Medical Devices and Pressure Injuries - Compression Stockings

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Overview

Compression stockings are primarily used for the prevention of venous disorders like deep vein thrombosis in hospitalized patients who may be immobilized due to surgical conditions or other disease processes.[1] Evidence suggests that due to the frequency of use among hospitalized patients, limited staff training, and/or prolonged use on patients who are unable to communicate due to sedation or confusion, the risks associated with pressure injuries caused by compression stockings may be overlooked.[1,2] Pressure injuries are formally defined by the National Pressure Injury Advisory Panel as, "…localized damage to the skin and underlying soft tissue usually over a bony prominence or related to a medical or other device."[3] These injuries can present as closed or open wounds and result from the combination of prolonged pressure and shear. A multistep staging system is typically used to define the progression of all ulcers and wounds. The system includes stages 1-4 (initial injury to full-thickness with tissue loss) and additional specifications to define unstageable, deep tissue, and medical device-related injuries.[4,5]

Like the general definition of pressure injuries, medical device-related pressure injuries are defined by National Pressure Injury Advisory Panel. They state, "Medical device-related pressure injuries result from the use of devices designed and applied for diagnostic or therapeutic purposes. The resultant pressure injury generally conforms to the pattern or shape of the device."[3] While pressure ulcers are typically defined as occurring over a bony prominence, medical device related-pressure injuries can result from many types of common medical devices that come in contact with a patient's skin for a prolonged period of time. Specific examples used for both diagnostic or therapeutic purposes may include oxygen tubing, intravenous lines, bed frames, sequential-compression devices, orthopedic devices, and graduated compression stockings, among others.[6]

According to a 2018 safety report from The Joint Commission, more than 30 percent of hospital-acquired pressure injuries are related to medical devices.[7] Any patient with a medical device is at risk for the development of device-related pressure injuries. Critical care patients are at even greater risk for skin breakdown, due in part to the use of multiple devices, poor nutrition, hemodynamic instability, and the use of vasoactive drugs.[8] As prevention is an essential component in the management of pressure injuries, patient risk assessment is an essential first step.[8]

Actions for Consideration

Partner: Engage physicians, nurses, care technicians, and wound care specialists to partner on prevention and care strategies. Depending on the facility this may include both clinical and non-clinical team members.

Connect: Connect with experts in nursing, as well as quality and performance improvement to help develop injury tracking metrics and other data collection. Collecting and reviewing data including patient injury and any association complications will help to inform the development of strategies for prevention and care.

Communicate: Share and educate all team members on prevention strategies and develop a common goal. Discuss appropriate use of products to manage use. Robust data sharing will not only enhance discussions, but may lead to actionable conversations between peers.

HealthTrust Resources: Access the Clinical Knowledge Insights Library to find other relevant documents and toolkits with actionable information.[9] Network on HealthTrust Huddle, our member community that shares ideas and seeks guidance from colleagues.[10]

Professional Society Statements and Clinical Practice Guidelines

- The Agency for Healthcare Research and Quality (AHRQ) has a comprehensive toolkit titled *Preventing Pressure Ulcers in Hospitals* (2023). This toolkit reviews essential components of quality improvement, including assessing readiness for change and designing sustainable practices, along with best practices for pressure injury prevention. The complete toolkit can be found here.[6]
- The National Pressure Injury Advisory Panel (NPIAP) provides definitions, staging images, and other resources on their website (Found here).[11] They additionally provide links to the 2019 International Clinical Practice Guideline for the *Prevention and Treatment of Pressure Ulcers/Injuries* in both full and abridged versions (Found here). These guidelines contain information about classification systems and evidence-based recommendations, including information about device-related injuries.[5]
- The details and methods for the revision of the pressure injury staging system can be found in the 2016 publication titled *Revised National pressure Ulcer Advisory Panel Pressure Injury Staging System* (Found here).[4] This article includes information about changes in terminology from *pressure ulcer* to *pressure injury*.

Clinical Evidence

There is extensive literature covering the topic of pressure injury and pressure injury prevention. Research reviewing the impact of compression stockings is relatively recent. Examples of the available literature are provided.

- A systematic review and meta-analysis by Jackson et al. (2019) synthesized data from 29 studies to assess medical device-related pressure injuries. The authors concluded that the pooled incidence and prevalence overall was 12% and 10%, respectively. Pressure injuries can decrease quality of life and add extensive hospital costs on to a patient's stay. They are additionally considered a nursing-key indicator for the quality of patient care. The authors described the need for strategies of prevention as well as risk assessment to address this significant challenge.[12]
- A retrospective review by Hobson et al. (2017) assessed the prevalence of pressure injury among patients in a surgical intensive care unit. A total of 1787 patients were included in the study. Of the 129 who developed pressure ulcers, 40 patients (31%) developed pressure injuries related to graduated compression stockings. The authors noted that prevention strategies and risk assessment are essential for prevention. Limitations of this study included decreased generalizability due to the single site, single unit study.[13]
- A study by Black et al. (2016) conducted a secondary analysis on pressure injury data collected by the Nebraska Medical Center in order to quantify the data on injuries specifically caused by medical devices. The researchers noted that the overall rate of medical device-related pressure ulcers was 34.5% (39 of 113 total pressure ulcers). Similarly, patients with a medical device (e.g. cervical collars, fecal containment devices, urinary catheters, splints, braces, and compression devices) were at a greater risk of pressure ulcer development of any kind (2.4 times more likely). The researchers emphasized the need for more literature to assess strategies for prevention, including communication and education of the multidisciplinary team.[14]
- An evidence-based practice project by Tessy et al. (2021) sought to reduce the overall incidence of pressure injury caused by compression stockings on a gastrointestinal sarcoma unit. The researchers conducted a project in which stockings were removed during the day and replaced at night. They reported that out of 3,141 patients seen in the unit between June-October 2017, there were zero

pressure injuries and zero deep vein thromboses. The authors noted that these results prompted the discontinuation of compression stockings in post-operative patients throughout the institution. Limitations included decreased generalizability due to the single site, single unit study.[2]

- A report of three specific case studies by Rathore et al. (2017) described the presence of pressure ulcers caused by compression stockings at a hospital in Pakistan. The authors indicated that a combination of prolonged application, inappropriate sizing, limited documentation, and unclear prevention strategies lead to an increased risk of pressure ulcers from compressions stockings. The authors recommended training and vigilant assessment to help prevent these complications.[1]

Summary

An important consideration for patient care in prevention of device-related pressure injuries is the early recognition of potential risk factors and the use of appropriate care techniques to prevent skin damage. If injury does occur, prompt treatment and staff education are noted to be important parts of the care plan. Communication and education should be addressed in advance of a product change. Partnering with the supplier of choice for education and in-servicing (in-person rounding, one-on-one training, product literature, product fairs, educational posters, brochures, videos or letters) is crucial. Supplier relationships can be beneficial to a successful conversion, provided clear communication and expectations are established and utilized.

References

1. Rathore FA, Ahmad F, Khan OJ. Compression Stockings and Pressure Ulcers: Case Series of a Neglected Issue. *Cureus.* 2017;9(10):e1763.
2. Siby T, Smith U, Shajimon A. Eliminating Hospital-Acquired Pressure Injuries Caused by Graduated Compression Stockings. *AJN The American Journal of Nursing.* 2021;121(7):60-65.
3. National Pressure Injury Advisory Panel. NPIAP Pressure Injury Stages. https://cdn.ymaws.com/npiap.com/resource/resmgr/online_store/npiap_pressure_injury_stages.pdf. Published 2023. Accessed November 21, 2023.
4. Edsberg LE, Black JM, Goldberg M, McNichol L, Moore L, Sieggreen M. Revised National Pressure Ulcer Advisory Panel Pressure Injury Staging System: Revised Pressure Injury Staging System. *J Wound Ostomy Continence Nurs.* 2016;43(6):585-597.
5. National Pressure Injury Advisory Panel. Accessing the 2019 Guideline. https://internationalguideline.com/2019. Published 2019. Accessed November 20, 2023.
6. Agency for Healthcare Research and Quality. Preventing Pressure Ulcers in Hospitals. https://www.ahrq.gov/patient-safety/settings/hospital/resource/pressureulcer/tool/index.html. Published 2023. Accessed November 20, 2023.
7. The Joint Commission. Quick Safety: Managing medical device-related pressure injuries. https://www.jointcommission.org/-/media/tjc/newsletters/qs_43_med_dev_pressure_injuries_7_17_18_final2pdf.pdf. Accessed November 21, 2023.
8. The Joint Commission. Quick Safety Issue 25: Preventing pressure injuries (Updated March 2022). https://www.jointcommission.org/resources/news-and-multimedia/newsletters/newsletters/quick-safety/quick-safety-issue-25-preventing-pressure-injuries/. Published 2022. Accessed November 21, 2023.
9. HealthTrust Performance Group. Clinical Knowledege Insights. http://www.hpginsights.com/. Published 2023. Accessed September 25, 2023.
10. HealthTrust Performance Group. HealthTrust Huddle. https://huddle.healthtrustpg.com/forum/. Published 2023. Accessed September 25, 2023.
11. National Pressure Injury Advisory Panel. Pressure Injury Stages. https://npiap.com/page/PressureInjuryStages. Published 2016. Accessed November 20, 2023.
12. Jackson D, Sarki AM, Betteridge R, Brooke J. Medical device-related pressure ulcers: A systematic review and meta-analysis. *Int J Nurs Stud.* 2019;92:109-120.
13. Hobson DB, Chang TY, Aboagye JK, et al. Prevalence of graduated compression stocking–associated pressure injuries in surgical intensive care units. *Journal of Critical Care.* 2017;40:1-6.
14. Black JM, Cuddigan JE, Walko MA, Didier LA, Lander MJ, Kelpe MR. Medical device related pressure ulcers in hospitalized patients. *Int Wound J.* 2010;7(5):358-365.