

The Journal of Bone & Joint Surgery

Quality of care in hip fracture patients - does compliance to national standards relate to improved outcomes? --Manuscript Draft--

Manuscript Number:	JBJS-D-17-00884R2
Full Title:	Quality of care in hip fracture patients - does compliance to national standards relate to improved outcomes?
Article Type:	Clinical
Section/Category:	Hip
Keywords:	hip fracture; neck of femur; clinical standards; Outcome; multidisciplinary; Scottish National Hip Fracture Audit; management guidelines
Corresponding Author:	Luke Farrow, MBChB University of Aberdeen Aberdeen, UNITED KINGDOM
Corresponding Author E-Mail:	luke.farrow@doctors.org.uk;luke.farrow@abdn.ac.uk
Corresponding Author Secondary Information:	
Corresponding Author's Institution:	University of Aberdeen
Corresponding Author's Secondary Institution:	
First Author:	Luke Farrow, MBChB, MRCS
First Author Secondary Information:	
Order of Authors (with Contributor Roles):	Luke Farrow, MBChB, MRCS
	Andrew Hall, MBChB, MRCS
	Adrian D Wood, PhD
	Rik Smith, Bsc, PhD
	Kate James, BA
	Graeme Holt, MBChB, FRCS(Tr&Orth)
	James Hutchison, PhD, FRCS(Tr&Orth)
	Phyo Kyaw Myint, MBBS, MD
Order of Authors Secondary Information:	
Additional Information:	
Question	Response
Is this a clinical trial? This is defined as any clinical research where patients are being randomized into two treatment groups OR where patients are being followed prospectively comparing two different treatments.	No
Was this study NIH funded?	No
Have any of the illustrations or tables used in this article been published previously (i.e. does another party now own the copyright to any illustration or table)?	No

How will this work influence the practice of Orthopaedics?	Our study provides novel research and supports the use of the Scottish Standards of Care for Hip Fracture Patients as a benchmark from which all hip fracture care can be judged. It also delivers further evidence regarding the potential benefits of a multidisciplinary team approach to the management of hip fracture patients. We believe our work is relevant to patients, public, health care providers, commissioners and policy makers and has potential to reduce the global burden of hip fracture.
(Optional) Please provide your Twitter username (“handle”). This may be used for marketing purposes if the paper is published in The Journal. If available, please also include your institution’s Twitter handle. This will help gain exposure for both you and your institution.	@docfarrow
Abstract:	<p>Background Optimising the perioperative care of patients with a hip fracture is a key healthcare priority. We aim to determine if adherence to the Scottish Standards of Care for Hip Fracture Patients (SSCHFP) is associated with improved patient outcome.</p> <p>Methods Retrospective cohort study of prospectively collected data from the Scottish National Hip Fracture Audit. We assessed adherence to the SSCHFP in twenty-one Scottish hospitals over a 9-month period in 2014, and examined the effect of the guidelines on 30- and 120-day mortality, length of hospital stay, and discharge destination.</p> <p>Results A total of 1,162 patients aged over 50 years and admitted with a hip fracture were included. There was a significant association between low adherence to SSCHFP and increased mortality at 30 and 120 days (OR 3.58, 95% CI 1.75 to 7.32, p<0.001 and OR 2.01, 95% CI 1.28 to 3.12, p=0.003). Low adherence was associated with a reduced likelihood of short length of stay (OR 0.58, 95% CI 0.42 to 0.78, p<0.001), but an increased odds of discharge to a high-care setting (OR 1.63, 95% CI 1.12 to 2.36, p<0.01). Early Physiotherapy and Occupational Therapy input was associated with a reduced likelihood of discharge to a high-care setting (OR 0.64, 95% CI 0.44 to 0.98, p=0.04 and OR 0.34, 95% CI 0.23 to 0.48, p<0.001 respectively).</p> <p>Conclusions Adherence to Scottish Standards of Care for Hip Fracture Patients is associated with better patient outcomes. These findings confirm the clinical utility of the SSCHFP and support their use as a benchmarking tool to improve quality of care in hip fracture.</p>



UNIVERSITY
OF ABERDEEN

Ageing
Clinical &
Experimental
Research



Mr Luke Farrow
BSc MBChB(Hons) MRCS

School of Medicine, Medical Sciences &
Nutrition
Institute of Applied Health Sciences
Polwarth Building, Foresterhill
Aberdeen, AB25 2ZD
Tel: +44 (0) 1224 437841
Fax: +44 (0)1224 437911

15/10/17

Professor Marc F. Swiontkowski, MD
Editor-in-Chief
JBJS

Subject: Response to reviewer comments

Dear Professor Swiontkowski,

We are pleased to re-submit our paper entitled **“Quality of care in hip fracture patients – does compliance to national standards relate to improved outcomes?”**

We greatly appreciate you and your team taking further time to consider our work for publication in the *Journal of Bone & Joint Surgery*. We were pleased to see that two of the assigned reviewers felt the manuscript suitable for publication. We have endeavoured to address all of constructive comments raised by the Deputy Editor through changes to the resubmitted manuscript. We hope that our updated responses address satisfactorily the comments made by the Deputy Editor for Methods, and that he/she now feels the manuscript to be of a standard suitable for publication in *JBJS*.

On behalf of all co-authors, I would like to take this opportunity to again thank the editors and reviewers for their insightful comments and suggestions which have helped to improve the quality of the manuscript.

Once again I can confirm that the paper has not been submitted to, and will not be published in (in whole, or in part) any other journal. Work associated with this manuscript has previously been presented at the EFORT Congress 2017 in Vienna, Austria and at the 2017 Scottish Hip Fracture Conference in Edinburgh, Scotland. All authors have read and agreed to the contents of the manuscript in its submitted form.

Yours sincerely,

Mr Luke Farrow
Clinical Research Fellow – University of Aberdeen
For and on-behalf of all co-authors

Responses to reviewer comments

Deputy Editor for Methods:

The authors have been able to address most of my main concerns. That being said they remain recalcitrant on some very important issues and in my opinion continue to willfully try and mislead the reader with respect to the import and significance of their study. Level of evidence reflects study design and threats to validity through study bias. The potential for selection and indication as well as classification bias are substantial threats to your study that cannot be controlled for. The author's ignore these facts in their assessment of evidence level. This is level III evidence at best. Many of their arguments ring hollow. All chart reviews are technically retrospective reviews of prospective data. This is a retrospective study design plain and simple as the authors clearly disclose in the answers to my queries. All good scientific work should have an a-priori hypothesis. The authors should not try and mislead the reader that by following good scientific practice, they have somehow enhanced the utility or import of this effort. Language to this effect or giving this impression should be removed.

The authors thank the Deputy Editor for Methods for taking his/her time to further consider the paper, and for providing their helpful comments. We have endeavoured to make all of the recommended changes that have been suggested. We would like to stress that it was never our intention to mislead the reader as to the level of evidence of this study. Our initial difference of opinion stemmed from the use of a different set of criteria used to designate levels of evidence. A reference to the criteria used was included in the previous response to reviewer comments. We have now amended the manuscript in line with the Deputy Editor's advice, and with the guidance published on the JBJS website.

We report the inclusion of an a priori research hypothesis in concordance with the STROBE statement for reporting of observational studies (<https://www.strobe-statement.org/index.php?id=strobe-home>). We do not attempt to suggest that this enhances the quality of the study other than that inferred by adherence to good scientific practice. If there remain any concerns over a particular phrase or statement in the manuscript, we would be happy to review this specifically.

My recommendations at this time are as follows:

1. This study should be designated level III evidence - if the authors remain resistant to this, we will be at an impasse. At such a time I would advocate a delay of any plan of acceptance in lieu of further review by the Deputy Editor for Evidence or a JBJS workshop session where this can be further reviewed by the other deputy editors.

After further discussion amongst the authors and review of the level of evidence documentation listed on the JBJS website, we have updated the designation of the level of evidence of the study to Level III in accordance with the advice of the Deputy Editor.

2. The authors should not refer to their variable names in the Discussion (pace MORT 30 etc). For ease of readability and comprehension, the meaning expressed by these monikers should be spelled out in full.

We thank the Deputy Editor for their advice, and have made the suggested changes with respect to the variable names in the Discussion section.

3. The Discussion at present is overly long and tangential with a number of digressions. I highly suggest revising to a 5 paragraph format with no more than 1,000 words to improve readability and comprehension for the reader. The paragraphs could be as follows:
 1. Qualitative restatement of the importance of the issue behind your study
 2. Restate main findings
 3. Couch findings in the context of other literature
 4. Limitations
 5. Take home message, practice implications, next steps. There should not be a separately designated conclusion section.

We thank the Deputy Editor for Methods for his/her insightful comments on the layout and content of the Discussion section. We have redesigned this section in accordance with the Deputy Editor's suggestions.

We hope that the further changes to the manuscript are sufficient that the Deputy Editor for Methods finds the updated manuscript to now be of a satisfactory standard for publication in JBJS.

Reviewer 1:

I found the revised manuscript greatly improved. I have no recommended changes.

The authors would like to thank Reviewer 1 for their comments and their support for publication of the manuscript within JBJS.

Reviewer 2:

After careful reassessment of the data submitted, I think the regression methods allows for significant conclusions. We see two important conclusions and that would be that older and elderly patients have a higher mortality rate at 30 and 120 days, and younger patients seem to make it through inpatient landmarks easier with less complications.

From my point of view after having a rather large number of these cases in my recent practice career, these findings are intuitive. I believe the overall perspective of this patient treatment paradigm will be of value for the practicing surgeon.

The authors are grateful to Reviewer 2 for their comments and their support for publication of the manuscript within JBJS.

Quality of care in hip fracture patients – does compliance to national standards relate to improved outcomes?

Luke Farrow MBChB, MRCS *¹; Andrew Hall MBChB, MRCS*^{1,3}; Adrian D Wood PhD¹; Rik Smith PhD²; Kate James BA²; Graeme Holt MBChB, FRCS(Tr&Orth)³; James Hutchison PhD, FRCS(Tr&Orth)¹; Phyo K Myint MBBS, MD¹

1. School of Medicine, Medical Sciences & Nutrition, University of Aberdeen, Aberdeen, United Kingdom
2. NHS National Services, Edinburgh, United Kingdom
3. University Hospital Crosshouse, Kilmarnock, United Kingdom

* denotes co-first authorship

Keywords: Hip fracture; neck of femur; clinical standards; outcome; multidisciplinary; Scottish National Hip Fracture Audit; management guidelines

Word count: 2845 words

Corresponding author

Luke Farrow

Institute of Applied Health Sciences

School of Medicine, Medical Sciences and Nutrition

University of Aberdeen

Foresterhill, Aberdeen, AB25 2ZD

Scotland, United Kingdom

Tel: +44 (0) 1224 437841

Mail to: luke.farrow@abdn.ac.uk

- 1 **Quality of care in hip fracture patients - does compliance to national standards relate to**
- 2 **improved outcomes?**

3 **Abstract**

4 **Background**

5 Optimising the perioperative care of patients with a hip fracture is a key healthcare priority.
6 We aim to determine if adherence to the Scottish Standards of Care for Hip Fracture Patients
7 (SSCHFP) is associated with improved patient outcome.

8 **Methods**

9 Retrospective cohort study of prospectively collected data from the Scottish National Hip
10 Fracture Audit. We assessed adherence to the SSCHFP in twenty-one Scottish hospitals over
11 a 9-month period in 2014, and examined the effect of the guidelines on 30- and 120-day
12 mortality, length of hospital stay, and discharge destination.

13 **Results**

14 A total of 1,162 patients aged over 50 years and admitted with a hip fracture were included.
15 There was a significant association between low adherence to SSCHFP and increased
16 mortality at 30 and 120 days (OR 3.58, 95% CI 1.75 to 7.32, $p<0.001$ and OR 2.01, 95% CI
17 1.28 to 3.12, $p=0.003$). Low adherence was associated with a reduced likelihood of short
18 length of stay (OR 0.58, 95% CI 0.42 to 0.78, $p<0.001$), but an increased odds of discharge to
19 a high-care setting (OR 1.63, 95% CI 1.12 to 2.36, $p<0.01$). **Early Physiotherapy and
20 Occupational Therapy input was associated with a reduced likelihood of discharge to a
21 high-care setting (OR 0.64, 95% CI 0.44 to 0.98, $p=0.04$ and OR 0.34, 95% CI 0.23 to
22 0.48, $p<0.001$ respectively).**

23 **Conclusions**

24 Adherence to Scottish Standards of Care for Hip Fracture Patients is associated with better
25 patient outcomes. These findings confirm the clinical utility of the SSCHFP and support their
26 use as a benchmarking tool to improve quality of care in hip fracture.

27

28 **Level of evidence**

29 Level III: retrospective cohort study (therapeutic – investigating the results of a treatment).

30 **Introduction**

31 Despite advances in the perioperative management of hip fractures, and greater
32 understanding of the causes of mortality and morbidity associated with hip fracture¹⁻⁴,
33 mortality rates have remained static for four decades⁵. By implementing the Scottish
34 Standards of Care for Hip Fracture Patients (SSCHFP), Scotland became the first country to
35 have a nationally-agreed, evidence-based collection of care standards to ensure a consistently
36 high level of care in hip fracture¹.

37

38 Despite implementation of the SSCHFP in 2014, there are no data assessing the effect of the
39 standards on patient outcomes. Previous studies of the UK National Hip Fracture Database
40 demonstrated an association between national audit, guidelines, and reduction in mortality,
41 however this is through indirect methods only².

42

43 The study aimed to: (1) determine which care standards are associated significantly with
44 outcomes; (2) ascertain whether cumulative attainment of the standards is predictive of
45 favourable outcome.

46

47 **Materials and Methods**

48 **A retrospective analysis of prospective cohort data** was undertaken utilising anonymised
49 audit data that had been collected prospectively by the Scottish MSk Orthopaedics Quality
50 Drive³ **on behalf of Health Improvement Scotland (HIS), a monitoring subsidiary of the**
51 **Scottish Department of Health. Data were collected by local audit coordinators who**
52 **were employed by the individual hospitals and given the role of collecting prospective**
53 **audit data which could be used for quality improvement and research purposes as part**
54 **of the Scottish Hip Fracture Audit framework** ⁴.

55 **These data have been used by the Scottish Government as annual trend reporting of**
56 **hospital-specific data, and audit data collection methods have been previously published**
57 **5-8.**

58 **The study hypothesis was derived by the authors without prior knowledge of (or access**
59 **to) the data, and the authors had no role in recruitment of patients.**

60 At the time of audit the SSCHFP⁶ contained six groups of care standards relating to
61 preoperative, perioperative, and postoperative care (Appendix A). We derived 12 individual
62 standards which are measurable reliably from these six groups as detailed below. **The**
63 **SSCHFP were rolled out concomitantly with the start of the audit process.** The data
64 included all hip fracture patients (aged over 50 years) admitted to any of the twenty-one
65 participating Scottish hospitals on a ‘one week in four’ basis (i.e. recruiting a quarter of all
66 patients) from January-September 2014, who were followed up for 120 days following
67 admission. Hip fracture cases were identified prospectively and data were collected from
68 medical notes, patient information, results reporting, referral management, and admission
69 tracking systems.

70 Descriptions of the demographic and outcome variables, and potential confounding co-
71 variates are shown in **Table 1.**

72

73 At the individual patient level, each care standard (CS) was categorised as being either
74 achieved (yes; score 1) or not achieved (no; score 0). Total Care Score (TCS) equates to the
75 sum of the CS values for each patient.

76

77 The criteria for meeting each care standard were:

78

79 1. Time spent in ED < 2 hours;

- 80 2. Analgesia offered in ED;
- 81 3. ED ‘Big Six’ bundle completed: analgesia, vital signs, fluid optimisation, laboratory
82 bloods, cognition assessment, pressure area assessment;
- 83 4. Inpatient assessment bundle completed within 24 hours: falls risk, nutrition,
84 cognition, and pressure area assessment;
- 85 5. Comprehensive Geriatric Assessment within 48 hours;
- 86 6. Fasting for food not > 10 hours;
- 87 7. Fasting for fluids not > 4 hours;
- 88 8. Surgery within 48 hours if medically fit;
- 89 9. No routine urinary catheterisation;
- 90 10. Physiotherapy by first postoperative day;
- 91 11. Occupational Therapy by third postoperative day;
- 92 12. Discharge planning commenced within 48 hours.

93

94 There was a potential score range from 0-12, however because no patient received a TCS > 9,
95 results were present for the range 1-9. Scores were stratified into low-, moderate-, and high-
96 adherence categories with cut-off points that ensured reasonable proportions based on
97 frequency distribution of the sample: TCS 1-4 (Category 1 – low adherence); TCS 5-6
98 (Category 2 – moderate adherence); TCS ≥ 7 (Category 3 – high adherence).

99

100 The number of men and women who met each CS was calculated and compared using Chi-
101 squared test. Using bivariate logistic regression, odds ratios for the outcomes of 30- & 120-
102 day mortality, dichotomised length of stay in an acute orthopaedic unit (less than median
103 versus greater than median), and discharge destination were calculated for each CS **and also**
104 **potential confounders (age, sex, and type of residence prior to admission). A multiple**

105 **regression model was then used to assess the same variables using a forward selection**
106 **model with a cut-off value of $p < 0.10$. In order to avoid overfit a maximum of 3 and 5**
107 **variables were selected for the outcomes of 30- & 120-day mortality, respectively. In the**
108 **circumstance of having eligible variables in excess of those allowed, then variables with**
109 **the lowest p-values on bivariate regression were selected. When two or more variables**
110 **had the same p-value then those with the largest effect size were chosen.** All logistic
111 regression results are presented as OR with 95% confidence interval (CI).

112

113 Demographic and outcome data were assessed across the TCS categories through the use of
114 Chi-squared analysis. The TCS categories were also used to determine odds ratios (OR) and
115 95% CI for outcome data comparing those with a low TCS (category 1; $TCS \leq 4$) with the
116 reference category (category 2 & 3 combined; $TCS \geq 5$). Values were adjusted for age, sex,
117 and residence prior to admission.

118

119 Statistical analysis was carried out using SPSS for Windows (version 24.0, SPSS Inc.). P-
120 values were set at a two-sided < 0.05 significance level in all analyses. All data missing were
121 assumed to be random as preliminary data checks demonstrated negligible differences in
122 characteristics between patients with complete and missing data.

123

124 Our study was conducted in accordance with the 1964 Helsinki declaration and its later
125 amendments. Approval was obtained from the governing body, NHS National Services. **The**
126 **study complied with the Caldicott principles – the data guardianship regulations**
127 **governing the use of patient data in the United Kingdom.** Given the nature of the study,
128 ethical approval was not required. We attest that we have obtained appropriate permissions
129 and paid any required fees for use of copyright protected materials.

130

131 **Source of Funding: There was no external funding source for the study.**

132

133 **Results**

134 1,162 patients (72.9% female) with hip fracture were identified and included in the data
135 collection. The data captured 98% of eligible subjects. Follow-up data to 120 days post-
136 admission were available for 99%, though a small number were lost to audit when transferred
137 to other areas. The most frequent age group was 80-84 years (21.8%) with significantly lower
138 proportions of males than females over 75 years (73.0% vs 78.4%, $p=0.05$).

139

140 Results for comparison of sample characteristics for those receiving optimum versus sub-
141 optimum care according to the Scottish Standards of Care for Hip Fracture Patients are
142 shown in **Table 1**. There was a significantly higher proportion of women who: underwent
143 perioperative urinary catheterisation; had oral fluids withheld for >4 hours, and received OT
144 input by end of the third postoperative day.

145

146 Results of **bivariate** logistic regression analysis demonstrated that absence of urinary
147 catheterisation, OT input by the end of the third postoperative day, **younger age, and a pre-**
148 **admission residence of home/sheltered housing ($FROM_{Home}$)** were associated significantly
149 with a lower risk of mortality at 30 ($MORT_{30}$) and 120 days ($MORT_{120}$). **Female sex was**
150 **also associated with a significantly lower risk of $MORT_{120}$.** The completion of all inpatient
151 assessment bundles within 24 hours of admission, geriatrician input within 48 hours, absence
152 of catheterisation, **and younger age** were all associated with a significantly greater likelihood
153 of a short length of stay (LOS_{short}) i.e. an acute orthopaedic LOS less than the median LOS.
154 **$FROM_{Home}$ was associated with an acute orthopaedic LOS that was significantly longer**

155 **than the median LOS (LOS_{Long}).** Care variables associated with a significantly higher
156 chance of discharge to a high care destination (destination other than home/sheltered housing;
157 DEST_{other}) included: discharge planning within 48 hours; completion of the ED Big Six
158 bundle, and geriatrician input within 48 hours. Care variables associated with a significantly
159 higher likelihood of discharge to a low care destination (home/sheltered housing; DEST_{home})
160 included: time in ED <2 hours; PT input by the first postoperative day; OT input by the third
161 postoperative day; fasting for fluids not > 4 hours, absence of catheterisation, **and younger**
162 **age.** Full results of this analysis are shown in **Table 2.**

163

164 **Results of the forward selection multiple logistic regression demonstrated that two**
165 **variables were associated significantly with a greater odds of reduced MORT₃₀: OT**
166 **input by the end of the third postoperative day, and younger age. These associations**
167 **were similar for MORT₁₂₀, with the addition of a reduced risk of death in patients**
168 **admitted FROM_{Home}, those not undergoing urinary catheterisation, female sex, and**
169 **younger age. Outcomes associated with a significantly greater likelihood of a LOS_{short}**
170 **included: absence of catheterisation, and younger age. FROM_{Home} was associated with a**
171 **significantly increased likelihood of LOS_{Long}. Only one care standard was associated**
172 **with a significantly greater odds of discharge to DEST_{other}: Commencement of**
173 **discharge planning within 48 hours of admission. PT and OT input by the first and**
174 **third postoperative days respectively, absence of urinary catheterisation, younger age,**
175 **and fasting for fluids not > 4 hours were associated with a significantly higher likelihood**
176 **of discharge DEST_{home}. Details of these results are shown in Table 2.**

177

178 Comparison of patient characteristics and outcome across categories of Total Care Score
179 (TCS) revealed significant differences in age, pre-admission residence, survival at 30- and
180 120-days, discharge destination, and length of stay (**Table 3**).

181
182 Low TCS was associated with a significantly increased $MORT_{30}$ and $MORT_{120}$ (OR 3.58,
183 95% CI 1.75 to 7.32, $p<0.0001$ & OR 2.01, 95% CI 1.28 to 3.12, $p=0.003$ respectively), and a
184 significantly lower probability of LOS_{short} (OR 0.58, 95% CI 0.42 to 0.78, $p<0.0001$). Low
185 TCS was also associated significantly with an increased likelihood of $DEST_{other}$ (OR 1.63,
186 95% CI 1.12 to 2.36, $p<0.01$) (**Table 4**).

187

188 **Discussion**

189 **Hip fracture is an important source of morbidity and mortality, with a threefold higher**
190 **age- and sex-standardised mortality rate compared to that of the general population⁹.**

191 **The incidence of hip fracture is rising due to the ageing population¹⁰, placing increasing**
192 **pressures on healthcare systems. The Scottish Standards of Care for Hip Fracture**
193 **Patients (SSCHFP) were introduced in 2014 to ensure a consistently high standard of**
194 **care across all hospitals managing hip fracture.**

195

196 This study found a significant association between cumulative attainment of the SSCHFP and
197 reduced 30- & 120-day mortality, increased likelihood of a short length of admission,
198 and higher probability of discharge to a destination equivalent to the pre-fracture level
199 of care. Analysis of individual care variables through multiple regression indicates that
200 the impact of the standards as a whole is greater than the sum of the parts, and
201 highlights the importance of a multidisciplinary team approach to the care of hip
202 fracture patients.

203

204 **The association between prompt physiotherapy and greater likelihood of discharge to a**
205 **favourable destination highlights the importance of early mobilisation of patients to**
206 **reduce the requirement for further care in a rehabilitation unit.**

207

208 **Adherence to the SSCHFP was reasonably good, with the exception of fluid and food**
209 **fasting times (both of which are associated with increased post-operative mortality¹¹),**
210 **and the Emergency Department Big Six bundle (completion of which was achieved in**
211 **only 10.1%, which represents an area deserving of further research).**

212

213 **The demographic characteristics of the patients captured were consistent with expected**
214 **patterns of hip fracture in the U.K., and with the findings of similar studies^{3, 12, 13},**
215 **making these findings relevant and generalisable. A number of factors which predict**
216 **hip fracture mortality have previously been described in the literature, including:**
217 **patient age; ASA grade; pre-fracture mobility; gender, and hip fracture type^{7, 14}.**

218 **Unfortunately, these variables are non-modifiable and therefore cannot be altered by**
219 **medical interventions. Previous studies related to the U.K. National Hip Fracture**
220 **Database have demonstrated an association between national audit, management**
221 **guidelines, and reduction in mortality, however these data were obtained through**
222 **indirect methods².**

223

224 **Our finding that cumulative attainment of care standards confers a clinical benefit that**
225 **is greater than the sum of its parts reflects an increasing recognition of the importance**
226 **of ‘marginal gains’ in healthcare, and the involvement of a multidisciplinary team of**
227 **specialists is the clinical manifestation of this philosophy. The importance of**

228 **geriatrician input in the management of complex elderly hip fracture patients supports**
229 **the findings of previous studies^{15, 16}. Absence of urinary catheterisation was associated**
230 **significantly with improved outcomes, and although catheterisation is often a marker of**
231 **frailty, previous evidence supports avoidance of its routine use in hip fracture¹⁷⁻²⁰.**

232

233 There are a number of strengths to this study. To our knowledge, it is the only direct
234 assessment of a set of nationally-agreed clinical standards for hip fracture management with
235 respect to patient outcome measures. **Although this study is observational, it is unlikely**
236 **that randomized controlled trials would be a suitable means of assessing these care**
237 **quality and outcome relationships, and any such attempt is unlikely to be sufficiently**
238 **inclusive to be generalisable to a real-world population. This study therefore represents**
239 **the best available evidence in this setting. The prospective collection of data avoids the**
240 **bias of case ascertainment associated with most retrospective cohort or case-control**
241 **studies. Compliance to care standards was determined by auditors performing data**
242 **collection and not by the study authors. These individuals were independent of our**
243 **research group and were working within the framework of a national health institution**
244 **with the purpose of improving the quality of care provided to patients.** The follow-up
245 rate was high (92%) ensuring fair capture of all outcomes; data collection was at individual
246 patient level, and the case-by-case recruitment method limited inaccuracies. The study cohort
247 was recruited nationally across 21 hospitals, thus our findings are representative of the
248 general population and are applicable to other populations with similar demographics. **The**
249 **study highlights areas of interest for future research, such as the role of the individual**
250 **ED interventions, and the effects of prolonged fasting on recovery and outcome.** Since
251 we reported care standard and outcome relationship, the findings are likely to be
252 generalisable and applicable to global populations.

253

254 We were unable to control for any known or unknown confounders due to the retrospective
255 nature of the analysis. The type of data collection also means that inferences from the study
256 can only be interpreted on a national level. **Further prospective studies are required to**
257 **better understand and gain deeper insight into the impact of case-mix and individual**
258 **patient level prognostic factors, including pre-admission performance status and**
259 **specific details pertaining to operative management. This approach will allow to**
260 **estimate the effects of the SSCHFP on an individual patient level.** The assessment of the
261 impact of care standards on patient outcome has significant policy implications. **This study**
262 **provides useful initial data pertaining to the effects of the SSCHFP on patient outcome.**
263 **Further research is required in order to confirm our findings in an independent dataset**
264 **prior to internal and external validation.**

265

266 **Cumulative attainment of the Scottish Standards of Care for Hip Fracture Patients is**
267 **associated with better patient outcomes. The higher level of compliance to the care**
268 **standards was associated with lower mortality at 30 and 120 days, shorter length of**
269 **acute orthopaedic admission, and a greater probability of discharged to a destination**
270 **equivalent to the pre-fracture level of care. Furthermore, a multidisciplinary approach**
271 **to care, with early geriatrician and allied health professional involvement, was**
272 **associated with favourable outcomes.**

273

274 **Our findings provide the best evidence currently available to clinicians, service**
275 **commissioners, and healthcare improvement agencies that the SSCHFP are clinically**
276 **beneficial and represent a benchmark by which to organize the optimal management of**
277 **hip fracture patients globally.**

278 **References**

- 279 1. Scottish Standards of Care for Hip Fracture Patients. 2014. 05/02/2017. Available
280 from:
281 <http://www.qihub.scot.nhs.uk/media/581060/scottish%20standards%20of%20care%20for%20hip%20fracture%20patients%20-%20consultation%20version%20-%20may%2014.pdf>.
282
- 283 2. Neuburger J, Currie C, Wakeman R, Johansen A, Tsang C, Plant F, et al. Increased
284 orthogeriatrician involvement in hip fracture care and its impact on mortality in England. Age
285 Ageing. 2016 Dec 02;46(2):187-92.
- 286 3. Audit of Care Pathways for Hip Fracture Patients in Scotland December 2012 to
287 March 2013. 2013. 06/02/2017. Available from:
288 <http://www.qihub.scot.nhs.uk/media/517649/audit%20of%20care%20pathways%20for%20hip%20fracture%20patients%20in%20scotland.pdf>.
289
- 290 4. SHFA Audit Guidelines and Definitions. 2016. Available from:
291 http://www.shfa.scot.nhs.uk/docs/20161031_SHFA_Audit_Guidelines_and_Definitions_V1_0.pdf.
292
- 293 5. Holt G, Smith R, Duncan K, Hutchison JD, Gregori A. Gender differences in
294 epidemiology and outcome after hip fracture: evidence from the Scottish Hip Fracture Audit.
295 J Bone Joint Surg Br. 2008 Apr;90(4):480-3.
- 296 6. Holt G, Smith R, Duncan K, Hutchison JD, Gregori A. Epidemiology and outcome
297 after hip fracture in the under 65s-evidence from the Scottish Hip Fracture Audit. Injury.
298 2008 Oct;39(10):1175-81.
- 299 7. Holt G, Smith R, Duncan K, Finlayson DF, Gregori A. Early mortality after surgical
300 fixation of hip fractures in the elderly: an analysis of data from the scottish hip fracture audit.
301 J Bone Joint Surg Br. 2008 Oct;90(10):1357-63.

- 302 8. Johnston AT, Barnsdale L, Smith R, Duncan K, Hutchison JD. Change in long-term
303 mortality associated with fractures of the hip: evidence from the scottish hip fracture audit. *J*
304 *Bone Joint Surg Br.* 2010 Jul;92(7):989-93.
- 305 9. Panula J, Pihlajamaki H, Mattila VM, Jaatinen P, Vahlberg T, Aarnio P, et al.
306 Mortality and cause of death in hip fracture patients aged 65 or older: a population-based
307 study. *BMC Musculoskelet Disord.* 2011 May 20;12:105.
- 308 10. Baker PN, Salar O, Ollivere BJ, Forward DP, Weerasuriya N, Moppett IK, et al.
309 Evolution of the hip fracture population: time to consider the future? A retrospective
310 observational analysis. *BMJ Open.* 2014 Apr 19;4(4):e004405.
- 311 11. Pedersen AB, Christiansen CF, Gammelager H, Kahlert J, Sorensen HT. Risk of acute
312 renal failure and mortality after surgery for a fracture of the hip: a population-based cohort
313 study. *Bone Joint J.* 2016 Aug;98-B(8):1112-8.
- 314 12. Campbell AJ, Reinken J, Allan BC, Martinez GS. Falls in old age: a study of
315 frequency and related clinical factors. *Age Ageing.* 1981 Nov;10(4):264-70.
- 316 13. Close J, Ellis M, Hooper R, Glucksman E, Jackson S, Swift C. Prevention of falls in
317 the elderly trial (PROFET): a randomised controlled trial. *Lancet.* 1999 Jan 09;353(9147):93-
318 7.
- 319 14. Smith T, Pelpola K, Ball M, Ong A, Myint PK. Pre-operative indicators for mortality
320 following hip fracture surgery: a systematic review and meta-analysis. *Age Ageing.* 2014
321 Jul;43(4):464-71.
- 322 15. Gosch M, Hoffmann-Weltin Y, Roth T, Blauth M, Nicholas JA, Kammerlander C.
323 Orthogeriatric co-management improves the outcome of long-term care residents with
324 fragility fractures. *Arch Orthop Trauma Surg.* 2016 Oct;136(10):1403-9.

- 325 16. Grigoryan KV, Javedan H, Rudolph JL. Orthogeriatric care models and outcomes in
326 hip fracture patients: a systematic review and meta-analysis. *J Orthop Trauma*. 2014
327 Mar;28(3):e49-55.
- 328 17. Cumming D, Parker MJ. Urinary catheterisation and deep wound infection after hip
329 fracture surgery. *Int Orthop*. 2007 Aug;31(4):483-5.
- 330 18. Lisk R, Yeong K. Reducing mortality from hip fractures: a systematic quality
331 improvement programme. *BMJ Qual Improv Rep*. 2014;3(1).
- 332 19. Stephan F, Sax H, Wachsmuth M, Hoffmeyer P, Clergue F, Pittet D. Reduction of
333 urinary tract infection and antibiotic use after surgery: a controlled, prospective, before-after
334 intervention study. *Clin Infect Dis*. 2006 Jun 01;42(11):1544-51.
- 335 20. Ollivere BJ, Kurien T, Morris C, Forward DP, Moran CG. Post-operative urinary tract
336 infection results in higher rates deep infection in patients with proximal femoral fractures.
337 2013. 06/02/2017; 95-B((SUPP 1)): [133 p.]. Available from:
338 http://www.bjjprocs.boneandjoint.org.uk/content/95-B/SUPP_1/133.

Acknowledgements

The authors acknowledge the contribution of Jane Campbell to the creation of the above manuscript through her work in the delivery of the Scottish national hip fracture audit.

Disclosure

"Competing interests: All authors have completed the ICMJE uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare: no support from any organisation for the submitted work; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; no other relationships or activities that could appear to have influenced the submitted work."

The lead author affirms that the manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

Table 1 - Comparative Sample characteristics of those receiving optimum & sub-optimal care according to the Scottish Standards of Care for Hip Fracture Patients

Variable	Optimum care			Sub-optimal care			P Value
	Total n = (%)	Men n =	Women n =	Total n = (%)	Men n =	Women n =	
Discharge planning within 48 hours from admission	239 (20.7)	57 (18.3)	182 (21.7)	913 (79.3)	255 (81.7)	658 (78.3)	0.21
Time in ED <2 hours	165 (16.2)	49 (18.2)	116 (15.4)	855 (83.8)	220 (81.8)	635 (84.6)	0.29
Analgesia given in ED	956 (94.1)	250 (93.6)	706 (94.3)	60 (5.9)	17 (6.4)	43 (5.7)	0.71
All six of big six ED bundle complete*	103 (10.1)	24 (23.3)	79 (10.6)	913 (89.9)	244 (91.0)	669 (89.4)	0.46
All inpatient assessment bundle complete within 24 hours**	686 (59.9)	188 (60.5)	498 (59.7)	459 (40.1)	123 (39.5)	336 (40.3)	0.82
Geriatric input within 48 hours from admission	276 (26.6)	80 (27.6)	196 (26.2)	763 (73.4)	210 (72.4)	553 (73.8)	0.64
Period of pre-operative fasting ≤ 10 hours	277 (24.7)	67 (22.0)	210 (25.7)	843 (75.3)	237 (78.0)	606 (74.3)	0.21
PT review by end of first post-operative day	779 (69.3)	206 (67.3)	573 (70)	345 (30.7)	100 (32.7)	245 (30.0)	0.38
No catheterisation	453 (40.3)	138 (46.3)	315 (38.2)	672 (59.7)	162 (54.0)	510 (61.8)	0.02
Time to theatre within 48 hours of admission	919 (89.8)	239 (90.2)	680 (89.7)	104 (10.2)	26 (9.8)	78 (10.3)	0.82
Length oral fluids withheld pre-operatively <4 hours	216 (19.4)	55 (18.2)	161 (19.9)	896 (80.6)	247 (81.8)	649 (80.1)	0.55
OT review by end of third post-operative day	467 (42.3)	109 (36.5)	358 (44.4)	638 (57.7)	190 (63.5)	448 (55.6)	0.02

Number presented are N(%) for categorical variables. * Big six ED bundle includes: Analgesia given; blood tests performed; optimisation of fluid balance; pressure area assessment; vital signs recorded and delirium screening. ** Inpatient assessment bundle includes: formal cognitive assessment; fluid, food and nutrition assessment; pressure area assessment (Waterlow scoring); falls risk assessment; MDT care

Table 2

Table 2 – Bivariate outcome data for those receiving each care standard compared with not receiving the same care, including confounders (1st column) and then multiple regression of forward selected variables (2nd column)

	30-day mortality				120-day mortality				Acute Orthopaedic length of stay below median				Discharge destination not home/sheltered			
	Column 1		Column 2		Column 1		Column 2		Column 1		Column 2		Column 1		Column 2	
	BR OR (95% CI)	p-value	MR OR (95% CI)	p-value	BR OR (95% CI)	p-value	MR OR (95% CI)	p-value	BR OR (95% CI)	p-value	MR OR (95% CI)	p-value	MR OR (95% CI)	p-value	MR OR (95% CI)	p-value
Discharge planning within 48 hours from admission	0.71 (0.39 to 1.27)	0.25			0.76 (0.50 to 1.13)	0.18			0.96 (0.72 to 1.28)	0.79			1.43 (1.03 to 1.99)	0.03	1.64 (1.04 to 2.62)	0.04
Time in ED <2 hours	0.67 (0.33 to 1.38)	0.28			0.88 (0.54 to 1.41)	0.60			1.16 (0.83 to 1.62)	0.39			0.70 (0.49 to 0.99)	0.04	0.64 (0.39 to 1.06)	0.09
Analgesia given in ED	0.72 (0.30 to 1.73)	0.47			0.81 (0.41 to 1.60)	0.54			1.29 (0.76 to 2.18)	0.34			0.94 (0.53 to 1.65)	0.82		
All six of big six ED bundle complete*	1.05 (0.49 to 2.26)	0.90			0.79 (0.43 to 1.45)	0.44			1.17 (0.78 to 1.76)	0.46			1.67 (1.03 to 2.71)	0.04	1.32 (0.70 to 2.49)	0.39
All inpatient assessment bundle complete within 24 hours**	0.87 (0.62 to 1.50)	0.87			1.10 (0.80 to 1.51)	0.57			1.30 (1.03 to 1.65)	0.03	1.30 (0.99 to 1.71)	0.06	1.13 (0.87 to 1.47)	0.35		
Geriatric input within 48 hours from admission	0.70 (0.40 to 1.23)	0.22			0.92 (0.64 to 1.33)	0.66			1.36 (1.03 to 1.80)	0.03	1.32 (0.97 to 1.80)	0.07	1.75 (1.26 to 2.44)	0.001	1.27 (0.84 to 1.91)	0.25
Period of pre-operative fasting ≤ 10 hours	1.19 (0.70 to 2.04)	0.52			1.30 (0.90 to 1.87)	0.16			1.14 (0.87 to 1.50)	0.35			0.88 (0.66 to 1.18)	0.38		
PT review by end of first post-operative day	0.68 (0.41 to 1.10)	0.12			0.74 (0.53 to 1.04)	0.09			1.27 (0.99 to 1.64)	0.07	1.11 (0.83 to 1.48)	0.47	0.60 (0.45 to 0.81)	0.001	0.64 (0.44 to 0.98)	0.04

Absence of Catheterisation	0.54 (0.32 to 0.92)	0.02	0.60 (0.34 to 1.09)	0.09	0.52 (0.37 to 0.74)	<0.001	0.58 (0.38 to 0.88)	0.01	1.50 (1.18 to 1.90)	0.001	1.45 (1.10 to 1.92)	0.008	0.45 (0.34 to 0.58)	<0.001	0.66 (0.46 to 0.94)	0.02
Time to theatre within 48 hours of admission	0.86 (0.38 to 1.94)	0.72			1.20 (0.66 to 2.22)	0.54			1.39 (0.92 to 2.08)	0.12			0.63 (0.39 to 1.02)	0.06	0.91 (0.48 to 1.70)	0.76
Length oral fluids withheld pre-operatively <4 hours	0.51 (0.24 to 1.08)	0.08			0.69 (0.44 to 1.09)	0.87			1.20 (0.89 to 1.62)	0.22			0.64 (0.47 to 0.88)	0.005	0.66 (0.44 to 1.00)	0.05
OT review by end of third post-operative day	0.26 (0.14 to 0.50)	<0.001	0.36 (0.19 to 0.69)	0.002	0.36 (0.25 to 0.53)	<0.001	0.60 (0.38 to 0.94)	0.03	1.02 (0.80 to 1.30)	0.86			0.26 (0.20 to 0.34)	<0.001	0.34 (0.23 to 0.48)	<0.001
Younger age	0.77 (0.67 to 0.87)	<0.001	0.76 (0.65 to 0.90)	0.001	0.76 (0.70 to 0.84)	<0.001	0.78 (0.69 to 0.88)	<0.001	1.08 (1.02 to 1.14)	0.006	1.11 (1.02 to 1.21)	0.01	0.66 (0.62 to 0.71)	<0.001	0.70 (0.63 to 0.78)	<0.001
Sex = Female	0.71 (0.48 to 1.12)	0.14			0.70 (0.50 to 0.97)	0.03	0.61 (0.41 to 0.91)	0.02	1.22 (0.94 to 1.58)	0.14			1.09 (0.82 to 1.45)	0.56		
Residence prior to admission = Home/Sheltered	0.56 (0.35 to 0.92)	0.02			0.34 (0.24 to 0.48)	<0.001	0.52 (0.35 to 0.80)	0.002	0.51 (0.38 to 0.68)	<0.001	0.39 (0.28 to 0.55)	<0.001	N/A	N/A		

BR = Bivariate regression, MR = Multiple regression; OR = Odds ratio; 95% CI = 95% Confidence interval. Discharge destination = discharge destination from acute orthopaedic unit: Home/Sheltered housing vs. other (e.g. further rehab, NHS continuing care). * Big six ED bundle includes: Analgesia given; blood tests performed; optimisation of fluid balance; pressure area assessment; vital signs recorded and delirium screening. ** Inpatient assessment bundle includes: formal cognitive assessment; fluid, food and nutrition assessment; pressure area assessment (Waterlow scoring); falls risk assessment; MDT care

Table 3 - Comparison of characteristics of patients and outcome categories across total care variable score (TCS) categories in the Scottish National Hip Fracture Audit (year 2014-2015)

	TCS Score	1-4 N= (%)	5-6 N= (%)	≥7 N= (%)	p-value
Age					
<75		51 (35)	73 (50)	21 (15)	0.002
75-84		110 (38)	149 (52)	28 (10)	
≥85		163 (51)	129 (41)	26 (8)	
Sex					
Male		77 (40)	100 (52)	16 (8)	0.25
Female		247 (44)	251 (45)	59 (11)	
Weekday admission?					
Yes		205 (45)	213 (47)	37 (8)	0.84
No		119 (40)	138 (47)	38 (13)	
Pre-fracture residence					
Home/Sheltered		228 (40)	283 (49)	66 (11)	0.0001
Other		93 (56)	64 (39)	8 (5)	
Alive at 30 days post admission					
No		33 (72)	12 (26)	1 (2)	<0.0001
Yes		287 (41)	337 (49)	70 (10)	
Alive at 120 days post admission					
No		61 (60)	36 (36)	4 (4)	0.001
Yes		259 (41)	313 (49)	67 (10)	
Discharge level of care					
Home/Sheltered		229 (48)	207 (43)	46 (9)	<0.0001
Other		71 (30)	136 (58)	28 (12)	
Length of stay in acute care					
Below median		143 (38)	189 (50)	48 (12)	0.002
Above median		181 (49)	162 (44)	27 (7)	
Length of stay in Hospital					
Below median		157 (39)	204 (51)	41 (10)	0.04
Above median		167 (48)	147 (42)	34 (10)	

Table 4 – Adjusted odds ratios and corresponding 95% CI for each selected outcome for low total care variable score (TCS) category (TCS 1-4) compared with categories 2 & 3 (TCS ≥5) (reference category)

Outcome	Odds ratio	95% CI	P Value
30 day mortality	3.58	1.75 to 7.32	<0.0001
120 day mortality	2.01	1.28 to 3.12	0.003
Length of acute orthopaedic stay (LOS) shorter than median	0.58	0.42 to 0.78	<0.0001
Discharge destination not Home/Sheltered	1.63	1.12 to 2.36	0.01

Values adjusted for age, sex and location of residence prior to admission.

CME Questions Submission Form

Enter all questions on this form. A total of **3 multiple-choice** questions are required. Please review the [Guidelines for Creation of CME Questions](#) in the Author Resource Center section of the JBJS website before submitting your questions.

Manuscript number: JBJS-D-17-00884

Article title: Quality of care in hip fracture patients - does compliance to national standards relate to improved outcomes?

Question 1

I. Does this question have an associated image or images?

- Yes No

(If YES – upload image(s) separately using the “CME Question Figure” item option in the Attach Files screen of Editorial Manager. Include a one to two sentence description of each figure here. All figures should be at least 5x7 inches with a resolution of 300 ppi.)

II. **Question:** (A patient-care scenario is preferred when appropriate; see *Guidelines* link above)

Increased compliance to the Scottish Standards of Care for Hip Fracture Patients (SSCHFP) was associated with which improved outcomes?

III. **Options:** *(In alphabetical or logical order. Please do not use “all of the above” or “none of the above” as potential answer choices.)*

A.	Improved 30 & 120 day mortality
B.	Improved 120 day mortality and reduced length of stay
C.	Reduced length of stay and lower likelihood of discharge to a high care destination
D.	Improved 30 day mortality, reduced length of stay and lower likelihood of discharge to a high care destination
E.	Improved 30 & 120 day mortality, reduced length of stay and lower likelihood of discharge to a high care destination

IV. **Answer:** (must be *clearly* the best of the options)

- A. B. C. D. E.

V. Correct Answer Location: Please identify the manuscript section where the correct answer is located (e.g. "Results" or "Discussion")

Results Paragraph 1

VI. Supporting Statement: Please include one sentence from the section identified above supporting the correct answer.

We found a significant association between cumulative attainment of the Scottish Standards of Care for Hip Fracture Patients (SSCHFP) and reduced MORT₃₀ & MORT₁₂₀, increased likelihood of LOS_{short}, and lower probability of discharge DEST_{other}

Question 2

V. Does this question have an associated image or images?

Yes No

(If YES – upload image(s) separately using the "CME Question Figure" item option in the Attach Files screen of Editorial Manager. Include a one to two sentence description of each figure here. All figures should be at least 5x7 inches with a resolution of 300 ppi.)

VI. **Question:** (A patient-care scenario is preferred when appropriate; see *Guidelines* link above)

Prompt post-operative physiotherapy was associated with which improved outcome?

VII. **Options:** (In alphabetical or logical order. **Please do not use "all of the above" or "none of the above" as potential answer choices.**)

A.	Reduced 30 day mortality
B.	Reduced 120 day mortality
C.	Shorter length of acute orthopaedic stay
D.	Increased chance of discharge to home or sheltered accomodation
E.	

VIII. **Answer:** (must be *clearly* the best of the options)

A. B. C. D. E.

V. **Correct Answer Location:** Please identify the manuscript section where the correct answer is located (e.g. "Results" or "Discussion")

Discussion paragraph 3

VI. **Supporting Statement:** Please include one sentence from the section identified above supporting the correct answer.

The link between prompt physiotherapy and greater likelihood of a better discharge destination highlights the importance of early mobilisation of patients to reduce chance of needing further care in a rehabilitation unit
--

Question 3

IX. Does this question have an associated image or images?

Yes

No

(If YES – upload image(s) separately using the “CME Question Figure” item option in the Attach Files screen of Editorial Manager. Include a one to two sentence description of each figure here. All figures should be at least 5x7 inches with a resolution of 300 ppi.)

X. **Question:** (A patient-care scenario is preferred when appropriate; see *Guidelines* link above)

Which of the 12 assessed Scottish Standards of Care for Hip Fracture Patients had the poorest compliance?

XI. **Options:** (In alphabetical or logical order. **Please do not use “all of the above” or “none of the above” as potential answer choices.**)

A.	Discharge planning within 48 hours from admission
B.	Geriatric input within 48 hours from admission
C.	All six of big six ED bundle complete
D.	Time to theatre within 48 hours of admission
E.	Length oral fluids withheld pre-operatively <4 hours

XII. **Answer:** (must be *clearly* the best of the options)

A.

B.

C.

D.

E.

V. **Correct Answer Location:** Please identify the manuscript section where the correct answer is located (e.g. “Results” or “Discussion”)

Table 1

VI. **Supporting Statement:** Please include one sentence from the section identified above supporting the correct answer.

Total receiving optimum care for all six of big six ED bundle complete = 10.1%



The Journal of Bone & Joint Surgery
The Journal of Bone and Joint Surgery, Inc.
20 Pickering St., Needham, MA 02492-3157, USA

Copyright Transfer and Author Agreement

In consideration of the review and/or editing by The Journal of Bone and Joint Surgery, Inc. (“JBJS, Inc.”) of the material submitted for publication in *The Journal of Bone & Joint Surgery* (“JBJS”) entitled
Quality of care in hip fracture patients – does compliance to national standards relate to improved outcomes?

(the “Work”) by the undersigned one or more person(s) (the “Author(s)”), the Author(s) hereby agree as follows:

AUTHORS: PLEASE READ CAREFULLY - DO NOT BE GUILTY OF FRAUD OR DUPLICATE SUBMISSION OR PUBLICATION – CONTACT THE EDITORIAL OFFICE BEFORE SIGNING IF YOU HAVE ANY QUESTIONS!

NOTE: IF YOU PROVIDE JBJS, INC. WITH VIDEOS ASSOCIATED WITH THE WORK, YOU MUST ALSO COMPLETE AND SIGN JBJS INC.’S VIDEO LICENSE AGREEMENT, WHICH WILL SUPPLEMENT AND BECOME A PART OF THIS AGREEMENT.

1. a. Each of the Author(s) hereby transfers, assigns and otherwise conveys to JBJS, Inc. all right, title and interest in the Work, including but not limited to any and all copyright(s) therein held by each undersigned Author, together with any rights of each such Author to secure renewals, reissues and extensions of such copyright that may be secured under the laws now or hereafter in force and effect in the United States or in any other country, and any and all rights to bring any court or other action to obtain damages, or injunctive or other relief, in connection with any past, present or future infringement of such copyright(s) or other claim in connection therewith.

b. **NOTE:** If the article is accepted, the Author(s) shall have the right to elect to have it published according to the **open-access** model, which provides the public with free unrestricted online access to the article on the JBJS web site immediately upon publication. If the Author(s) choose the open-access option and pay the applicable article processing charge, the Author(s) will retain the copyright to the article by signing, and uploading to the JBJS manuscript submission system, the Wolters Kluwer Open Access License Agreement (the “Open Access License”). The Open Access License grants JBJS, Inc. and its publishing partner Wolters Kluwer the exclusive license to publish the article and to identify themselves as the original publisher. The Open Access License supersedes and replaces Section 1.a of this Agreement and the article is published under the terms of the Creative Commons license designated in the Open Access License.

UNITED STATES GOVERNMENT EMPLOYEES. Check this “United States Government Employees” option if the Work or a portion of it has been prepared by any Author (a) who is an employee of the United States Government and (b) as part of such Author’s official employment duties. A work prepared by an employee of the United States Government as part of his or her official duties is called a “work of the United States Government” and is not subject to copyright protection. If it is not prepared as part of the employee’s official duties, it may be subject to copyright protection. Therefore, if this “United States Government Employees” option is checked, the Work will be published with the following legend: “Written work prepared by employees of the Federal Government as part of their official duties is, under the United States Copyright Act, a ‘work of the United States Government’ for which copyright protection under that Act is not available. As such, copyright protection does not extend to the contributions of employees of the Federal Government prepared as part of their employment.”

2. Each of the Author(s) hereby also grants permission to JBJS, Inc. to use such Author’s name and likeness in

connection with any past, present or future promotional activity by JBJS, Inc., including, but not limited to, promotions for upcoming issues or publications, circulation solicitations, advertising or other publications in connection with JBJS, Inc.

3. Each of the Author(s) hereby warrants, represents and covenants that (i) each of the Author(s) has read and approved the final manuscript or version of the Work; (ii) the Work is original; (iii) the Author(s) are the sole owners of all rights of any kind in the Work; (iv) the Work has not been previously published and is not under consideration for publication by any person or entity, including electronic publishers, other than *The Journal of Bone & Joint Surgery*, and that the Author(s) have not previously transferred, assigned or conveyed, or agreed to transfer, assign or convey, any rights in connection with the Work to any person or entity other than JBJS, Inc.; (v) the Work is not libelous, and the publication of the Work will not infringe upon or misappropriate any copyright, right to privacy, trade secret, proprietary or any other right of any person or other entity; and (vi) any and all necessary approvals, consents, waivers or permissions from third parties in connection with the Work and its publication have been obtained, and that the Author(s) will deliver copies of the same to JBJS, Inc. upon its request. Upon the request of the Editor-in-Chief of JBJS, Inc., the author(s) will provide to JBJS, Inc., in a timely fashion, any or all of the data, facts and information included in or forming the basis for the Work (the "Data"); JBJS, Inc. shall have the right to use (and to permit others to use) the Data in reviewing and/or editing the Work and for any other purpose other than the creation or publication of any other work based exclusively on the Data.

4. To enable Author(s) to comply with the requirements of outside funding bodies, JBJS, Inc. will deposit, into the PubMed Central (PMC) Archive, the final published version of any article identified as requiring such deposit below. PMC will make these articles freely available after an embargo period of 12 months, 6 months (Wellcome Trust only), or immediately upon publication (if the Author(s) choose the open-access option).

Please disclose below if you have received funding for research on which your article is based from any of the following organizations. JBJS, Inc. will not be held responsible for retroactive deposits to PMC if the Author(s) do not identify the funding agency below.

- | | |
|---|--|
| <input type="checkbox"/> National Institutes of Health (NIH) | <input type="checkbox"/> Wellcome Trust |
| <input type="checkbox"/> Howard Hughes Medical Institute (HHMI) | <input type="checkbox"/> Research Councils UK (RCUK) |
| <input type="checkbox"/> Other funding body requiring deposit in repository offering free access after embargo (please list): | |


5. Each of the Author(s) hereby releases and shall indemnify and hold harmless JBJS, Inc. and its successors, assigns, licensees, officers, directors, employees, and their respective heirs and representatives from and against any and all liabilities, losses, damages and expenses arising out of any claims of any kind that may be asserted against any of them based in whole or in part on any breach of the Author(s)' representations or warranties herein or in the Work or anything contained in the Work, including but not limited to any claims for copyright infringement or violation of any rights of privacy or publicity.

6. Nothing in this Agreement shall constitute any promise by or obligation of *The Journal of Bone & Joint Surgery* or JBJS, Inc. to publish the Work, or any portions thereof, at any time in any publication of JBJS, Inc. However, if at any time *The Journal of Bone & Joint Surgery* finally elects not to publish the Work, JBJS, Inc. shall reconvey to the Author(s), without any representation, warranty or recourse, all of JBJS, Inc.'s rights in the Work under Section 1 hereof at the time of such reconveyance and shall notify the Author(s) of such election and reconveyance; the provisions of section 3 hereof shall survive such reconveyance, and in no event shall *The Journal of Bone & Joint Surgery* or JBJS, Inc. have any obligation to return to any Author the manuscript or any other copy(ies) or embodiment(s) of the Work or the Data delivered to JBJS, Inc. by the Author(s) or made by JBJS, Inc.

7. This Copyright Transfer and Author Agreement shall be governed by Massachusetts law. In the unlikely event that the parties hereto are unable amicably to resolve any dispute arising under or in connection with this Agreement, such dispute shall be adjudicated in an appropriate state or federal court in Boston, Massachusetts.

NOTE: Handwritten, DocuSigned, digitally verified Adobe, or similar signatures only. Digital signatures must display certification if printed. No other form of electronic or stamped signature is acceptable.

Authors are permitted to sign separate forms as long as each form is completed in its entirety.

AUTHOR'S SIGNATURE: 
Name (please print): Andrew Hall DATE: 2nd July 2017

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

Upload this signed, completed form to the online submission site or email a scanned copy to editorial@jbjs.org.



THE JOURNAL
Excellence Through Peer Review

The Journal of Bone & Joint Surgery
The Journal of Bone and Joint Surgery, Inc.
20 Pickering St., Needham, MA 02492-3157, USA

Copyright Transfer and Author Agreement

In consideration of the review and/or editing by The Journal of Bone and Joint Surgery, Inc. ("JBJS, Inc.") of the material submitted for publication in *The Journal of Bone & Joint Surgery* ("JBJS") entitled

Quality of care in hip fracture patients – does compliance to national standards relate to improved outcomes?

(the "Work") by the undersigned one or more person(s) (the "Author(s)"), the Author(s) hereby agree as follows:

AUTHORS: PLEASE READ CAREFULLY - DO NOT BE GUILTY OF FRAUD OR DUPLICATE SUBMISSION OR PUBLICATION – CONTACT THE EDITORIAL OFFICE BEFORE SIGNING IF YOU HAVE ANY QUESTIONS!

NOTE: IF YOU PROVIDE JBJS, INC. WITH VIDEOS ASSOCIATED WITH THE WORK, YOU MUST ALSO COMPLETE AND SIGN JBJS INC.'S VIDEO LICENSE AGREEMENT, WHICH WILL SUPPLEMENT AND BECOME A PART OF THIS AGREEMENT.

1. a. Each of the Author(s) hereby transfers, assigns and otherwise conveys to JBJS, Inc. all right, title and interest in the Work, including but not limited to any and all copyright(s) therein held by each undersigned Author, together with any rights of each such Author to secure renewals, reissues and extensions of such copyright that may be secured under the laws now or hereafter in force and effect in the United States or in any other country, and any and all rights to bring any court or other action to obtain damages, or injunctive or other relief, in connection with any past, present or future infringement of such copyright(s) or other claim in connection therewith.

b. **NOTE:** If the article is accepted, the Author(s) shall have the right to elect to have it published according to the **open-access** model, which provides the public with free unrestricted online access to the article on the JBJS web site immediately upon publication. If the Author(s) choose the open-access option and pay the applicable article processing charge, the Author(s) will retain the copyright to the article by signing, and uploading to the JBJS manuscript submission system, the Wolters Kluwer Open Access License Agreement (the "Open Access License"). The Open Access License grants JBJS, Inc. and its publishing partner Wolters Kluwer the exclusive license to publish the article and to identify themselves as the original publisher. The Open Access License supersedes and replaces Section 1.a of this Agreement and the article is published under the terms of the Creative Commons license designated in the Open Access License.

UNITED STATES GOVERNMENT EMPLOYEES. Check this "United States Government Employees" option if the Work or a portion of it has been prepared by any Author (a) who is an employee of the United States Government and (b) as part of such Author's official employment duties. A work prepared by an employee of the United States Government as part of his or her official duties is called a "work of the United States Government" and is not subject to copyright protection. If it is not prepared as part of the employee's official duties, it may be subject to copyright protection. Therefore, if this "United States Government Employees" option is checked, the Work will be published with the following legend: "Written work prepared by employees of the Federal Government as part of their official duties is, under the United States Copyright Act, a 'work of the United States Government' for which copyright protection under that Act is not available. As such, copyright protection does not extend to the contributions of employees of the Federal Government prepared as part of their employment."

2. Each of the Author(s) hereby also grants permission to JBJS, Inc. to use such Author's name and likeness in

connection with any past, present or future promotional activity by JBJS, Inc., including, but not limited to, promotions for upcoming issues or publications, circulation solicitations, advertising or other publications in connection with JBJS, Inc.

3. Each of the Author(s) hereby warrants, represents and covenants that (i) each of the Author(s) has read and approved the final manuscript or version of the Work; (ii) the Work is original; (iii) the Author(s) are the sole owners of all rights of any kind in the Work; (iv) the Work has not been previously published and is not under consideration for publication by any person or entity, including electronic publishers, other than *The Journal of Bone & Joint Surgery*, and that the Author(s) have not previously transferred, assigned or conveyed, or agreed to transfer, assign or convey, any rights in connection with the Work to any person or entity other than JBJS, Inc.; (v) the Work is not libelous, and the publication of the Work will not infringe upon or misappropriate any copyright, right to privacy, trade secret, proprietary or any other right of any person or other entity; and (vi) any and all necessary approvals, consents, waivers or permissions from third parties in connection with the Work and its publication have been obtained, and that the Author(s) will deliver copies of the same to JBJS, Inc. upon its request. Upon the request of the Editor-in-Chief of JBJS, Inc., the author(s) will provide to JBJS, Inc., in a timely fashion, any or all of the data, facts and information included in or forming the basis for the Work (the "Data"); JBJS, Inc. shall have the right to use (and to permit others to use) the Data in reviewing and/or editing the Work and for any other purpose other than the creation or publication of any other work based exclusively on the Data.

4. To enable Author(s) to comply with the requirements of outside funding bodies, JBJS, Inc. will deposit, into the PubMed Central (PMC) Archive, the final published version of any article identified as requiring such deposit below. PMC will make these articles freely available after an embargo period of 12 months, 6 months (Wellcome Trust only), or immediately upon publication (if the Author(s) choose the open-access option).

Please disclose below if you have received funding for research on which your article is based from any of the following organizations. JBJS, Inc. will not be held responsible for retroactive deposits to PMC if the Author(s) do not identify the funding agency below.

National Institutes of Health (NIH)

Wellcome Trust

Howard Hughes Medical Institute (HHMI)

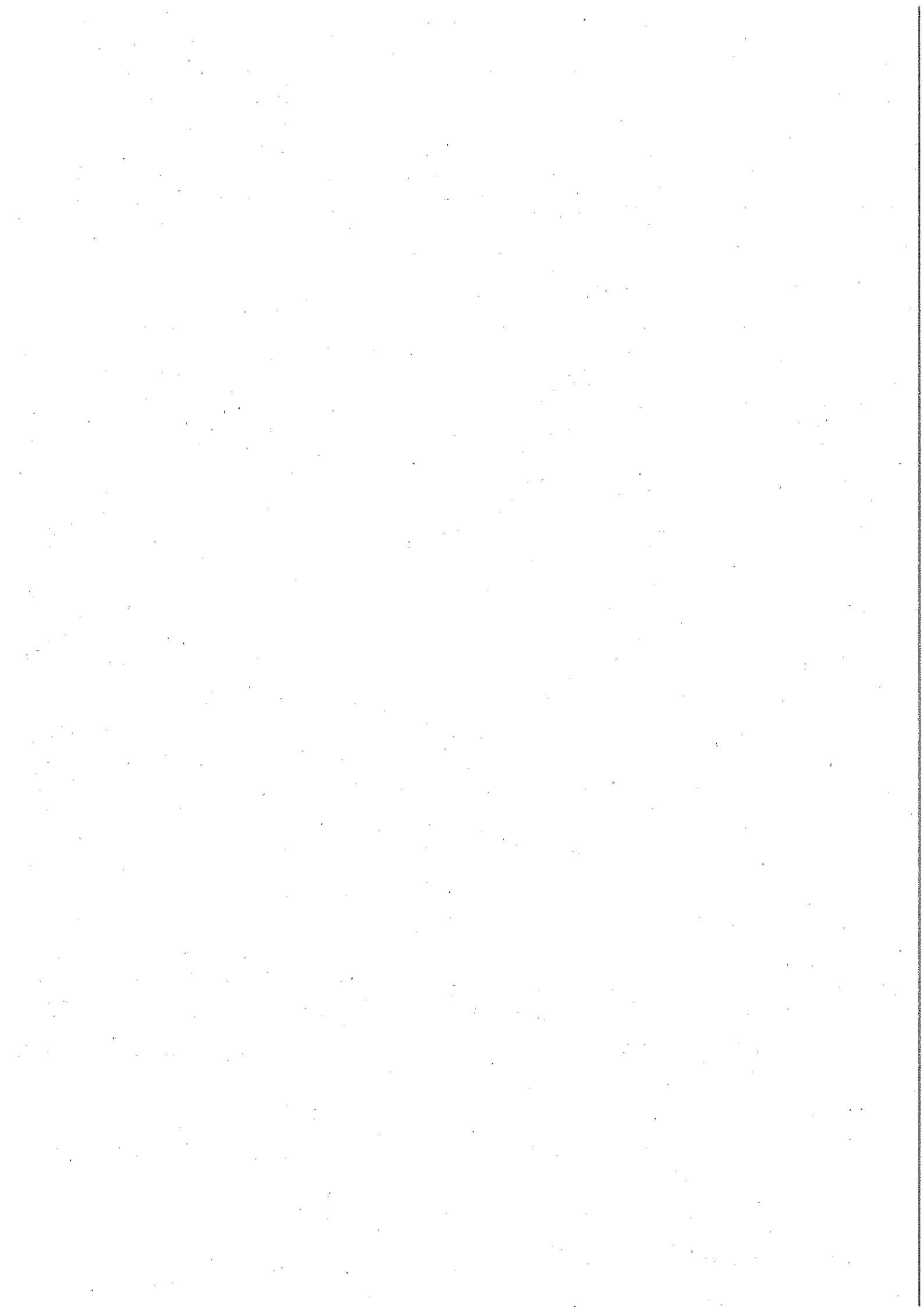
Research Councils UK (RCUK)

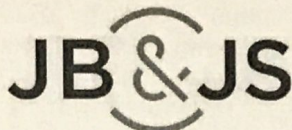
Other funding body requiring deposit in repository offering free access after embargo (please list):

5. Each of the Author(s) hereby releases and shall indemnify and hold harmless JBJS, Inc. and its successors, assigns, licensees, officers, directors, employees, and their respective heirs and representatives from and against any and all liabilities, losses, damages and expenses arising out of any claims of any kind that may be asserted against any of them based in whole or in part on any breach of the Author(s)' representations or warranties herein or in the Work or anything contained in the Work, including but not limited to any claims for copyright infringement or violation of any rights of privacy or publicity.

6. Nothing in this Agreement shall constitute any promise by or obligation of *The Journal of Bone & Joint Surgery* or JBJS, Inc. to publish the Work, or any portions thereof, at any time in any publication of JBJS, Inc. However, if at any time *The Journal of Bone & Joint Surgery* finally elects not to publish the Work, JBJS, Inc. shall reconvey to the Author(s), without any representation, warranty or recourse, all of JBJS, Inc.'s rights in the Work under Section 1 hereof at the time of such reconveyance and shall notify the Author(s) of such election and reconveyance; the provisions of section 3 hereof shall survive such reconveyance, and in no event shall *The Journal of Bone & Joint Surgery* or JBJS, Inc. have any obligation to return to any Author the manuscript or any other copy(ies) or embodiment(s) of the Work or the Data delivered to JBJS, Inc. by the Author(s) or made by JBJS, Inc.

7. This Copyright Transfer and Author Agreement shall be governed by Massachusetts law. In the unlikely event that the parties hereto are unable amicably to resolve any dispute arising under or in connection with this Agreement, such dispute shall be adjudicated in an appropriate state or federal court in Boston, Massachusetts.





THE JOURNAL
Excellence Through Peer Review

The Journal of Bone & Joint Surgery
The Journal of Bone and Joint Surgery, Inc.
20 Pickering St., Needham, MA 02492-3157, USA

Copyright Transfer and Author Agreement

In consideration of the review and/or editing by The Journal of Bone and Joint Surgery, Inc. ("JBJS, Inc.") of the material submitted for publication in *The Journal of Bone & Joint Surgery* ("JBJS") entitled

QUALITY OF CARE IN HIP FRACTURE PATIENTS - DOES COMPLIANCE TO NATIONAL STANDARDS RELATE TO IMPROVED OUTCOMES?

(the "Work") by the undersigned one or more person(s) (the "Author(s)"), the Author(s) hereby agree as follows:

AUTHORS: PLEASE READ CAREFULLY - DO NOT BE GUILTY OF FRAUD OR DUPLICATE SUBMISSION OR PUBLICATION - CONTACT THE EDITORIAL OFFICE BEFORE SIGNING IF YOU HAVE ANY QUESTIONS!

NOTE: IF YOU PROVIDE JBJS, INC. WITH VIDEOS ASSOCIATED WITH THE WORK, YOU MUST ALSO COMPLETE AND SIGN JBJS INC.'S VIDEO LICENSE AGREEMENT, WHICH WILL SUPPLEMENT AND BECOME A PART OF THIS AGREEMENT.

1. a. Each of the Author(s) hereby transfers, assigns and otherwise conveys to JBJS, Inc. all right, title and interest in the Work, including but not limited to any and all copyright(s) therein held by each undersigned Author, together with any rights of each such Author to secure renewals, reissues and extensions of such copyright that may be secured under the laws now or hereafter in force and effect in the United States or in any other country, and any and all rights to bring any court or other action to obtain damages, or injunctive or other relief, in connection with any past, present or future infringement of such copyright(s) or other claim in connection therewith.

b. **NOTE:** If the article is accepted, the Author(s) shall have the right to elect to have it published according to the **open-access** model, which provides the public with free unrestricted online access to the article on the JBJS web site immediately upon publication. If the Author(s) choose the open-access option and pay the applicable article processing charge, the Author(s) will retain the copyright to the article by signing, and uploading to the JBJS manuscript submission system, the Wolters Kluwer Open Access License Agreement (the "Open Access License"). The Open Access License grants JBJS, Inc. and its publishing partner Wolters Kluwer the exclusive license to publish the article and to identify themselves as the original publisher. The Open Access License supersedes and replaces Section 1.a of this Agreement and the article is published under the terms of the Creative Commons license designated in the Open Access License.

* **UNITED STATES GOVERNMENT EMPLOYEES.** Check this "United States Government Employees" option if the Work or a portion of it has been prepared by any Author (a) who is an employee of the United States Government and (b) as part of such Author's official employment duties. A work prepared by an employee of the United States Government as part of his or her official duties is called a "work of the United States Government" and is not subject to copyright protection. If it is not prepared as part of the employee's official duties, it may be subject to copyright protection. Therefore, if this "United States Government Employees" option is checked, the Work will be published with the following legend: "Written work prepared by employees of the Federal Government as part of their official duties is, under the United States Copyright Act, a 'work of the United States Government' for which copyright protection under that Act is not available. As such, copyright protection does not extend to the contributions of employees of the Federal Government prepared as part of their employment."

2. Each of the Author(s) hereby also grants permission to JBJS, Inc. to use such Author's name and likeness in

connection with any past, present or future promotional activity by JBJS, Inc., including, but not limited to, promotions for upcoming issues or publications, circulation solicitations, advertising or other publications in connection with JBJS, Inc.

3. Each of the Author(s) hereby warrants, represents and covenants that (i) each of the Author(s) has read and approved the final manuscript or version of the Work; (ii) the Work is original; (iii) the Author(s) are the sole owners of all rights of any kind in the Work; (iv) the Work has not been previously published and is not under consideration for publication by any person or entity, including electronic publishers, other than *The Journal of Bone & Joint Surgery*, and that the Author(s) have not previously transferred, assigned or conveyed, or agreed to transfer, assign or convey, any rights in connection with the Work to any person or entity other than JBJS, Inc.; (v) the Work is not libelous, and the publication of the Work will not infringe upon or misappropriate any copyright, right to privacy, trade secret, proprietary or any other right of any person or other entity; and (vi) any and all necessary approvals, consents, waivers or permissions from third parties in connection with the Work and its publication have been obtained, and that the Author(s) will deliver copies of the same to JBJS, Inc. upon its request. Upon the request of the Editor-in-Chief of JBJS, Inc., the author(s) will provide to JBJS, Inc., in a timely fashion, any or all of the data, facts and information included in or forming the basis for the Work (the "Data"); JBJS, Inc. shall have the right to use (and to permit others to use) the Data in reviewing and/or editing the Work and for any other purpose other than the creation or publication of any other work based exclusively on the Data.

4. To enable Author(s) to comply with the requirements of outside funding bodies, JBJS, Inc. will deposit, into the PubMed Central (PMC) Archive, the final published version of any article identified as requiring such deposit below. PMC will make these articles freely available after an embargo period of 12 months, 6 months (Wellcome Trust only), or immediately upon publication (if the Author(s) choose the open-access option).

Please disclose below if you have received funding for research on which your article is based from any of the following organizations. JBJS, Inc. will not be held responsible for retroactive deposits to PMC if the Author(s) do not identify the funding agency below.

National Institutes of Health (NIH)

Wellcome Trust

Howard Hughes Medical Institute (HHMI)

Research Councils UK (RCUK)

Other funding body requiring deposit in repository offering free access after embargo (please list):

5. Each of the Author(s) hereby releases and shall indemnify and hold harmless JBJS, Inc. and its successors, assigns, licensees, officers, directors, employees, and their respective heirs and representatives from and against any and all liabilities, losses, damages and expenses arising out of any claims of any kind that may be asserted against any of them based in whole or in part on any breach of the Author(s)' representations or warranties herein or in the Work or anything contained in the Work, including but not limited to any claims for copyright infringement or violation of any rights of privacy or publicity.

6. Nothing in this Agreement shall constitute any promise by or obligation of *The Journal of Bone & Joint Surgery* or JBJS, Inc. to publish the Work, or any portions thereof, at any time in any publication of JBJS, Inc. However, if at any time *The Journal of Bone & Joint Surgery* finally elects not to publish the Work, JBJS, Inc. shall reconvey to the Author(s), without any representation, warranty or recourse, all of JBJS, Inc.'s rights in the Work under Section 1 hereof at the time of such reconveyance and shall notify the Author(s) of such election and reconveyance; the provisions of section 3 hereof shall survive such reconveyance, and in no event shall *The Journal of Bone & Joint Surgery* or JBJS, Inc. have any obligation to return to any Author the manuscript or any other copy(ies) or embodiment(s) of the Work or the Data delivered to JBJS, Inc. by the Author(s) or made by JBJS, Inc.

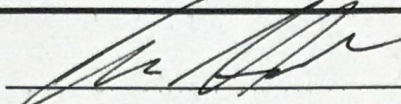
7. This Copyright Transfer and Author Agreement shall be governed by Massachusetts law. In the unlikely event that the parties hereto are unable amicably to resolve any dispute arising under or in connection with this Agreement, such dispute shall be adjudicated in an appropriate state or federal court in Boston, Massachusetts.

NOTE: Handwritten, DocuSigned, digitally verified Adobe, or similar signatures only. Digital signatures must display certification if printed. No other form of electronic or stamped signature is acceptable.

Authors are permitted to sign separate forms as long as each form is completed in its entirety.

x AUTHOR'S SIGNATURE: _____

Name (please print): _____


CRATON HOLT

DATE: _____

4/7/17

AUTHOR'S SIGNATURE: _____

Name (please print): _____

DATE: _____

AUTHOR'S SIGNATURE: _____

Name (please print): _____

DATE: _____

AUTHOR'S SIGNATURE: _____

Name (please print): _____

DATE: _____

AUTHOR'S SIGNATURE: _____

Name (please print): _____

DATE: _____

AUTHOR'S SIGNATURE: _____

Name (please print): _____

DATE: _____

Upload this signed, completed form to the online submission site or email a scanned copy to editorial@jbjs.org.



THE JOURNAL
Excellence Through Peer Review

The Journal of Bone & Joint Surgery
The Journal of Bone and Joint Surgery, Inc.
20 Pickering St., Needham, MA 02492-3157, USA

Copyright Transfer and Author Agreement

In consideration of the review and/or editing by The Journal of Bone and Joint Surgery, Inc. ("JBJS, Inc.") of the material submitted for publication in *The Journal of Bone & Joint Surgery* ("JBJS") entitled
Quality of care in hip fracture patients – does compliance to national standards relate to improved outcomes?

(the "Work") by the undersigned one or more person(s) (the "Author(s)"), the Author(s) hereby agree as follows:

AUTHORS: PLEASE READ CAREFULLY - DO NOT BE GUILTY OF FRAUD OR DUPLICATE SUBMISSION OR PUBLICATION – CONTACT THE EDITORIAL OFFICE BEFORE SIGNING IF YOU HAVE ANY QUESTIONS!

NOTE: IF YOU PROVIDE JBJS, INC. WITH VIDEOS ASSOCIATED WITH THE WORK, YOU MUST ALSO COMPLETE AND SIGN JBJS INC.'S VIDEO LICENSE AGREEMENT, WHICH WILL SUPPLEMENT AND BECOME A PART OF THIS AGREEMENT.

1. a. Each of the Author(s) hereby transfers, assigns and otherwise conveys to JBJS, Inc. all right, title and interest in the Work, including but not limited to any and all copyright(s) therein held by each undersigned Author, together with any rights of each such Author to secure renewals, reissues and extensions of such copyright that may be secured under the laws now or hereafter in force and effect in the United States or in any other country, and any and all rights to bring any court or other action to obtain damages, or injunctive or other relief, in connection with any past, present or future infringement of such copyright(s) or other claim in connection therewith.

b. **NOTE:** If the article is accepted, the Author(s) shall have the right to elect to have it published according to the **open-access** model, which provides the public with free unrestricted online access to the article on the JBJS web site immediately upon publication. If the Author(s) choose the open-access option and pay the applicable article processing charge, the Author(s) will retain the copyright to the article by signing, and uploading to the JBJS manuscript submission system, the Wolters Kluwer Open Access License Agreement (the "Open Access License"). The Open Access License grants JBJS, Inc. and its publishing partner Wolters Kluwer the exclusive license to publish the article and to identify themselves as the original publisher. The Open Access License supersedes and replaces Section 1.a of this Agreement and the article is published under the terms of the Creative Commons license designated in the Open Access License.

UNITED STATES GOVERNMENT EMPLOYEES. Check this "United States Government Employees" option if the Work or a portion of it has been prepared by any Author (a) who is an employee of the United States Government and (b) as part of such Author's official employment duties. A work prepared by an employee of the United States Government as part of his or her official duties is called a "work of the United States Government" and is not subject to copyright protection. If it is not prepared as part of the employee's official duties, it may be subject to copyright protection. Therefore, if this "United States Government Employees" option is checked, the Work will be published with the following legend: "Written work prepared by employees of the Federal Government as part of their official duties is, under the United States Copyright Act, a 'work of the United States Government' for which copyright protection under that Act is not available. As such, copyright protection does not extend to the contributions of employees of the Federal Government prepared as part of their employment."

2. Each of the Author(s) hereby also grants permission to JBJS, Inc. to use such Author's name and likeness in

connection with any past, present or future promotional activity by JBJS, Inc., including, but not limited to, promotions for upcoming issues or publications, circulation solicitations, advertising or other publications in connection with JBJS, Inc.

3. Each of the Author(s) hereby warrants, represents and covenants that (i) each of the Author(s) has read and approved the final manuscript or version of the Work; (ii) the Work is original; (iii) the Author(s) are the sole owners of all rights of any kind in the Work; (iv) the Work has not been previously published and is not under consideration for publication by any person or entity, including electronic publishers, other than *The Journal of Bone & Joint Surgery*, and that the Author(s) have not previously transferred, assigned or conveyed, or agreed to transfer, assign or convey, any rights in connection with the Work to any person or entity other than JBJS, Inc.; (v) the Work is not libelous, and the publication of the Work will not infringe upon or misappropriate any copyright, right to privacy, trade secret, proprietary or any other right of any person or other entity; and (vi) any and all necessary approvals, consents, waivers or permissions from third parties in connection with the Work and its publication have been obtained, and that the Author(s) will deliver copies of the same to JBJS, Inc. upon its request. Upon the request of the Editor-in-Chief of JBJS, Inc., the author(s) will provide to JBJS, Inc., in a timely fashion, any or all of the data, facts and information included in or forming the basis for the Work (the "Data"); JBJS, Inc. shall have the right to use (and to permit others to use) the Data in reviewing and/or editing the Work and for any other purpose other than the creation or publication of any other work based exclusively on the Data.

4. To enable Author(s) to comply with the requirements of outside funding bodies, JBJS, Inc. will deposit, into the PubMed Central (PMC) Archive, the final published version of any article identified as requiring such deposit below. PMC will make these articles freely available after an embargo period of 12 months, 6 months (Wellcome Trust only), or immediately upon publication (if the Author(s) choose the open-access option).

Please disclose below if you have received funding for research on which your article is based from any of the following organizations. JBJS, Inc. will not be held responsible for retroactive deposits to PMC if the Author(s) do not identify the funding agency below.

National Institutes of Health (NIH)

Wellcome Trust

Howard Hughes Medical Institute (HHMI)

Research Councils UK (RCUK)

Other funding body requiring deposit in repository offering free access after embargo (please list):

5. Each of the Author(s) hereby releases and shall indemnify and hold harmless JBJS, Inc. and its successors, assigns, licensees, officers, directors, employees, and their respective heirs and representatives from and against any and all liabilities, losses, damages and expenses arising out of any claims of any kind that may be asserted against any of them based in whole or in part on any breach of the Author(s)' representations or warranties herein or in the Work or anything contained in the Work, including but not limited to any claims for copyright infringement or violation of any rights of privacy or publicity.

6. Nothing in this Agreement shall constitute any promise by or obligation of *The Journal of Bone & Joint Surgery* or JBJS, Inc. to publish the Work, or any portions thereof, at any time in any publication of JBJS, Inc. However, if at any time *The Journal of Bone & Joint Surgery* finally elects not to publish the Work, JBJS, Inc. shall reconvey to the Author(s), without any representation, warranty or recourse, all of JBJS, Inc.'s rights in the Work under Section 1 hereof at the time of such reconveyance and shall notify the Author(s) of such election and reconveyance; the provisions of section 3 hereof shall survive such reconveyance, and in no event shall *The Journal of Bone & Joint Surgery* or JBJS, Inc. have any obligation to return to any Author the manuscript or any other copy(ies) or embodiment(s) of the Work or the Data delivered to JBJS, Inc. by the Author(s) or made by JBJS, Inc.

7. This Copyright Transfer and Author Agreement shall be governed by Massachusetts law. In the unlikely event that the parties hereto are unable amicably to resolve any dispute arising under or in connection with this Agreement, such dispute shall be adjudicated in an appropriate state or federal court in Boston, Massachusetts.

NOTE: Handwritten, DocuSigned, digitally verified Adobe, or similar signatures only. Digital signatures must display certification if printed. No other form of electronic or stamped signature is acceptable.

Authors are permitted to sign separate forms as long as each form is completed in its entirety.

AUTHOR'S SIGNATURE: _____

Name (please print): _____

PHYO KYAW MYINT

PHYO KYAW MYINT

DATE: _____

3 JULY 2017

AUTHOR'S SIGNATURE: _____

Name (please print): _____

DATE: _____

AUTHOR'S SIGNATURE: _____

Name (please print): _____

DATE: _____

AUTHOR'S SIGNATURE: _____

Name (please print): _____

DATE: _____

AUTHOR'S SIGNATURE: _____

Name (please print): _____

DATE: _____

AUTHOR'S SIGNATURE: _____

Name (please print): _____

DATE: _____

Upload this signed, completed form to the online submission site or email a scanned copy to editorial@jbjs.org.



The Journal of Bone & Joint Surgery
The Journal of Bone and Joint Surgery, Inc.
20 Pickering St., Needham, MA 02492-3157, USA

Copyright Transfer and Author Agreement

In consideration of the review and/or editing by The Journal of Bone and Joint Surgery, Inc. ("JBJS, Inc.") of the material submitted for publication in *The Journal of Bone & Joint Surgery* ("JBJS") entitled
Quality of care in hip fracture patients - does compliance to national standards relate to improved outcomes?

(the "Work") by the undersigned one or more person(s) (the "Author(s)"), the Author(s) hereby agree as follows:

AUTHORS: PLEASE READ CAREFULLY - DO NOT BE GUILTY OF FRAUD OR DUPLICATE SUBMISSION OR PUBLICATION – CONTACT THE EDITORIAL OFFICE BEFORE SIGNING IF YOU HAVE ANY QUESTIONS!

NOTE: IF YOU PROVIDE JBJS, INC. WITH VIDEOS ASSOCIATED WITH THE WORK, YOU MUST ALSO COMPLETE AND SIGN JBJS INC.'S VIDEO LICENSE AGREEMENT, WHICH WILL SUPPLEMENT AND BECOME A PART OF THIS AGREEMENT.

1. a. Each of the Author(s) hereby transfers, assigns and otherwise conveys to JBJS, Inc. all right, title and interest in the Work, including but not limited to any and all copyright(s) therein held by each undersigned Author, together with any rights of each such Author to secure renewals, reissues and extensions of such copyright that may be secured under the laws now or hereafter in force and effect in the United States or in any other country, and any and all rights to bring any court or other action to obtain damages, or injunctive or other relief, in connection with any past, present or future infringement of such copyright(s) or other claim in connection therewith.

b. **NOTE:** If the article is accepted, the Author(s) shall have the right to elect to have it published according to the **open-access** model, which provides the public with free unrestricted online access to the article on the JBJS web site immediately upon publication. If the Author(s) choose the open-access option and pay the applicable article processing charge, the Author(s) will retain the copyright to the article by signing, and uploading to the JBJS manuscript submission system, the Wolters Kluwer Open Access License Agreement (the "Open Access License"). The Open Access License grants JBJS, Inc. and its publishing partner Wolters Kluwer the exclusive license to publish the article and to identify themselves as the original publisher. The Open Access License supersedes and replaces Section 1.a of this Agreement and the article is published under the terms of the Creative Commons license designated in the Open Access License.

UNITED STATES GOVERNMENT EMPLOYEES. Check this "United States Government Employees" option if the Work or a portion of it has been prepared by any Author (a) who is an employee of the United States Government and (b) as part of such Author's official employment duties. A work prepared by an employee of the United States Government as part of his or her official duties is called a "work of the United States Government" and is not subject to copyright protection. If it is not prepared as part of the employee's official duties, it may be subject to copyright protection. Therefore, if this "United States Government Employees" option is checked, the Work will be published with the following legend: "Written work prepared by employees of the Federal Government as part of their official duties is, under the United States Copyright Act, a 'work of the United States Government' for which copyright protection under that Act is not available. As such, copyright protection does not extend to the contributions of employees of the Federal Government prepared as part of their employment."

2. Each of the Author(s) hereby also grants permission to JBJS, Inc. to use such Author's name and likeness in

connection with any past, present or future promotional activity by JBJS, Inc., including, but not limited to, promotions for upcoming issues or publications, circulation solicitations, advertising or other publications in connection with JBJS, Inc.

3. Each of the Author(s) hereby warrants, represents and covenants that (i) each of the Author(s) has read and approved the final manuscript or version of the Work; (ii) the Work is original; (iii) the Author(s) are the sole owners of all rights of any kind in the Work; (iv) the Work has not been previously published and is not under consideration for publication by any person or entity, including electronic publishers, other than *The Journal of Bone & Joint Surgery*, and that the Author(s) have not previously transferred, assigned or conveyed, or agreed to transfer, assign or convey, any rights in connection with the Work to any person or entity other than JBJS, Inc.; (v) the Work is not libelous, and the publication of the Work will not infringe upon or misappropriate any copyright, right to privacy, trade secret, proprietary or any other right of any person or other entity; and (vi) any and all necessary approvals, consents, waivers or permissions from third parties in connection with the Work and its publication have been obtained, and that the Author(s) will deliver copies of the same to JBJS, Inc. upon its request. Upon the request of the Editor-in-Chief of JBJS, Inc., the author(s) will provide to JBJS, Inc., in a timely fashion, any or all of the data, facts and information included in or forming the basis for the Work (the "Data"); JBJS, Inc. shall have the right to use (and to permit others to use) the Data in reviewing and/or editing the Work and for any other purpose other than the creation or publication of any other work based exclusively on the Data.

4. To enable Author(s) to comply with the requirements of outside funding bodies, JBJS, Inc. will deposit, into the PubMed Central (PMC) Archive, the final published version of any article identified as requiring such deposit below. PMC will make these articles freely available after an embargo period of 12 months, 6 months (Wellcome Trust only), or immediately upon publication (if the Author(s) choose the open-access option).

Please disclose below if you have received funding for research on which your article is based from any of the following organizations. JBJS, Inc. will not be held responsible for retroactive deposits to PMC if the Author(s) do not identify the funding agency below.

- | | |
|---|--|
| <input type="checkbox"/> National Institutes of Health (NIH) | <input type="checkbox"/> Wellcome Trust |
| <input type="checkbox"/> Howard Hughes Medical Institute (HHMI) | <input type="checkbox"/> Research Councils UK (RCUK) |
| <input type="checkbox"/> Other funding body requiring deposit in repository offering free access after embargo (please list): | |

5. Each of the Author(s) hereby releases and shall indemnify and hold harmless JBJS, Inc. and its successors, assigns, licensees, officers, directors, employees, and their respective heirs and representatives from and against any and all liabilities, losses, damages and expenses arising out of any claims of any kind that may be asserted against any of them based in whole or in part on any breach of the Author(s)' representations or warranties herein or in the Work or anything contained in the Work, including but not limited to any claims for copyright infringement or violation of any rights of privacy or publicity.

6. Nothing in this Agreement shall constitute any promise by or obligation of *The Journal of Bone & Joint Surgery* or JBJS, Inc. to publish the Work, or any portions thereof, at any time in any publication of JBJS, Inc. However, if at any time *The Journal of Bone & Joint Surgery* finally elects not to publish the Work, JBJS, Inc. shall reconvey to the Author(s), without any representation, warranty or recourse, all of JBJS, Inc.'s rights in the Work under Section 1 hereof at the time of such reconveyance and shall notify the Author(s) of such election and reconveyance; the provisions of section 3 hereof shall survive such reconveyance, and in no event shall *The Journal of Bone & Joint Surgery* or JBJS, Inc. have any obligation to return to any Author the manuscript or any other copy(ies) or embodiment(s) of the Work or the Data delivered to JBJS, Inc. by the Author(s) or made by JBJS, Inc.

7. This Copyright Transfer and Author Agreement shall be governed by Massachusetts law. In the unlikely event that the parties hereto are unable amicably to resolve any dispute arising under or in connection with this Agreement, such dispute shall be adjudicated in an appropriate state or federal court in Boston, Massachusetts.

NOTE: Handwritten, DocuSigned, digitally verified Adobe, or similar signatures only. Digital signatures must display certification if printed. No other form of electronic or stamped signature is acceptable.

Authors are permitted to sign separate forms as long as each form is completed in its entirety.

AUTHOR'S SIGNATURE: _____
Name (please print): LUKE FARROW DATE: 14/07/17

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

Upload this signed, completed form to the online submission site or email a scanned copy to editorial@jbjs.org.



The Journal of Bone & Joint Surgery
The Journal of Bone and Joint Surgery, Inc.
20 Pickering St., Needham, MA 02492-3157, USA

Copyright Transfer and Author Agreement

In consideration of the review and/or editing by The Journal of Bone and Joint Surgery, Inc. ("JBJS, Inc.") of the material submitted for publication in *The Journal of Bone & Joint Surgery* ("JBJS") entitled
Quality of care in hip fracture patients - does compliance to national standards relate to improved outcomes?

(the "Work") by the undersigned one or more person(s) (the "Author(s)"), the Author(s) hereby agree as follows:

AUTHORS: PLEASE READ CAREFULLY - DO NOT BE GUILTY OF FRAUD OR DUPLICATE SUBMISSION OR PUBLICATION – CONTACT THE EDITORIAL OFFICE BEFORE SIGNING IF YOU HAVE ANY QUESTIONS!

NOTE: IF YOU PROVIDE JBJS, INC. WITH VIDEOS ASSOCIATED WITH THE WORK, YOU MUST ALSO COMPLETE AND SIGN JBJS INC.'S VIDEO LICENSE AGREEMENT, WHICH WILL SUPPLEMENT AND BECOME A PART OF THIS AGREEMENT.

1. a. Each of the Author(s) hereby transfers, assigns and otherwise conveys to JBJS, Inc. all right, title and interest in the Work, including but not limited to any and all copyright(s) therein held by each undersigned Author, together with any rights of each such Author to secure renewals, reissues and extensions of such copyright that may be secured under the laws now or hereafter in force and effect in the United States or in any other country, and any and all rights to bring any court or other action to obtain damages, or injunctive or other relief, in connection with any past, present or future infringement of such copyright(s) or other claim in connection therewith.

b. **NOTE:** If the article is accepted, the Author(s) shall have the right to elect to have it published according to the **open-access** model, which provides the public with free unrestricted online access to the article on the JBJS web site immediately upon publication. If the Author(s) choose the open-access option and pay the applicable article processing charge, the Author(s) will retain the copyright to the article by signing, and uploading to the JBJS manuscript submission system, the Wolters Kluwer Open Access License Agreement (the "Open Access License"). The Open Access License grants JBJS, Inc. and its publishing partner Wolters Kluwer the exclusive license to publish the article and to identify themselves as the original publisher. The Open Access License supersedes and replaces Section 1.a of this Agreement and the article is published under the terms of the Creative Commons license designated in the Open Access License.

UNITED STATES GOVERNMENT EMPLOYEES. Check this "United States Government Employees" option if the Work or a portion of it has been prepared by any Author (a) who is an employee of the United States Government and (b) as part of such Author's official employment duties. A work prepared by an employee of the United States Government as part of his or her official duties is called a "work of the United States Government" and is not subject to copyright protection. If it is not prepared as part of the employee's official duties, it may be subject to copyright protection. Therefore, if this "United States Government Employees" option is checked, the Work will be published with the following legend: "Written work prepared by employees of the Federal Government as part of their official duties is, under the United States Copyright Act, a 'work of the United States Government' for which copyright protection under that Act is not available. As such, copyright protection does not extend to the contributions of employees of the Federal Government prepared as part of their employment."

2. Each of the Author(s) hereby also grants permission to JBJS, Inc. to use such Author's name and likeness in

connection with any past, present or future promotional activity by JBJS, Inc., including, but not limited to, promotions for upcoming issues or publications, circulation solicitations, advertising or other publications in connection with JBJS, Inc.

3. Each of the Author(s) hereby warrants, represents and covenants that (i) each of the Author(s) has read and approved the final manuscript or version of the Work; (ii) the Work is original; (iii) the Author(s) are the sole owners of all rights of any kind in the Work; (iv) the Work has not been previously published and is not under consideration for publication by any person or entity, including electronic publishers, other than *The Journal of Bone & Joint Surgery*, and that the Author(s) have not previously transferred, assigned or conveyed, or agreed to transfer, assign or convey, any rights in connection with the Work to any person or entity other than JBJS, Inc.; (v) the Work is not libelous, and the publication of the Work will not infringe upon or misappropriate any copyright, right to privacy, trade secret, proprietary or any other right of any person or other entity; and (vi) any and all necessary approvals, consents, waivers or permissions from third parties in connection with the Work and its publication have been obtained, and that the Author(s) will deliver copies of the same to JBJS, Inc. upon its request. Upon the request of the Editor-in-Chief of JBJS, Inc., the author(s) will provide to JBJS, Inc., in a timely fashion, any or all of the data, facts and information included in or forming the basis for the Work (the "Data"); JBJS, Inc. shall have the right to use (and to permit others to use) the Data in reviewing and/or editing the Work and for any other purpose other than the creation or publication of any other work based exclusively on the Data.

4. To enable Author(s) to comply with the requirements of outside funding bodies, JBJS, Inc. will deposit, into the PubMed Central (PMC) Archive, the final published version of any article identified as requiring such deposit below. PMC will make these articles freely available after an embargo period of 12 months, 6 months (Wellcome Trust only), or immediately upon publication (if the Author(s) choose the open-access option).

Please disclose below if you have received funding for research on which your article is based from any of the following organizations. JBJS, Inc. will not be held responsible for retroactive deposits to PMC if the Author(s) do not identify the funding agency below.

- | | |
|---|--|
| <input type="checkbox"/> National Institutes of Health (NIH) | <input type="checkbox"/> Wellcome Trust |
| <input type="checkbox"/> Howard Hughes Medical Institute (HHMI) | <input type="checkbox"/> Research Councils UK (RCUK) |
| <input type="checkbox"/> Other funding body requiring deposit in repository offering free access after embargo (please list): | |


5. Each of the Author(s) hereby releases and shall indemnify and hold harmless JBJS, Inc. and its successors, assigns, licensees, officers, directors, employees, and their respective heirs and representatives from and against any and all liabilities, losses, damages and expenses arising out of any claims of any kind that may be asserted against any of them based in whole or in part on any breach of the Author(s)' representations or warranties herein or in the Work or anything contained in the Work, including but not limited to any claims for copyright infringement or violation of any rights of privacy or publicity.

6. Nothing in this Agreement shall constitute any promise by or obligation of *The Journal of Bone & Joint Surgery* or JBJS, Inc. to publish the Work, or any portions thereof, at any time in any publication of JBJS, Inc. However, if at any time *The Journal of Bone & Joint Surgery* finally elects not to publish the Work, JBJS, Inc. shall reconvey to the Author(s), without any representation, warranty or recourse, all of JBJS, Inc.'s rights in the Work under Section 1 hereof at the time of such reconveyance and shall notify the Author(s) of such election and reconveyance; the provisions of section 3 hereof shall survive such reconveyance, and in no event shall *The Journal of Bone & Joint Surgery* or JBJS, Inc. have any obligation to return to any Author the manuscript or any other copy(ies) or embodiment(s) of the Work or the Data delivered to JBJS, Inc. by the Author(s) or made by JBJS, Inc.

7. This Copyright Transfer and Author Agreement shall be governed by Massachusetts law. In the unlikely event that the parties hereto are unable amicably to resolve any dispute arising under or in connection with this Agreement, such dispute shall be adjudicated in an appropriate state or federal court in Boston, Massachusetts.

NOTE: Handwritten, DocuSigned, digitally verified Adobe, or similar signatures only. Digital signatures must display certification if printed. No other form of electronic or stamped signature is acceptable.

Authors are permitted to sign separate forms as long as each form is completed in its entirety.

AUTHOR'S SIGNATURE: 
Name (please print): ADRIAN D WOOL DATE: 04/07/2017

AUTHOR'S SIGNATURE: _____

Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____

Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____

Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____

Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____

Name (please print): _____ DATE: _____

Upload this signed, completed form to the online submission site or email a scanned copy to editorial@jbjs.org.



The Journal of Bone & Joint Surgery
The Journal of Bone and Joint Surgery, Inc.
20 Pickering St., Needham, MA 02492-3157, USA

Copyright Transfer and Author Agreement

In consideration of the review and/or editing by The Journal of Bone and Joint Surgery, Inc. ("JBJS, Inc.") of the material submitted for publication in *The Journal of Bone & Joint Surgery* ("JBJS") entitled
Quality of care in hip fracture patients - does compliance to national standards relate to improved outcomes?

(the "Work") by the undersigned one or more person(s) (the "Author(s)"), the Author(s) hereby agree as follows:

AUTHORS: PLEASE READ CAREFULLY - DO NOT BE GUILTY OF FRAUD OR DUPLICATE SUBMISSION OR PUBLICATION – CONTACT THE EDITORIAL OFFICE BEFORE SIGNING IF YOU HAVE ANY QUESTIONS!

NOTE: IF YOU PROVIDE JBJS, INC. WITH VIDEOS ASSOCIATED WITH THE WORK, YOU MUST ALSO COMPLETE AND SIGN JBJS INC.'S VIDEO LICENSE AGREEMENT, WHICH WILL SUPPLEMENT AND BECOME A PART OF THIS AGREEMENT.

1. a. Each of the Author(s) hereby transfers, assigns and otherwise conveys to JBJS, Inc. all right, title and interest in the Work, including but not limited to any and all copyright(s) therein held by each undersigned Author, together with any rights of each such Author to secure renewals, reissues and extensions of such copyright that may be secured under the laws now or hereafter in force and effect in the United States or in any other country, and any and all rights to bring any court or other action to obtain damages, or injunctive or other relief, in connection with any past, present or future infringement of such copyright(s) or other claim in connection therewith.

b. **NOTE:** If the article is accepted, the Author(s) shall have the right to elect to have it published according to the **open-access** model, which provides the public with free unrestricted online access to the article on the JBJS web site immediately upon publication. If the Author(s) choose the open-access option and pay the applicable article processing charge, the Author(s) will retain the copyright to the article by signing, and uploading to the JBJS manuscript submission system, the Wolters Kluwer Open Access License Agreement (the "Open Access License"). The Open Access License grants JBJS, Inc. and its publishing partner Wolters Kluwer the exclusive license to publish the article and to identify themselves as the original publisher. The Open Access License supersedes and replaces Section 1.a of this Agreement and the article is published under the terms of the Creative Commons license designated in the Open Access License.

UNITED STATES GOVERNMENT EMPLOYEES. Check this "United States Government Employees" option if the Work or a portion of it has been prepared by any Author (a) who is an employee of the United States Government and (b) as part of such Author's official employment duties. A work prepared by an employee of the United States Government as part of his or her official duties is called a "work of the United States Government" and is not subject to copyright protection. If it is not prepared as part of the employee's official duties, it may be subject to copyright protection. Therefore, if this "United States Government Employees" option is checked, the Work will be published with the following legend: "Written work prepared by employees of the Federal Government as part of their official duties is, under the United States Copyright Act, a 'work of the United States Government' for which copyright protection under that Act is not available. As such, copyright protection does not extend to the contributions of employees of the Federal Government prepared as part of their employment."

2. Each of the Author(s) hereby also grants permission to JBJS, Inc. to use such Author's name and likeness in

connection with any past, present or future promotional activity by JBJS, Inc., including, but not limited to, promotions for upcoming issues or publications, circulation solicitations, advertising or other publications in connection with JBJS, Inc.

3. Each of the Author(s) hereby warrants, represents and covenants that (i) each of the Author(s) has read and approved the final manuscript or version of the Work; (ii) the Work is original; (iii) the Author(s) are the sole owners of all rights of any kind in the Work; (iv) the Work has not been previously published and is not under consideration for publication by any person or entity, including electronic publishers, other than *The Journal of Bone & Joint Surgery*, and that the Author(s) have not previously transferred, assigned or conveyed, or agreed to transfer, assign or convey, any rights in connection with the Work to any person or entity other than JBJS, Inc.; (v) the Work is not libelous, and the publication of the Work will not infringe upon or misappropriate any copyright, right to privacy, trade secret, proprietary or any other right of any person or other entity; and (vi) any and all necessary approvals, consents, waivers or permissions from third parties in connection with the Work and its publication have been obtained, and that the Author(s) will deliver copies of the same to JBJS, Inc. upon its request. Upon the request of the Editor-in-Chief of JBJS, Inc., the author(s) will provide to JBJS, Inc., in a timely fashion, any or all of the data, facts and information included in or forming the basis for the Work (the "Data"); JBJS, Inc. shall have the right to use (and to permit others to use) the Data in reviewing and/or editing the Work and for any other purpose other than the creation or publication of any other work based exclusively on the Data.

4. To enable Author(s) to comply with the requirements of outside funding bodies, JBJS, Inc. will deposit, into the PubMed Central (PMC) Archive, the final published version of any article identified as requiring such deposit below. PMC will make these articles freely available after an embargo period of 12 months, 6 months (Wellcome Trust only), or immediately upon publication (if the Author(s) choose the open-access option).

Please disclose below if you have received funding for research on which your article is based from any of the following organizations. JBJS, Inc. will not be held responsible for retroactive deposits to PMC if the Author(s) do not identify the funding agency below.

- | | |
|---|--|
| <input type="checkbox"/> National Institutes of Health (NIH) | <input type="checkbox"/> Wellcome Trust |
| <input type="checkbox"/> Howard Hughes Medical Institute (HHMI) | <input type="checkbox"/> Research Councils UK (RCUK) |
| <input type="checkbox"/> Other funding body requiring deposit in repository offering free access after embargo (please list): | |

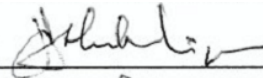
5. Each of the Author(s) hereby releases and shall indemnify and hold harmless JBJS, Inc. and its successors, assigns, licensees, officers, directors, employees, and their respective heirs and representatives from and against any and all liabilities, losses, damages and expenses arising out of any claims of any kind that may be asserted against any of them based in whole or in part on any breach of the Author(s)' representations or warranties herein or in the Work or anything contained in the Work, including but not limited to any claims for copyright infringement or violation of any rights of privacy or publicity.

6. Nothing in this Agreement shall constitute any promise by or obligation of *The Journal of Bone & Joint Surgery* or JBJS, Inc. to publish the Work, or any portions thereof, at any time in any publication of JBJS, Inc. However, if at any time *The Journal of Bone & Joint Surgery* finally elects not to publish the Work, JBJS, Inc. shall reconvey to the Author(s), without any representation, warranty or recourse, all of JBJS, Inc.'s rights in the Work under Section 1 hereof at the time of such reconveyance and shall notify the Author(s) of such election and reconveyance; the provisions of section 3 hereof shall survive such reconveyance, and in no event shall *The Journal of Bone & Joint Surgery* or JBJS, Inc. have any obligation to return to any Author the manuscript or any other copy(ies) or embodiment(s) of the Work or the Data delivered to JBJS, Inc. by the Author(s) or made by JBJS, Inc.

7. This Copyright Transfer and Author Agreement shall be governed by Massachusetts law. In the unlikely event that the parties hereto are unable amicably to resolve any dispute arising under or in connection with this Agreement, such dispute shall be adjudicated in an appropriate state or federal court in Boston, Massachusetts.

NOTE: Handwritten, DocuSigned, digitally verified Adobe, or similar signatures only. Digital signatures must display certification if printed. No other form of electronic or stamped signature is acceptable.

Authors are permitted to sign separate forms as long as each form is completed in its entirety.

AUTHOR'S SIGNATURE: 
Name (please print): JAMES DOUGLAS HUTCHINSON DATE: 070717

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

Upload this signed, completed form to the online submission site or email a scanned copy to editorial@jbjs.org.



The Journal of Bone & Joint Surgery
The Journal of Bone and Joint Surgery, Inc.
20 Pickering St., Needham, MA 02492-3157, USA

Copyright Transfer and Author Agreement

In consideration of the review and/or editing by The Journal of Bone and Joint Surgery, Inc. ("JBJS, Inc.") of the material submitted for publication in *The Journal of Bone & Joint Surgery* ("JBJS") entitled
Quality of care in hip fracture patients - does compliance to national standards relate to improved outcomes?

(the "Work") by the undersigned one or more person(s) (the "Author(s)"), the Author(s) hereby agree as follows:

AUTHORS: PLEASE READ CAREFULLY - DO NOT BE GUILTY OF FRAUD OR DUPLICATE SUBMISSION OR PUBLICATION – CONTACT THE EDITORIAL OFFICE BEFORE SIGNING IF YOU HAVE ANY QUESTIONS!

NOTE: IF YOU PROVIDE JBJS, INC. WITH VIDEOS ASSOCIATED WITH THE WORK, YOU MUST ALSO COMPLETE AND SIGN JBJS INC.'S VIDEO LICENSE AGREEMENT, WHICH WILL SUPPLEMENT AND BECOME A PART OF THIS AGREEMENT.

1. a. Each of the Author(s) hereby transfers, assigns and otherwise conveys to JBJS, Inc. all right, title and interest in the Work, including but not limited to any and all copyright(s) therein held by each undersigned Author, together with any rights of each such Author to secure renewals, reissues and extensions of such copyright that may be secured under the laws now or hereafter in force and effect in the United States or in any other country, and any and all rights to bring any court or other action to obtain damages, or injunctive or other relief, in connection with any past, present or future infringement of such copyright(s) or other claim in connection therewith.

b. **NOTE:** If the article is accepted, the Author(s) shall have the right to elect to have it published according to the **open-access** model, which provides the public with free unrestricted online access to the article on the JBJS web site immediately upon publication. If the Author(s) choose the open-access option and pay the applicable article processing charge, the Author(s) will retain the copyright to the article by signing, and uploading to the JBJS manuscript submission system, the Wolters Kluwer Open Access License Agreement (the "Open Access License"). The Open Access License grants JBJS, Inc. and its publishing partner Wolters Kluwer the exclusive license to publish the article and to identify themselves as the original publisher. The Open Access License supersedes and replaces Section 1.a of this Agreement and the article is published under the terms of the Creative Commons license designated in the Open Access License.

UNITED STATES GOVERNMENT EMPLOYEES. Check this "United States Government Employees" option if the Work or a portion of it has been prepared by any Author (a) who is an employee of the United States Government and (b) as part of such Author's official employment duties. A work prepared by an employee of the United States Government as part of his or her official duties is called a "work of the United States Government" and is not subject to copyright protection. If it is not prepared as part of the employee's official duties, it may be subject to copyright protection. Therefore, if this "United States Government Employees" option is checked, the Work will be published with the following legend: "Written work prepared by employees of the Federal Government as part of their official duties is, under the United States Copyright Act, a 'work of the United States Government' for which copyright protection under that Act is not available. As such, copyright protection does not extend to the contributions of employees of the Federal Government prepared as part of their employment."

2. Each of the Author(s) hereby also grants permission to JBJS, Inc. to use such Author's name and likeness in

connection with any past, present or future promotional activity by JBJS, Inc., including, but not limited to, promotions for upcoming issues or publications, circulation solicitations, advertising or other publications in connection with JBJS, Inc.

3. Each of the Author(s) hereby warrants, represents and covenants that (i) each of the Author(s) has read and approved the final manuscript or version of the Work; (ii) the Work is original; (iii) the Author(s) are the sole owners of all rights of any kind in the Work; (iv) the Work has not been previously published and is not under consideration for publication by any person or entity, including electronic publishers, other than *The Journal of Bone & Joint Surgery*, and that the Author(s) have not previously transferred, assigned or conveyed, or agreed to transfer, assign or convey, any rights in connection with the Work to any person or entity other than JBJS, Inc.; (v) the Work is not libelous, and the publication of the Work will not infringe upon or misappropriate any copyright, right to privacy, trade secret, proprietary or any other right of any person or other entity; and (vi) any and all necessary approvals, consents, waivers or permissions from third parties in connection with the Work and its publication have been obtained, and that the Author(s) will deliver copies of the same to JBJS, Inc. upon its request. Upon the request of the Editor-in-Chief of JBJS, Inc., the author(s) will provide to JBJS, Inc., in a timely fashion, any or all of the data, facts and information included in or forming the basis for the Work (the "Data"); JBJS, Inc. shall have the right to use (and to permit others to use) the Data in reviewing and/or editing the Work and for any other purpose other than the creation or publication of any other work based exclusively on the Data.

4. To enable Author(s) to comply with the requirements of outside funding bodies, JBJS, Inc. will deposit, into the PubMed Central (PMC) Archive, the final published version of any article identified as requiring such deposit below. PMC will make these articles freely available after an embargo period of 12 months, 6 months (Wellcome Trust only), or immediately upon publication (if the Author(s) choose the open-access option).

Please disclose below if you have received funding for research on which your article is based from any of the following organizations. JBJS, Inc. will not be held responsible for retroactive deposits to PMC if the Author(s) do not identify the funding agency below.

National Institutes of Health (NIH)

Wellcome Trust

Howard Hughes Medical Institute (HHMI)

Research Councils UK (RCUK)

Other funding body requiring deposit in repository offering free access after embargo (please list):

5. Each of the Author(s) hereby releases and shall indemnify and hold harmless JBJS, Inc. and its successors, assigns, licensees, officers, directors, employees, and their respective heirs and representatives from and against any and all liabilities, losses, damages and expenses arising out of any claims of any kind that may be asserted against any of them based in whole or in part on any breach of the Author(s)' representations or warranties herein or in the Work or anything contained in the Work, including but not limited to any claims for copyright infringement or violation of any rights of privacy or publicity.

6. Nothing in this Agreement shall constitute any promise by or obligation of *The Journal of Bone & Joint Surgery* or JBJS, Inc. to publish the Work, or any portions thereof, at any time in any publication of JBJS, Inc. However, if at any time *The Journal of Bone & Joint Surgery* finally elects not to publish the Work, JBJS, Inc. shall reconvey to the Author(s), without any representation, warranty or recourse, all of JBJS, Inc.'s rights in the Work under Section 1 hereof at the time of such reconveyance and shall notify the Author(s) of such election and reconveyance; the provisions of section 3 hereof shall survive such reconveyance, and in no event shall *The Journal of Bone & Joint Surgery* or JBJS, Inc. have any obligation to return to any Author the manuscript or any other copy(ies) or embodiment(s) of the Work or the Data delivered to JBJS, Inc. by the Author(s) or made by JBJS, Inc.

7. This Copyright Transfer and Author Agreement shall be governed by Massachusetts law. In the unlikely event that the parties hereto are unable amicably to resolve any dispute arising under or in connection with this Agreement, such dispute shall be adjudicated in an appropriate state or federal court in Boston, Massachusetts.

NOTE: Handwritten, DocuSigned, digitally verified Adobe, or similar signatures only. Digital signatures must display certification if printed. No other form of electronic or stamped signature is acceptable.

Authors are permitted to sign separate forms as long as each form is completed in its entirety.

AUTHOR'S SIGNATURE: Kate James
Name (please print): KATE JAMES DATE: 5/7/17

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

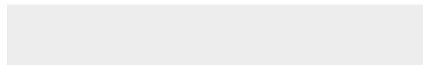
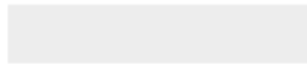
AUTHOR'S SIGNATURE: _____
Name (please print): _____ DATE: _____

Upload this signed, completed form to the online submission site or email a scanned copy to editorial@jbjs.org.



Click here to access/download

Conflict of Interest (see above)
Luke Farrow.pdf





Click here to access/download

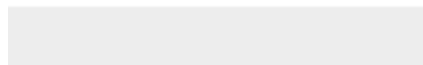
Conflict of Interest (see above)
conflict-pkmupdate.pdf





Click here to access/download

Conflict of Interest (see above)
AJHconflictupdate.pdf





Click here to access/download
Conflict of Interest (see above)
conflict 04-07-17 adwupdate.pdf





Click here to access/download

Conflict of Interest (see above)

JBJS Conflict Graeme Holtupdate.pdf





Click here to access/download
Conflict of Interest (see above)
coi_disclosure Jamesupdate.pdf

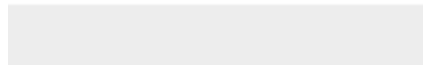




Click here to access/download

Conflict of Interest (see above)

HUTCHISON coi_disclosureupdate.pdf





Click here to access/download

Conflict of Interest (see above)
coi_disclosure - Rik Smithupdate.pdf



Go straight to content.



Health Research Authority

Do I need NHS REC approval?

i To print your result with title and IRAS Project ID please enter your details below:

Title of your research:

Quality of care in hip fracture patients - does compliance to national standards relate to improved outcomes?

IRAS Project ID (if available):

Your answers to the following questions indicate that **you do not need NHS REC approval for sites in Scotland**. However, **you may need other approvals**.

You have answered **'YES'** to: Is your study research?

You answered **'NO'** to all of these questions:

Question Set 1

- Is your study a clinical trial of an investigational medicinal product?
- Is your study one or more of the following: A non-CE marked medical device, or a device which has been modified or is being used outside of its CE mark intended purpose, and the study is conducted by or with the support of the manufacturer or another commercial company (including university spin-out company) to provide data for CE marking purposes?
- Does your study involve exposure to any ionising radiation?
- Does your study involve the processing of disclosable protected information on the Register of the Human Fertilisation and Embryology Authority by researchers, without consent?
- Is your study a clinical trial involving the participation of practising midwives?

Question Set 2

- Will your study involve research participants identified from, or because of their past or present use of services (adult and children's healthcare within the NHS), for which the UK health departments are responsible (including services provided under contract with the private or voluntary sectors), including participants recruited through these services as healthy controls?

- Will your research involve collection of tissue or information from any users of these services (adult and children's healthcare within the NHS)? This may include users who have died within the last 100 years.
- Will your research involve the use of previously collected tissue or information from which the research team could identify individual past or present users of these services (adult and children's healthcare within the NHS), either directly from that tissue or information, or from its combination with other tissue or information likely to come into their possession?

Question Set 3

- Does your research involve recruiting adults who lack capacity to consent for themselves, including participants retained in study following the loss of capacity?
- Will your research involve whole organs retained from a post mortem examination carried out on the instructions of the Procurator Fiscal?
- Will your research involve the analysis of DNA from bodily material, collected on or after 1st September 2006, and this analysis is not within the terms of consent for research from the donor?

Question Set 4

- Is your research health-related and involving prisoners?
- Does your research involve xenotransplantation?
- Is your research a social care project funded by the Department of Health (England)?

If your research extends beyond **Scotland** find out if you need NHS REC approval by selecting the '*OTHER UK COUNTRIES*' button below.

OTHER UK COUNTRIES

If, after visiting all relevant UK countries, this decision tool suggests that you do not require NHS REC approval [follow this link for final confirmation and further information.](#)

Print This Page

NOTE: If using Internet Explorer please use browser print function.

[About this tool](#) [Feedback](#) [Contact](#) [Glossary](#)

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No.	Recommendation	Page No.
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4-5
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	5
		<i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls	
		<i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed	N/A
		<i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	4-6
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	4-6
Bias	9	Describe any efforts to address potential sources of bias	6
	10	Explain how the study size was arrived at	4

Continued on next page

Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	6-7
		(b) Describe any methods used to examine subgroups and interactions	6-7
		(c) Explain how missing data were addressed	7-8
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	6-7
		(e) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8
		© Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1
		(b) Indicate number of participants with missing data for each variable of interest	N/A
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	6
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	Table 1-4
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Table 1-4
		(b) Report category boundaries when continuous variables were categorized	Table 1-4
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	

Continued on next page

Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Table 1-4
Discussion			
Key results	18	Summarise key results with reference to study objectives	11
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	13-14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	11-14
Generalisability	21	Discuss the generalisability (external validity) of the study results	14
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	N/A

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.