

# Evidence-based practice: Medical device–related pressure injury prevention

Learn the risk factors and tailor prevention to device type.

By Gustavo Camacho-Del Rio, MBA-HM, MAP, BSN, RN



**THE** Joint Commission’s *Quick Safety* issue on managing medical device–related pressure injuries (MDRPIs) points out that nearly all hospital patients require at least one medical device for care and treatment, putting them at risk for injury. The National Pressure Ulcer Advisory Panel (NPUAP) defines MDRPI as “localized damage to the skin and/or underlying soft tissue usually over a bony prominence or related to a medical or other device. The injury can present as intact skin or an open ulcer and may be painful. The injury occurs as a result of intense and/or prolonged pressure or pressure in combination with shear.”

Nurses can take the lead in preventing MDRPIs by understanding risk factors, tailoring prevention to the device type, collaborating with other team members to ensure continuity of care, and monitoring for change.

## Risk

Risk factors associated with MDRPIs include:

- tight device securement that results in poor circulation, friction, or shearing
- poor and/or prolonged patient positioning (pressure for as little as 10 minutes can result in a pressure injury [PI])
- heat that increases perspiration
- moisture under the device that results in macerated skin
- edema that increases skin tension
- lack of awareness by staff and patients of preventive measures and PI potential
- failure to routinely assess patients’ skin and devices (skin assessments should be performed at the earliest contact with the patient [in the emergency department or on admission to the unit] and according to the device manufacturer’s

recommendations or more often depending on comorbidities and medications).

A 2018 study by Kayser and colleagues found that the most common anatomic locations for MDRPIs are the ears and the feet, and the most common devices associated with MDRPIs include nasal oxygen tubes, casts and splints, and continuous positive airway pressure (CPAP)/bilevel positive airway pressure (BiPAP) masks.

## Prevention

Preventing MDRPIs involves reducing pressure or redistributing it over a larger area, controlling the skin’s microclimate, improving patient nutrition, encouraging mobility, and addressing comorbidities. NPUAP prevention guidelines include:

- choosing the correct size medical device to fit the patient
- cushioning and protecting the

- skin with dressings in high-risk areas (nasal bridge, rim of device)
- removing or moving devices, when possible, to assess skin at least daily
- avoiding device placement over sites of prior or existing PIs
- educating staff about the correct use of devices and skin breakdown prevention
- being cognizant of edema under devices and the potential for skin breakdown (edema can develop after device application, especially in patients receiving massive fluid resuscitation or those with unresolved soft-tissue inflammation)
- confirming that devices aren't placed directly under a patient who is bedridden or immobile.

Identifying and proactively addressing the cause of an MDRPI can be challenging. (See *Early identification*.) However, the NPUAP 2014 consensus panel noted that some device-related PIs may be unavoidable when adjusting or moving a device is medically contraindicated, when a device prevents patient turning or repositioning, and when tissue edema or moisture under a device compromises tissue tolerance and increases the risk for pressure and shear forces.

Prevention measures are unique to the device being used. Consider the following strategies when caring for and monitoring patients.

### Nasal cannulas

Nasal cannulas may cause PIs behind the ears, around the nostril, or in the nasal vestibule.

**Prevention:** Soft nasal cannulas can dramatically lower the incidence of PIs. If a high-flow cannula is needed, protect the back of the ears with a hydrocolloid or foam dressing.

**Comment:** A quality improvement (QI) project by Lukose and colleagues found that using preventive measures (soft cannulas, hydrocolloid/foam dressing) de-

## Early identification

Early detection of medical device–related pressure injuries (MDRPIs) is essential to minimize harmful effects. The Joint Commission *Quick Safety* on managing MDRPIs recommends seven safety actions that promote early identification. Here are some highlights for each action; complete details are at [bit.ly/2BVj3l6](http://bit.ly/2BVj3l6).

- **Assessment.** Assess the skin under the medical device.
- **Education.** Teach patients and families about the device.
- **Positioning.** Reposition patients to redistribute pressure and decrease shear force.
- **Device care.** Be sure patients receive the proper size and type of device, secure the device to decrease movement, and pad the skin.
- **Documentation and communication.** Communicate the plan of care from one caregiver to the next.
- **Teamwork.** Work with others to create plans for reducing MDRPIs from an organizational perspective.
- **Continuous monitoring.** Observe baseline and progression or healing over time.

creased the incidence of PIs from 5.4% to zero. Lukose's organization maintained zero PIs related to nasal cannulas for 23 months. In addition to reducing PI incidence, this QI project saved nurses time and has the potential of saving the organization \$41,932 per year.

### Masks

Masks—including oxygen, CPAP, and BiPAP—may cause injuries to the cheeks, chin, or bridge of the nose.

**Prevention:** Placing silicone border or hydrocolloid dressings over bony prominences or other areas that come in contact with the device, and between the device and the skin, has been proven to decrease MDRPIs.

**Comment:** According to a June 2015 presentation from the Collaborative Alliance for Nursing Outcomes, Memorial Health System in California found that implementing PI prevention and using silicone-based dressings reduced the incidence of stage 3+ MDRPIs per 1,000 patient days from 0.06% to zero in children (benchmark 0.0%-0.04%) and from 0.28% to zero in adults (benchmark 0.05%-0.09%). The benchmarks used for the study are a comparison to other similar acute care facilities with 500+ beds.

### Casts and braces

Casts and braces, as well as cervical collars and stabilizers, put patients at risk for PIs directly under the rim of the device.

**Prevention:** A study by Browning and Williams found that the following steps help prevent MDRPIs related to casts, braces, cervical collars, and stabilizers.

- Choose the correct device size and position it properly.
- Cushion and protect skin with dressings or silicone pads in high-risk areas.
- Use vigilance around hard-to-see areas (scalp or hairline, under dressings).
- Avoid placing devices over sites of prior or existing injury.
- Be aware of current edema and developing edema under the device.
- Educate staff about correct device use and skin breakdown prevention.
- Remove or reposition devices and provide basic skin care under them.
- Regularly reposition the device, if possible, and record on care and comfort chart.
- If possible, ensure that there's no contact between the patient's body and the device.

- Instruct patients and families to inform staff of any discomfort.

**Comment:** Another measure implemented in the Browning and Williams study included wrapping a red band around the top and bottom of a patient's plaster cast to alert staff that he or she is at risk of developing a PI and needs specific care.

### Tracheostomy flange/ties or securement devices

The patient's soft tissue under the tracheostomy sheath is at risk for PI.

**Prevention:** A study by O'Toole and colleagues found that standardizing postoperative procedures reduces the incidence of tracheostomy-related PIs. The protocol includes:

- placing a hydrocolloid dressing under the tracheostomy flange during the postoperative period
- removing plate sutures within 7 days of the procedure
- placing a polyurethane foam dressing after suture removal
- placing the patient's head in a neutral position.

**Comment:** In the O'Toole study, the incidence of tracheostomy-related MDRPI decreased from 20 of 183 tracheostomies (10.93%) to two of 155 (1.29%). After implementing this protocol at my organization (Michael E. DeBakey VA Medical Center), we've achieved zero MDRPI from April 2017 to date.

### Catheters

Catheters (urinary, arterial, venous), nasogastric/oral gastric tubes, and fecal management systems present PI risk for any soft tissue that comes in to direct contact with these devices.

**Prevention:** Preventing PIs related to catheters requires:

- assessing for risk factors (sensory deficit, edema, inadequate equipment selection, device positioning or securement, and impaired perfusion)
- using an approved securement device to avoid pressure, trauma,

or dislodgment and following the manufacturer's instruction for indications, monitoring, application, and removal

- inspecting skin under and around the device at least daily
- positioning tubing so that it's not under the patient or pannus
- educating staff on correct device use and skin breakdown prevention
- checking site frequently for moisture.

**Comment:** Identifying the possible affected area when performing the assessment is imperative; the assessment should include the skin's condition and whether there are areas that will be more susceptible to pressure from the catheter.

### Sequential compression devices

Improper placement of sequential compression devices (SCDs) can cause injury to the lower extremities.

**Prevention:** To prevent injuries from SCDs, perform a baseline assessment that includes:

- presence and level of pain
- pallor
- palpable or Doppler pulses
- paresthesia ("pins and needles" sensation)
- paralysis (weakness or lack of movement)
- skin abnormalities under the sleeve
- pain associated with movement or touch
- increasing extremity edema
- signs or symptoms of possible blood clots to the extremity (swelling, redness, pain)
- circumference of the extremity (one size does not fit all).

**Comment:** Perform routine skin assessments per the manufacturer's recommendations, and follow placement instructions to ensure that the SCD doesn't kink, fold, or cause areas of high pressure (check for these issues each time the SCD is activated). Remove SCD sleeves every 8 hours and when bathing,

checking for erythema and excessive edema. To protect the skin from increased moisture, use an approved moisture barrier.

### What happens if...

Despite best efforts, sometimes a PI may occur. Stage MDRPIs using the standard PI staging system. Exceptions to this rule are mucosal PIs (tongue, GI tract, inner nasal passages, urinary tract, and the vaginal canal), which usually are the result of devices such as oxygen tubing, endotracheal tubes, bite blocks, orogastric and nasogastric tubes, urinary catheters, and fecal containment devices. Although these injuries may be caused by pressure, there's no way to differentiate depth, and mucosal injuries typically resolve with no scarring.

### It takes a team

It takes a team of devoted staff members, supervisors, nursing executives, and wound care specialists to ensure MDRPI prevention. For example, at the Michael E. DeBakey VA Medical Center, respiratory technicians play an integral role in prevention by initiating protective measures whenever a CPAP, BiPAP, endotracheal tube, or nasal cannula is in use.

### Pay attention

All medical devices that might touch patients' skin, including many not discussed in this article (for example, bed pans and prosthetic limbs), require special attention to address the underlying factors that may lead to an MDRPI. Implementing PI prevention in your practice and organization can reduce injuries and improve patient care. ★

Visit [americannursetoday.com/?p=51566](http://americannursetoday.com/?p=51566) for a list of selected references.

Gustavo Camacho-Del Rio is a wound specialist on the skin risk management team at Michael E. DeBakey VA Medical Center in Houston, Texas.