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Nurses' perspectives and experiences about pressure injuries caused by medical devices

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Abstract

Background: Medical device-related pressure injuries (MDRPI) are a significant health issue in healthcare settings, with medical devices often contributing to the development of pressure injuries. Despite advancements in technology and the availability of preventative products, the prevention of MDRPI remains a challenge. Nurses play a crucial role in managing and preventing these injuries, yet there is limited research exploring their perceptions and experiences regarding MDRPI. This study aims to explore nurses' perceptions, experiences, and the challenges they face in preventing MDRPI.

Methods: This study design was employed. Semi-structured, face-to-face interviews were conducted with 30 nurses from various clinical departments in a large acute care hospital. Participants were selected using purposive sampling and data were analyzed using thematic analysis to identify recurring themes related to their experiences and perceptions of MDRPI prevention.

Results: The study identified several key themes: 1) *Preventable Yet Unavoidable*, with nurses recognizing that MDRPIs are largely preventable through regular assessments and monitoring, though underlying patient conditions can complicate prevention efforts; 2) *Shared Responsibility*, where nurses highlighted their primary role in prevention while emphasizing the importance of teamwork across all healthcare staff; and 3) *Aligning Theory with Practical Reality*, where nurses expressed a gap between their theoretical knowledge and the practical challenges encountered, leading to feelings of frustration when MDRPIs occurred despite their efforts.

Conclusion: Nurses play a pivotal role in the prevention and management of MDRPIs, but challenges such as patient-related factors and inadequate teamwork can hinder effective prevention. Improved education, regular training, and interdisciplinary collaboration are essential for enhancing MDRPI prevention efforts. The study underscores the need for a holistic approach that includes both practical and theoretical education to bridge the gap between knowledge and practice, ultimately improving patient outcomes.

INTRODUCTION

Medical device-related pressure injuries (MDRPI) are common and significantly worsen the patient's health condition (Black & Kalowes, 2016). Research by Black et al. (2010) indicates that patients using medical devices are 2.4 times more likely to develop pressure injuries. Nearly 30% of severe pressure injuries are attributed to medical devices (Apold & Rydrych, 2012). According to Black and Kalowes (2016), nasal cannulas (12.9%–47%) (Weng, 2008) and noninvasive continuous positive airway pressure (CPAP) masks (17%–97%) are frequently responsible for MDRPI (Cai, Zha, & Chen, 2019).

The National Pressure Ulcer Advisory Panel (NPUAP) (2016) defines a pressure injury as localized damage to the skin or underlying soft tissue, typically over a bony prominence, caused by sustained pressure. In some cases, this damage is linked to diagnostic or therapeutic medical devices that need to be securely fastened for effective use (Black et al., 2010). The NPUAP (2016) specifies that MDRPIs are pressure injuries caused by devices designed for diagnostic or therapeutic purposes, with the injury often resembling the shape or pattern of the device. Furthermore, adjusting or padding under such devices might be medically inappropriate, and conditions such as oedema or moisture may increase vulnerability to pressure (NPUAP, 2014).

Recent global data shows that the prevalence of pressure injuries (PI) in acute care settings ranges from 6% to 18.5%, with estimates for Singapore at around 18.1% (Teo, Claire, Lopez, & Shorey, 2019). While there is a notable gap in studies on the prevalence and incidence of MDRPI in Singapore, it can be inferred that MDRPI occurs at similar rates in this region, reflecting global trends in pressure injuries.

Nurses have a pivotal role in preventing pressure injuries, and this responsibility is fundamental to nursing practice (Nuru, Zewdu, Amsalu, & Mehretie, 2015). Factors such as workload (Al-Kandari & Thomas, 2009) and insufficient knowledge (Aydin & Karadag, 2010) can impact the effectiveness of pressure injury prevention. While most nurses can identify devices that may lead to pressure injuries and recommend strategies to mitigate them (Karadag, Hanönü, & Eyikara, 2017), some may not fully recognize the risks of placing medical devices in direct contact with the skin (Barakat-Johnson, Barnett, Wand, & White, 2017). This discrepancy in awareness is likely influenced by varied exposure to MDRPI cases (Usher et al., 2018).

Research by Nuru et al. (2015) shows that higher educational levels, formal training, and clinical experience are positively linked to better knowledge and practices regarding pressure injury prevention. Additionally, Kim, Lee, and the Korean Association of Wound Ostomy Continence Nurses (2019) found that clinical practice-based education was effective in emphasizing the importance of MDRPI prevention. Regular feedback and reflection on care quality also help identify areas for improvement (Sving, Fredriksson, Gunningberg, & Mamhidir, 2017).

Nurses' attitudes toward pressure injuries significantly influence their adherence to preventive measures (Beeckman, Defloor, Schoonhoven, & Vanderwee, 2011). Compliance with hospital guidelines and evidence-based protocols is crucial to reducing MDRPI rates (Lomas et al., 2017). However, positive attitudes alone are insufficient to drive change in practice, as behavioral modification is complex (Moore & Price, 2004). Achieving a mindset focused on pressure injury prevention is essential, as shifts in understanding lead to changes in behavior, influencing both individual actions and overall care quality (Sving et al., 2017).

Patients who develop hospital-acquired pressure injuries are more likely to experience longer hospital stays, higher mortality rates, and increased readmission rates within 30 days after discharge (Lyder et al., 2012), making the prevention of pressure injuries a key priority for healthcare institutions (Black & Kalowes, 2016). Nurses are integral to ensuring patient safety in this context (Moore & Price, 2004). Gaining insight into nurses' perspectives and needs can inform future research and improvements in education and management strategies, ultimately fostering evidence-based practices. Currently, there is a lack of studies exploring nurses' views

and experiences regarding MDRPI in diverse healthcare settings. Moreover, without understanding the factors that influence nurses' positive or negative attitudes toward MDRPI, it is difficult to develop effective interventions to address the root causes of behaviors and improve patient outcomes. Thus, the objective of this study is to explore nurses' perceptions and experiences related to MDRPI, as well as to examine the challenges and barriers they perceive in preventing these injuries.

METHODS

This study conducted thorough Semi-structured, face-to-face interviews were conducted with nurses across various clinical departments, including medical, surgical, and geriatric wards, within a large acute care hospital.
Participants were chosen through purposive sampling, taking into account factors such as ethnicity, age, gender, work experience, and job position. A diverse and representative sample reflecting the hospital's nursing staff was selected to capture a wide array of perceptions. Eligible participants were full-time registered or enrolled nurses who met the professional certification requirements and had worked under the supervision of a registered nurse . Additionally, participants had to be over 21 years old and have had prior experience managing MDRPI in the past six months. Data saturation determined the sample size, which was reached after 19 interviews, as no new information emerged.
The interview guide was designed based on the research objectives and existing literature. It underwent review by two experts before being submitted for ethical approval. A pilot interview was carried out, and the guide was refined based on initial data collection, with probes and supplementary questions added as necessary to address the research objectives.
Participants were recruited via in-person invitations by the primary researcher (JJMT), an honors student with no prior personal or professional relationship with the participants. The researcher received guidance on interview techniques from an experienced researcher (WW), who also observed the pilot interview and the second interview to provide feedback on the interview process.
After assessing participant eligibility, the researcher (JJMT) explained the study's purpose, potential risks, and participants' rights. A total of 30 nurses were approached, with two declining participation and two not meeting the inclusion criteria. Consistency was ensured by having the same trained female interviewer (JJMT) conduct all interviews in a private setting. Written consent and demographic data were obtained before starting the interviews. Two audio recording devices were used during each interview, which lasted 45–60 minutes. The interviewer asked open-ended questions to allow for free expression and follow-up questions to clarify specific experiences. Field notes were taken to capture participants' body language and facial expressions, providing a comprehensive understanding of their responses (Polit & Beck, 2018).

Data Analysis

All interviews were transcribed verbatim, with each transcript labeled by participant code and numbered accordingly. Transcriptions included specific language and slang terms used by the nurses to preserve authenticity. Transcripts were cross-checked with audio recordings for accuracy.
Thematic analysis was conducted using the framework outlined by Braun and Clarke (2006). Initially, the researcher (JJMT) familiarized herself with the data by reviewing the transcripts and field notes. Codes were generated based on recurring themes and ideas, which were then grouped into subthemes and broader themes. These themes were refined through discussions with the research team, and any differing interpretations were resolved with the assistance of a

supervising researcher (WW). This process ensured the credibility and trustworthiness of the data analysis (Polit & Beck, 2018).

Results

A total of 30 nurses participated in the study, with a wide range of nursing experience spanning from 3 to 23 years. Their positions varied from enrolled nurses to nurse clinicians, with responsibilities including managing both acute and chronic conditions, developing treatment plans, and assisting in the training of healthcare staff. The diversity in experience can be attributed to varying academic qualifications, skills, and levels of responsibility, such as overseeing staff and planning patient care. The socio-demographic characteristics of the participants are summarized in Table 1, and

Participants generally agreed that the development of medical device-related pressure injuries (MDRPI) was preventable, particularly through regular monitoring and the use of available wound care products. One participant emphasized the importance of continuous patient assessment, noting that failure to do so could lead to avoidable injuries.

"Always assess. Assess, assess, assess. Sometimes you miss important things, but it's the most crucial. Constant checking is challenging, but when you think about it, MDRPI could have been avoided with proper assessments," shared one participant.

Another highlighted the importance of proper monitoring to prevent harm from medical devices, suggesting that neglecting regular checks could worsen the situation.

Despite advancements in technology, such as the availability of foam dressings and pressure-relieving products, some participants felt that certain uncontrollable factors—like patients' underlying health conditions—made the prevention of MDRPI more difficult. One participant expressed frustration, noting that poor skin condition, malnutrition, dehydration, immobility, and skin elasticity loss could all contribute to pressure injuries, which sometimes occurred regardless of nursing care.

All participants acknowledged that nurses played the primary role in preventing MDRPIs, citing their continuous presence with patients and their focus on factors that contribute to pressure injury prevention. One participant stressed the significant responsibility nurses bear, explaining that while doctors may assess overall health, they do not provide the constant, hands-on care necessary for pressure injury management.

"It's really up to the nurse to prevent and manage MDRPI. Proper repositioning, checking, and assessing the skin are essential tasks," one participant noted.

Some nurses felt personally accountable for MDRPI development, viewing it as a failure of their own care when prevention efforts fell short.

In addition to the individual responsibility of nurses, participants emphasized the importance of teamwork within the nursing staff and the broader multi-disciplinary team. Collaboration among doctors, physiotherapists, and technicians was seen as crucial in preventing MDRPI. One nurse pointed out that despite the nurses' diligence, the success of prevention efforts often depended on the cooperation of the entire healthcare team, including actions like ensuring that patients' medical devices are properly managed and that family members are informed about care procedures.

Participants also discussed the need for greater awareness across all healthcare staff, from doctors to technicians, about how small actions—such as leaving medical equipment on the patient's bed—could contribute to pressure injury development. By promoting awareness and responsibility across all involved parties, they suggested that better prevention outcomes could be achieved.

From the perspective of nurse managers, some participants emphasized how fostering knowledge, curiosity, and a proactive attitude among staff could improve care. They highlighted that a shift from complacency to a more inquisitive approach had led to better staff

awareness, with nurses actively seeking guidance on wound care products and best practices when necessary.
Participants discussed how their theoretical understanding of MDRPI evolved after completing in-service training, noting that they were now able to identify and report MDRPI incidents.
Previously, we didn't report MDRPI separately; we just reported pressure injuries. Now, we distinguish between the two, which gives us a clearer view of the situation.
However, when an MDRPI occurred despite their best efforts, many nurses expressed feelings of frustration. This gap between their expectations and the reality led to feelings of shock and guilt. Some participants described their disbelief and distress when MDRPIs developed.
Through these challenging experiences, some nurses became overly concerned and fixated on the possibility of MDRPI, even when they understood the theoretical causes of skin breakdown. When transferring patients from other departments to intensive care, the first thing they ask is about the skin. In such situations, participants noted the importance of nursing leaders in helping to bridge the gap between expectations and the realities faced by nurses.
Some nurses shared how, through experience, they learned to anticipate the development of MDRPI and proactively apply preventive measures.
Furthermore, some participants managed to reconcile their feelings of guilt by viewing MDRPI within the broader context of patient care. They acknowledged their limitations, accepted that some things were beyond their control, and focused on minimizing the injury as much as possible.
Medical devices are only used when absolutely necessary, and many participants reflected on how these devices, which are crucial for the patient's recovery, also exposed the patient to the risk of MDRPI. Nurses often found themselves in situations where their efforts to prevent MDRPI seemed inadequate.
A significant barrier to effectively managing MDRPI was the lack of familiarity with certain medical devices. Even though education on MDRPI is provided, it may not be enough for nurses to confidently manage real-life cases.
Education is essential for nurses, but it's not just about theoretical knowledge. The reason many nurses struggle with MDRPI is because they haven't had the chance to work with it on real patients. Classroom learning is different from hands-on experience.
Some participants expressed concerns about their limited experience with MDRPI identification and management, especially when such cases are infrequent.

Table 1. Socio-demographic data (*n* = 30)

Characteristics	**%**
Gender	
Female	90.48
Male	9.52
Age (years old)	
21–30	19.05
31–40	76.19
41–50	4.76
Highest level of education	
Institute of Technical Education	4.76
Polytechnic Diploma	14.29
Bachelor's Degree	71.43
Master's Degree	9.52
Number of years of nursing experience	
1–5	19.05

6–10	28.57
11–15	33.33
>15	19.05
Current staff position	
Enrolled Nurse	9.52
Senior Enrolled Nurse	14.29
Staff Nurse	19.05
Senior Staff Nurse	33.33
Assistant Nurse Clinician	9.52
Nurse Clinician	14.29
Number of cases of MDRPI managed in the past 6 months	
None	33.33
1–4	57.15
5 or more	9.52

Discussion

The participants expressed varied perspectives on their challenges in preventing MDRPI, which in turn influenced their decisions on how to manage these injuries. This diversity in opinions likely stemmed from the different roles and positions held by the nurses involved in the study, as it included both registered and enrolled nurses. A common theme among participants was the belief that MDRPI is preventable with consistent monitoring of high-risk areas. This viewpoint aligns with the ongoing in-service education efforts focused on pressure injury management, a key component of nursing training in the institution (SingHealth, 2019). Despite these preventive measures, some participants viewed MDRPI as unavoidable in certain cases, especially among patients with severe health conditions. The use of medical devices in critical care settings has been identified as a contributing factor to the prevalence of MDRPI, particularly among critically ill or bedridden patients with multiple comorbidities (Amirah, Rasheed, Parameaswari, Numan, & al Muteb, 2017). In these cases, nurses must continue to apply preventive measures with mindfulness and vigilance (Delmore & Ayello, 2017).

All participants agreed that preventing MDRPI was primarily a nursing responsibility. However, many acknowledged the importance of involving the multidisciplinary team in this effort, as their expertise could provide valuable insights that nurses might overlook (Samuriwo, 2012). Research has shown that in some healthcare settings, communication among multidisciplinary teams regarding patient care plans is not always common, and decision-making can often be hierarchical (Saini et al., 2012). Poor communication can negatively impact MDRPI prevention, underscoring the importance of clear and collaborative communication within the healthcare team to achieve optimal patient outcomes (Delmore & Ayello, 2017).

In addition to clinical factors, some participants raised concerns about religious items, such as prayer beads, left on patients, which could potentially lead to pressure injuries. The practice of incorporating religious artifacts is common among patients, and families are encouraged to inform nursing staff when such items are present (Delmore & Ayello, 2017). This cultural awareness is vital in preventing unintended complications. Religiosity helps patients and their relatives cope with disease processes or impending death (Bousso, Poles, Serafim, & de Miranda, 2011).

Despite being aware of preventive interventions, some participants expressed feelings of shock and guilt when they were unable to prevent MDRPI, especially when they believed they had followed the correct procedures. Such feelings of guilt often arise when nurses' actions conflict with their professional values, leading them to question their abilities and decisions. In some cases, this discomfort results in nurses becoming overly focused on tasks, driven by the fear of

inadequacy (Kalisch, Landstrom, & Hinshaw, 2009). While task-oriented efficiency is often emphasized in many healthcare environments, this focus can sometimes conflict with the need for person-centered care, leading to moral distress and dissatisfaction in the workplace (Sharp, Mcallister, & Broadbent, 2017).

Some participants acknowledged that nurses might not always be able to provide the highest level of care when managing skin integrity, especially in environments with high patient volumes and limited staffing. In critical care units, the priority may shift to more immediate concerns such as maintaining oxygen levels or stabilizing other medical conditions, often leaving skin care as a secondary consideration (Urden, Stacy, & Lough, 2016).

Medical devices, while essential to patient recovery, were also identified as a factor contributing to the development of MDRPI. Nurses often rationalized the use of medical devices as necessary for patient survival and recovery, which sometimes limited their efforts to prevent pressure injuries. This dependence on medical technology is widespread in healthcare settings and is often normalized in the context of advanced medical care (Rahman, Adigun, Yusuf, & Ofoegbu, 2006). Healthcare professionals freely acknowledge the benefits brought by medical devices in developed countries, normalizing their use (Rahman et al., 2006).

Another challenge in the prevention and management of MDRPI is the patient's underlying medical condition. In critically ill patients, deep tissue injuries and ischemic wounds may develop despite the best nursing care, and these injuries are often slow to heal unless the patient's primary health issues are addressed (Anderson & Hamm, 2012).

Participants also identified a lack of hands-on experience with MDRPI during in-service training as a barrier to effective intervention. While theoretical knowledge gained during training improves understanding, the lack of practical experience often leaves nurses feeling uncertain about applying new skills in real-life situations (Aydin & Karadag, 2010). Experiential learning is emphasized in nursing schools to bridge the gap between theoretical knowledge and real-life application (National University of Singapore, 2018).

Conclusion

This study, being one of the first of its kind in its region, offers valuable insights into the nursing perspectives on managing MDRPI. The findings suggest potential improvements to nursing practices and policies aimed at preventing MDRPI, particularly by addressing the challenges posed by limited experiential learning and raising awareness about MDRPI among healthcare professionals. The study also highlights the need for further research, including multi-site studies and the evaluation of the long-term effectiveness of educational programs, to enhance the prevention and management of MDRPI and ultimately improve patient outcomes.

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