Medical Device–Related Pressure Injuries During the COVID-19 Pandemic

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ABSTRACT

BACKGROUND: Medical device–related pressure injuries (MDRPIs) account for more than 30% of all hospital-acquired pressure injuries. The COVID-19 pandemic introduced a large population of patients at risk for MDRPIs due to prolonged intubation and prone positioning. We reviewed our experience with MDRPIs during the 2020 COVID-19 pandemic at an Academic Medical Center.

CASES: We evaluated 30 cases of MDRPIs acquired during the peak of our pandemic, April 1 to May 31, 2020, and compared these to injuries seen over a similar time period prior to the pandemic.

CONCLUSIONS: Our experiences with MDRPIs during this time has led the WOC team to begin development of a quality improvement project aimed at improving management of high-risk respiratory illness patients requiring intubation and prone positioning.

KEY WORDS: COVID-19, medical device–related, pressure injury, pressure ulcer, skin.

INTRODUCTION

Pressure injuries increase morbidity and mortality and are associated with 60,000 patients dying per year.1 The costs for pressure injuries in the United States may exceed $26.8 billion.2 The mortality of patients who develop a pressure injury is 9.1% in comparison to 1.8% for patients who do not develop a pressure injury.3 In addition, the length of stay for a patient who develops a pressure injury, on average, is prolonged 4 to 6 days more than the patient without a pressure injury, increasing the cost of hospitalization approximately $50,000 to $60,000 per admission. Upon discharge, 76.9% of patients with pressure injuries require transfer to subacute care facilities or home with home care services, further adding to the cost of healthcare.4 Medical device–related pressure injuries (MDRPIs) are iatrogenic and account for more than 30% of all hospital-acquired pressure injuries.5,6

Patients with COVID-19, with the accompanying severe acute respiratory syndrome (SARS-CoV), are at particular risk for development of pressure injuries. Both national and international entities have rapidly developed guidelines and tips to help care providers assess, manage, and limit the tissue damage and pressure-related injuries. For example, the European Pressure Ulcer Advisory Panel (EPUAP) developed a Facebook page, titled “COVID-19 and Pressure Ulcer Prevention Forum.”7 The Wound, Ostomy, and Continence Nurses Society (WOCN Society) developed a comprehensive resource Web site including recommendations for assessment and photography, skin issues related to personal protective equipment, and a forum to discuss new skin treatment challenges during the pandemic.8–10 The National Pressure Injury Advisory Panel (NPIAP) developed a white paper, titled “Skin Manifestations With COVID-19: The Purple Skin and Toes That You Are Seeing May Not Be Deep Tissue Pressure Injury,” and a resource guide that included guidelines for the prevention of MDRPIs, prone positioning, and prophylactic foam dressings in sacral pressure injuries.11 The clinical challenges around pressure injuries and COVID-19 spearheaded a multitude of changes and initiatives as global providers continue to face a rapid influx of high-acuity and high-risk patients requiring lifesaving medical device use.

CASES

Our Academic Medical Center, as of May 31, 2020, had discharged 557 COVID-19–positive patients and had 107 COVID-19–related deaths. At our peak, we had 171 inpatients, with 91 requiring intensive care management. During April and May 2020, we noted a spike in the incidence of MDRPIs, particularly in our prone-positioned patients. A retrospective review of reportable pressure injuries (stage 3, stage 4, unstageable) during this time period has allowed us the opportunity to seek quality improvement initiatives to improve patient outcomes specific to MDRPIs.

Our average daily intensive care unit census increased by 27.5% during the months of April and May 2020. Within these 2 peak months of the pandemic, we reported 30 hospital-acquired pressure injuries (HAPIs), a 275% increase over our prior 2-month period. During the months of February and March 2020, we had 8 reportable pressure injuries, of which 4 were MDRPIs and 3 of the 4 were related to the...
use of respiratory care devices. All reportable pressure injuries were unstageable at the time of the initial wound care consultation. Fifty percent (n = 15) of all reported pressure injuries during this 2-month period were related to MDRPIs, with 11 of 15 involving the use of endotracheal tubes and associated securement devices. The Table shows a breakdown of patient demographics and anatomic location of all HA-PIs that occurred during April and May 2020. Fourteen were reported by the nursing staff to be attributed to prone positioning, and 6 were unknown (Figure 1). Nevertheless, data analysis revealed that 73% of our reported pressure injuries were associated with a COVID-19–positive diagnosis (Figure 2). As evidenced by Figures 3A to 3F, the clinical relevance of these pressure-related injuries is apparent.

**Figure 1.** Medical device–related pressure injuries resulting from prone positioning.

**Figure 2.** COVID-19 diagnosis and PI. PI indicates pressure injury. NEG indicates negative; POS, positive.

**DISCUSSION**

While definitive data have not yet been published, our clinical experience overwhelmingly indicates that a staggering increase in patients with acute respiratory illness requiring high-level treatment and lifesaving maneuvers such as lengthy intubation, tracheostomies, and prone positioning has led to a steep increase in the incidence of pressure-related injuries including those related to medical device use. Initial evidence strongly suggests that prone positioning is associated with increased survival rates in patients with SARS-CoV.\(^{12,13}\) In addition to increased survival rates in SARS-CoV patients, prone positioning has been linked with a 3-fold increase in pressure-related injuries when compared to supine positioning.\(^3\) Prone position exerts compressive and shear forces from tubes exiting the mouth and nose on adjacent facial structures, increasing the risk for pressure injury.\(^14\) Positioning, offloading, and repositioning the prone patient are limited, given the context of care for these critically ill patients. Prone-positioned patients typically have medical devices in place, are sedated, and have an increase in both moisture and tissue loads, leading to an increased likelihood for development of pressure injury. In addition to prone positioning, the catastrophic effects of COVID-19 include a cytokine release storm, endothelial dysfunction, and ischemia, further perpetuating processes that are also postulated to increase the likelihood of pressure injury.\(^15,16\) Gefen and Ousey\(^3\) describe 8 factors that correlate with MDRPIs after an initial insult, including tissue deformation, cell damage, cell death, inflammation, edema, interstitial pressure, ischemia, and tissue death. When we consider the intensive care, COVID-19–positive patients who require intubation and medical device use in conjunction with the cellular changes occurring, we assert that this patient population is at extreme risk for MDRPI development and will likely require additional pressure injury prevention maneuvers.

The rapid influx of this acute patient population in our facility required prompt multidisciplinary responses aimed at preventing and minimizing skin injury. During this time frame, a prone positioning team, including physical therapists, was initiated to assist with the workload required to position this patient population. Indicative of the high level of acuity and workload, the prone team positioned and repositioned more than 500 times during this period, with 4 to 6 people required to complete the reposition each time. The WOC nurses collaborated with the prone team to develop a pressure injury plan for all patients placed in the prone position for prolonged periods of time. This plan included developing a positioning and product guide for the prone team and the nursing staff (Figure 4). This guide includes photographs of appropriate positioning, use of offloading, and recommended positioning products. In addition
to collaboration with the prone team and the respiratory therapy department, unit-based consultation and daily rounding by the WOC nurses were completed, targeting education regarding pressure injury prevention, best practices, and treatment.

Treatment and offloading of MDRPIs in these patients were limited, if not impossible, owing to the necessity of continued medical device use. In addition, the warm humid microclimate and location of pressure injuries limited effective dressing application. Lengthy prone positioning also limited our ability to assess and reposition patients and medical devices. Debridement of necrotic pressure injuries in the acute care setting was not typically completed in the setting of high acuity patient status and hypercoagulopathy.

CONCLUSIONS

The COVID-19 pandemic has brought an unprecedented challenge to healthcare. Among the multiple challenges associated with the pandemic, prolonged placement in a prone position and use of respiratory support equipment have increased the risk for MDRPIs. Pressure injuries secondary to prone positioning can lead to emotional, physical, and pecuniary suffering for both the patient and the facility. Although improving MDRPI incidence was an initiative pre-pandemic, the fast influx of highly acuity patients strained our resources, including the system for prevention of pressure injury. A review of the incidence of MDRPIs at our facility prompted us to evaluate the etiology and risk factors for patients with COVID-19 and those with SARS-CoV who require intubation and prone positioning. We have identified potential areas of improvement, and we are moving forward with an aggressive program that includes an evaluation of staff learning needs, along with the use of preventive dressings, endotracheal securement devices, pressure redistribution surfaces, and the option of virtual inpatient wound consultation.

Figure 3. Photographic evidence of several medical device–related pressure injuries in COVID-19–positive patients. (A) Pressure injury chin. (B) Pressure injury left cheek. (C) Pressure injury nose, left lip. (D) Pressure injury left cheek inpatient. (E) Pressure injury left cheek postdischarge. (F) Pressure injury forehead.
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