



■ TRAUMA

Variation of implant use in A1 and A2 trochanteric hip fractures

A STUDY FROM THE NATIONAL HIP FRACTURE DATABASE OF ENGLAND AND WALES

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Aims

Patients with A1 and A2 trochanteric hip fractures represent a substantial proportion of trauma caseload, and national guidelines recommend that sliding hip screws (SHS) should be used for these injuries. Despite this, intramedullary nails (IMNs) are routinely implanted in many hospitals, at extra cost and with unproven patient outcome benefit. We have used data from the National Hip Fracture Database (NHFD) to examine the use of SHS and IMN for A1 and A2 hip fractures at a national level, and to define the cost implications of management decisions that run counter to national guidelines.

Methods

We used the NHFD to identify all operations for fixation of trochanteric fractures in England and Wales between 1 January 2021 and 31 December 2021. A uniform price band from each of three hip fracture implant manufacturers was used to set cost implications alongside variation in implant use.

Results

We identified 18,156 A1 and A2 trochanteric hip fractures in 162 centres. Of these, 13,483 (74.3%) underwent SHS fixation, 2,352 (13.0%) were managed with short IMN, and 2,321 (12.8%) were managed with long IMN. Total cost of IMN added up to £1.89 million in 2021, and the clinical justification for this is unclear since rates of IMN use varied from 0% to 97% in different centres.

Conclusion

Most trochanteric hip fractures are managed with SHS, in keeping with national guidelines. There is considerable variance between hospitals for implant choice, despite the lack of evidence for clinical benefit and cost-effectiveness of more expensive nailing systems. This suggests either a lack of awareness of national guidelines or a choice not to follow them. We encourage provider units to reassess their practice if outwith the national norm. Funding bodies should examine implant use closely in this population to prevent resource waste at a time of considerable health austerity.

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Introduction

Hip fractures are a considerable burden for patients and systems of care.¹ Choice of sliding hip screws (SHS) or intramedullary nails (IMNs) for fractures that require fixation are subject to national guidelines, although variance in use exists. There are considerable financial

differences when implant use for the simpler extracapsular hip fractures is considered. While attempts have been made to address this, investigation of variance across a national health system has not been performed to date.

The A1 and A2 hip fractures are injuries of the trochanteric region of the proximal

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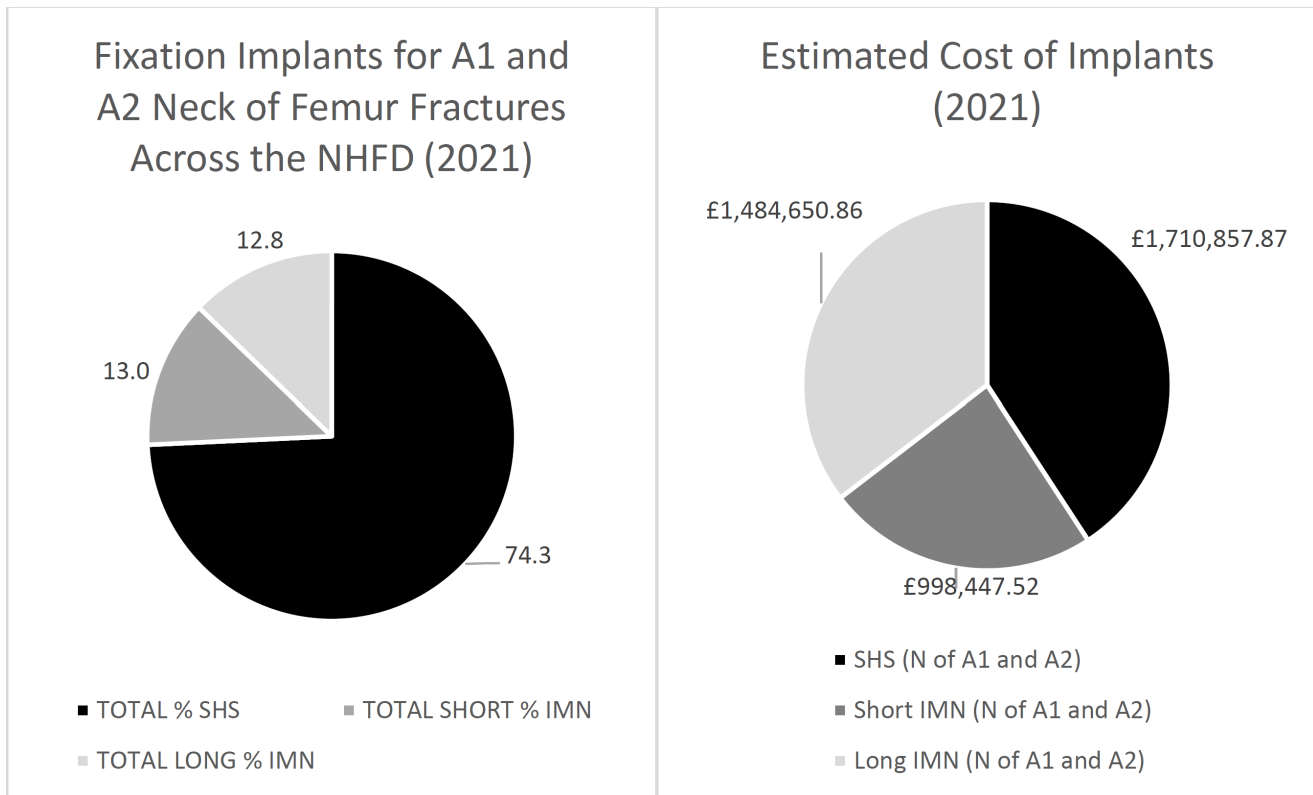


Fig. 1

Proportion of implant use and implant costs for A1 and A2 trochanteric fractures in England and Wales in 2021. IMN, intramedullary nail; SHS, sliding hip screw.

femur. These fractures lie outside of the hip joint capsule and their geometry is roughly parallel to that of the intertrochanteric crest. This pertrochanteric location distinguishes them from their geometrically different associated injury, the A3 fracture.²

Randomized controlled trials of SHS versus IMN, systematic reviews, registry data, and guidelines all inform implant selection.^{1,3-8} SHS and IMN (which may be short or long) are comparable for most (AO, A1, and A2) extracapsular trochanteric fractures.¹ Despite this, many patients with these fractures are treated with IMN.⁹⁻¹¹ This is important as SHS are considerably more cost-effective, and implant costs have a positive linear association with overall inpatient cost of care.¹²

The National Institute for Health and Care Excellence (NICE) recommends that SHS should be used in preference to an IMN for A1 and A2 fractures.⁸ It might therefore be expected that SHS would be used routinely and uniformly across England and Wales for the treatment of all A1 and A2 hip fractures.

We set out to assess variation in use of SHS or IMN for A1 and A2 hip fractures across all hospitals treating hip fractures in England and Wales, and to highlight the cost implications associated with variation in implant choice.

Methods

The National Hip Fracture Database (NHFD) is a national clinical audit designed to facilitate improvements in the quality of hip fracture care.¹³ It is a mature data collection system that, for 15 years, has captured over 95% of all > 60-year-olds with hip fracture, in all hospitals in England and Wales.¹⁴

After excluding patients with fractures outside the hip or periprosthetic, intracapsular, sub-trochanteric, and A3 variants, we used NHFD data to assess the fixation of all simple trochanteric (A1 and A2)² fractures operated on between 1 January 2021 and 31 December 2021.

To establish the cost impact of implant use variance, data from three high-volume hip fracture implant manufacturers (Stryker, DePuy Synthes, and Smith & Nephew) were obtained in February 2022. These data included each component implant part and consumables such as reaming and guide wires, as well as drills. Due to banding alterations on unit volume impact, we were quoted a uniform price band from each manufacturer for a consigned account on the lowest possible price. This was to ensure that cost forecasts were realistic and represented actual implant costs to all hospitals across England and Wales, regardless of relationship with provider. These

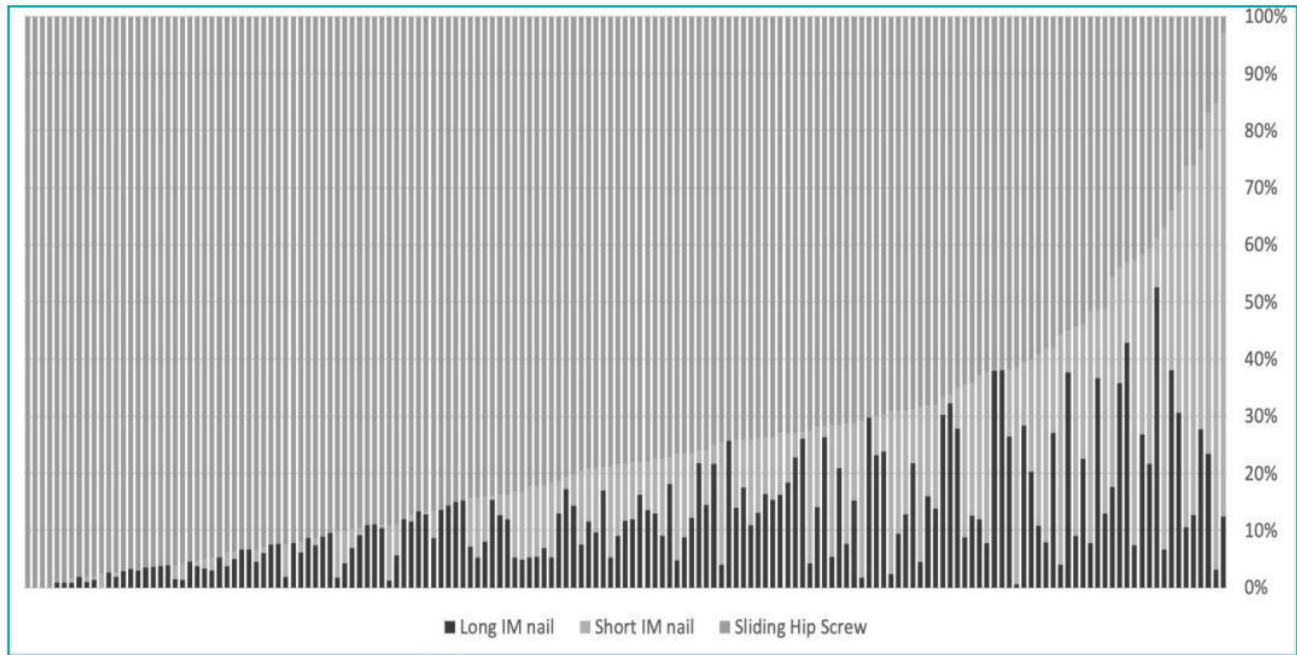


Fig. 2

Extracapsular fracture implant use in hospitals in England and Wales in 2021. IM, intramedullary.

Table I. Financial implications of changing proportion of implant use for A1 and A2 hip fractures.

Implant	Current utilization of implants			Model A			Model B		
	Use, n	%	Cost, £	Use, n	%	Cost, £	Use, n	%	Cost, £
SHS	13,483	74.3	1,710,857.90	14,524	80.0	1,842,950.36	16,340	90.0	2,073,433.36
Short IMN	2,352	13.0	998,447.52	1,816	10.0	770,740.36	1,816	10.0	770,740.36
Long IMN	2,321	12.8	1,484,650.90	1,816	10.0	1,161,366.70	0	0	0
Total	18,156		4,193,956.30	18,156		3,775,957.42	18,156		2,844,173.71

IMN, intramedullary nail; SHS, sliding hip screw.

implant costs were used to model potential savings when different implants were used.

Results

In England and Wales between 1 January 2021 and 31 December 2021, 69,248 patients were recorded on the NHFHD from 162 hospitals.

Overall, 2,430 patients were managed conservatively, died before surgery could take place, or did not have their operation type recorded. We excluded 4,051 (5.67%) fractures that were periprosthetic or lay outwith the hip, 38,078 (53.3%) with intracapsular variants, and 6,533 (9.14%) with subtrochanteric or A3 fracture variants, leaving 18,156 (26.2%) surgically managed for an A1 or A2 hip fracture.

Across all 162 centres (Figure 1), a median 74.3% (IQR 76.5% to 90.3%) of A1 and A2 fractures underwent SHS fixation. In total, a median 13.0% (IQR 0.9% to 15.0%) of patients received short IMN fixation and a median 12.8%

(IQR 5.0% to 16.3%) received long IMN fixation. Variation in implant use at unit level is considerable across all hospitals (Figure 2). SHS use for A1 and A2 fractures ranges between 3% and 100%, short IMN use from 0% to 85%, and long IMN from 0% to 53%. Four hospitals did not use IMN in any A1 or A2 fractures. Long IMN were used for A1 and A2 fractures in 157 hospitals, and 33 hospitals used no short IMN. A total of 16 hospitals used SHS in fewer than half of cases.

To estimate the financial implications of not following NICE guidelines, we used implant costs from three manufacturers. These gave mean costs for a SHS of £126.89, for a short IMN of £424.51, and for a long IMN of £639.66.

At these prices, the total cost of implants used in 2021 was £4,193,956.25. Although 74.3% (n = 13,483) of A1/A2 fractures were managed with a SHS, these only explained 41% of implant cost (£1,710,857.87). Conversely, short IMN and long IMN were each used in approximately 13% of cases (short IMN n = 2,352; long IMN n = 2,321), but

made up 24% (£998,447.52) and 35% (£1,484,650.86) of total implant costs, respectively (Figure 1).

Model A (Table I) demonstrates a theoretical SHS utilization of 80% with 10% long IMN usage and 10% short IMN usage. This shows a cost saving of £418,898.88 nationally. Model B shows a SHS utilization of 90% with 10% short IMN usage and 0% long IMN usage. This shows a cost saving of £1,349,782.54. Finally, 100% SHS utilization translates to a cost saving of £1,890,141.40.

Discussion

Most A1 and A2 fractures in England and Wales in 2021 were treated by SHS. This is comparable to the previous year and illustrates little change in practice over time.¹⁵ However, as seen in Europe and the USA,⁹⁻¹¹ there is a trend of decreasing SHS use.

Having shown that SHS is the most common implant for fixation of A1 and A2 hip fractures, we also demonstrate that there is huge variability between centres.

NICE recommends that all A1 and A2 fractures are treated with a SHS,⁸ however in contrast to guidance and with absence of patient benefit, IMNs were used in all but three centres for these simple hip fractures. It has been previously suggested that patients receiving IMN over SHS may regain greater mobility,^{3,4} including in a small subset of active high-functioning patients,¹⁶ and this may go a small way to explaining the rationale of using an IMN in a subset of cases. This alone, however, cannot account for the degree of difference in practice between centres, given the similarity in caseload.

Nearly 10% (16 of 162) of NHFD centres used SHS in less than half of suitable cases. This supports evidence that local surgeon and hospital factors, rather than patient factors, heavily influence the utilization of IMN over SHS.^{2,3} This utilization of IMN over SHS is not a benign event, directly increasing cost of care in an already financially depleted system.¹⁴ We calculated total implant costs of around £4.19 million in 2021. If, in keeping with current NICE guidance, SHS was the sole implant of choice, this would save £1.89 million per annum. Evidently, 100% utilization of SHS is not pragmatic, but the differences highlighted through our work still have the potential of saving hundreds of thousands of pounds per annum. A modest increase of just under 6% in SHS use nationally to 80% alone would save £418,898.88 per annum. It follows therefore that much more substantial proportional savings are available in hospitals using SHS in as little as 3% of eligible patients.

Change can have an effect and it is realistic that adopting a more SHS-centred model as we propose can work. The introduction of an evidenced-based algorithm for the treatment of hip fractures has been shown to reduce costs while maintaining quality of care.⁴ While management of traumatic injury can never - by its nature - be uniform, it is feasible that by raising awareness of

the recommendations and the reasoning behind them, individual surgeons and local bodies can be influenced in their practice.

Studies such as ours are limited by accurate data recording and coding, particularly in the case of classification of hip fractures.¹⁷ Lumping of data and inability to capture the impact of confounding variables could therefore lead to inaccuracy in the results. Further limitations of 'big data' such as those used here are largely ameliorated through incentivized quality-controlled coding and data collection, and the triangulation of national trends with local data and literature exploring individual patient management. No outcome measure was used in this study, however this is irrelevant to this work as the guidelines themselves are distillations of multiple, outcome-centred studies. We do not attempt here to say which implant should be used or why, as this has been exhaustively addressed elsewhere. The mean cost of each implant was calculated across all providers, meaning that in some trusts each implant might cost more or less than that described. No provider, however, sold a short IMN or long IMN at a smaller price than a SHS. Using only three implant providers may be seen as a limitation, however these three companies account for over 80% of the UK implant use for fixing hip fractures and so, while it is acknowledged that it is not representative of every manufacturer, it is generalizable to what is consigned to and used in the majority of hospitals in England and Wales.

In conclusion, most A1 and A2 hip fractures in England and Wales are treated with SHS in accordance with national guidelines. There is, however, considerable variance between centres. Some centres exclusively use a cheaper evidence-based implant, whereas others in the majority of their patients use expensive implants without any proven additional benefit to offset the extra cost. This highlights an opportunity to drive targeted standardization practice across England and Wales with positive impact on healthcare costs, without impacting patient outcomes.



Take home message

- Most trochanteric hip fractures are managed with sliding hip screws (SHS), in keeping with national guidelines.
- There is considerable variance between hospitals for implant choice, despite the lack of evidence for clinical benefit and cost-effectiveness of more expensive nailing systems.
- This variance from national guidance has cost implications, with modelling demonstrating that increasing SHS utilization has the potential to save hundreds of thousands per annum in implant costs.

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- C. Koubaesh: Data curation, Writing – review & editing.
- A. Johansen: Conceptualization, Writing – review & editing.
- W. G. P. Eardley: Conceptualization, Data curation, Supervision, Writing – review & editing.

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