

# A Case Report of Deterioration in a Non-frail Octogenarian Burn Patient

Manya Bali <sup>1</sup>, Denise Nadora <sup>1</sup>, Olivia Wu <sup>1</sup>, Kaila Polizzi <sup>1</sup>, Eldo Frezza <sup>2</sup>

1. Medicine, College of Medicine, California Northstate University, Elk Grove, USA 2. Surgery, College of Medicine, California Northstate University, Elk Grove, USA

**Corresponding author:** Eldo Frezza, eldo.frezza@cnsu.edu

Review began 09/03/2024

Review ended 10/12/2024

Published 10/18/2024

© Copyright 2024

Bali et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

DOI: 10.7759/cureus.71808

---

---

## Abstract

While advancements in critical care and burn treatment have improved over the decades, elderly burn victims continue to face high mortality rates. Measurements of frailty among patients have become popular tools for predicting burn outcomes over chronological age. In this report, we provide a case of a non-frail octogenarian burn victim who deteriorated rapidly during treatment, suggesting that frailty alone is not sufficient in predicting outcomes in older burn patients.

An active 86-year-old male with hypertension presented to the emergency department with 35% total body surface area (TBSA) burns following a welding accident. He experienced second and third degree burns to his face, thorax, chest, back, and arms and had possible inhalation injury. Despite wound cleaning and fluid resuscitation, the patient's vitals and pain worsened while waiting for transfer to the burn unit, requiring an oxygen mask and intravenous hydromorphone to be administered multiple times. In the emergency department (ED), the patient also experienced myoglobinuria, decreased urine output, and progressive confusion.

Frailty involves understanding how patient comorbidities and functional status influence the body's ability to respond to stressors. Unlike their younger counterparts, octogenarian patients appear to be vulnerable to worse burn outcomes even when non-frail. Thus, physicians should consider injury severity and systemic responses to injury on admission in addition to an elderly patient's pre-burn physiology to guide prognosis and treatment.

---

**Categories:** Emergency Medicine, Geriatrics, Trauma

**Keywords:** burn protocol, elderly burns, emergency department, frailty, geriatrics, octogenarian

## Introduction

In the United States, nearly 400,000 people are treated for burns annually, and approximately 30,000 of those patients are hospitalized for burn-related injuries each year [1]. In recent decades, outcomes for burn victims have improved across all age groups due to advancements in critical care treatment, yet mortality among elderly patients remains high. From the age of 55 to 70 years, the mean lethal dose (LD50) decreases from 45% total body surface area (TBSA) burns to only 25% TBSA [2].

While many studies have established increased age as a predictor for burn mortality and decreased long-term function [3,4], there has been a recent interest in understanding how frailty scores may provide a more comprehensive assessment of elderly burn outcomes [5,6]. Frailty is a state of physiological vulnerability in which multiple body systems have reduced reserve or ability to function when faced with stressors [7]. A single standardized frailty scale has not yet been adopted, but the Canadian Study for Health and Aging Clinical Frailty Score (CFS) and the Modified Frailty Index-5 (mFI-5) are the commonly used assessments [6]. Both scoring systems utilize functional status/independence and comorbidities to stratify patients [8,9].

In this paper, we present a case of an 86-year-old patient who suffered a 35% TBSA burn. Despite his non-frail constitution and appropriate treatment by burn protocol, the patient's condition declined rapidly, suggesting that factors beyond frailty should be considered by emergency providers.

## Case Presentation

An 86-year-old male presented to the emergency department (ED) due to a burn while welding in his yard. A spark ignited his shirt and caused burns on his face (shown in Figure 1), chest, upper back, and upper arms with hair burned at the level of the nose and possible CO<sub>2</sub> inhalation. Over the next two hours, his blood pressure decreased from 140/100 to 120/80 to 110/70, while his heart rate continued to increase from 99 to 101 to 120 beats per minute. His oxygen saturation was 86% without supplementation. Medical history was unremarkable except for hypertension, which is controlled by lisinopril 10 mg. Vital signs are summarized in Table 1.

### How to cite this article

Bali M, Nadora D, Wu O, et al. (October 18, 2024) A Case Report of Deterioration in a Non-frail Octogenarian Burn Patient. Cureus 16(10): e71808. DOI 10.7759/cureus.71808



**FIGURE 1: Burns of the left face and upper chest**

Burn boundaries are demarcated by the dotted lines.

	First Reading - Upon Arrival	Second Reading - 30 minutes	Third Reading - 90 minutes	Reference Range
Blood pressure	140/100	120/80	110/70	120/80
Heart rate	99	101	120	60-100

**TABLE 1: Progression of vital signs**

Upon physical exam, he was found to have second and third degree burns covering 35% of his body with

demarcated painful and painless areas on the chest and leathery burns on his back (Figures 2, 3). The patient was awake, alert, and ambulatory upon admission (GCS 15), but the patient became progressively confused with time and location within one hour of admission. Carboxyhemoglobin levels were at 9 percent. A chest x-ray showed no pulmonary complications despite the hair burn at the level of his nose. An electrocardiogram was performed, which showed a normal sinus rhythm. Additional laboratory findings upon arrival are summarized in Table 2.



**FIGURE 2: Burns of the chest and arm**

Burn boundaries are demarcated by the dotted lines.





**FIGURE 3: Burns of the back**

Burn boundaries are demarcated by the dotted lines.

	Value	Reference Range
White Blood Cell count (WBCs/ $\mu$ L)	19,000	4,500-11,000
Hemoglobin (g/dL)	14	13.8–17.2
Creatinine (mg/dL)	0.7	0.7-1.3
Urinalysis	Myoglobinuria	N/A

**TABLE 2: Laboratory findings upon arrival**

The patient was placed on a 2-liter nasal cannula, which increased his oxygen saturation to 90%. He underwent fluid resuscitation according to the Parkland formula for four hours prior to transfer to the burn unit. His wounds were cleaned with water and treated with silver sulfadiazine. Additionally, a Foley catheter was placed.

By the time of transfer, the patient's pain level had worsened, requiring intravenous hydromorphone to be administered three times. The color of his urine, initially yellow, changed to a darker, orange color. He also required 5-liter of O<sub>2</sub> by mask, resulting in an oxygen saturation of 94%. A bronchoscopy was performed and was negative for inhalation injury. From the burn unit, the patient was then transferred to the intensive care unit (ICU) where he remained for three days. After an additional three days in the wards, he was discharged home.

## Discussion

Frailty can be considered a distinct geriatric syndrome that increases risk of adverse health conditions, comorbidities, physical and mental decline, fall-related accidents, and mortality [10]. The scoring guidelines of two commonly used assessments, the CFS and mFI-5, in burn studies are listed in Tables 3, 4, respectively [8,9].

Clinical Frailty Scale
1 Very Fit: active, energetic, and motivated with regular exercise
2 Well: no active disease and occasional activity
3 Managing Well: well-controlled medical problems and some activity beyond walking
4 Vulnerable: independent but symptoms limit activities
5 Mildly Frail: evident slowing and need help with high-order activities of daily living (ADLs)
6 Moderately Frail: needs help with all outside activities and in the house
7 Severely Frail: completely dependent for personal care
8 Very Severely Frail: completely dependent and approaching end of life
9 Terminally Ill: life expectancy of less than six months and not evidently frail

**TABLE 3: A summary of the Clinical Frailty Score (CFS)**

Modified 5-Item Frailty Index
Diabetes mellitus
Congestive heart failure
Hypertension requiring medication
History of chronic obstructive pulmonary disease (COPD) or pneumonia
Non-independent functional status

**TABLE 4: Modified five-item Frailty Index (mFI-5)**

The CFS is perhaps the most well-studied index of frailty in burn patients; multiple investigations have found that a CFS score of 5 or higher in the elderly is associated with greater mortality [11-13]. Interestingly, this conclusion is not found in all studies. Sephehpour et al. reported that CFS scores were correlated with treatment complications but not life expectancy in burn patients [14]. Using the mFI-5, one study of 574 patients found that frailty was not associated with mortality or complications but was correlated with longer hospital stay in burn victims aged over 65 years [15].

Our patient, an active octogenarian with well-controlled hypertension, would not be classified as frail under these guidelines, scoring a 3 on the CFS and a 1 on the mFI-5. Nonetheless, his condition declined considerably despite emergency treatment. For those over the age of 50, any burn greater than 10% TBSA is classified as severe and can cause significant systemic inflammation and intravascular fluid loss, leading to hypovolemia and hypoperfusion [16]. The presence of burned nostril hair in our patient suggests a degree of nasal inhalation injury despite a normal chest x-ray and bronchoscopy, and inhalation injury also classically increases mortality risk [17]. With his age, 35% TBSA, inhalation injury, and myoglobinuria, our patient clearly sustained a high level of injury that depleted his physiological reserve.

All elderly patients, regardless of frailty, will experience some level of age-related decreased pulmonary function, body mass, skin thickness, circulation, and immune response which can contribute to worse burn outcomes [18]. Considering the progression of our patient, providers should be cautioned against using frailty metrics alone as prognostic tools for burns. Adding additional factors to frailty indices beyond comorbidities and functional status appears to increase their accuracy in predicting burn outcomes. A report by Maxwell et al. developed a burn-specific frailty index that accurately predicted morbidity and mortality in

elderly frail patients by including mental health and burn severity on admission into its scoring system in addition to patient comorbidities and functional status [19]. A separate analysis of over 1000 patients used the following factors to score frailty: age > 70 years, body mass index <18.5 kg/m<sup>2</sup>, hematocrit <35%, albumin <3.4 g/dL, and creatine >2.0 mg/dL. Patients with three or more risk factors had increased 90-day mortality and prolonged ICU stay [20]. Although these study-specific indices can be more difficult to calculate on admission, understanding the combined role of age, frailty, injury severity, and the systemic response of burn patients may more accurately guide prognosis and treatment management.

## Conclusions

Elderly patients have a decreased ability to respond to external stressors such as burns as compared to their younger counterparts. This contributes to higher complication and mortality rates among elderly burn patients. Although frailty indices consider patient comorbidities and functional status, they may not be sufficient in predicting outcomes, especially among octogenarians as shown in this case. Physicians should understand aspects of an elderly patient's pre-burn physiology as well as their injury severity and systemic responses on admission to guide prognosis and treatment.

## Additional Information

### Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

**Concept and design:** Manya Bali, Denise Nadora, Olivia Wu, Kaila Polizzi, Eldo Frezza

**Acquisition, analysis, or interpretation of data:** Manya Bali, Denise Nadora, Olivia Wu, Kaila Polizzi, Eldo Frezza

**Drafting of the manuscript:** Manya Bali, Denise Nadora, Olivia Wu, Kaila Polizzi, Eldo Frezza

**Critical review of the manuscript for important intellectual content:** Manya Bali, Denise Nadora, Olivia Wu, Kaila Polizzi, Eldo Frezza

**Supervision:** Eldo Frezza

### Disclosures

**Human subjects:** Consent was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

## References

1. Annual Burn Injury Summary Report: Analysis of Inpatient Care at Burn Centers 2018–2022 . (2023). Accessed: August 5, 2024; <https://ameriburn.org/wp-content/uploads/2024/03/2023-aba-bisr-overview-w-link-to-bisr.pdf>.
2. Jeschke MG, Pinto R, Costford SR, Amini-Nik S: Threshold age and burn size associated with poor outcomes in the elderly after burn injury. *Burns*. 2016, 42:276-81.
3. Wearn C, Hardwicke J, Kitsios A, Siddons V, Nightingale P, Moiemmen N: Outcomes of burns in the elderly: revised estimates from the Birmingham Burn Centre. *Burns*. 2015, 41:1161-8. [10.1016/j.burns.2015.04.008](https://doi.org/10.1016/j.burns.2015.04.008)
4. Palmieri TL, Molitor F, Chan G, Phelan E, Shier BJ, Sen S, Greenhalgh DG: Long-term functional outcomes in the elderly after burn injury. *J Burn Care Res*. 2012, 33:497-503. [10.1097/BCR.0b013e31825aeaac](https://doi.org/10.1097/BCR.0b013e31825aeaac)
5. Romanowski KS, Barsun A, Pamlieri TL, Greenhalgh DG, Sen S: Frailty score on admission predicts outcomes in elderly burn injury. *J Burn Care Res*. 2015, 36:1-6. [10.1097/BCR.0000000000000190](https://doi.org/10.1097/BCR.0000000000000190)
6. Shafiee A, Arabzadeh Bahri R, Rajai S, Ahoopai M, Seighali N, Amini MJ: Frailty as a predictor of adverse outcomes in burn patients: a systematic review. *BMC Geriatr*. 2023, 23:680. [10.1186/s12877-023-04302-5](https://doi.org/10.1186/s12877-023-04302-5)
7. Campbell AJ, Buchner DM: Unstable disability and the fluctuations of frailty. *Age Ageing*. 1997, 26:315-8. [10.1093/ageing/26.4.315](https://doi.org/10.1093/ageing/26.4.315)
8. Rockwood K, Song X, MacKnight C, Bergman H, Hogan DB, McDowell I, Mitnitski A: A global clinical measure of fitness and frailty in elderly people. *Canadian Medical Association Journal*. 2005, 173:489-95. [10.1503/cmaj.050051](https://doi.org/10.1503/cmaj.050051)
9. Obed D, Knoedler S, Salim M, et al.: The modified 5-item frailty index as a predictor of complications in burn patients. *JPRAS Open*. 2023, 36:62-71. [10.1016/j.jpra.2023.03.001](https://doi.org/10.1016/j.jpra.2023.03.001)
10. Fried LP, Tangen CM, Walston J, et al.: Frailty in older adults: evidence for a phenotype. *J Gerontol A Biol Sci Med Sci*. 2001, 56:M146-56. [10.1093/gerona/56.3.m146](https://doi.org/10.1093/gerona/56.3.m146)
11. Cords CI, van Baar ME, Nieuwenhuis MK, Pijpe A, van der Vlies CH: Reliability and validity of a frailty

- assessment tool in specialized burn care, a retrospective multicentre cohort study. *Burns*. 2023, 49:1621-31. [10.1016/j.burns.2023.05.001](https://doi.org/10.1016/j.burns.2023.05.001)
12. Iles KA, Duchesneau E, Strassle PD, et al.: Higher admission frailty scores predict increased mortality, morbidity, and healthcare utilization in the elderly burn population. *J Burn Care Res*. 2022, 43:315-22. [10.1093/jbcr/irab221](https://doi.org/10.1093/jbcr/irab221)
  13. Masud D, Norton S, Smailes S, Shelley O, Philp B, Dziewulski P: The use of a frailty scoring system for burns in the elderly. *Burns*. 2013, 39:50-6. [10.1016/j.burns.2012.03.002](https://doi.org/10.1016/j.burns.2012.03.002)
  14. Sepehrpour S, Duggineni S, Shahsavari S, Dheansa B: Life expectancy in elderly patients following burns injury. *Burns*. 2018, 44:1446-50. [10.1016/j.burns.2018.04.009](https://doi.org/10.1016/j.burns.2018.04.009)
  15. Litmanovich B, Alizai Q, Stewart C, et al.: Outcomes of geriatric burn patients presenting to the trauma service: how does frailty factor in?. *J Surg Res*. 2024, 293:327-34. [10.1016/j.jss.2023.08.049](https://doi.org/10.1016/j.jss.2023.08.049)
  16. Schaefer TJ, Nunez Lopez O: *Burn resuscitation and management*. StatPearls. StatPearls Publishing, Treasure Island, FL; 2023.
  17. Lionelli GT, Pickus EJ, Beckum OK, Decoursey RL, Korentager RA: A three decade analysis of factors affecting burn mortality in the elderly. *Burns*. 2005, 31:958-65. [10.1016/j.burns.2005.06.006](https://doi.org/10.1016/j.burns.2005.06.006)
  18. Huang SB, Chang WH, Huang CH, Tsai CH: Management of elderly burn patients. *Int J Gerontol*. 2008, 2:91-7. [10.1016/S1873-9598\(08\)70044-9](https://doi.org/10.1016/S1873-9598(08)70044-9)
  19. Maxwell D, Rhee P, Drake M, Hodge J, Ingram W, Williams R: Development of the Burn Frailty Index: a prognostication index for elderly patients sustaining burn injuries. *Am J Surg*. 2019, 218:87-94. [10.1016/j.amjsurg.2018.11.012](https://doi.org/10.1016/j.amjsurg.2018.11.012)
  20. Yu J, Kong YG, Park JY, et al.: Chart-derived Frailty Index and 90-day mortality after burn surgery. *J Surg Res*. 2024, 293:291-9. [10.1016/j.jss.2023.08.041](https://doi.org/10.1016/j.jss.2023.08.041)