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Medical device-related pressure injuries: An exploratory descriptive study in an acute tertiary hospital in Australia

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ABSTRACT

Aim: To examine and explore medical device-related pressure injuries in an 800-bed tertiary hospital.
Materials and methods: An exploratory descriptive study design was employed. A prospective review of all data on reported hospital-acquired pressure injuries was conducted on a weekly basis from July 2015 to August 2016. This included a patient assessment and medical record review as well as brief semi-structured interviews with nurses.
Results: The overall incidence of medical device-related pressure injuries was 27.9% (50/179) with the majority (68%, 34/50) occurring in intensive care. The most common cause of a medical device-related pressure injury was oxygen tubing behind ears (n = 21) and endotracheal tubes (n = 13). Nurses were unaware of the implications of medical devices in contact with the skin and patient medical records did not present a valuable source of information in relation to pressure injury prevention.
Conclusion: Medical device-related pressure injuries were represented in 27.9% of our entire patient cohort; primarily occurring on the ear from oxygen tubing and on the mouth from endotracheal tubes in patients in intensive care. Additional support, education and monitoring for nurses at a local level on the prevention of medical device-related pressure injuries is necessary to prevent their occurrence. Furthermore, consensus on the classification and reporting of medical device-related pressure injuries is still in development, making reporting and monitoring challenging. Medical device-related pressure injuries are a continuing clinical issue that require further exploration.

What is already known

- Hospital-acquired pressure injuries are adverse events that are largely preventable.
- Medical device-related pressure injuries are a significant clinical problem.
- Patients who have a medical device are at high risk of developing pressure injuries.

What this manuscript contributes

- This manuscript contributes to the international literature by identifying issues on the prevention, causes, and reporting of medical device-related pressure injuries.
- This study provides quantitative and qualitative data which demonstrates that medical device-related pressure injuries remain a significant clinical issue requiring further investigation.
- Collecting and analysing data on medical device-related pressure injuries will assist in devising strategies and interventions to prevent their occurrence.

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1. Introduction

Hospital-Acquired Pressure Injury (HAPI) is a serious health care complication, with significant implications for the patient and their family [1–3], the clinical setting and organisational funding [4,5]. HAPI contributes to hospital morbidity and mortality [6], yet many are largely preventable with research evidence emphasising preventative strategies [7].

A Pressure injury (PI) is defined as a 'localised injury to the skin or underlying tissue, usually over a bony prominence or a medical device, resulting from sustained pressure [8].' They commonly occur on the sacrum, coccyx and heels and are staged according to the National and European Pressure Ulcer Advisory Panel (NPUAP & EPUAP) classification system. Most recently, the NPUAP and EPUAP updated the classification system to include the additional wording "and related to a medical or other device" [8].

Medical Device-Related Pressure Injury (MDRPI) differ from most PIs as they (i) are caused by a device (ii) usually mimic the shape of the device [9] and (iii) can occur in mucosal membranes [8]. MDRPIs are caused by prolonged unrelieved pressure from a medical device and/or the way in which it is secured [10,11]. Additional contributing factors include failure to check under the device [12] and a lack of staff awareness of the risk of PIs. The occlusion of the device on the skin may cause excessive moisture [13] and increase temperature, which impairs microclimate and causes friction. The combination of pressure, friction and impaired microclimate predisposes tissue damage [14]. Failure to check under the device prevents the identification of early warning signs, such as blanchable erythema, which may lead to the development of a stage 1 PI [8,15]. When classifying mucosal PIs, staging may be difficult because of the anatomical location, such as the mucosa, and therefore should only be classified and reported as a mucosal PI [8].

MDRPIs can develop at any anatomical location and at insertion sites for devices. The most common locations reported are the head, face, neck and extremities [9,12]. MDRPIs tend to progress rapidly as they typically occur over areas lacking adipose tissue, where the pressure is constant and microclimate becomes impaired [11]. Importantly, any patient who has a medical device in contact with their skin or mucosa has the potential to develop a PI associated with the device [16].

Preventing MDRPIs can be challenging when the device itself is an essential part of the patient's treatment. Patients who are dependent on medical devices, such as those who are critically ill, have a higher chance of developing a MDRPI due to severity of their condition, duration of the use of the medical device and/or sedation [20]. Patients who are sedated or confused are at higher risk because they are unable to report discomfort or pain associated with the device.

The types of medical devices associated with PIs are wide-ranging and presented in Box 1. Orthopaedic braces and cervical collars [21], catheters, drains and compression stockings have also been shown to cause MDRPIs [13]. Adhesive tapes and cannulas are also associated with MDRPIs, although the rate is higher in neonates due to their fragile skin, environment and inability to move [22–24].

MDRPIs have been reported for many years, however the literature is limited despite the high prevalence and incidence. Prevalence and incidence for MDRPI rates range from 1.7% [9] in adults in medical and surgical units through to 86% in intensive care services (ICS) [25]. MDRPIs are a frequently cited risk in the and neonate population. Incidence rates are as high as 50%, with the most common attributable devices being Continuous Positive Airway Pressure (CPAP), Bilevel Positive Airway Pressure (BI-PAP) and pulse oximeter [26]. Almost one-third of serious PIs are device-related and are usually not identified until they are at stage 3 or 4, or unable to be staged [12].

This current study is part of a larger study examining reported HAPIs in the *Incident Information Management System*© (IIMS) (Box 2). Of the 179 confirmed HAPIs, 50 were related to medical devices. It was identified that MDRPI required further exploration. Therefore, the aim of this study was to conduct an examination of MDRPIs in relation to medical device management and PI prevention in order to inform preventative strategies. This included repositioning, off-loading, correct sizing and cleaning under the device.

2. Methods

2.1. Study design

Between July 2015 and August 2016 an exploratory descriptive study was conducted on all confirmed MDRPIs. Various steps were then undertaken: (i) a prospective clinical review and patient assessment involving a head-to-toe skin inspection, (ii) a prospective medical record review of PI prevention and treatment strategies, and (iii) brief semi-structured interviews with nurses. Informed verbal consent was obtained from all patients prior to the review. Ethical approval to conduct the study was granted by the local district research ethics review committee (ref: HREC/15/RPAH/482).

2.2. Setting and sample

This study was conducted in an 800-bed urban tertiary referral hospital in Australia comprising of acute and sub-acute care inpatient units and Intensive Care Services (ICS).

All hospitalised patients who had a MDRPI over a 13-month period were reviewed (N = 50). Patients were reviewed in different units across the hospital including neurology, cardiothoracic, aged care, paediatric, maternity, as well as ICS which comprises of 48 beds across four units.

2.3. Study procedures

2.3.1. Clinical patient review

A prospective patient assessment was conducted on a weekly basis following the collation of all HAPIs reported in IIMS, which was obtained via a computer-generated report. The audit team consisted of two senior wound nurse consultants, a quality patient safety manager and an incident information manager (Box 2). Nurses were consulted prior to patient assessment to understand any relevant medical conditions. Once the patient's verbal consent

Box 1
Common Causes of Medical Device-Related Pressure Injury

- Oxygen tubing [17]
- Endotracheal tube (ETT)
- Nasal prongs
- Respiratory masks
- Anti-embolism stockings
- Saturation probe [9]
- Continuous Positive Airway Pressure (CPAP) [18]
- Nasogastric tube (NGT) [19]
- Ankle band
- Epistaxis balloon

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