

Original Article

Achieving the hip fracture Best Practise Tariff during the COVID-19 pandemic

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Objectives: Achieving the hip fracture best practice tariff is associated with decreased mortality rates. The aim of this study is to evaluate the impact of Covid-19 pandemic on achieving Best Practice Tariff. **Methods:** We retrospectively reviewed all adult hip fractures admitted to our unit between March and June 2020. Patient's characteristics, place of residence, delirium assessment, and mobility status were recorded. All the Best practice Tariff criteria have been analysed. Covid-19 was diagnosed using reverse transcriptase polymerase chain reaction. **Results:** 178 patients with a mean age of 82.8 years presented with hip fractures during the study period. 18 patients (10.1%) tested positive for COVID-19. 44.4% failed to achieve the BPT from the COVID-19 positive group and 22.5% from the negative group. **Conclusion:** Based on this study, hip fractures associated with Covid-19 infection are more likely to fail the BPT and have higher 30-day mortality rates compare to the COVID-19 negative patients.

Keywords: Best Practise Tariff, Covid-19 Infection, Hip Fracture, 30-day Mortality

Introduction

A novel virus, SARS-CoV-2 (Covid-19) has been the cause of a fatal global pandemic. It has been causing a significant disruption in the medical services across the world. During the first wave of Covid-19 infection, the overall estimate of death rate in the UK was 0.66%¹. Higher death rates have been found in patients with high comorbidity index and those of older age^{2,3}.

Fracture neck of femur in elderly is one of the frequent admissions to the hospitals in United Kingdom (UK). The numbers of admissions are estimated to be about 80,000 per year and the cost implications are predicted to an annual cost of two billion pounds⁴. It is one of the commonest causes of fracture related death in UK and the incidence is expected to rise to 100,000 by 2030⁴.

The 30-day mortality rate ranges from 3.5% to 10%^{5,6}. In the UK, the National Hip Fracture Database (NHFD) showed 30-day mortality rates of 7%⁷. Different predictors and risk factors of hip fractures such as falls, physical inactivity, muscle weakness, body anthropometrics, bone structure, chronic health conditions, impaired cognition, impaired vision, environmental factors as well as 30-day mortality had been studied⁷⁻⁹. The National Institute of Clinical Excellence (NICE)¹⁰ guidelines recommend early surgery for patients

admitted with fracture neck of femur and hence the modified BPT was introduced in 2011 to improve the outcomes such as time to theatre, length of stay and mortality after fracture neck of femur surgery.

The Best Practice Tariff, which is a Pay-for-performance initiative, was introduced in 2010 and later modified in 2011 to give an incentive of £1335 per case of fracture neck of femur treated according to the criteria set³. The criteria was further modified with addition of nutritional, delirium and physiotherapy assessment before or after surgery⁴ Table 1.

Later reports concluded that achieving the BPT was associated with increased –year survival rate¹¹. Intubation as well as using bone saw intra-operatively have been listed

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The BPT price is payable only if all these characteristics are achieved:
a) time to surgery from arrival in an emergency department, or – if an admitted patient – time of diagnosis to the start of anaesthesia, is within 36 hours
b) assessment by a geriatrician ⁴³ in the perioperative period (within 72 hours of admission)
c) fracture prevention assessments (falls and bone health)
d) an abbreviated mental test performed before surgery and the score recorded in National Hip Fracture Database (NHFD)
e) a nutritional assessment during the admission [introduced in 2017]
f) a delirium assessment using the 4AT screening tool during the admission [introduced in 2017]
g) assessed by a physiotherapist the day of or day following surgery [introduced in 2017].

Table 1. Requirements to achieve BPT.

as aerosol generating procedures, hence knowing the COVID status of those patients pre-operatively is crucial¹². The peri-operative precautions taken by anaesthetic, theatre and surgical teams as well as obtaining the COVID test in a timely fashion might have impacted on achieving the BPT¹³. Up to date there is no published evidence on the impact of Covid-19 on hip fractures Best Practise Tariff target.

The aim of this study is to evaluate the impact of Covid-19 infection on achieving Best Practise Tariff.

Materials and methods

We retrospectively reviewed all adult hip fractures admitted to North Cumbria Integrated Care NHS Foundation Trust between March and June 2020. Inclusion criteria were all patient over the age of sixty years at the time of injury, patients had pertrochanteric fracture, and had low injury closed hip fracture. Exclusion criteria were: Patients younger than sixty years of age at the time of injury, high injury or open hip fractures, femoral shaft fractures and patients who had concomitant acetabular fracture. The data was collected from the hospital fracture neck of femur database and cross checked with National Hip Fracture database. The data was collected prospectively by the hospital hip fracture specialist nurse.

The collected data included patient's characteristics, place of residence, admission details, mobility prior and following injury, (American society of Anesthesiologists) ASA grade, Abbreviated Mental Test Score (AMTS), fracture type, performed surgery, Anaesthesia, reasons for delayed surgery, complications, delirium and falls assessment and level of supervision were recorded. All the Best practise Tariff criteria have been analysed. Covid-19 was diagnosed according to the national and local guidelines, using reverse transcriptase polymerase chain reaction (SARS-CoV-2 RdRp RT-PCR) of throat swap samples. RT-PCR is a nucleic acid assay that works by copying a very small number of viral RNA strands into billions that can be easily detected. The envelope protein (E), nucleocapsid protein (N) and RdRp (RNA-dependent RNA polymerase) genes are the main

three regions of the SARS-CoV-2 genome targeted by RT-PCR. Among these, detecting the RdRp gene has the highest analytical sensitivity¹⁴.

All patients had received low molecular weight heparin daily to prevent thromboembolic event.

The primary outcome measure was achieving the Best Practise Tariff target in the COVID-19 positive patients. The secondary outcome measures included individual assessment of BPT criteria highlighted in table-1 as well as medical and surgical complications.

Statistical analysis

The results were analysed to assess BPT achievement. Pearson Chi-square and Fisher exact tests were used for categorical data and Student t test were used for continuous data. Covariates were adjusted using multivariate analysis. Statistical Package for social Science (SPSS, version 24.0, IBM Co., Armonk, NY, USA) had been used. We have analysed the data using the tests of normality, namely the Kolmogorov-Smirnov Test and the Shapiro-Wilk Test. The Shapiro-Wilk Test is used as it is more appropriate for small sample sizes.

Ethics

This was a retrospective study which did not require IRB/ethics committee approval. The data was collected as part of the national hip fracture database and was performed in accordance with the ethical standards of the 1964 Declaration of Helsinki as revised in 2000.

Results

One hundred Seventy-eight patients presented with hip fractures during the study period. Table 2 summarizes the patients' characteristics. The mean age was 82.8 years (SD: 8.2). Females were 126 (70.8%). All hip fractures (n=178) were due to low velocity injury. One hundred and forty-one (79.2%) patients were admitted from their own home, 28 (15.7%) cases from residential care, and nine

	Covid-19 positive patients n=18	Covid-19 negative patients n=160	Statistical significance
Age (mean)	85.6 years	82.5years	$p=0.1$
Gender			
Female	11 (61.1%)	115 (71.9%)	$p=0.3$
Male	7 (38.9%)	45 (28.1%)	
Mortality			
Yes	5 (27.8%)	21 (13.1%)	$p=0.09$
No	13 (72.2%)	139 (86.9%)	
Fracture classification			
Intra-capsular	9 (50%)	92 (57.5%)	$p=0.9$
Extra-capsular	9 (50%)	88 (62.5.1%)	
BPT			
Failed	8 (44.4%)	36 (22.5%)	$p=0.04$
Achieved	10 (55.6%)	124 (77.5%)	
Operations			
Cemented hemiarthroplasty	7 (38.9%)	72 (45.0%)	$p=0.42$
Cannulated screws	1 (5.6%)	8 (5.0%)	
Dynamic hip screw	4 (22.2%)	40 (25.0%)	
Intra-medullary nail	4 (22.2%)	26 (16.2%)	
Total Hip replacement	0 (0%) none met criteria	10 (6.2%)	
Conservative	2 (11.1%)	3 (1.9%)	
Surgeon grade ^a			
Consultant	16 (88.9%)	155 (96.9)	$p=0.07$
Registrar	0 (0%)	5 (1.2%)	
Anaesthetic grade ^b			
Consultant	16 (88.9%)	153 (95.6%)	$p=0.06$
Registrar	0 (0%)	4 (2.5%)	
Anaesthetic			
General	8 (44.4%)	85 (53.1%)	$p=0.07$
Spinal	8 (44.4%)	72 (45.0%)	
Delirium assessment			
Day 0-3	10 (55.6%)	140 (87.5%)	$P=0.001$
Day 4-7	1 (5.6 %)	9 (5.6%)	
Not done	7 (38.9%)	11 (6.9%)	
Delirium score (mean)	1.82	1.88	$P=0.9$
AMTS score (mean)	4.5	7.0	$P=0.06$

Table 2. Summary of the data analysis.

(5.1%) from nursing care. Fifty-two patients (29.2%) were freely mobile pre-injury, twenty-five (14.0) were mobile outdoor with one stick, and ninety (50.6%) never go out without help. Fifteen (83.3%) of the COVID-19 positive patients never go out without help pre-injury

compared 75 (46.8%) of COVID-19, $p=0.01$.

The Covid-19 infection rate was 10.1% (n=18). The COVID-19 positive group has significantly failed to achieve the BPT (n=8, 44.4%) compared to COVID-19 negative group (n=36, 22.5%) $p=0.04$.

The 30-day mortality was higher in COVID-19 positive patients (n=5, 27.8%) compared to 13.1% (n=21) in COVID-19 negative group. However with no statistically significant difference (p=0.09).

Assessment of PBT criteria showed that 44.4% (n=8) and 22.5% (n=36) had surgical delay more than 36 hours in COVID-19 positive and negative, respectively. Five patients (2.8%) were managed conservatively due to medical reasons. Six patients (33.4%) had significantly delayed delirium assessment due to COVID-19 infection compared to 10.5% (n=17) in COVID-19 negative cases, p=0.001. The mean delirium score was 1.88 and 1.82 in COVID-19 negative and positive patients, p=0.3. Forty-one (23.1%) patients missed the 72 hours cut-off form geriatric assessment. One hundred and seventy-six cases (98%) had fall assessment and 174 (97.7%) cases were evaluated for pressure areas and found two patients (1.1%) admitted with pressure areas.

The majority of the cases had intra-capsular hip fracture (n=101, 56.8%) followed by grade A1/A2 extra-capsular fracture (n=48, 27%). There were two pathological fractures (1.1%) that managed with cemented hemi arthroplasty of the hip. Cemented hip hemiarthroplasty was the most common operation (n=79, 44.4%), followed by Dynamic hip screw fixation (n=44, 24.7%). Ten (5.6%) patients had cemented total hip replacements, thirty (16.9%) underwent Cephalo-medullary device, and five (2.8%) patients were managed conservatively. Ninety-three patients (52.2%) had general anaesthesia. Consultant orthopaedic surgeon was present in 96.1% (n=171) and in 169 (94.6) operation was led by consultant anaesthetist. A senior trainee will be scrubbed when the consultant is not present.

The mean Abbreviated mental status test (AMST) was 6.7 (Range: 0-10). The mean ASA was 2.9 (SE: 0.06). The average hospital stay was 23.6 days (SE: 1.5) with higher mean in the COVID-19 positive group (37.1 days, SE: 5.7) compared to COVID-19 negative group (22.05 days, SE: 1.5), p=0.07. Sixty-nine (38.8%) patients returned back to their own home, twenty-one (11.8%) cases were discharged to acute hospital, and twenty-one (11.8%) went to residential care. Eight patients who were COVID-19 positive discharged to residential care.

Discussion

This study presents the first evidence of the effect of Covid-19 infection on Best Practise Tariff. We found that COVID-19 infection had a negative effect on achieving the BPT target and although there was no significant statistical difference in mortality, the role of BPT in improving the 30-days mortality rate is well known and supported in the literature. Much of the success of the National Hip Fracture database and of BPT in reducing 30-day mortality in England can be traced to their promotion of collaborative orthopaedic-geriatric working^{15,16}.

A review of 1414 hip fractures cases by Karres et al.

showed that achieving the BPT reduced 30-days mortality and improved the rate of maintaining pre-injury mobility status¹⁷. Add to that the study by Metcalfe et al. which provided evidence that a pay-for-performance programme improved the outcomes after a hip fracture in England¹⁸.

Our study showed that COVID-19 infection resulted in higher 30-days mortality and increased failure rate in achieving the BPT target compared to COVID-19 negative patients. Recent report from the UK showed high mortality (50%) associated with COVID-19 infection and worse outcomes when associated with hip fracture¹⁹. A multicentre study showed a COVID-19 infection with hip fractures 30-day mortality of 32.5%²⁰. Furthermore, in analysis of 404 cases it showed increase hospital length of stay for COVID-19 patients²¹. In our study the 30-day mortality was comparable to this figure at 27.8% and COVID-19 positive patients stayed 15 days longer in hospital compared to COVID-19 negative patients.

The introduction of BPT came from the principles of 'Equity and Excellence: liberating the NHS' white paper²². Loss of BPT results in financial loss of monetary incentives and poor patients' outcomes. Few studies looked to hip fractures outcomes based on BPT achievement. A study looked to the criteria of BPT and found improved 1 year survival with achieving BPT target²³. The national hip fracture Database reported 37.9% failure of PBT target²⁴. We found less achievement of BPT target in COVID-19 patients (44.4%) Vs 22.5% in Covid-19 negative group. This can be due to the complexity of the pre-operative assessment of hip fractures associated with COVID-19 infection. On the other hand, having better results (22.5%) can be due to admitting a smaller number of trauma cases during the lockdown time and subsequently having more theatre space. We have identified the main area of failure which was delirium assessment.

Optimising the management of COVID-19 infection associated with hip fracture can be achieved by adopting a well-structured protocol^{25,26}. The relocation of the COVID-19 positive patients to medical wards may hinder the full BPT criteria assessment and patient rehabilitation; hence it may lead to worse outcomes, loss of financial incentives and increased mortality.

Limitations

The limitations of this study include its retrospective nature, being a single centred with relatively small number of patients. We could have included more variables in our assessment such as co-morbidities, lipid profile, ASA grade and potential confounders for mortality. However, our study reported a clinically important difference in the 30-day mortality and BPT target achievement between Covid-19 positive and Covid-19 negative hip fractures patients. We have advised for establishment of clear and well-structure policy for the management of these challenging cases.

Conclusion

Based on this study, hip fractures associated with Covid-19 infection are more likely to fail the BPT. Although there was no statistically significant difference with regard to mortality rates the clinical significance of our findings suggests that the Covid-19 positive group has higher 30-day mortality rates compare to the COVID-19 negative group. Establishing a protocol for managing the hip fracture associated with covid-19 infection, is of a paramount importance in order to improve patient's satisfaction, clinical outcomes and decrease the National Health Service (NHS) financial loss.

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