

Hip fracture in the COVID-19 era: what can we say about care and patient outcomes?

Alex Bottle ,¹ Alex Liddle²

¹School of Public Health, Imperial College London, London, UK

²MSK Lab, Imperial College London, London, UK

Correspondence to

Professor Alex Bottle, Imperial College London School of Public Health, London W6 8RP, UK; robert.bottle@imperial.ac.uk

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Hip fractures remain an important public health issue, being the most common reason for emergency anaesthesia and surgery in older people. Following the start of the COVID-19 pandemic in March 2020, hospitals in many countries observed considerable reductions in admissions for acute medical conditions such as stroke and acute myocardial infarction^{1 2} but not for falls in older adults.³ Nevertheless, the pandemic greatly affected care for patients with hip fractures in the first wave, both directly for those patients who also were infected with COVID-19 before admission and indirectly, as staff were redeployed to deal with COVID-19 admissions and surgical protocols were changed to try to protect both patients and staff from the virus. In the UK, hospitals were also urged to prepare for the anticipated influx of patients with COVID-19 by cancelling non-cancer elective surgery and expediting discharge home or to care homes. It is important to evaluate whether the latter had an impact on the quality of care delivered in terms of the treatment of hip fractures and their outcomes. However, it is also useful to consider what lessons may be drawn from this that have relevance beyond hip fracture and in the next phase of the pandemic.

In this issue of *BMJ Quality and Safety*, Grimm *et al*⁴ allow us to do both. They analysed national administrative data for England (Hospital Episodes Statistics, HES) for the period of March 2019 to February 2021, comparing mortality and length of stay since the pandemic onset with the year before for three patient groups depending on their usual residence: own home (ie, community based), residential home and nursing home. These three groups were chosen because they represent different levels of expected mobility and prefracture health. In England, residential homes

provide accommodation and personal care, while nursing homes also provide 24-hour nursing care. The latter group are therefore the frailest. Most other HES analyses determine the patient's type of residence from the source of admission field, which is often inaccurate. The authors improved on this by linking to data held by the national regulator. They acknowledge that some misclassification of residence is still likely; however, the impact of this is uncertain. When comparing the prepandemic and pandemic periods, the authors found a rise in in-hospital mortality and a reduction in length of stay for all patients with hip fracture combined but a fall in in-hospital mortality for patients without documented COVID-19 infection; the patterns were similar across the three residential groups.

The combination of reduced length of stay and changes in in-hospital mortality highlights a methodological issue relevant for other quality improvement studies: competing risks. Even though linkage of HES to the national death register is commonly done to include deaths after discharge, this was not possible for this study, so the primary outcome was in-hospital death. This means that live discharge from hospital was a competing risk as the patient cannot experience the outcome (ie, an in-hospital death) thereafter. This may introduce bias if, for example, the sickest or frailest patients are discharged earlier and are therefore less likely to die in hospital. However, whether this should be handled in the analysis depends on the study aims and perspectives and is discussed in more detail in a recent paper published in this journal.⁵ In this case, competing risks did need to



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be included in the analysis because the aim was to estimate the risk of death (a prognostic question).

During the first months of the pandemic, patients with hip fracture were discharged more quickly than before the pandemic. This shorter length of stay meant less 'opportunity' to die in hospital, which in turn would reduce the observed death rate in the pandemic period. There is therefore a potential bias in making pre-post comparisons—whether they relate to the start of a pandemic or, more commonly, following an intervention or other quality improvement initiative. The authors found a statistically significant adjusted HR of 1.11 (95% CI 1.05 to 1.16) for in-hospital death, taking into account the competing risk of live discharge, implying that the daily risk of in-hospital death increased by 11% during the pandemic. Daily chances of discharge increased by 40%. The findings of Grimm *et al* are consistent with those from other studies. The National Hip Fracture Database (NHFD), one of many national clinical audits in the UK, found the total 30-day mortality rate for patients with hip fracture to be higher during 2020 than 2019,⁶ which will have included any postdischarge deaths at the patients' residence, although we do not know whether the cause of death was related to the fracture or, for example, to COVID-19. However, we do know that care home mortality from the virus in 2020 was very high in the UK.⁷ The total 30-day mortality rate in the NHFD analysis was higher than the in-hospital mortality rate given by Grimm *et al*, suggesting that at least some of the NHFD patients died at their place of residence and so were not captured by Grimm *et al*. Irrespective of the causes of these postdischarge deaths, the difference between the in-hospital and total 30-day death rates reinforces the need to handle competing risks and suggests that the observed increased mortality risk may even be an underestimate of the impact of the pandemic on hip fracture treatment.

Several studies have been published comparing mortality rates in hip fracture and other patients with and without COVID-19 infection. The overall picture is that patients who did not have the disease during their stay had a comparable mortality rate to that observed in previous years, while the rate was greatly elevated in those with a positive COVID-19 test during their stay.⁸ This illustrates the importance of stratifying the analysis by the risk factor of interest, in this case COVID-19 status, rather than only presenting the overall rates. More generally, when evaluating a new intervention at a given time point rather than a pandemic, patient factors such as comorbidities or socioeconomic deprivation that are associated with the outcome of interest should be considered for stratified analysis. In addition, formally testing for an interaction between these factors and the intervention would also be useful to determine, for example, if people from more deprived neighbourhoods benefited just as much from the intervention as those in wealthier areas.

The reported reduction in length of stay for patients with hip fracture in this study (2 days for people from residential care or from the community and 1 day for people from nursing homes) has moved England some way towards other countries that have shorter average stays, sometimes much shorter, for example, in the USA.⁹ This was achieved largely through central pressure to facilitate discharge of patients from the National Health Service to social care settings in an effort to maintain capacity for the surge of admissions expected in a respiratory pandemic and to reduce the risk of hospital-acquired COVID-19. Other countries achieve their shorter length of stays either through integration of health and social care (as in continental Europe) or through pressure from insurers to drive care to less expensive intermediate facilities (as in the USA). In the UK system, in-hospital hip fracture care has been improved by the use of best practice tariffs (where the level of remuneration that facilities receive for individual patients is linked to the achievement of quality of care targets¹⁰). However, whether that kind of centrally driven lever can be used across separate health and social care systems to maintain the reduction in length of stay achieved during the pandemic is doubtful—and observations by those of us who work in hip fracture care would suggest a degree of reversion to prepandemic norms already.

There are more factors that need to be considered when interpreting length of stay, including patient behaviour, admission thresholds and inpatient and discharge policies. One driver of longer lengths of stay after hip fracture is the perception of patients, relatives and staff that hospital is a safe place where there is mitigation of risks (particularly the risk of falling) present in the home environment. During the pandemic, the risk of COVID-19 infection changed this calculus for all three groups, a change that favoured early discharge. Modification of these factors is potentially more complex than facilitating integration between health and social care. Examining the practice of exemplar hospitals with short length of stay and low mortality rates, particularly changes in processes of care as intermediate variables, may help explain how reductions in length of stay may have come about.

With regard to these intermediate care process variables, the NHFD's most recent report noted transient dips in performance for two of their six indicators—proportion with prompt orthopaedic and orthogeriatric review (K1) and proportion without postoperative delirium (K5)—but otherwise stable rates compared with prepandemic ones. The dip in K1 levels is likely due to staff redeployment to deal with COVID-19 admissions mentioned earlier, and one would expect the performance on K5 to be directly related to the performance on K1. Another facet of redeployment is that one might expect consultant surgeons to perform more hip fracture cases as they are less likely to be performing elective surgery. In this

context, it might appear surprising that fewer total hip replacements were performed relative to hemiarthroplasties in the Grimm *et al* hip fracture cohort⁴ as, during the pandemic, trained joint replacement surgeons were often redeployed from elective work to trauma care (including the treatment of patients with hip fracture). However, this reflects a broader trend observed since the publication of the hip fracture evaluation with alternatives of total hip arthroplasty versus hemiarthroplasty (HEALTH) randomised trial, which suggested that total hip replacement for patients with hip fracture was not as superior to alternative treatment options as reported by previous studies.¹¹ Again, the longer term postpandemic trend will be instructive; short-term pre-post studies will inevitably miss underlying temporal trends.

This study represents one of a number examining the outcomes of hip fractures in the context of the pandemic using diverse study designs and sources of data.^{12 13} Collectively, they demonstrate the wealth of data we have available on this clinically, economically and socially important injury. The NHFD is expanding this year to collect data on other fragility fractures of the femur such as distal femoral and periprosthetic fractures, which have much in common with hip fractures (in terms of the demographic group affected, the perioperative considerations and the clinical outcomes) but which have been somewhat neglected in the literature to date. The COVID-19 studies have demonstrated the value of the structures we have in place for the collection of data on these patients; the hope is that they can be used to embed positive changes and drive improvements in outcomes for these patients as the impact of the pandemic recedes. Beyond hip fracture, we know that much healthcare utilisation fell after COVID-19, with many people missing out on important services but others avoiding unnecessary treatments and some harms.¹⁴ Detailed data and careful analysis of how this affected quality of care can help countries do better with fewer resources.

Twitter Alex Bottle @DrAlexBottle

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ORCID iD

Alex Bottle <http://orcid.org/0000-0001-9978-2011>

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