Pressure Injury Management in Critically Ill Patients with COVID-19 in a Makeshift Hospital in Indonesia

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Case Report

Pressure Injury Management in Critically Ill Patients with COVID-19 in a Makeshift Hospital in Indonesia: A Report of Two Cases

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ABSTRACT

Patients who are critically ill with COVID-19 need ventilation support in the ICU. However, ICU patients are at higher risk of developing a pressure injury (PI). Unfortunately, PI prevention is not optimally implemented in Indonesia, especially in the makeshift hospitals created during the COVID-19 pandemic. Here, the authors report two cases of critically ill patients with COVID-19 who developed large sacral PIs during hospitalization in a makeshift hospital in Indonesia. The first patient developed a stage 3, 7 × 7-cm sacral PI on the 14th day of hospitalization. The second patient developed a stage 4, 12 × 8-cm sacral PI on the 16th day of hospitalization. Both patients had elevated D-dimer levels and used a noninvasive ventilator for 1 week. The wounds were treated with surgical debridement, silver hydrogel dressing, and hydrocolloid dressing and complemented with static air mattress overlay. The authors recommend that in situations where there is a shortage of healthcare workers, the government should provide pressure-redistribution devices and silicone foam dressings for all critically ill patients to prevent PI development and lighten the workload of healthcare workers.

KEYWORDS: case report, COVID-19, hospital-acquired pressure injury, ICU, Indonesia, pressure injury

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INTRODUCTION

COVID-19 has a wide clinical spectrum.[1] Although the majority of those infected with COVID-19 are asymptomatic or have only mild symptoms, older adults and those with comorbidities are more likely to become critically ill.[2] Among patients who are critically ill with COVID-19, the majority develop acute respiratory distress syndrome (ARDS), a life-threatening form of respiratory failure with high mortality.[3,4] Patients who develop ARDS require ventilation support in the ICU. However, patients in the ICU are also at higher risk of pressure injury (PI) development due to prolonged immobilization.[5-7]

Unfortunately, PI prevention measures are not optimally implemented in Indonesia,[8] especially in the makeshift hospitals created during the COVID-19 pandemic.[9] Here, the authors report two cases of critically ill COVID-19 patients who developed large PIs during hospitalization in a makeshift hospital in one of the largest cities in Indonesia. Written informed consent was provided by the legal guardian (for case 1) and by the subject of the case (for case 2) to publish the case details and associated images. The authors highlight challenges in PI management during the COVID-19 pandemic and propose several suggestions to aid PI prevention.

CASE REPORT

Case 1

A 40-year-old man with a medical history of schizophrenia and intellectual disability presented to the ED with the chief complaints of irritability, fever, dry cough, and shortness of breath. Three days before admission, the patient developed a fever of 38 °C at home. On physical examination at the ED, the patient's temperature was 37 °C, BP was 120/80 mm Hg, heart rate was 102 beats per minute, respiratory rate was 24 breaths per minute, and oxygen saturation was 85% without any oxygen support. Lung auscultation revealed rales in the left lung, and chest X-ray revealed

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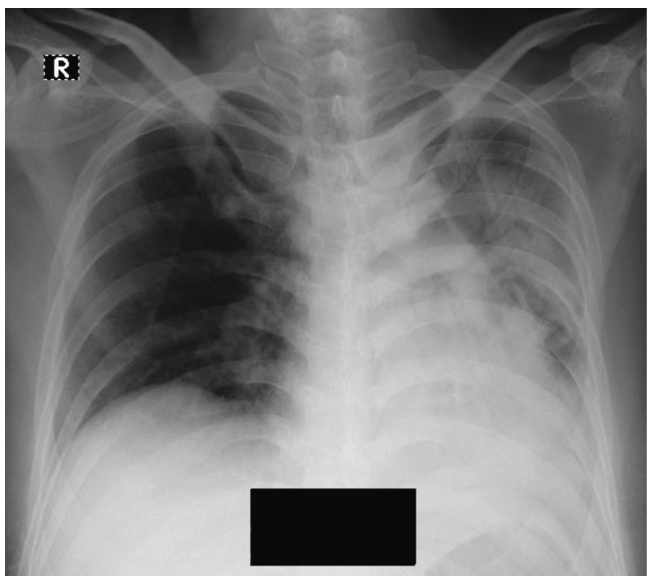
pulmonary infiltrates in the left lung (Figure 1). Laboratory evaluation showed elevated D-dimers (>20,000 ng/mL FEU) and hypoalbuminemia (2.2 mg/dL). Based on the initial evaluation, COVID-19 infection was suspected. A nasopharynx specimen was taken for COVID-19 reverse transcriptase-polymerase chain reaction evaluation to confirm the COVID-19 diagnosis.

While waiting for the test result, the patient was given 15 L/min oxygen via nonrebreathing mask and treated with IV moxifloxacin 400 mg daily, IV acetylcysteine 500 mg daily, IV albumin 50 g daily, and 40 mg subcutaneous enoxaparin twice daily. To treat the symptoms of schizophrenia, the patient was given oral clozapine 50 mg twice daily, oral quetiapine 200 mg twice daily, and oral trihexyphenidyl 2 mg twice daily. Because the patient was uncooperative, the patient was restrained on the bed after his legal guardian provided written consent. A Foley catheter was then inserted, and a diaper was used. The following day, the patient's COVID-19 test result came back positive. The patient was then given additional treatment of IV oseltamivir 75 mg twice daily.

During hospitalization, the patient's oxygen saturation was not improving. On day 10, blood gas analysis showed uncompensated respiratory acidosis (pH 7.28, P_{O_2} 122 mm Hg, P_{CO_2} 51.8 mm Hg, and HCO_3 24.9 mEq/L) with Jackson-Rees circuit oxygen support. The patient also developed ARDS (Pa_{O_2}/F_{IO_2} ratio = 122). Because this makeshift hospital lacked mechanical ventilators, a noninvasive ventilator was used. The patient had mean arterial pressure of 60 mm Hg (reference range, 70-100 mm Hg) and Glasgow Coma Scale score of 8, indicating ongoing septic shock. Thus, IV norepinephrine (0.1 μg/kg per minute) was administered continuously using a syringe pump. Because the patient was immobilized, 30-minute right-oblique and 30-minute left-oblique passive mobilization was undertaken every 8 hours. The restraints were released prior to mobilization and retied after mobilization to the new position. To maintain nutrition intake, a nasogastric feeding tube was inserted. The required nutrition was calculated by the dietitian and given as milk feeding.

Figure 1. CHEST X-RAY IN CASE 1
X-ray showing infiltrate in the left lung.



Because of the limited number of healthcare workers (HCWs) available every shift and their high workload, PI risk assessment was not performed. However, the patient's skin was inspected every 8 hours during diaper changes. On day 14, a 7 × 7-cm bilateral sacral wound was noted with epithelial surface and superficial wound bed (Figure 2A). The wound was cleansed using normal saline and wound irrigation solution, and a silver hydrogel dressing was applied to the wound bed. A hydrocolloid foam dressing was placed on top of the silver hydrogel dressing and extended 2 cm around the wound to protect the periwound skin from maceration. To prevent urine or fecal contamination, nonsterile gauze was placed above the hydrocolloid foam dressing and fixed with retention tape. In addition, a static air mattress overlay was placed on the bed as a pressure-redistribution device (PRD). The wound dressing was changed every 3 days, or earlier if contaminated with urine or feces.

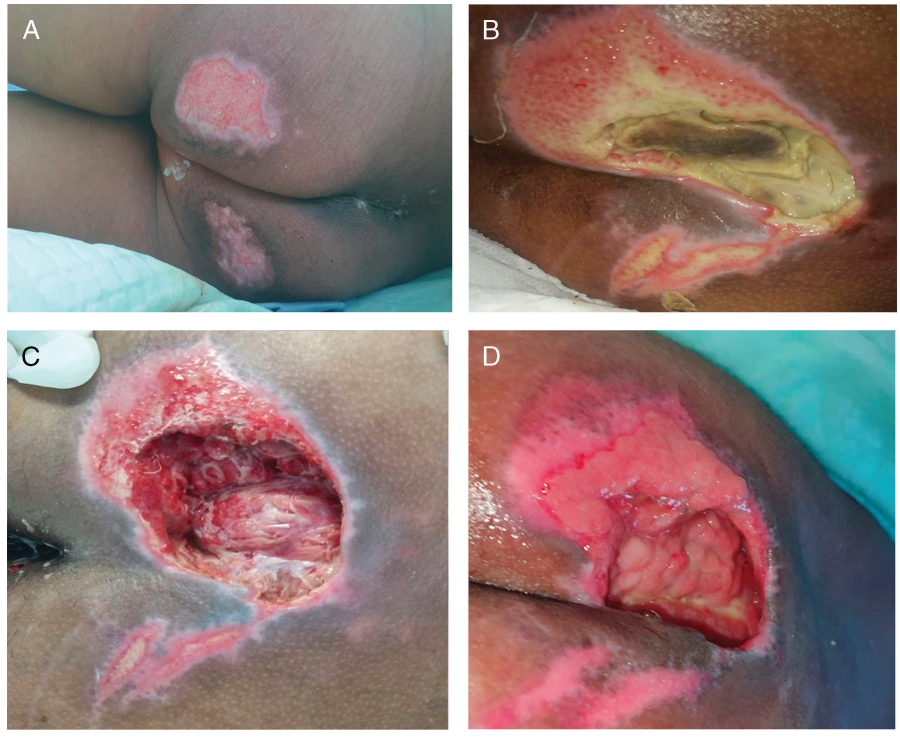
On day 18, the sacral wound enlarged to 15 × 10 cm with slough and suspicion of "deeper ulceration" (Figure 2B). Surgical debridement was then performed by the nurses at the bedside. After surgical debridement, fascia was seen at the wound bed (Figure 2C), resulting in a stage 3 classification.[10] Because of the deep cavity wound, sterile gauze was placed in the cavity to fill the space after applying a silver hydrogel dressing onto the wound bed. The wound dressing was changed every 2 days instead of every 3 days, or earlier if contaminated with urine or feces. When needed, surgical debridement was performed again. On day 26, granulation began to appear from the wound (Figure 2D). The patient was discharged on day 39. Nurses followed up with weekly home visits until the wound was completely closed to evaluate the wound-healing process, perform surgical debridement if needed, change the wound dressing, and teach family members how to change the wound dressing in between home visits.

Case 2

A 59-year-old man with a medical history of type 2 diabetes mellitus, hypertension, and cerebrovascular accident (CVA) with resulting left-side hemiplegia presented to the ED with the chief complaints of fever, cough, and shortness of breath. Five days earlier, the patient had developed a cough and fever of 38.5 °C at home. The patient tested positive for COVID-19 3 days before presenting to the ED. On physical examination at the ED, his temperature

Figure 2. SACRAL ULCER IN CASE 1

A, Sacral ulcer with epithelial wound bed measuring 7 × 7 cm on day 14. B, Covered by slough and suspicion of "deeper ulcer," measuring 15 × 10 cm on day 18. C, Minimal slough and fascia in the wound bed after surgical debridement and wound dressing, 15 × 10 cm with depth of 6 cm on day 22. D, Granulation tissue on day 26, measuring 10 × 6 cm.



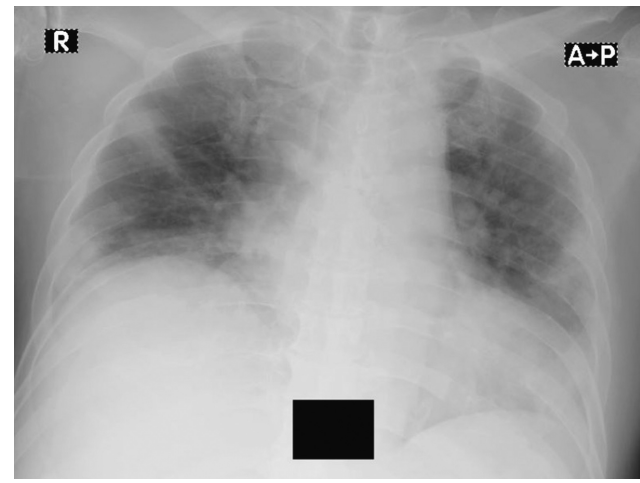
was 37.5 °C, BP was 140/90 mm Hg, heart rate was 110 beats per minute, respiratory rate was 24 breaths per minute, and oxygen saturation was 75% without any oxygen support. Lung auscultation revealed rales in both lungs. Chest X-ray revealed bilateral pulmonary opacities and cardiomegaly (Figure 3). Laboratory evaluation showed elevated D-dimers (2,100 ng/mL FEU), elevated interleukin 6 level (120 pg/mL), and hypoalbuminemia (2.8 mg/dL). Based on the initial evaluation, the patient was diagnosed with COVID-19 and recent CVA.

The patient was given 15 L/min oxygen via Jackson-Rees circuit and treated with IV moxifloxacin 400 mg daily, IV acetylcysteine 500 mg daily, IV albumin 50 g daily, subcutaneous heparin 5,000 international unit (IU), IV dexamethasone 6 mg daily, 400 mg IV tocilizumab single dose, and oral oseltamivir 75 mg twice daily. To treat the hypertension, the patient was given oral amlodipine 10 mg once daily and oral candesartan 16 mg once daily. The patient also received subcutaneous long-acting insulin 20 IU once daily and rapid-acting insulin 16 IU thrice daily to treat the diabetes mellitus.

During hospitalization, the patient's oxygen saturation was not improving. On day 7, blood gas analysis showed uncompensated respiratory acidosis (pH 7.3, P_{O_2} 150 mm Hg, P_{CO_2} 50.2 mm Hg, and HCO_3 23.5 mEq/L) with Jackson-Rees circuit oxygen support. The patient developed ARDS (Pa_{O_2}/Fi_{O_2} ratio = 150) and was given a noninvasive ventilator because of the lack of mechanical ventilators. Because the patient was immobilized, 30-minute right-oblique and 30-minute left-oblique passive mobilization was undertaken every 8 hours. To maintain nutrition intake, a nasogastric feeding tube was inserted; milk feeding was calculated by a dietitian.

Figure 3. CHEST X-RAY IN CASE 2

X-ray showing infiltrate in both lungs and cardiomegaly with cardiothoracic ratio of 60%.



Because of the limited number of HCWs every shift and their high workload, PI risk assessment was not performed. However, the patient's skin was inspected every 8 hours during diaper changes. On day 16, a 12 × 8-cm sacral wound with suspicion of "deeper ulceration" was found on both sides of the sacrum (Figure 4A). On day 18, central necrotic tissue was present (Figure 4B). Nurses performed surgical debridement at the bedside (Figure 4C), and the wound was cleansed using normal saline and wound irrigation solution. A silver hydrogel dressing was applied on the wound bed, and a hydrocolloid foam dressing was placed on top of the silver hydrogel dressing and extended 2 cm around the wound to protect the periwound skin from maceration. To prevent urine or fecal contamination, nonsterile gauze was placed above the hydrocolloid foam dressing and fixed with retention tape. Further, a static air mattress overlay was placed on the bed as a PRD. The wound dressing was changed every 3 days or earlier if contaminated with urine or feces. When needed, surgical debridement was performed again.

Two days after treatment, the wound bed was larger than at initial presentation with bone and tendon exposure (Figure 4D), or a stage 4 pressure injury.[10] Because of the deep cavity wound, the cavity was filled with sterile gauze after applying a silver hydrogel dressing onto the wound bed. The wound dressing was changed every 2 days instead of every 3 days, or earlier if contaminated with urine or feces. On day 25, granulation tissue presented on the ulcer (Figure 4E), and by day 30, the ulcer had narrowed (Figure 4F). The patient was discharged on day 35. Nurses followed up with weekly home visits until the wound was completely closed to evaluate the wound-healing process, perform surgical debridement if needed, change the wound dressing, and teach family members how to change the wound dressing in between the scheduled home visits.

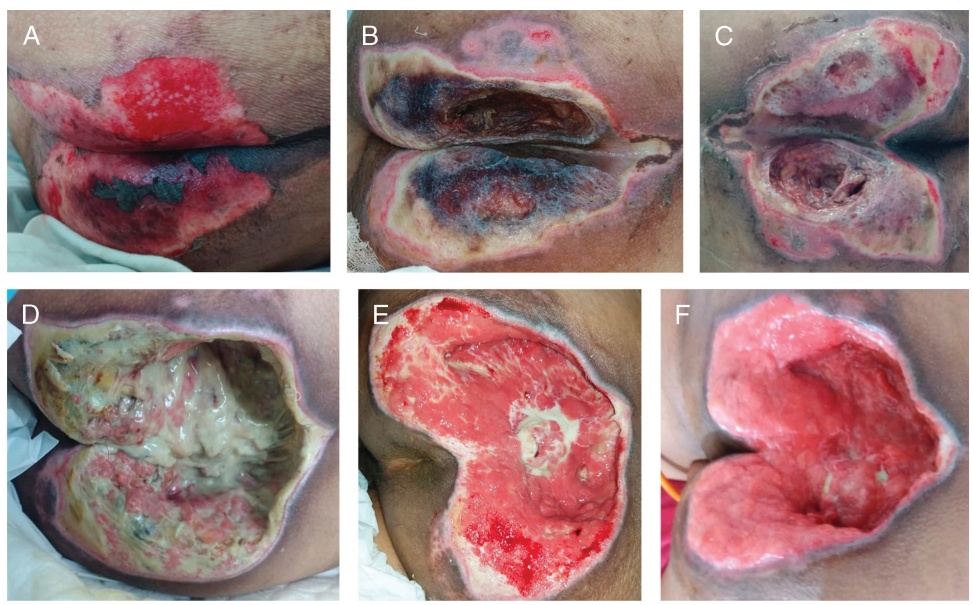
DISCUSSION

The main factors influencing PI development are pressure, shear, and soft tissue tolerance.[10] Pressure refers to sustained physical force on a local point, whereas shearing occurs when two opposing surfaces slide in opposite directions. When pressure and shear disrupt blood flow and local tissue hypoxia lasts for a critical period of time, tissue damage results.[11] However, at what intensity and duration of force tissue damage occurs depends on the tissue tolerance.[12] Pressure injuries usually occur in bony areas such as the sacrum.[13]

Researchers have identified a number of PI risk factors, including immobility, being confined to bed, malnutrition, dehydration, infection, urinary and bowel incontinence, diabetes, vascular disease, and vasopressor use.[14–16] Patients who are sedated are particularly prone to PIs because they do not perceive painful stimuli from intense and prolonged pressure and cannot actively change their position in bed.[7,17,18] Recently, it has been reported that patients who are critically ill with COVID-19 are also at higher risk of PI.[19] These patients have

Figure 4. SACRAL ULCER IN CASE 2

A, Sacral ulcer on both sides of the buttocks with epithelial wound bed and necrotic tissue on central side, measuring 12 × 8 cm on day 16. B, Covered with both slough and necrotic tissue, measuring 12 × 10 cm on day 18. C, After surgical debridement on day 18. D, Covered with massive slough, depth of 7 cm on day 20. E, Granulation tissue and minimal slough on day 25. F, Granulation tissue on day 30.



reduced perfusion and are more likely to develop systemic coagulopathy, which leads to decreased tissue tolerance.[19] In the first case, the patient was critically ill with COVID-19 and required a vasopressor. Further, this patient had impaired mental health as a comorbidity. People with severe mental health impairment such as schizophrenia tend to have poor diet and may neglect their personal hygiene, causing similar conditions to having urinary and bowel incontinence.[13] In the second case, the patient was also critically ill with COVID-19 and had CVA and diabetes mellitus as comorbidities.

Pressure injury is associated with prolonged hospitalization.[20–22] The length of stay was 39 days for the first case report patient and 35 days for the second patient. The first patient could have been discharged 9 days earlier if there were no PI present; the second patient could have been discharged 5 days earlier. In a previous case series of three severely ill patients with COVID-19, PIs were first noted between 7 and 19 days after hospitalization.[19] For the patients described herein, PI was noted on day 14 of hospitalization for the first patient, and on day 16 for the second patient.

According to the latest guidelines, comprehensive PI risk assessment, preventive skin care, and early mobilization and repositioning are some of the PI management strategies that should be considered.[23] In terms of patients who are critically ill with COVID-19, Tang et al[24] found that PIs can be managed by improving the underlying contributing factors; providing PRD with proper positioning; improving mobility; minimizing excessive moisture; correcting malnutrition; and performing close daily monitoring of the PI including the dressing, surrounding skin, and any possible complications.

However, proper PI management translates to an extra workload for nurses. Unfortunately, because of significant staffing shortages, HCWs' workload during the COVID-19 pandemic in Indonesia was already high.[9] In this makeshift hospital, there were only one doctor and three nurses on every shift, resulting in an HCW-to-patient ratio of 1:5. In addition, most of the patients with COVID-19 were critically ill. With a very unbalanced HCW-to-patient ratio and resultant high workload for the HCWs, it is not possible to follow the guidelines for proper PI management. As a result, PI risk assessment was not performed when patients arrived at the facility; mobilization and skin assessment were performed every 8 hours (once per HCW's working shift) instead of being individualized according to risk assessment.

With regard to PRDs, a recent study found that PRD use was associated with an 88% reduced risk of PI development in high-risk ICU patients.[25] Similarly, a previous systematic review also concluded that PRD should be provided to patients who are at high risk of PI development.[26] Pressure-redistribution devices help prevent PIs by decreasing the magnitude and duration of pressure and reducing the shear and friction between the patient and the bed surface.[10,25,27] Thus, providing PRDs for all critically ill patients with COVID-19 would be a beneficial strategy for PI prevention. However, in the makeshift hospital, only two PRDs are available and thus are allocated for PI treatment and not for PI prevention.

Based on the difficulties experienced during the COVID-19 pandemic, the authors recommend several PI prevention strategies for hospitals with HCW shortages:[23,28]

1. Reeducate HCWs about PI management.
2. Conduct skin assessments as often as possible.
3. Ensure patients have adequate nutrition and hydration.
4. Use PRDs for all patients who are critically ill with COVID-19.
5. Apply silicone foam dressings over the bony prominences that serve as the main pressure points in all critically ill patients with COVID-19.

CONCLUSIONS

Patients who are critically ill with COVID-19 are also at greater risk of PI development during hospitalization. In a situation where there is a shortage of HCWs, governments should compensate by providing additional PRDs and silicone foam dressings for all critically ill patients to prevent PI development and lighten the workload of HCWs. ●

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