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Treatment patterns and clinical and economic burden of hip dislocation following primary total hip arthroplasty in England

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Aims

The aim of this study was to estimate the clinical and economic burden of dislocation following primary total hip arthroplasty (THA) in England.

Methods

This retrospective evaluation used data from the UK Clinical Practice Research Datalink database. Patients were eligible if they underwent a primary THA (index date) and had medical records available 90 days pre-index and 180 days post-index. Bilateral THAs were excluded. Healthcare costs and resource use were evaluated over two years. Changes (pre- vs post-THA) in generic quality of life (QoL) and joint-specific disability were evaluated. Propensity score matching controlled for baseline differences between patients with and without THA dislocation.

Results

Among 13,044 patients (mean age 69.2 years (SD 11.4), 60.9% female), 191 (1.5%) had THA dislocation. Two-year median direct medical costs were £15,333 (interquartile range (IQR) 14,437 to 16,156) higher for patients with THA dislocation. Patients underwent revision surgery after a mean of 1.5 dislocations (1 to 5). Two-year costs increased to £54,088 (IQR 34,126 to 59,117) for patients with multiple closed reductions and a revision procedure. On average, patients with dislocation had greater healthcare resource use and less improvement in EuroQol five-dimension index (mean 0.24 (SD 0.35) vs 0.44 (SD 0.35); $p < 0.001$) and visual analogue scale (0.95 vs 8.85; $p = 0.038$) scores, and Oxford Hip Scores (12.93 vs 21.19; $p < 0.001$).

Conclusion

The cost, resource use, and QoL burden of THA dislocation in England are substantial. Further research is required to understand optimal timing of revision after dislocation, with regard to cost-effectiveness and impact on QoL.

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Introduction

Dislocation after primary total hip arthroplasty (THA) has been estimated to range from 0.2% to 10% within one year of THA.^{1,2} Previous studies evaluating the clinical and economic impact of the treatment of THA dislocation have mainly focused on the occurrence and cost of THA revision and have not comprehensively evaluated the long-term cumulative consequences of THA dislocation.²⁻⁵ The decision to revise a THA after dislocation will only be made once several attempts at conservative treatment have been undertaken, and each

of these treatment cycles carry cost and quality of life (QoL) consequences. Additionally, once successful treatment is completed, the patient with THA dislocation will require additional rehabilitation and may be at a higher risk of further complications. The burden of THA dislocation has been shown to differ by study design, and by the patient populations and countries of analysis.^{2,4-6} To our knowledge, data regarding the real-world prevalence, treatment practice patterns, and clinical and economic burden of hip dislocation in England are not available. Hence, the objectives of the

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Table I. Patient selection of Clinical Practice Research Datalink primary total hip arthroplasty patients without and with dislocation.

Inclusion/exclusion criteria	Number retained (%)	Dislocated (%)
Patients who had initial primary THA procedure in the study period	30,616 (N/A)	477 (1.56)
Research-grade acceptable patients	30,616 (100)	477 (1.56)
Patients with complete medical records for at least 3 months pre-index	27,263 (89.1)	407 (1.49)
Patients with complete medical records for at least 6 months post-index	13,074 (48.0)	192 (1.47)
Patients who did not have bilateral THA procedure on or before index primary THA or within 2 years' follow-up	13,044 (99.8)	191 (1.46)

N/A, not applicable; THA, total hip arthroplasty.

Table II. Baseline demographic and clinical characteristics for Clinical Practice Research Datalink primary total hip arthroplasty patients without and with dislocation, before and after propensity score matching.

Variable	Before matching				After matching			
	Dislocation	No dislocation	p-value	SMD	Dislocation	No dislocation	p-value	SMD
n	191	12,853			190	378		
Mean age, yrs (SD)	69.6 (11.0)	69.2 (11.4)	0.592*	0.04	69.6 (11.1)	70.3 (11.2)	0.510*	0.06
Male sex, n (%)	87 (45.5)	5,015 (39.0)	0.078†	0.13	86 (45.3)	183 (48.4)	0.535†	0.06
BMI category, n (%)			0.235‡	0.13			0.988‡	0.02
< 18.5 kg/m ²	< 5	79 (0.6)			< 5	6 (1.6)		
18.5 to 24.9 kg/m ²	23 (12.0)	1,420 (11.0)			23 (12.1)	48 (12.7)		
25 to 34.9 kg/m ²	150 (78.5)	10,578 (82.3)			149 (78.4)	296 (78.3)		
35 kg/m ² or higher	> 5	776 (6.0)			> 5	28 (7.4)		
Smoking status, n (%)			0.017†	0.20			0.808†	0.06
Current smoker	26 (13.6)	1,320 (10.3)			26 (13.7)	45 (11.9)		
Ex-smoker	53 (27.7)	2,754 (21.4)			53 (27.9)	104 (27.5)		
Non-smoker	112 (58.6)	8,779 (68.3)			111 (58.4)	229 (60.6)		
Mean CCI score (SD)	0.11 (0.39)	0.08 (0.37)	0.343*	0.07	0.11 (0.38)	0.07 (0.30)	0.328*	0.09
Alcohol/drug abuse, n (%)	10 (5.2)	535 (4.2)	0.580†	0.05	10 (5.3)	15 (4.0)	0.622†	0.06
Previous procedure on hip, n (%)	29 (15.2)	1,398 (10.9)	0.076†	0.13	28 (14.7)	61 (16.1)	0.756†	0.04
Cognitive or neuromuscular disease, n (%)	179 (93.7)	12,440 (96.8)	0.030†	0.15	178 (93.7)	361 (95.5)	0.467†	0.08
Type of index primary diagnosis, n (%)			< 0.001†	0.28			0.732†	0.07
Fracture of neck of femur	22 (11.5)	709 (5.5)			22 (11.6)	38 (10.1)		
Osteoarthritis	149 (78.0)	11,340 (88.2)			149 (78.4)	307 (81.2)		
Other diagnosis	20 (10.5)	804 (6.3)			19 (10.0)	33 (8.7)		
Index THA year, n (%)			0.483†	0.09			0.844†	0.05
2010 to 2011	75 (39.3)	4,967 (38.6)			75 (39.5)	149 (39.4)		
2012 to 2013	63 (33.0)	4,717 (36.7)			63 (33.2)	133 (35.2)		
2014 to 2015	53 (27.7)	3,169 (24.7)			52 (27.4)	96 (25.4)		

*Independent-samples *t*-test.

†Chi-squared test.

‡Fisher's exact test.

CCI, Charlson Comorbidity Index; IQR, interquartile range; SD, standard deviation; SMD, standardized mean difference; THA, total hip arthroplasty.

current study were to quantify the incidence of hip dislocation following THA and the two-year practice patterns, healthcare resource use, costs, and QoL outcomes associated with hip dislocation in England.

Methods

Data source. This study used data from the UK Clinical Practice Research Datalink (CPRD). CPRD is an ongoing primary care database of anonymized medical records from general practitioners, including 20.7 million patients from 983 practices in the UK. Approximately 4.5% of the UK population are included with research-quality records, and patients are broadly representative of the UK general population. CPRD was established in 1987 and is one of the largest databases of longitudinal medical records from primary care in the world.^{7,8} Approximately half of the CPRD patients are eligible for linkage to other

datasets. In this study, it was linked to the England Hospital Episode Statistics (HES) and the Office for National Statistics (ONS) death registration databases, hence limiting the scope of this study to England. Patients were included from 1 January 2010 to 31 December 2015. The study was granted approval by the Independent Scientific Advisory Committee for Medicines and Healthcare products Regulatory Agency database research (ISAC Protocol: 19-184 R), and the East Midlands- Derby Health Research Authority Research Ethics Committee (Reference number: 05/MRE04/87). The study was exempt from informed consent.

Patient population. Patients with a primary THA for any indications in the study period were identified. The date of the primary THA was the index date. Patients were followed up for two years. Patients with bilateral THA were excluded. Only patients with "research-grade" medical records available for a

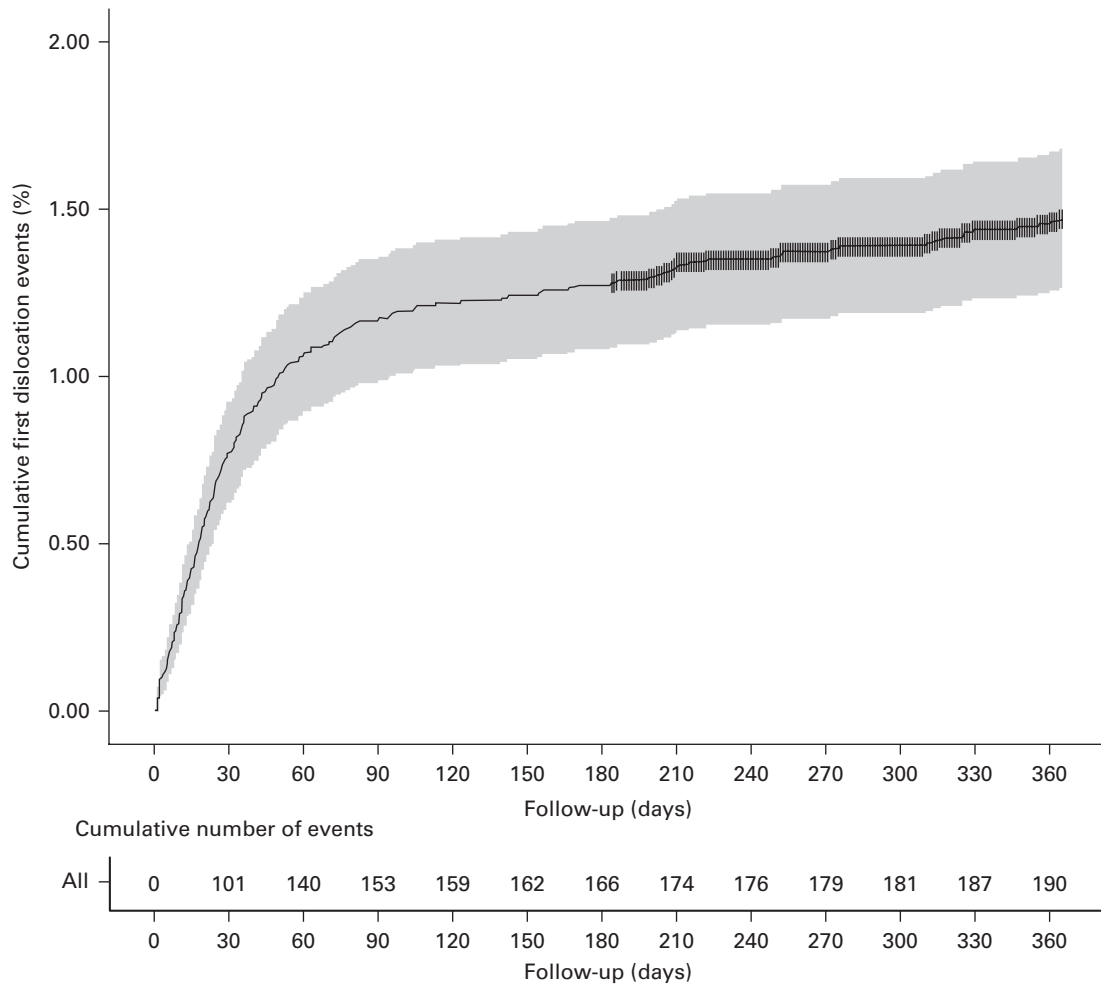


Fig. 1

Time to dislocation for Clinical Practice Research Datalink primary total hip arthroplasty patients one year postoperatively. Shaded region indicates 95% confidence interval.

minimum of 90 days pre-index (baseline period) and 180 days post-index were included. Research grade is a metric defined by CPRD and is recommended as a first step to select research-quality patients.⁸

Study measures. The main independent variable was the presence of dislocation diagnosis (yes/no) within one year after THA, as most dislocations happen within this time.^{9,10} Baseline demographic and clinical characteristics were evaluated. Comorbidity was assessed using the Charlson Comorbidity Index (CCI).¹¹ Healthcare resource use and healthcare costs were evaluated over two years. Healthcare costs were obtained from the Personal Social Services Research Unit 2018 Cost of Care public document and Healthcare Resource Group codes available in HES and NHS 2018 reference costs.¹² Drug costs were obtained from the 2018 British National Formulary. Changes (pre- vs post-THA) in patient-reported outcome measures (PROMs) were evaluated with the generic EuroQol five-dimension index (EQ-5D),¹³ and the joint-specific disability measure using the Oxford Hip Score (OHS).^{14,15} Both PROMs are only routinely collected twice in NHS patients: prior to and six months after

the primary THA. Only patients who completed PROMs post-dislocation were analyzed in the dislocation group. Presence of dislocation within two years was also investigated.

Propensity score matching and study analyses. Propensity score matching (PSM) using nearest neighbour method was used to control for differences in baseline characteristics between patients with and without hip dislocation (1:2 matching). Patients were matched based on age, sex, BMI, smoking status, alcohol/drug abuse, previous procedure on the hip, cognitive or neuromuscular disease, index primary diagnosis, index THA year, and CCI score. An absolute standardized difference < 0.1 indicated a negligible difference between patients with and without dislocation.

Frequency counts and proportions were provided for categorical variables. Means and standard deviation (SD) or median and interquartile range (IQR) were provided for continuous variables. For bivariate analysis, independent-samples *t*-test was used for continuous variables that followed normal distribution, and Mann-Whitney U test for non-normal variables. For categorical variables, chi-squared test was used, and Fisher's exact test was used for categorical variables having low cell

Table III. Healthcare resource use and mortality for matched Clinical Practice Research Datalink primary total hip arthroplasty patients without and with dislocation over two years.

Resource used	Dislocation	No dislocation	p-value
All	190	378	
Inpatient resource use			
Median hospital LOS, days (IQR)	22 (12 to 47)	7 (5 to 12)	< 0.001*
ICU stay, n (%)	28 (14.7)	11 (2.9)	< 0.001†
Median ICU LOS stay, days (IQR)	2 (2 to 3)	4 (2 to 5)	0.351*
Readmissions, n (%)	176 (92.6)	181 (47.9)	< 0.001†
Median number of re-admissions (IQR)	2 (1 to 5)	0 (0 to 2)	< 0.001*
Hospital outpatient resource use			
Outpatient visits, n (%)	188 (98.9)	372 (98.4)	0.894†
Median number of hospital outpatient visits (IQR)	12 (6 to 22)	7 (4 to 13)	< 0.001*
ED attendances, n (%)	162 (85.3)	135 (35.7)	< 0.001†
Median number of ED attendances (IQR)	2 (1 to 3)	0 (0 to 1)	< 0.001*
Community care resource use			
Median number of consultations (IQR)	97 (69 to 141)	75 (50 to 110)	< 0.001*
Median number of diagnostic tests (IQR)	54 (26 to 113)	59 (28 to 103)	0.888*
Median number of prescription medications (IQR)	69 (39 to 125)	48 (18 to 94)	< 0.001*
Physical therapy visits, n (%)	68 (35.8)	97 (25.7)	0.016†
Median number of physical therapy visits (IQR)	5 (2 to 9)	4 (2 to 6)	0.130*
Mortality			
Mortality, n (%)	5 (2.6)	5 (1.3)	0.435†

*Mann-Whitney U test

†Chi-squared test.

ED, emergency department; ICU, intensive care unit; IQR, interquartile range; LOS, length of stay; THA, total hip arthroplasty.

counts (< 5). Time to event outcomes (mortality and dislocation) were represented with Kaplan-Meier survival curves or cumulative hazard plots, compared with log-rank test and hazard ratio generated with a Cox proportional hazard model. Analyses were performed in R v. 4.0.0 (R Foundation for Statistical Computing, Austria). Statistical significance was set at $p < 0.05$ (two-sided). For patients with incomplete follow-up data due to administrative censoring, economic outcomes were linearly extrapolated until the end of the follow-up period. Sensitivity analysis was conducted on patients having complete medical records for two years of follow-up.

Results

Patient selection and occurrence and treatment of dislocation. Table I presents the selection of THA patients from the CPRD database using the inclusion and exclusion criteria. A total of 191 patients (1.5%) had a hip dislocation over one year. After 1:2 PSM, 190 patients with hip dislocation and 378 patients without dislocation were selected. One dislocation patient

Table IV. Quality of life for Clinical Practice Research Datalink primary total hip arthroplasty patients with and without dislocation.

QoL measure	With dislocation (n = 190)	Without dislocation (n = 378)	p-value
EQ-5D index, n	66	187	
Mean change for primary THA (SD)	0.24 (0.35)	0.44 (0.35)	< 0.001*
EQ-VAS, n	62	175	
Mean change for primary THA (SD)	0.95 (26.1)	8.85 (22.9)	0.038*
OHS, n	70	197	
Mean change for primary THA (SD)	12.9 (11.7)	21.2 (10.1)	< 0.001†

*Mann-Whitney U test.

†Independent-samples *t*-test.

EQ-5D, EuroQol five-dimension index; OHS, Oxford Hip Score; QoL, quality of life; SD, standard deviation; THA, total hip arthroplasty; VAS, visual analogue scale.

was excluded as no match was found, and two dislocation patients found one match only.

The one-year total dislocation rate was 21.2 (95% confidence interval (CI) 18.7 to 23.8) dislocations per 1,000 person-years (PY). The first event rate, also known as patient time incidence rate from the National Joint Registry (NJR),¹⁶ was 15.1 (95% CI 13.1 to 17.5). Among patients with a hip dislocation, 166 (86.9%) experienced the dislocation within 180 days after index (Figure 1). Over the two years, approximately one-third of the patients with dislocation (33.7%; $n = 64$) had more than one dislocation. The mean number of dislocations per patient was 1.6 (SD 0.9) with a maximum of five. Among patients with a hip dislocation, 169 patients (88.9%) had at least one closed reduction and 39 patients (20.5%) had revision surgery with a mean of 1.5 dislocations (SD 0.9) prior to revision surgery. Incidence rate for revision due to dislocation was 1.7 (95% CI 1.2 to 2.3) per 1,000 PY.

Baseline demographic and clinical characteristics. Baseline demographic and clinical characteristics of patients without and with hip dislocation before and after PSM matching are presented in Table II. The mean age of patients was approximately 69 years for both groups. Before matching, a greater proportion of patients in the dislocation group were male (45.5% vs 39.0%), and were current (13.6% vs 10.3%) or former (27.7% vs 21.4%) smokers. Patients with dislocation were less likely to have had prior history of fracture of the neck of the femur (11.5% vs 5.5%). After matching, the patients with and without hip dislocation were well-balanced in their baseline characteristics (Supplementary Figure a).

Healthcare resource use and death. Healthcare resource use for matched patients is presented in Table III. Compared to patients without hip dislocation, patients with hip dislocation had longer two-year hospital length of stay (LOS) (median difference (MD) 15 (95% CI 8 to 16)), a greater number of readmissions (MD 2 (95% CI 1 to 2)), a greater number of outpatient visits (MD 5 (95% CI 2 to 7)), a greater number of emergency department (ED) attendances (MD 2 (95% CI 1 to 2)), a greater number of primary care consultations (MD 23 (95% CI 13 to 31)), and a greater number of prescription medications (MD 22 (95% CI 9 to 32)). The dislocation compared to no dislocation

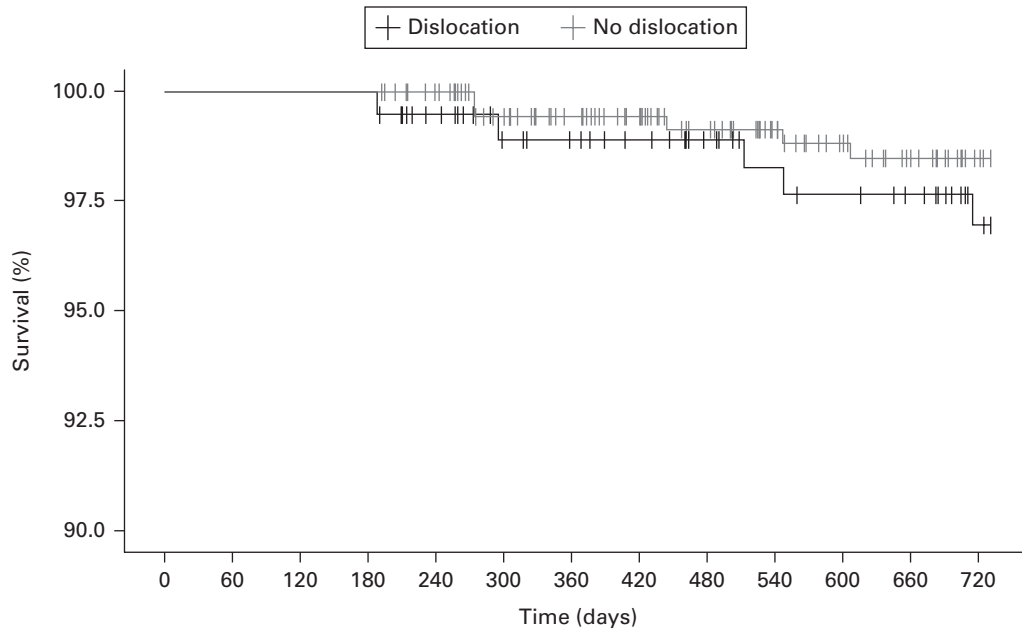


Fig. 2

Kaplan-Meier survival curves for the risk of death over two years for matched Clinical Practice Research Datalink primary total hip arthroplasty patients without and with hip dislocation. $p = 0.280$, log-rank test.

odds ratios (ORs) were 13.7 (95% CI 7.7 to 24.5) for readmission, 5.8 (95% CI 2.8 to 11.9) for intensive care unit (ICU) stay, 10.4 (95% CI 6.6 to 16.4) for ED visits, and 1.6 (95% CI 1.1 to 2.4) for physiotherapy visits. The probability of death was higher for patients with a hip dislocation; however, the differences were not statistically significant ($p = 0.280$, Kaplan-Meier survival curve; and Cox proportional hazard ratio 1.95 (95% CI 0.57 to 6.75)) (Figure 2).

Costs. Overall two-year median direct medical costs were statistically significantly higher among patients with a hip dislocation compared to patients without a hip dislocation (MD £15,333 (IQR 14,437 to 16,156); Figure 3). The higher costs among patients with hip dislocation are due to higher median two-year inpatient costs (MD £12,558 (IQR 11,839 to 13,882)), outpatient costs (MD £938 (IQR 789 to 1,119)), ED costs (MD £440 (IQR 399 to 477)), primary care costs (MD £730 (IQR 632 to 821)), primary care consultation costs (MD £212 (IQR 128 to 288)), primary care medication costs (MD £223 (IQR 186 to 275), and physiotherapy visit costs (MD £119 (IQR 58 to 159); $p = 0.048$, Mann-Whitney U test). ICU costs and primary care test costs were not statistically significantly different (Supplementary Table i).

Two-year median costs for patients without dislocation were £12,046 (IQR 9,106 to 19,683). The median cost increased to £18,383 (IQR 13,692 to 30,122) for patients with one closed reduction ($n = 92$), and £34,420 (IQR 23,473 to 44,311) for patients with multiple closed reductions due to dislocation ($n = 59$). The two-year median cost for patients with multiple closed reductions and revision procedure was £54,088 (IQR 34,126 to 59,117) ($n = 10$) (Figure 4). Two-year median costs increased with increase in dislocation events (Supplementary Figure b).

QoL and disability. Patients with dislocation after primary THA had less improvement in EQ-5D index (mean 0.24 (standard deviation (SD) 0.35) vs 0.44 (SD 0.35); $p < 0.001$, Mann-Whitney U test) and EQ-VAS (mean 0.95 (SD 26.1) vs 8.85 (SD 22.9); $p = 0.038$, Mann-Whitney U test) (Table IV). Both group changes and the between-groups difference were found to exceed the minimal clinically important difference (MCID) threshold of 0.1 required for the EQ-5D index.¹⁷

There was also less disability improvement among patients with dislocation after THA, as demonstrated by change in the OHS (12.93 (SD 11.69) vs 21.19 (SD 10.10); $p < 0.001$, independent-samples *t*-test) (Table IV). Beard et al¹⁸ recommended that, for THA, the OHS minimally important change (MIC) indicating a meaningful change from baseline was 11 points in a single group study design (vs clinical trial), while Kang¹⁷ estimated the MCID was nine points. Hence, the improvement in OHS scores was clinically meaningful for patients with and without dislocation, and the between-groups difference was significant. Increase in number of dislocation events decreased QoL (Supplementary Table ii).

Sensitivity analysis. A total of 140 patients with dislocation (73.7%) and 226 patients without dislocation (70.4%) had complete datasets ($p = 0.296$). For complete cases, two-year median costs were higher for patients with dislocation (£25,122 (IQR 16,394 to 41,545) vs £10,797 (IQR 8,462 to 14,824); $p < 0.001$, Mann-Whitney U test).

Discussion

Dislocation after THA continues to be a prevalent and costly complication that diminishes the clinical benefits and cost-effectiveness of an otherwise very successful surgical

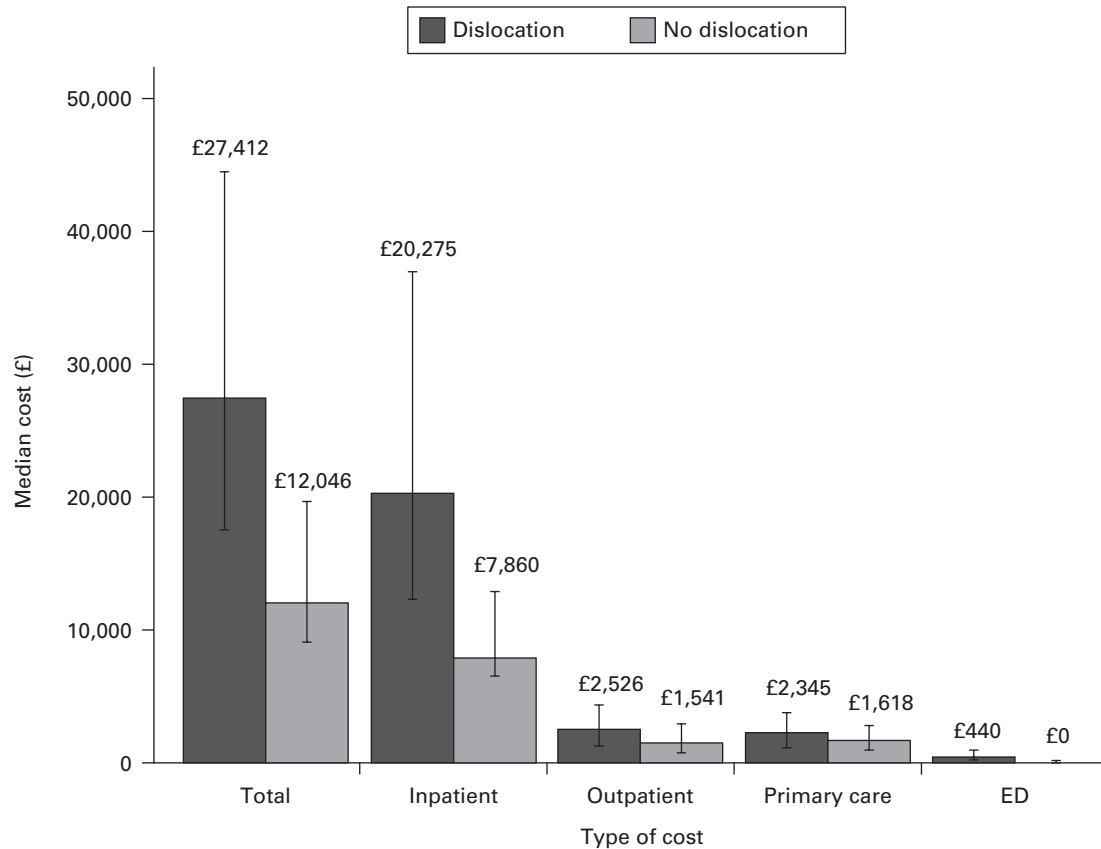


Fig. 3

Overall two-year direct medical costs for matched Clinical Practice Research Datalink primary total hip arthroplasty patients without and with a hip dislocation by resource category. Error bars indicate the interquartile range. ED, emergency department.

procedure.² Our study findings showed that overall two-year median direct medical costs were 228% higher among patients with a hip dislocation compared to patients without a hip dislocation (£27,412 vs £12,046) due to higher inpatient costs, outpatient costs, ED costs, and primary care costs overall. Two-year median costs increased from £12,046 for patients without dislocation to £18,383 for patients with one closed reduction, £34,420 for patients with multiple closed reductions, and £54,088 for patients with multiple closed reductions and a revision procedure. Additional efforts to prevent dislocation and reduce its clinical and economic burden after primary THA could be made, such as the identification of at-risk groups and the use of technologies to reduce the likelihood of dislocation in some populations (e.g. use of lipped liners, dual-mobility sockets, robotic technology, and other patient-specific planning tools in at-risk groups).^{19–22} An implant reducing total dislocations by 50% and 80% would be cost-neutral to the healthcare system at an additional cost per implant of £162 and £262, respectively.

This study found that 191 patients (1.5%) had a hip dislocation and the one-year total dislocation rate was 21.2 dislocations per 1,000 PY. The approach to identifying dislocations was designed to be as thorough as possible, using clinical and procedures codes from the International Classification of Diseases,²³ OPCS Classification of Interventions

and Procedures,²⁴ and Read coding systems.²⁵ The identification algorithm was based on algorithms from the NJR,³ the Scottish Arthroplasty Project (SAP),²⁶ and the assistance of professional clinical coders. The approach aimed to identify all types of dislocation, as done in Hermansen et al,⁹ and their associated treatment, including conservative treatment with closed reduction, rather than only revision due to dislocation. The approach permitted a comprehensive assessment of costs associated with dislocation due to the different treatment pathways. The rate of dislocation observed in the current study is towards the lower end of the range found in previously published studies (0.2% to 10% within one year of THA).^{1,2,7} However, it is aligned with the 2016 SAP report (1% in 2015 to 16),²⁶ and a previous study using HES data (1.4% at one year).²⁷ Direct comparison with the NJR was not possible as it only reports rate of revision due to dislocation. Nevertheless, the latter was 1.7 per 1,000 PY in our study and 0.9 in the NJR data during the same period, suggesting that our study did not underestimate the revision rate due to dislocation and, therefore, may not have underestimated the true dislocation rate. Reasons for differences in rates of hip dislocation across studies may be due to improved treatment practices over the years, differences in the patient populations evaluated, or differences in practice patterns within and among countries. Some dislocation cases may not have been identified based on

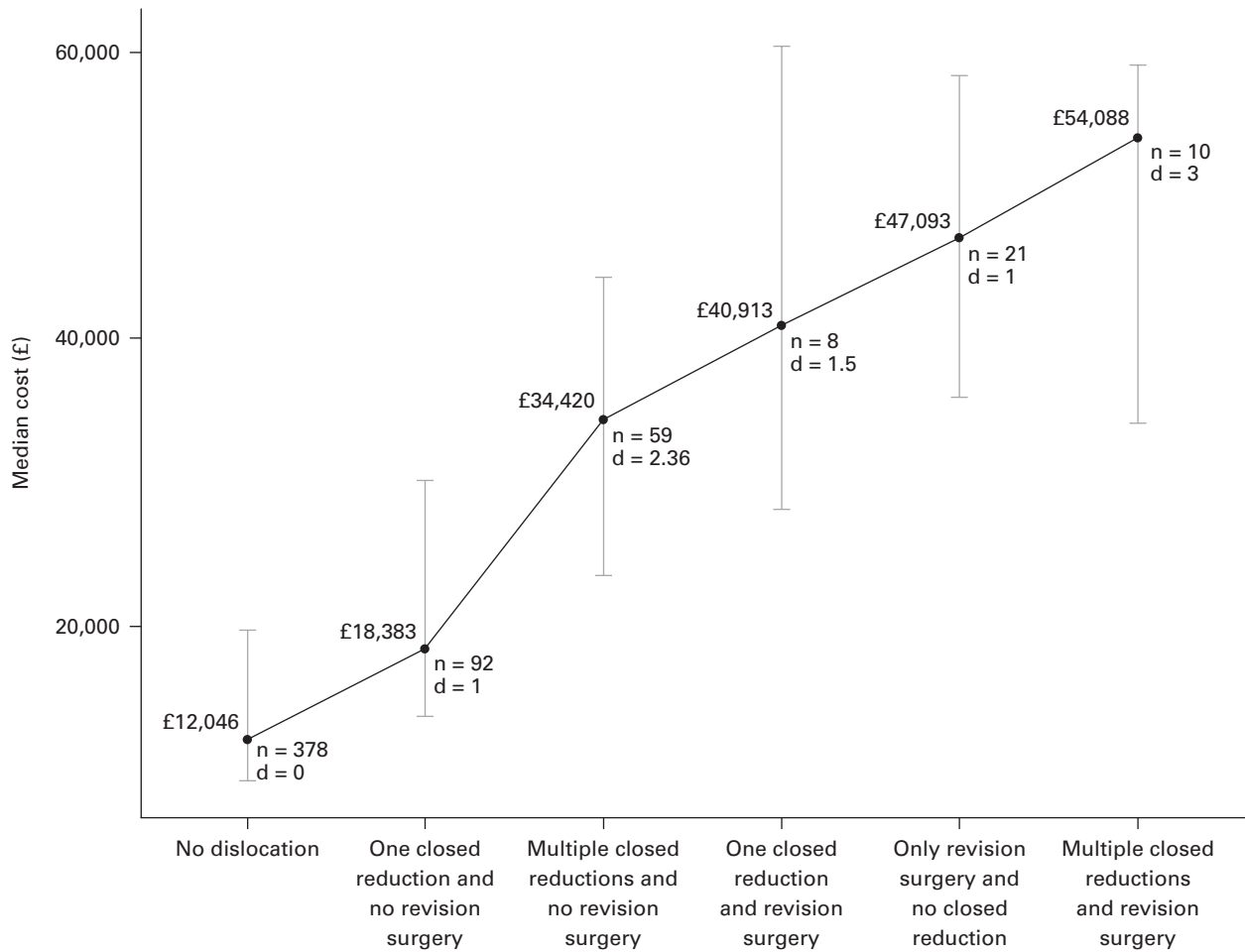


Fig. 4

Overall two-year direct medical costs for matched Clinical Practice Research Datalink primary total hip arthroplasty patients without a hip dislocation and with hip dislocation according to treatments received. Error bars indicate the interquartile range. n = number of patients per category, d = average number of dislocations per category.

coding misclassification; however, this is unlikely to change the cost results.

Our findings are consistent with previous studies evaluating the economic impact of THA hip dislocation. In the UK, Abdel et al⁴ found that recurrent dislocation and operative treatment increased direct medical costs by 300% (£11,456) and 40% (£5,217), respectively. The mean cost of surgical treatment for dislocation was found to be £10,893 per case by Vanhegan et al.⁶ In the USA, Sanchez-Sotelo et al² found that revision procedures represented 148% of the cost of an uncomplicated primary THA. Recently, a large retrospective database analysis of USA Medicare patients by Mantel et al⁵ found that cost increases with dislocation were \$19,590 per patient over one year and \$24,211 per patient over two years.

The enhanced healthcare resource use among patients with hip dislocation included longer duration of LOS overall, and more readmissions, admissions to the ICU, outpatient visits, ED attendances, primary care consultations, medications, and physiotherapy. The significant increase in resource use is indicative of the acuteness of the care required for patients with THA dislocation. Dislocation not only increases revision surgery,

as seen in previous studies, but it is also associated with other healthcare needs. Patients with dislocation after primary THA also had significantly less improvement in QoL and disability after THA. The impact of dislocation on QoL was clinically meaningful for the EQ-5D¹⁷ and the OHS.^{17,18}

In this study, there was significant variation in the treatment pathways for patients who suffer dislocation post-THA. This relates, first, to the multiple possibilities in terms of the individual patient's re-entry point into the health service, and then in the options that exist in terms of initial and ongoing clinical treatment. Better characterization of this variation and a better quantification of patient QoL outcomes may facilitate recommendations that could enhance the delivery of NHS services in this area and improve patient care. It is assumed that patients effectively recover physical function after revision for dislocation; however, this was not adequately demonstrated in the current study and has not been demonstrated from any UK population studies of which we are aware. However, this study showed that the QoL for patients with several dislocations was as diminished as patients with one dislocation only. The optimal timing of revision after dislocation has also not been

established, however our study found that patients undergo revision surgery after a mean of 1.5 dislocations (1 to 5). Additional research would help to identify best practices, and may present opportunities for improvement in the delivery and efficiency of THA care within the NHS. This could also enable insight into the relative value of alternative treatment strategies to prevent dislocation if introduced,^{28,29} or to evaluate the risk of dislocation in specific groups of patients.^{30–32} These research opportunities should consider datasets with larger sample sizes than CPRD-linked HES data, as they may otherwise be limited by the low incidence of dislocation.

A strength of the current study is the availability of electronic health record (EHR) data available in the CPRD database. EHRs have clinical data that provide a more thorough understanding of patient outcomes. EHRs capture a variety of patient-level data that represent integral components of provider care that are not typically available through other data sources, such as administrative claims databases. However, some of the challenges associated with the use of EHR data include missing data, erroneous inputs, uninterpretable data, inconsistencies among providers and over time, and data stored in non-coded text notes. These challenges were addressed in this study by selecting research-grade patients only, and extrapolating results for patients with missing data due to administrative censoring. Additionally, a sensitivity analysis excluding these patients was conducted (complete case analysis).

The main limitation of this study is its observational nature. Identification of factors associated with dislocation is limited to data that are captured as part of the database, and relies on appropriate diagnostic codes to detect these events. We were not able to account for type of THA implant or bearing surface (e.g. metal-on-metal, dual-mobility) or the THA approach used (e.g. anterior vs posterior). Additionally, socioeconomic differences, which were not available in our data source, might have contributed to the findings. Hence, we were not able to account for unmeasured, inadequately measured, and unmeasurable residual confounding. The economic outcomes were evaluated at two years post-THA, while PROMs assessment was only done at six months due to NHS routine collection practice. This might have underestimated the impact of dislocation on QoL, as approximately 13% of dislocations occurred after six months. Furthermore, a significant portion of patients were excluded from the analysis according to our population definition (Table I). However, they did not differ in terms of dislocation rates from the analyzed cohort, suggesting that this study was not subject to selection bias. Another limitation is that the study did not evaluate outcomes by the timing of the dislocation. Finally, the study results will be generalizable only to patients in England who meet the inclusion and exclusion criteria.

In conclusion, findings from this large retrospective database study demonstrated the substantial cost, healthcare resource use, and QoL burden of THA dislocation in England. Future advances in surgical technique and prosthesis design aimed at decreasing the rate of THA dislocation could help alleviate these concerns and the mounting national health burden of THA dislocation.



Take home message

- Patients with dislocation post-total hip arthroplasty (THA) may experience different treatment pathways.
- Accordingly, this study quantified the total economic burden of dislocation post-THA.

Supplementary material



Figures and tables displaying the additional results on the matching balance, costs, and quality of life.

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