PSRS system is that it allows security services to be called immediately and discreetly.

The aim of this study was to provide a qualitative description of the experience of nurses regarding violence prevention technology at HRH.

FIGURE 3. Personal safety response system.

Methods

Study design and participants

A qualitative assessment (based on basic interpretive study design, providing an enriched descriptive account) of nurses' perspectives on the effectiveness of the flagging system and panic alert button was conducted at HRH. Eligibility criteria for participating nurses included working on inpatient units, working at the hospital for least six months and willingness to participate in the study. Written informed consent was obtained from all participants, and approval for the study was obtained from the HRH Research Ethics Board.

Violence prevention interventions

A search of peer-reviewed and grey literature was conducted to determine existing violence screening tools that can be used to identify potentially violent patients. Three violence risk assessment tools were identified and were further evaluated: the Violence Assessment Tool (VAT) (Wilkes et al. 2010), the Dynamic Appraisal of Situational Aggression (DASA) (Ogloff and Daffern 2006) and the Brøset Violence Checklist (BVC) (Almvik and Wood 1998). The VAT was selected as the most appropriate tool following consultations with internal stakeholders and other healthcare organizations. Additionally, an environmental scan was undertaken to determine the best technologies that could be used to inform staff of patients who are potentially aggressive or violent. Information technology (IT) staff were involved in making recommendations regarding violence prevention technology.

Clinical practice leaders collaborated with IT staff to build an algorithm within the electronic medical record (EMR) that would identify potentially violent patients based on the VAT. Patients are assessed within the emergency department and at each shift in the inpatient units. The information is then visible by all staff who access the patient's medical record. Additionally, when a violent or aggressive patient is identified in the inpatient units, a symbol is generated on the digital display by the patient's room. The symbol provides a visual alert to hospital staff regarding violent patients but does not explicitly disclose the information to non-staff.

RTLS devices containing the PSRS were affixed to employee ID badges and implemented across all hospital units in October 2016. Digital maps of all floors and rooms within the hospital, as well as all parking lots, were created to provide accurate location information. The occupational health and safety team, information services, information technology and security staff were involved in the process of developing and executing the violence prevention system.

Although all hospitals must plan for any period of downtime due to power or equipment failure, HRH has developed robust policies and procedures to enable the continuity of clinical and business operations given the fully digital infrastructure nurses practise in. For example, during any period that the EMR is unavailable, such as during software upgrades, HRH has procedures in place for manual documentation and tracking of patient flagging, printed paper signs and tape located in "downtime boxes" that are available at every nursing station. Following the downtime period, there is also a procedure for the back entry of data assessments into the EMR.

Data collection

Semi-structured, in-depth interviews with nurses were conducted in October and November 2018 to conduct a qualitative assessment of violence prevention technology at HRH. The option of participating in either a focus group or a one-on-one interview was offered to all participants. Those who were unable to attend the group discussion or wanted to share information in private chose to participate in the one-on-one interview. Three nurses took part in the one-on-one interviews and eight nurses took part in the one-hour focus group. One-on-one interviews ranged from 15 to 30 minutes. Interviews continued until data saturation was reached. Demographic data were collected at the time of the interviews.

Data analysis

Demographic data were summarized. Data were qualitatively analyzed using content analysis. The following steps were taken to conduct the qualitative analysis: (1) all interviews were digitally recorded and transcribed verbatim; (2) statements were grouped into categories reflecting similar central messages; and (3) core themes were identified from the data and were critically analyzed, described and verified.

Results

Participant characteristics

Twelve nurses participated in the study. Participants were in their 20s and 30s, and the majority (66.7%) of participants were female. Content analysis revealed three themes with regard to nurses' experiences with the violence prevention technology: reassurance of safety, an increase in proactive preventive measures and limitations of technology. The results are presented under thematic headings with selected interview responses given.

Reassurance of safety

Both violence prevention technologies provided participants with the reassurance of safety. Participants regarded the interventions as highly beneficial because the signage warning was digital and updated directly with any new entry in the EMR. Nurses stated that in other hospitals, paper signage warning staff members of violent patients could get easily misplaced and was not consistently updated when a new patient was admitted in the room:

> I think it's helpful when you're entering a patient's room and you see that sign; you know what the risk is, and it's not really conveyed to anyone else that's going into the room other than staff.

> We had many abusive incidents [on the previous hospital site], and now we really don't have that much because of the safety precautions.

> You feel more safe as a nurse, so I have to say that it's a great tool to have.

Regarding the panic alarm button, none of the participants reported ever having had to use the device. However, all participants noted that the panic alarm button provided them with reassurance:

> I've not had to use it, thankfully, but from people that I know that have had to use it, it alerts staff on the unit, and they get help within a couple of seconds.

> They are very helpful, especially on the mental health unit, because they can activate it quickly if they need to.

Increase in proactive preventive measures

Participants felt that due to the flagging system, they were better able to anticipate imminent violence and were, therefore, better able to take personal preventive measures to manage potentially violent patients. Participants identified a number of personal preventive measures, including conscious awareness, communication and tactical strategies:

> Once I see that sign on the board, I would be a little more diligent in talking to that patient.

> It's made me more cautious when entering a patient's room; I keep it in the back of my mind.

Communication strategies included being kind, making eye contact and comforting the patient:

> If you have a nice tone with them, make eye contact, listen to what they have to say, usually even someone who has a flag can be calmed down quite easily.

Tactical strategies used by participants included standing in a position that would allow them to exit the room quickly, removing any objects in the room that can be used to harm either the nurse or the patient and bringing another nurse along to help protect them:

> I always try to find where my exit doors are in case I need to leave.

> I would just kind of peek in and make sure everything is okay and just ask him or her if they are okay and just take a look at the environment [within the room] and see if there is anything in the room that would put them or myself at risk.

Limitations of technology

Participants also noted that violence prevention technologies and interventions as a whole were somewhat limited in their ability to prevent patient-related violence. Although the flagging system can warn nurses of the potential for a violent event, it cannot prevent it. One nurse stated, "There's only so much that technology can help."

The participants did not expect this technology or any other components of the hospital violence prevention system to result in a decrease in violent incidents. Most nurses reported that they expected to experience some form of violence because of their job. Nurses seemed to accept that patient violence was somewhat unavoidable due to several factors known to precipitate violence, such as pain, anxiety and aggression due to anaesthetics or a medical condition (e.g., dementia):

> Most of the time, [the violence is] unpredictable … Sometimes it's because of illness, or they don't know where they are, they are very confused, and some of the medications can also cause them to act out.

Overall, there was a consensus among participants that the flagging system was highly effective and that along with the violence prevention policies and procedures of the hospital, it provided a comprehensive violence prevention program. When asked for suggestions to improve the efficacy of the program, participants stated that they highly endorsed the interventions. There were only a few suggestions for improvements, including colour coding patients at risk for violence on the EMR for higher visibility and adding prompts for nurses to complete additional assessments in the EMR after a violent incident is captured to continually screen for violence.

Discussion

Nurses are victimized at the highest rates because they spend the most time in contact with patients (Phillips 2016). The technology-enabled violence prevention system at HRH provides a clear, dependable and discreet process to alert nurses about patients with a history of violence and enable nurses to obtain immediate assistance in the event of a violent confrontation. The aim of this study was to provide a qualitative description of the experience of nurses regarding violence prevention technology at HRH.

Most nurses perceived the benefits of the HRH technology-enabled violence prevention system as providing the reassurance of safety and enabling pre-emptive measures to be taken to reduce the incidence of violence. One study participant had commented that the construction of larger patient rooms was also aided in the prevention of harm as multiple nurses or staff would be able to help a nurse who was experiencing patient-related violence. Many nurses observed that

violence prevention systems, whether HRH's technology enabled or otherwise, could not in fact "prevent" violence. The majority of the 11 nurses were resigned to violence as a known risk factor of their job and considered it unavoidable in light of various patient factors that induce violent behaviour.

The findings from this study are similar to others in which emphasis is placed on preventive actions versus reactive responses to violence (Lanctôt and Guay 2014; Papa and Venella 2013; Phillips 2016). Our findings confirmed the value that nurses place on being forewarned about violent patients, which in turn generated feelings of safety. This suggests that flagging strategies may be central to enabling nurses to feel prepared and safe to deal with violent patients. Nurses who feel confident and equipped to deal with violent patients may be in a better position to both circumvent violence using pre-emptive strategies and manage violence through de-escalation tactics. As suggested across a number studies, there are several negative consequences of exposure to violence in the workplace, including physical and psychological injury and illness and emotional trauma, such as fear and anger (Lanctôt and Guay 2014; Papa and Venella 2013; Phillips 2016). The ability to avoid violence and manage violent patients more effectively may reduce the impact of negative consequences associated with violence in the workplace.

Similar to other research, our findings suggested the need for violence prevention strategies to be coupled with internal policies, procedures and enhancements to the physical environment to ensure the safety of staff (Papa and Venella 2013; Phillips 2016). Nurses in this study viewed the personal panic alarm button and design of patient rooms as a reassuring measure of safety. Every employee at HRH is required, by policy, to wear the PSRS identification badge. The findings from our study affirm the need to provide staff with tangible safeguards that are anchored in definitive policy, signifying the commitment of the hospital to ensure a safer workplace.

Previous studies have identified nurses' acceptance of patient violence as an unavoidable consequence of providing care (Lanctôt and Guay 2014; Papa and Venella, 2013; Phillips 2016). Our study had similar results, with nurses reporting that they expected to experience violent behaviour from patients because of unavoidable circumstances, such as pain, dementia and anxiety. A possible explanation for this is the role that empathy plays in nursing practice. Although there are inherent risks with certain patient populations, we cannot become complacent and merely assent to violence as a component of nursing practice. Creating increased awareness by educating nurses about the boundary between empathy and safety may help shift this perspective.

Few studies have addressed the effectiveness of systems to prevent workplace violence (Phillips 2016). Our study provided the opportunity for nurses to consider the benefits and challenges of the technology-enabled violence prevention system at HRH. Given that very few violence prevention systems have been

evaluated in the literature, the opinions of nurses at HRH, who are primary users of this system, are important and can help inform modifications and enhancements to future systems. There were two notable suggestions to improve the violence prevention program provided by nurses who participated in this study. First, nurses suggested that the flagging symbol of patients at risk for violence should be more visible in the EMR and include a distinguishable colour-coded symbol. This is an important concern raised by nurses because the premise behind the flagging system in the EMR is to ensure that the risk of violence is identified prior to any interaction with the patient. If the flag is not highly visible, then potentially it could be missed and pose an unnecessary risk to nurses and other healthcare providers. As such, we are continuing to engage with nurses and our human factors engineering team to implement modifications to the EMR flagging symbol.

The second suggestion nurses provided was to add prompts in the EMR for nurses to complete additional assessments in circumstances where a violent incident had occurred. This was an interesting and important suggestion that had not been previously considered by the violence prevention system developers. At HRH and many hospitals, there is a system for documenting staff incident reports. However, this system is separate from the patient record. Integrating the circumstances of, responses to and outcomes of staff incidents of violence within the EMR may further support a proactive approach to managing violent patients and identifying the therapeutic interventions that best manage the unique needs of the patient and prevent harm to nurses or other caregivers.

Limitations

As a qualitative study, the small sample size provided insights for the subject matter and is not necessarily generalizable. In addition, the findings were based on data collected from face-to-face interviews, which may have resulted in respondents exhibiting social desirability bias. Finally, the present study did not make any conclusions about the effectiveness of the flagging system in decreasing the overall rate of violent incidents. Future evaluations of any violence prevention strategies should be assessed both quantitatively and qualitatively to gain a deeper understanding of its value and limitations.

Conclusions

Violence occurs in the workplace but should not be viewed as part of the job. Nurses recognize the risks associated with the compromised physical and psychological health of patients, which places them under stress and induces the potential for violence. However, appropriate, real-time tools embedded and enforced in policy are necessary supports to ensure that the risks related to violence in the workplace are minimized. Violence prevention tools, such as technology-enabled flagging systems and PSRS, are helpful to reassure safety and appropriately prepare nurses to avoid and manage violence.

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