Ten top tips: Preventing device-related pressure ulcers

In the current battle to eliminate all avoidable pressure ulcers nurses now report and examine every episode of tissue damage where pressure is believed to have been a contributing factor. This reporting has led to a wealth of data which not only identify ulcer category, but also the site and source of pressure. Recognised sites for pressure ulcer development are tissues overlying a bony prominence, however, additional sites have also been identified [Figure 1]. When investigated, damage to these areas is frequently attributable to the use of a medical device[1,2].

Medical devices are often integral to the provision of patient care by either enabling monitoring, such as oxygen saturation probes, or aiding treatment, such as collars, casts and splints for immobilisation [Figure 2]. The prevalence of medical device-related pressure ulcers (MDRPU) varies considerably and appears to be dependent on population characteristics, although paediatrics are often excluded from prevalence studies[5]. A small percentage of children have multiple morbidities and as such their health status is generally better than those in the adult population, thus making them less prone to pressure ulcers[5]. However, with increased survival rates in the critically ill and chronic sick paediatric populations, the risk of pressure ulcers associated with therapeutic aids may increase[5].

VanGilder[5] reported that MDRPUs accounted for 11.9% (785) of a total of 6589 hospital-acquired pressure ulcers from an adult and paediatric population. In a smaller study looking at 113 hospital-acquired pressure ulcers from an adult and paediatric population. In a smaller study looking at 113 hospital-acquired pressure ulcers from an adult population only, a prevalence of 34% MDRPU was reported, while Hamilton et al[11] reported a 64% prevalence of MDRPUs in the paediatric population only. Learning from root cause analysis by the author suggests that the development of MDRPU cannot always be defined as being ‘unavoidable’.

MDRPU can be caused by:
- The rigid material from which device is made
- Poor device selection
- Placement on body sites with little adipose tissue
- Changes caused by the device to the microclimate of the underlying skin
- Fixation methods employed to secure device.

In addition, the nature of the device or rationale for its use and consequences of displacement can lead to a reluctance by staff to perform positional changes[1,2,5].

1 Risk assessment

When assessing risk of pressure ulcer development, nurses rely on a combination of risk assessment tools such as Waterlow and Braden[10-12], alongside visual inspection of skin and clinical judgment. However, current formal risk assessment tools may not adequately identify a patient’s risk of MDRPU development. Black et al[1] examined the risk factors for traditional pressure ulcers vs the risk factors for MDRPU. While there were shared common risk factors relating to the development of hospital-acquired pressure ulcers, there was no statistical difference found in the Braden profile of the two groups. On this basis, traditional risk assessment tools such as Braden cannot be used to predict a patient’s risk of MDRPU development, given their focus on immobility of the patient rather than mobility of the device. Since no unique risk factors specific to MDRPU development have yet been identified, patients are reliant on nursing judgment as a means of identifying risk and implementing preventative care.

Incidents of MDRPUs have been shown to occur in a range of specialties, including paediatrics, maternity, critical care and long-term care units among others[1,5]. However, trends are evident towards specific devices that are more commonly used within certain settings[1,13]. Common attributes to MDRPU have been identified[1,3,6]:
- Use of multiple devices
- Dependence on devices for survival
- Prolonged use of device/s
- Localised tissue oedema at site of device
- Poor tissue oxygenation
- Peripheral shutdown, e.g. associated with sepsis or use of vasoconstrictors
- An altered metabolic state
- Nutritional compromise
- Reduced sensory perception
- Limited ability to respond to signals of discomfort.

Nurses should be vigilant to these attributes, and where one or more of these is identified, nurses should implement actions to prevent MDRPUs.

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2 Considered device selection

Medical devices often require a degree of rigidity to maintain shape and enable functionality. However, this rigidity can cause tissue damage to occur. Softer, more comfortable products have been developed to address this, however, such devices are usually associated with an increased cost which can pose a financial burden to the healthcare facility if adopted as a whole. One solution to this problem is targeting the supply of such equipment to those specialties where there is a high incidence of tissue damage associated with use of a specific product or prolonged use of certain devices. For example, in care environments where patients are dependent on long-term oxygen via nasal cannulae, a less rigid product which has additional foam tubing for placement over the ears to reduce localised pressure could be introduced to reduce the risk of pressure ulcers resulting from nasal cannulae. In addition, clinicians should work with product developers to ensure new devices take pressure damage prevention into design considerations.

3 Regular repositioning

It is recommended that, where possible, medical devices should be repositioned regularly to redistribute pressure and decrease shear forces. However, in the author’s experience, nurses can be reluctant to alter the position of a device which is integral to the patients treatment, especially when the consequences of dislodgement could result in harm to the patient. One such example is adjusting the position of an endotracheal tube in the ventilated patient; the potential for the development of pressure damage within the oral cavity is high. It is important to ensure that an appropriate skill mix is available on each shift to enable adequate support to be provided for junior staff to ensure regular repositioning of devices. It is recognised that there are can be extreme cases where the nurse considers the risk posed by repositioning a device to be so high that it would outweigh any benefits achieved. In such instances a course of action should be agreed by the multidisciplinary team as a whole and the decision relating to how often the device is repositioned and by whom should be documented in the patient’s records. In the case of the fluctuating nature of critically ill patients, this decision must be reviewed and documented daily.

4 Careful fixation

It is often necessary to secure medical devices to prevent dislodgement, however, this should be done without creating additional pressure on surrounding tissues. Nasogastric and endotracheal tubes are often associated with damage as a result of their fixation methods which may involve adhesive tapes. Successful fixation requires tape with strong adhesive properties but with limited flexibility, such as a zinc oxide tape. Although these tapes are effective in securing tubes, the application process can cause tension to the surrounding tissue, increasing shear and causing pressure from the device onto the adjacent skin. The strength of the adhesive used may also make the tape difficult to remove from the device, thereby increasing the risk of dislodgement during each change, which in turn may increase reluctance of staff to change the tapes. In addition, epidermal
stripping can occur on removal of tape from the patients skin\textsuperscript{19}. Manufacturers have responded to this by developing specific fixators for use with individual pieces of equipment. These are designed to reduce the pressure and shear caused by the device while maintaining adequate placement of the tube. The use of gentler adhesives also reduces the potential for tissue damage relating to epidermal stripping. Education in the correct application of these products is important\textsuperscript{16}.

5 Standardising procedures
It is clear that standardised procedures across care settings are required to reduce the risk of patients sustaining a MDRPU. While there appears an agreement that clinical guidance is needed if the prevalence of MDRPUs is to be reduced, there is little in the way of published guidance which relates to reduction strategies for specific devices \textsuperscript{16,17,18}. The National Institute of Clinical Excellence\textsuperscript{19} 2014 guidance on preventing pressure ulcers appears to have excluded any discussion of MDRPU. However, the National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance\textsuperscript{14} 2014 guidance make some general recommendations which promote an awareness of the potential for pressure ulcers in association with medical devices. These recommendation can then be used to develop local care standards.

6 Dressings at specific body sites
Medical devices are often placed in locations with little adipose tissue thereby limiting the body’s natural ability to redistribute pressure. Dressings have typically been used as a means of protecting the skin underlying medical devices. Film dressings and sprays can provide some protection against friction from medical devices\textsuperscript{20}. Foam dressings are useful in managing moisture and as such can aid maintenance of the skin microclimate; this is of particular use where there is excess moisture associated with the presence of the medical device, for example, under a tracheostomy. However, caution is recommended as the use of over-thick dressings or multiple layers can themselves increase the pressure exerted between the device and the skin\textsuperscript{14}.

There are drawbacks to the use of dressings. The application of an opaque adhesive dressing can prevent visualisation of the underlying skin, which prevents subtle changes from being detected and timely interventions being made. However, frequent removal of adherent dressings causes epidermal stripping thereby increasing skin vulnerability. While foams offer some additional padding, there is little evidence that they effectively redistribute pressure\textsuperscript{21}. Manufacturers have responded to this problem by producing gel pads such as Aderma\textsuperscript{\textregistered}, which act as a synthetic adipose tissue when applied to the site and redistribute pressure\textsuperscript{22}. These products have many versatile functions in relation to prevention of MDRPU, for example, in preventing pressure ulcers to the bridge of the nose when used in conjunction with continuous positive airway pressure masks, while enabling maintenance of a sealed system necessary to deliver the positive airway pressure.

7 Early removal of devices
It is recommended that medical devices that have an increased potential to harm the patient by causing pressure damage should be removed as soon as is medically feasible. Thomas splints are commonly used as a means of stabilising long bone fractures while patients await surgery. However, in the author’s own practice, there has been a high incidence of pressure ulcers associated with the positioning of the thigh ring. To minimise this risk, the orthopaedic team must limit the duration of splint use by aiming to ensure surgical fixation occurs within a 48-hour window. However, this process can fail when surgery is delayed owing to the need for further medical management or resuscitation; and also be challenged in a non-orthopaedic specialty where nurses may have limited knowledge of caring for patients with such devices. Therefore extra vigilance for patients in these situations is recommended.

Similarly Davis et al’s\textsuperscript{23} study looking at pressure ulcers relating to the use of cervical collars reported 33% of patients had ulcers at five days of use, increasing to 44% when the collar was in situ for more than five days. By documenting application and preferred removal dates of devices, length of device use can be monitored and prolonged usage prevented.

8 Monitoring appearance of skin and presence of pain
It is recommended that the skin under and around a medical device should be inspected at least twice daily\textsuperscript{14}. This allows subtle changes in skin appearance to be identified and action to be taken to prevent these changes advancing towards damage. However, there is a limited ability to remove some medical devices, such as a plaster cast, therefore the nurse should ask...
the patient about any altered sensation to the area underneath the device in addition. Pain has been identified as an early predictor of pressure ulcer formation\(^2\). In a survey of non-invasive positive pressure ventilation mask users, Jones et al\(^2\) found that over half experienced discomfort (53%), and 17% of these patients also developed tissue damage, again demonstrating that discomfort provides an early warning signal for potential pressure ulcer development. If healthcare staff actively seek out such information from patients then they can instigate preventative actions through redistribution or relief of device-related pressure.

**Patient education**

Improved patient outcomes can be achieved through partnership working between healthcare staff, patients and caregivers. When using medical devices it is important not only to explain the rationale for their use to the patient or caregiver but also the potential problems that devices can cause and how these can be minimised. It is particularly useful for patients and caregivers in the community to be taught how to perform skin inspections and regular repositioning of the device, to relieve pressure\(^3\). Patients and caregivers must be aware of how to distinguish between an anticipated level of discomfort associated with device usage and localised pain at a body site which may indicate harmful pressure. Patients should also be educated about what actions may be safely undertaken if such situations occur. Verbal information should be supported in a written format for the patient, caregivers or other healthcare professionals to refer to as required.

**Multidisciplinary team working and shared learning**

The increased drive to reduce patient harm through the prevention of pressure ulcers has led to many members of the multidisciplinary team reviewing their role in this important aspect of care provision\(^4\). Preventing MDRPUs is one such area where disciplines other than nursing can have a positive impact in preventing harm. For example, devices such as collars and splints are often prescribed by disciplines other than nursing. An awareness within the allied health professions of the need to ensure that devices fit correctly, not only as a means of providing stabilisation but to ensure excess pressure is avoided, can have a positive impact on reducing MDRPUs. Joint working across the specialities has the potential to reduce an individual’s risk of developing pressure ulcers by harnessing the shared knowledge of the different specialities, resulting in devices that provide both stabilisation and pressure redistribution\(^4\).

Debate remains within the nursing profession as to how medical devices should be reported. Many UK trusts include MDRPUs within their overall figures, but no distinction can then be made which identifies the split between traditional and MDRPU within the national frameworks provided. There remains a disparity in reported data with some studies including paediatric populations within prevalence figures while others concentrate only on adult populations. By separating the population into adult and paediatrics we may gain further insight into the real size of the problem for each population. In conjunction with this, there appears to be a reluctance by nurses to file ‘Alerts’ which involve MDRPUs, owing to the assumption that they have occurred as a result of poor care rather than manufacturer or device design.

**Conclusion**

These top tips provide healthcare professionals with information on identifying and preventing MDRPU. However, to tackle the problem effectively, further information and research is required. For example, does the recent work on tissue distortion\(^2\, 27\) suggest a difference in the risk of MDRPU compared to traditional pressure ulcers? There also remains a need to explore specific devices in relation to their unique risk, and further work should be conducted with manufacturers to look at ways to reduce the risk of pressure ulceration associated with medical devices. Finally, wider discussion is required by healthcare professionals on MDRPUs, so that we can learn from each others’ experiences and identify devices on the market which are not fit for purpose.
References


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