

Geriatric hip fracture patients with a COVID-19 diagnosis within one week of surgical stabilization are at greatest risk of perioperative adverse events

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Introduction: Geriatric hip fractures are common injuries for which surgical stabilization is routine, but adverse events are common. Unfortunately, the geriatric patient population's increased susceptibility for Sars-CoV-19 (COVID-19) has exacerbated the risks associated with hip fractures. While many elective surgeries can be delayed following the diagnosis of COVID-19, hip fractures do not allow for this due to demonstrated poorer outcomes in delayed surgical treatment. The current study aimed to assess the correlation of postoperative adverse outcomes based on time from COVID-19 diagnosis to hip fracture surgery.

Methods: Geriatric patients (> 65 years of age) with a diagnosis code of proximal femur fracture and who underwent surgery with screw and side plate, intramedullary device, percutaneous screws, hemiarthroplasty, or total hip arthroplasty were identified in the 2010 to Q3 2021 PearlDiver M157 administrative database. Study patients with a pre-operative COVID-19 diagnosis were then identified and categorized based on the time from COVID-19 diagnosis to hip fracture surgery: ≤ 1 week, > 1 to ≤ 4 weeks, > 4 to ≤ 7 weeks, > 7 to ≤ 10 weeks, and > 10 to ≤ 13 weeks. Ninety-day postoperative adverse events were assessed and compared with univariable analysis and multivariable logistic regression (controlling for age, sex, and Elixhauser Comorbidity Index). A Bonferroni correction was applied to both analyses, with significance defined as $p \leq 0.0007$. All statistical analysis was conducted with either the PearlDiver Bellwether software or GraphPad Prism 9.4.1.

Results: Overall, 263,771 geriatric hip fracture patients were identified, of which COVID-19 was noted in the 13 weeks prior to surgery for 976 (0.37%). Of COVID-19 positive patients, COVID-19 had been diagnosed ≤ 1 week from surgery for 507 patients, > 1 to ≤ 4 weeks from surgery for 174 patients, > 4 to ≤ 7 weeks from surgery for 103 patients, > 7 to ≤ 10 weeks from surgery for 125 patients, and > 10 to ≤ 13 weeks from surgery for 67 patients. Based on multivariable analyses, patients with a COVID-19 diagnosis ≤ 1 week preoperative demonstrated increased rates of the following: aggregated minor adverse events (odds ratio (OR)=1.50, $p<0.0001$), surgical site infection (OR=1.50, $p<0.0001$), aggregated all adverse events (OR=1.63, $p<0.0001$), sepsis (OR=1.70, $p=0.0005$), and pneumonia (OR=2.35, $p<0.0001$), but not other assessed adverse outcomes including venous thromboembolism (**Figure 1**). For all later COVID-19 time-point categories, there were no significant differences for any of the post-operative adverse events or readmission rates compared to those without a preoperative COVID-19 diagnosis (**Figure 2**).

Discussion: COVID-19 has been well-established to carry substantial inflammatory and systemic complications that can affect patients in the postoperative period. The current study assessed the postoperative course of hip fracture patients who had COVID-19 diagnosed within defined time windows prior to timely surgical intervention. Only patients with COVID-19 diagnosis within one week of hip fracture surgery were found to be at greater risk for defined adverse events. However, it is important to note the timing of COVID-19 infection relied on administrative coding which may have not coincided with the actual infection timeline. While the effects and severity of COVID-19 have evolved since the onset of the pandemic, understanding the risks associated with COVID-19 infection in geriatric patients undergoing hip fracture surgery is limited to those infected within 1 week from surgery may be of clinical utility.

Significance/Clinical Relevance: With the continued impact of COVID-19, preoperative COVID-19 infection remains an important surgical consideration even to the planning of hip fracture surgery. This study characterized the increased risk of defined complications that were limited to geriatric patients with COVID-19 infection within 1 week of hip fracture surgery. These data may aid perioperative care pathways for this patient population.

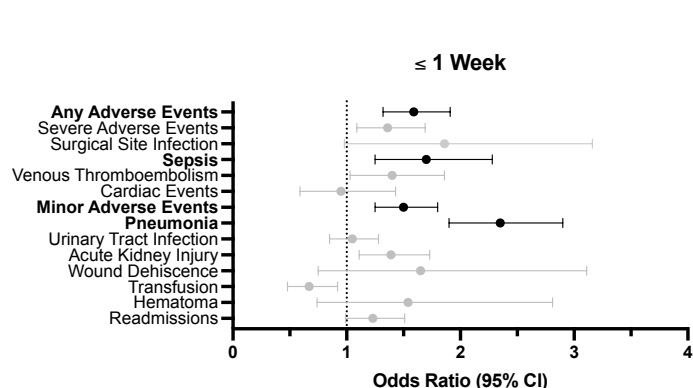


Figure 1. Forest plot of odds ratios with 95% confidence intervals in patients with COVID-19 less than 1-week postoperative relative to the control cohort. Black bars are statistically significant, whereas gray bars are not. CI = Confidence Interval.

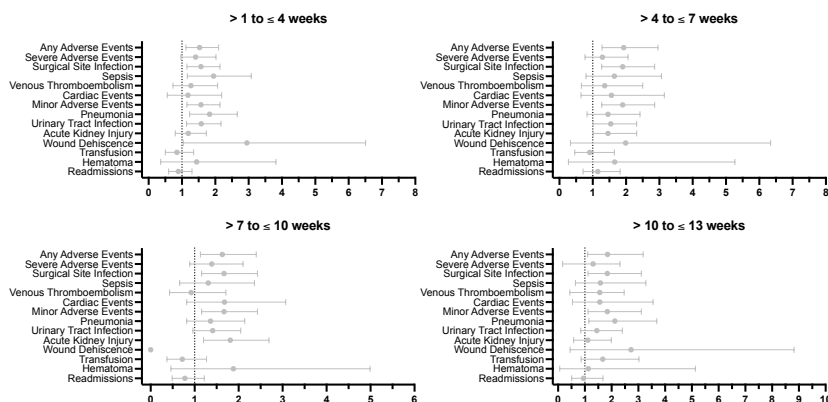


Figure 2. Forest plot of odds ratios with 95% confidence intervals in COVID-19 positive patients within the specified timing category relative to the control cohort. Gray bars are not statistically significant.