Mortality and Incidence Rate of SARS-CoV-2 (COVID-19) Infection in Patients Admitted and Operated for Hip Fracture during SARS-CoV-2 pandemic in a London Hospital*

Mortalidade e incidência da infecção por SARS-CoV-2 (COVID-19) em pacientes internados e operados por fratura de quadril durante a pandemia de SARS-CoV-2 em um hospital de Londres

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Abstract

Objective We are doing a study on patients admitted with hip fractures to determine the impact of COVID-19 on a vulnerable patients group in the United Kingdom. This will help us in making informed decisions about restarting elective surgical services and expanding trauma surgical services. The objectives of the study are: 1) to find the incidence of COVID-19 in patients admitted with hip fractures; 2) To find the 30-day mortality in patients operated with hip fractures; 3) To find the 30-day mortality of patients with hip fracture and COVID 19; and 4) to compare this data with the mortality in hip fractures in previous years.

Methods This is a single-center, observational, retrospective, cohort study involving 65 patients who were admitted in our trust with hip fractures. Besides epidemiological data, patient records were followed-up for 14 days to look for COVID positive polymerase chain reaction (PCR) swabs, and the patient records were followed-up for 30 days to look for mortality.

Results A total of 64% of the patients had no significant comorbidity. The incidence of hospital-acquired COVID-19 infections in our trust was 9%. Overall, the 30-day mortality was of 15%. Mortality was much higher in COVID positive patients (40%) and in patients with "very high risk" (63%) operated during this period.

Conclusion It should be safe to start elective surgery in patients with low, moderate and high risk without an appreciable rise in mortality. We will need more data to understand the impact of COVID-19 on very high risk patients.

Keywords
- COVID-19
- hip fracture
- mortality
- infections
- risk

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Resumo

Objetivo Estamos fazendo um estudo em pacientes internados com fraturas de quadril para determinar o impacto da COVID-19 no grupo de indivíduos vulneráveis do Reino Unido. O presente estudo nos ajudará a tomar decisões informadas sobre o reinício dos serviços cirúrgicos eletivos e a expansão dos serviços cirúrgicos em casos de traumatismos. Os objetivos do presente estudo são a determinação da incidência de COVID-19 em pacientes internados com fratura de quadril e 1) determinar a mortalidade em 30 dias em pacientes com fratura de quadril submetidos ao tratamento cirúrgico; 2) determinar a mortalidade em 30 dias de pacientes com fratura de quadril e COVID-19; 3) comparar esses dados com a mortalidade associada a fraturas de quadril em anos anteriores.

Métodos Este é um estudo de coorte unicêntrico, observacional e retrospectivo com 65 pacientes com fraturas de quadril internados em nossa instituição. Além dos dados epidemiológicos, os prontuários dos pacientes foram acompanhados por 14 dias quanto a resultados positivos para COVID-19 à reação em cadeia de polimerase (PCR, na sigla em inglês) em amostras de *swab*, e por 30 dias quanto à mortalidade.

Resultados Na nossa amostra, 64% dos pacientes não apresentavam comorbidade significativa. A incidência de infecções nosocomiais por COVID-19 foi de 9%. A mortalidade geral em 30 dias foi de 15%. A mortalidade foi muito maior em pacientes COVID-positivos (40%) e em pacientes com "risco muito alto" (63%) operados durante este período.

Conclusão A realização de cirurgias eletivas em pacientes com risco baixo, moderado e alto parece ser segura, já que não houve aumento apreciável da mortalidade. Mais dados são necessários para entender o impacto da COVID-19 em pacientes de risco muito alto.

Palavras-chave

- COVID-19
- fratura de quadril
- mortalidade
- infecções
- risco

Introduction

In December 2019, a Corona virus pandemic began in Wuhan, China, and over the coming months it quickly spread to most of the world.[1] This pandemic was named "Coronavirus disease 2019" or "COVID-19" and, more precisely, it was named "severe acute respiratory syndrome - Coronavirus 2" or "SARS-CoV-2".[2]

The first confirmed cases of Coronavirus in the United Kingdom were detected on January 29, 2020.[3] On March 11, 2020, the World Health Organization (WHO) declared the disease a pandemic.[4] On March 23, 2020, the UK was put under lockdown.[5] At that time, there were 6.650 confirmed cases and 335 deaths. (►**Fig. 1**) In the UK, the peak/plateau of the disease was reached in April (►**Fig. 2**).[6]

During lockdown, most hospitals in the UK stopped all elective surgeries to protect the patients (many of whom are old and have multiple comorbidities) from contracting the disease in hospital. This enabled them to also free resources in preparation for the sudden and overwhelming surge of COVID-19 patients. However, emergency and trauma surgeries continued. This was facilitated by staff deployment and modification of service areas.[7] The cessation of elective surgery in the UK has led to a massive backlog for the patients awaiting operations.[8]

The British Orthopaedic Association (BOA) published guidelines regarding restarting nonurgent trauma and orthopaedic care on May 15, 2020.[9] In this publication, they mention a study Lei et al. published from Wuhan in 2020 of 34 patients who underwent elective surgery and developed COVID-19 symptoms in the postoperative period.[10]. This study showed a mortality of 20.5%. For 'category 3' procedures like total hip replacement, this study reported an intensive care unit (ICU) admission rate of 65% and a death rate of 35%.

These figures are concerning. This has made it necessary to do a study in the UK to determine the impact of COVID-19 on this vulnerable patient group undergoing surgery. This would help us make informed decisions about restarting elective surgical services and expand trauma theater services.

For the present study, we chose patients who underwent surgery during this period due to hip fractures, and we studied their outcomes. Patients with hip fractures are a vulnerable group due to age and the usual presence of multiple comorbidities, and this vulnerability has increased during this pandemic.[11]

Around 76.000 hip fractures occur among a population of 66.46 million UK residents every year ($\sim$ 115 per 100.000 per year).[12] Hip fractures are common in patients who often already suffer medical comorbidities,[13] and the mortality rate is high in hip fractures even without COVID-19 infection. In the UK, proximal femoral fractures are associated with a 6.2% mortality rate in the first 30 days,[14] and with a 22%

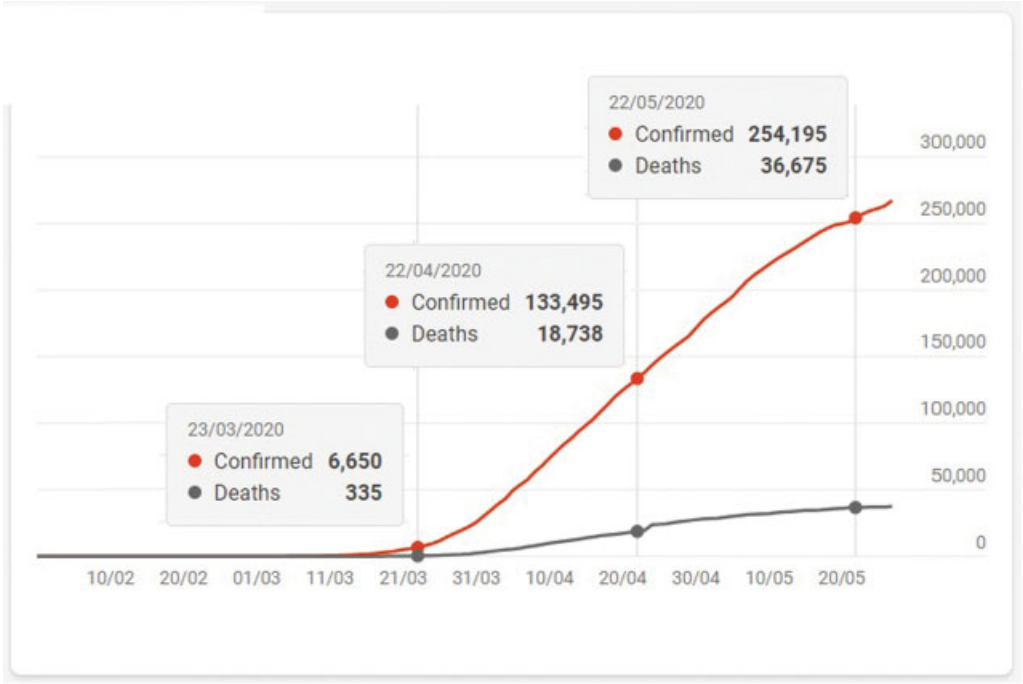

Fig. 1 Cumulative number of cases and deaths of COVID-19 in the UK.

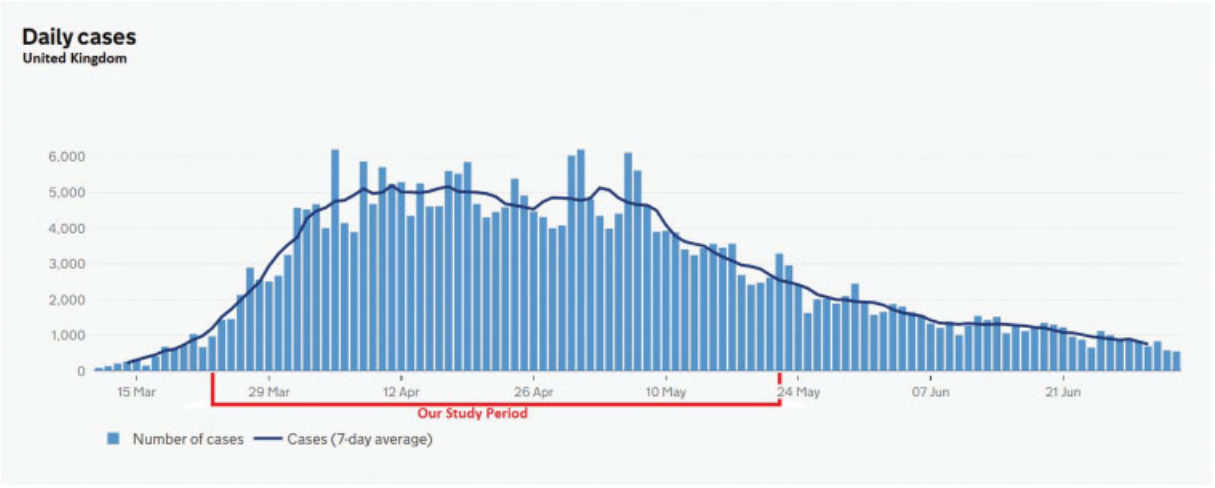

Fig. 2 Daily incidence of cases in the UK.

mortality rate during the 1st year globally.[15] Elderly patients with a hip fracture are also at a higher short-term risk of death ~ 22–30%) in case they contract COVID 19 infection.[16,17] Patients admitted in hospitals come in contact with other patients and staff and, therefore, are at a higher risk of getting infected with COVID 19.

Unfortunately, this makes this patient group ideal for our study.

The aim of our observational study is to:

1. Find out the incidence of hospital-acquired COVID-19 in patients admitted with hip fractures during the UK lockdown.
2. Find out the 30-day mortality in patients admitted with hip fractures.
3. Find out the 30-day mortality of patients with hip fracture and COVID-19.
4. Compare the 30-day mortality in these patients with data of previous years.

Materials and Methods

This is a single-center, observational, retrospective, cohort study involving 65 patients who were admitted in our trust with hip fractures.

The inclusion criteria were:

- Patients admitted with proximal femoral fractures in our trust.
- Patients admitted between March 23 and May 22, 2020.
- All ages.
- Both genders.

The exclusion criteria were:

- Open fractures.
- Pathological fractures.
- Periprosthetic fractures.
- Peri-implant fractures.
- Polytrauma.

Data collection included age, gender, type of fracture, date of admission, date of surgery, and treatment received.

The patients were classified into 4 categories: low risk, moderate risk, high risk, and very high risk, signifying their vulnerability to COVID-19 (►**Fig. 3**).[9]

The diagnosis of COVID-19 was made in these patients if they developed fever and cough using a polymerase chain reaction (PCR) test from nasal swab samples. Records from the trust and from the general physician were searched for PCR tests.

As the incubation period of COVID-19 infection is of between 2 and 14 days,[18] patients who were tested positive in < 2 days of admission and those who were tested positive after 14 days of discharge were not considered to have hospital-acquired infection.

The patients were followed-up for a minimum of 30 days from the day of admission for mortality.

This data of mortality was compared with data from the National Hip Fracture Database (NHFD).[14]

Results

Demographics

We admitted 65 patients with hip fractures in our trusts between March 23 and May 22.

A total of 43 of these were females (66%) and 22 were males (34%).

All patients were between 63 and 104 years old, with the average age being 84 years old. Only 1 patient was < 65 years old (63 years old).

A total of 28 patients had left-sided injuries, and 37 had right-sided injuries.

Out of the total sample, 4 patients were managed non-operatively and, 61 underwent operation.

Out of the 61 patients who underwent operation, 34 underwent a cemented hemiarthroplasty (56%), 21 had a dynamic hip screw fixation (34%), and 6 had a gamma nail fixation (10%).

Risk Category

The risk level of the patients differed:

- No patient in our cohort had low risk.
- A total of 42 patients had moderate risk; 41 patients were > 65 years old, with no significant comorbidities, while one 63-year-old patient had one mentioned comorbidity.

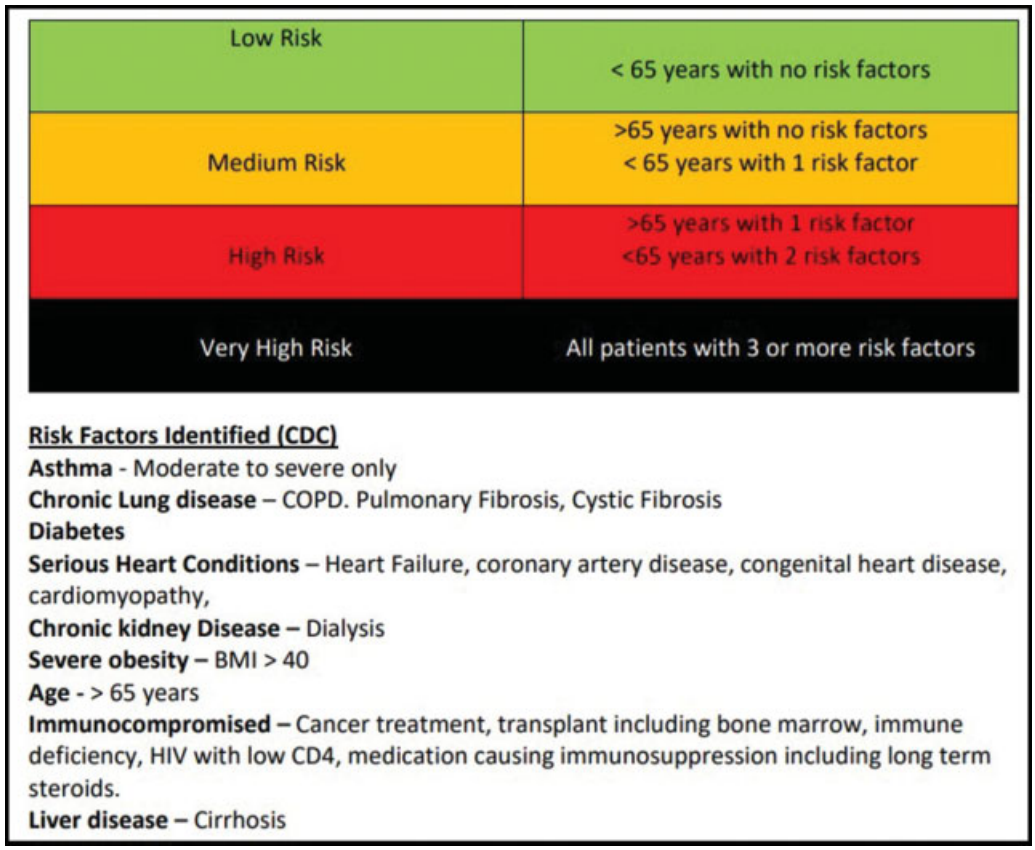

Fig. 3 Centers for Disease Control and Prevention (British Orthopaedic Associtaion recommended) risk stratification for vulnerability to COVID-19.

- A total of 12 patients were classified as high risk. All of them were > 65 years old and had 1 comorbidity.
- A total of 11 patients were classified as very high risk, all > 65 years old. Nine had two comorbidities, and two had three comorbidities.

The incidence of COVID 19 in patients admitted with hip fractures after the UK lockdown was:

In total, 10 patients had COVID-19 detected; of these, 3 patients had COVID-19 detected within their hospital stay, and 7 once they had been discharged.

Out of the 3 patients who were COVID-positive during their hospital admission, 1 was positive on the 1st day of admission, 1 on day 6, and 1 on day 10.

Of those who were positive after discharge, 1 had COVID-19 detected on the day of discharge, 1 had COVID-19 detected 10 days after discharge, 1 12 days after discharge, 1 13 days after discharge, 1 26 days after discharge, and 2 28 days after.

We do not consider that the 1 patient who tested positive on the day of admission to have been infected in the hospital, since the minimum incubation period is of 2 days, and we do not consider the 3 patients who tested positive at 26 and 28 days to have been infected in the hospital, since the maximum incubation period for COVID-19 is of 14 days.

As such, we consider only 6 (9%) patients to have been infected during their stay in the hospital.

The 30-day mortality rates in patients admitted with hip fractures were:

Overall, in 65 patients with hip fractures, 10 died within 30 days (15%).

Out of the 4 patients managed nonoperatively, 2 died within 30 days (50%).

Out of the 61 patients who underwent operation, 8 died within 30 days (13%).

The risk level of the 10 patients who died differed:

- Seven patients were classified as very high risk
- One patient was classified as high risk
- Two patients were classified as medium risk
- There was no low-risk patient in our cohort.
- The 30-day mortality rate in the 54 patients with moderate and high risk was 3 (5.6%).

The 30-day mortality rate in the 11 patients with very high risk was 7 (64%).

There were 9 patients who had COVID-19 and who were underwent operation for hip fractures; 3 of these patients died (33%). Out of these 9 patients:

- The mortality rate in moderate-high risk/operated/COVID+ patients was of ⅙ (17%).
- The mortality rate in very high risk/operated/COVID+ patients was of ⅔ (►**Fig. 4**).

Out of the 55 patients who did not have COVID-19 infection, 6 died (11%); 6 of these patients died during their hospital stay, and 4 died after discharge.

Discussion

Our study showed that the majority (41/64; 64%) of the > 65 years old had no significant comorbidity. They were still at

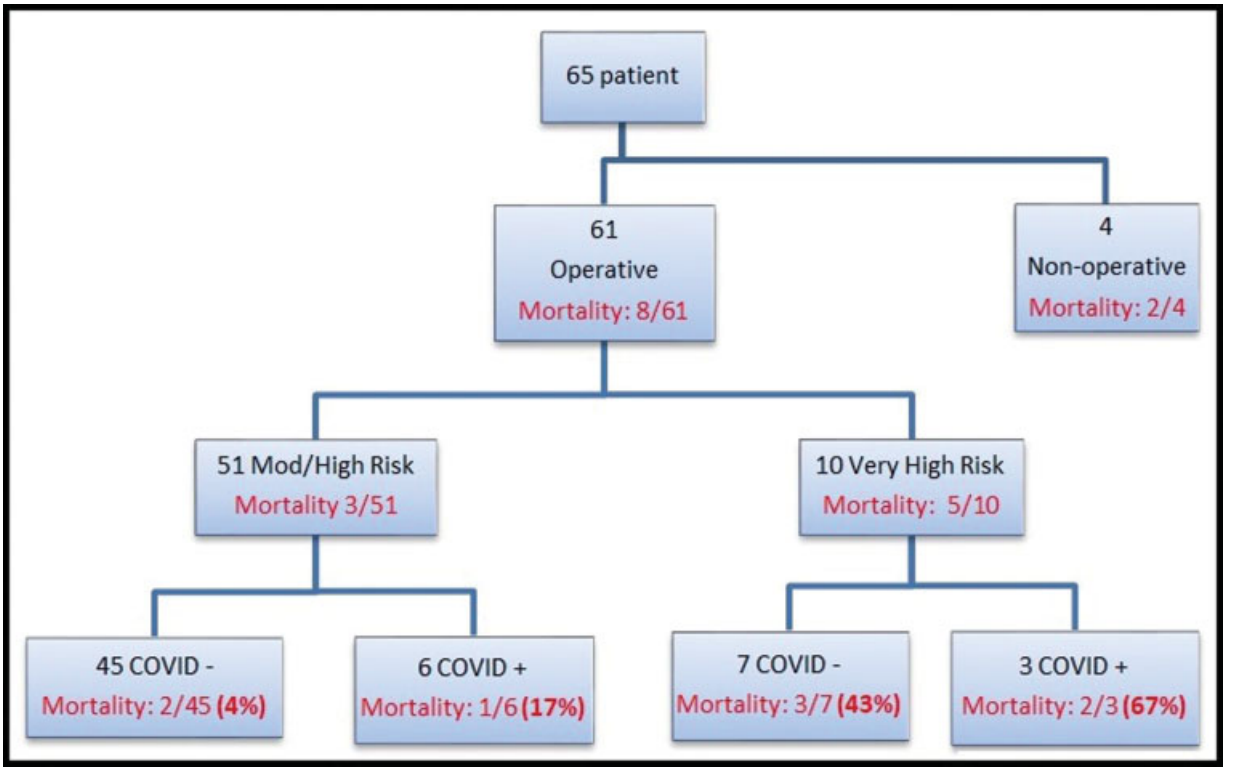

Fig. 4

Table 1 Comparison of studies

	Current Study	Archer et al.[16]	Muñoz Vives et al.[17]
Study period	23/03/2020 - 22/05/2020	25/03/2020 - 25/04/2020	14/03/2020- 04/04/2020
Sample size	65 (61 operated)	142(142 operated)	136 (124 operated)
Mean age (years old)	84 (63–104)	82 (55–101)	85 (65–101)
COVID-19 positive	10 (6 hospital-acquired); 15%	18; 13%	23; 17%
30-day mortality in COVID-19 positive patients	40%	22.2%	30.3% (14-day mortality)
Mortality in noninfected operated patients	7.8%	4%	
Total 30-day mortality	15%	6%	9.6% (14-day mortality)

moderate risk due to their age. A total of 8.5% were high risk, and 17% were very high risk.

The incidence of hospital acquired COVID-19 infections in our trust was of 9%. The overall infection rate (hospital- and community-acquired) was of 15%.

The overall 30-day mortality rate was of 15%. Even in non-COVID patients with hip fractures, the 30-day mortality rate was of 9%. This is higher than the national average of 6.2% according to the NHFD.[14]

Mortality was much higher in COVID positive patients, with a rate of 40%.

But the most important finding was that the 30-day mortality rate in patients with moderate and even high risk (85% of the patients) was of only 5.6%, which is lower than the national average.

For patients with very high risk operated during this period, the mortality risk was of 63%.

A similar study of 142 patients by Archer et al. in the UK found the incidence of COVID-19 in patients admitted with hip fractures was of 12.67%, and the 30-day mortality rate in patients with neck of femur fracture and COVID-19 was of 22.2%.[16]

Another study of 136 patients with a hip fracture in Spain found that the incidence of COVID-19 incidence was of 17%. The total 14-day mortality rate was found to be 9.6%, while the 14-day mortality rate in COVID-19 positive patients was of 30.4%.[17]

Both these studies used American Society of Anesthesiologists (ASA) grades rather than the Centers for Disease Control and Prevention (CDC) classification for risk assessment (►**Table 1**).

If we combine the data from these 3 studies, out of 343 patients admitted with hip fractures, 51 got infected with COVID-19 (15%). The mortality for COVID-19 patients was of 29%. The total short-term mortality of hip fractures during this period was > 9.3%.

Conclusion

Our study demonstrates the vulnerability of the elderly population with comorbidities who were operated during the worst phase of the COVID-19 pandemic. The 30-day mortality of patients with hip fractures seems to have increased with the onset of the pandemic. The worst hit patients are the ones in the **very** high-risk category and the ones diagnosed with COVID-19.

However, the mortality in patients with moderate and even high risk was of only 5.6%, which is lower than the national average of normal days. This group constitutes 85% of the elderly patient population.

Our opinion is that as the peak is now over, and that it should be safe to start elective surgery in patients with low, moderate, and high risk without an appreciable rise in mortality. We recommend more data and more time before we start elective surgeries for very high risk patients.

We recommend future studies to look into mortality in **very** high-risk patients in the period after the COVID peak (June 2020 and onwards) and to compare it with the pre-Covid mortality in the very high-risk patient group. We also recommend a larger study of mortality in **low, moderate and high**-risk patients who underwent operation and contracted COVID-19 infection.

Note
The present study was developed at Ealing Hospital, London, UK.

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Conflict of Interests
The authors have no conflict of interests to declare.

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