

**Title:****Hip Hemiarthroplasty for Fractured Neck of Femur; A Freedom of Information Study To Assess National Variation In Implant Selection and Procurement****Abstract:****Introduction:**

During 2016 over 65,000 patients suffered a hip fracture of which approximately half underwent hemiarthroplasty. Clear guidelines exist on the usage of proven cemented implants. The Getting It Right First Time (GIRFT) Report highlighted the financial implications of 'unwarranted variation' and stressed the importance of rationalising and standardising service provision, in particular implant usage.

**Methods:**

We aimed to assess implant usage for hip hemiarthroplasty. In addition to assessing the implant used, we assessed the implant costs and the degree of variation across treating hospitals. Freedom of Information Requests (FOI) were sent to all 177 hospitals listed in the 2017 National Hip Fracture Database (NHFD) Report.

**Results:**

At time of submission 166 (94%) responses were received. Eighty four (51%) provided implant name and cost, 78 (47%) provided implant name but refused costs and 4 (3%) refused to provide any details. Nineteen different prostheses were used nationally with 20 hospitals using a non-ODEP (Orthopaedic Data Evaluation Panel) 10A implant. Average total cost was £725.00 (range £71-£1,378). Significant cost variation was demonstrated for the same implants; one implant was £978.19 at it's most costly and £285.59 at it's cheapest.

**Discussion:**

This study has demonstrated a large variation in the implants used for hip hemiarthroplasty in the trauma setting. Notwithstanding the nuances of departmental procurement processes, the cost implications for this variation are significant.

**Conclusions:**

This article demonstrates a requirement for rationalisation of implant usage and procurement in order to potentially improve patient outcomes and provide opportunities for significant cost saving in an already overstretched health service.

## Introduction:

Proximal femoral fractures continue to increase in incidence worldwide with significant associated cost implications for healthcare systems. Estimates suggest 1.4% of total healthcare burden is currently utilised to treat proximal femoral fractures worldwide.<sup>(1)</sup> In the United Kingdom (UK) alone, the total cost of caring for these patients is estimated at £1 billion.<sup>(2)</sup>

Just over half of all proximal femoral fractures are intracapsular and the majority of these undergo hemiarthroplasty.<sup>(2)</sup> Numerous implant options for hip hemiarthroplasty are available, each with a variable degree of evidence to support their use. Multiple research articles have attempted to identify the best performing implant. Recent work has questioned the superiority of modern cemented polished tapered femoral stems compared with the original monoblock cemented stems first introduced almost 70 years ago.<sup>(3)</sup>

Furthermore, debate in the literature continues regarding cemented versus uncemented femoral stems for treating hip fractures with a further randomised controlled trial on-going (WHITE-5). The WHITE-5 study is a Randomised Controlled Trial (RCT) working embedded within the World Hip Trauma Evaluation Study (WHITE). The WHITE-5 study is aiming to determine whether the modern cemented or modern uncemented hemiarthroplasty stems are superior.<sup>(4)</sup>

Whilst debate amongst the Trauma and Orthopaedic community continues regarding implant options for this patient cohort, guidelines exist regarding implant choice in the UK. The National Institute of Health and Care Excellence (NICE) Guidelines recommend the use of cemented implants in addition to the use of 'proven femoral stem designs', with Orthopaedic Device Evaluation Panel

(ODEP) rating 3B or greater (97% at three years).<sup>(5)</sup> It is noteworthy, however, that these guidelines recommend implant types and do not dictate specific implant models or manufacturers.

In 2015 the Getting It Right First Time (GIRFT) Report was published. This report highlighted the occurrence of ‘unwarranted variation’ in elective orthopaedic practice and outcomes and opportunities for improvement in patient care whilst generating cost savings.<sup>(6)</sup> An area of focus in this report was the choice of implants and their cost. A notable finding was that with respect to implant selection, trends within Trusts were driven by established behaviours or marketing factors rather than by evidence. Whilst the initial GIRFT report was specific to elective orthopaedic practice, we feel that similar ‘unwarranted variation’ with respect to implant choice may occur with hemiarthroplasty implants.

The aim of this study was to assess implant usage for hip hemiarthroplasty procedures, and specifically, assess the variation in implant costs. By identifying similar ‘unwarranted variation’ in implant usage we hoped to identify opportunities for improvements in patient care and cost saving.

## **Materials and Methods**

This study utilised the Freedom of Information Act (FOIA) and the National Hip Fracture Database (NHFD). The Freedom of Information Act 2000 provides public access to information held by public authorities, such as the National Health Service (NHS), including how taxpayers’ money is spent.<sup>(7)</sup> The FOIA requires information requests to be responded to within twenty working days following receipt of request.<sup>(8)</sup> Multiple caveats are set out in the FOIA

which allow refusal to provide the requested information if exemption criteria are met. Of most relevance to this request, Section 43 states that 'Information is exempt information if its disclosure under this Act would, or would be likely to, prejudice the commercial interests of any person (including public authority holding it).'(8)

The NHFD, established in 2007, is a continuous audit tool that collects information about all patients with a fracture of the proximal femur in England and Wales. All hospitals treating such patients are required to submit information including patient demographic data, operative intervention details and basic outcome data. The NHFD publishes an annual report of their data.

For this study, the Annual 2017 NHFD report was studied. All hospitals listed in the NHFD report as treating fractures of the proximal femur were identified. An online search for each hospital was performed to identify their FOIA request protocol. Either a formal email request was sent by one of the authors (AM) or, where necessary, an online request FOIA request form was completed and submitted. All hospitals received the same standardised request for information; *'As regards hip hemiarthroplasties for hip fractures carried out at your hospital for the year 2016: 1) Which was the most commonly used hip hemiarthroplasty prosthesis (model/manufacturer/cemented or uncemented). 2) What was the cost of this prosthesis to the hospital (including separate cost of cement if applicable) per patient?'*. If, following FOIA request, no response was received within twenty working days further follow-up emails were sent. If still no response was provided, under Section 50 of the FOIA a request was sent to the Information Commissioner's Office, who oversees the FOIA.

## **Results**

**Responses:** The NHFD Annual Report 2017 identified 177 hospitals that treated 65,645 patients with a fracture of the proximal femur.<sup>(2)</sup> Of these hospitals, at time of writing 166 (94%) hospitals had responded to the FOIA requests. Eleven (6%) hospitals had failed to respond despite multiple requests being sent. Of the 166 hospitals that had responded to the request 162 (98%) provided details of the most commonly used prosthesis whilst four (3%) refused to provide both implant type and cost information. Eighty four (51%) hospitals provided the requested implant costs whilst the remaining 78 (47%) refused to provide implant costs. Hospitals refusing to release the requested information cited either a Section 43 exemption, as mentioned previously, or a Section 1 exemption (a public authority is not obliged to comply with a request if the authority estimates that the cost of complying with the request would exceed the appropriate limit).

### **Implant usage (Figure 1):**

One hundred sixty two hospitals provided details of their most commonly used hip hemiarthroplasty implant. A total of eighteen different femoral stem implants are currently in use. The three most commonly used implants are the Exeter Trauma Stem (39/162 hospitals, 24%), the Exeter V40 stem with Unitrax femoral head (Stryker Ltd., Newbury, United Kingdom)(39/162, 24%) and the Furlong cemented stem (Joint Replacement Instruments, Sheffield, England) (22/162, 14%). Both the Austin Moore and Thompson's prostheses were still in use in 1/162 (0.6%) and 19/162 (12%) hospitals, respectively.

Regarding cementation, 85 hospitals provided details of the cement that was used. Feedback from the 85 hospitals to respond demonstrated five different

types of bone cement to be in use. The most commonly used bone cement was Palacos (Heraeus Medical, Hanau, Germany) used in 62/85 (73%). Other brands of cement used included Simplex (Stryker Ltd., Newbury, United Kingdom), Copal (Heraeus Medical, Hanau, Germany), Refobacin (Zimmer Biomet, Warsaw, Indiana) and Vancogenx (Tecres, Sommacampagna, Italy).

**ODEP Rating:** With the exception of the Thompson's, Austin Moore and Exeter Trauma Stem, which do not currently hold a rating, all hemiarthroplasty stems in use in the responding hospitals held an ODEP rating of at least 3A.

**Implant cost (Figures 2-4):** Specific prosthesis costs were available for 84/166 hospitals from whom responses were provided. Mean prosthesis cost was £725.00 including VAT. Prosthesis costs ranged from £71.61 at their cheapest to £1378.00. The cheapest prosthesis was the Thompson's hemiarthroplasty whilst the most costly implant was the Corail cemented stem (DePuy Synthes, Warsaw, Indiana).

Fifty one of the 166 hospitals to respond provided specific costs of cement, per patient. Mean cement cost was £71.52. Similar to prosthesis pricing, cement costs per patient demonstrated a wide range from £27.74 to £185.00 per patient. Median prosthesis cost was £350.00 (interquartile range £200.00-£579.90). Median cement cost was £56.00 (interquartile range £46.24-£84.54). Median total implant cost (prosthesis plus bone cement) was £438.00 (interquartile range £319.90-£674.40). Comparison of ODEP rated (3A-10A) versus non-ODEP rated prostheses demonstrated a statistically significant ( $p < 0.0001$ ) increased cost via a Mann Whitney U Test; median cost of ODEP rated implants was £565.30 (interquartile range £366.10-£702.00) compared to median cost of non ODEP rated implants of £180.80 (interquartile range £153.40-£298.70).

## Discussion

This Freedom of Information study has identified several important findings with respect to implant usage in treatment of displaced intracapsular neck of femur fractures in the United Kingdom. There are significant financial implications of such variation in practice and this work supports the suggestions put forth, originally in the elective orthopaedic setting, by the GIRFT report that significant 'unwarranted variation' is occurring across the country.

Firstly, a huge difference has been identified in prices paid for hemiarthroplasty implants at different hospitals. A £1306.39 difference has been demonstrated between the most costly and cheapest hemiarthroplasty prosthesis. According to NHFD data 43% of hip fractures were treated with hemiarthroplasty in the year 2016, corresponding to 28,160 patients. Therefore if all hospitals utilised the Thompsons cemented prosthesis, obtained at the cheapest rate recorded (£71.61) a cost saving on prosthesis cost alone would be achieved of just over £18,000,000 per year. With recent evidence suggesting no significant clinical difference between the Thompson hemiarthroplasty and more modern cemented modular prostheses huge cost savings could be made with apparently no risk of inferior clinical outcome.<sup>(3)</sup> Despite this recent evidence, if reverting to one of the older designs of hip hemiarthroplasty is deemed not appropriate and a modern proven cemented stem was required as per NICE guidelines, opportunities for significant cost savings are still available.<sup>(5)</sup> For

example, the most commonly used modular prosthesis was the Exeter V40 stem with Unitrax femoral head (Stryker Ltd., Newbury, United Kingdom). The average cost for this prosthesis was reported as £619.34. If all hospitals utilising this prosthesis were able to procure it at the lowest price recorded (£350.89), an average cost saving of £268.45 per patient would be achieved. We have also demonstrated similar variation in usage and cost of bone cement. With five different brands of bone cement in use with a difference of £157.26 per patient between the cheapest and most costly, there is clearly opportunity for significant cost saving in the absence of evidence to suggest a change in clinical outcome.

A point of particular interest in this study is the variability in the interpretation of the Freedom of Information Act and Hospital's willingness to provide implant pricing. Forty eight percent of the hospitals to respond refused to publish their implant pricing. Whilst creating an incomplete dataset and therefore limiting the generalizability of our findings, the refusal is a point of interest in it's own right. The most common reason cited for refusal to comply with the request was Section 43 of the FOIA (Information is exempt information if its disclosure under this Act would, or would be likely to, prejudice the commercial interests of any person (including public authority holding it)). This seems counterintuitive to providing an open market within which industry competition can help to drive down costs. If potential competitors are made aware of implant procurement costs it provides an opportunity for more competitive, cost saving, offers to be made.

The main limitation of this study is in the incomplete dataset provided. As previously noted, the high rate of refusal to publish implant costs limits the generalizability of our findings. However, despite this we feel the degree of

variation in implant usage and implant costs is likely to also be reflected in the hospitals that have failed to provide data. A further limitation of this study is possible inaccuracies in the information provided. The process of responding to FOIA requests differs between hospitals and we can not guarantee absolute accuracy of the information provided. Furthermore, this was a retrospective study and therefore demonstrates practice and implant costs that may now be either outdated or hospitals may have changed their chosen implants based on evolving data or improved procurement processes.

A further noteworthy point of this study is the fact that hospitals may have a number of different hip hemiarthroplasty implants in use and various algorithms for deciding which to use on a patient-by-patient basis. The type and cost of these additional 'on shelf' implants have been not investigated here. We only aimed to ascertain the implant, and it's cost, that was most commonly used at each hospital. We feel that this has allowed adequate data capture to demonstrate the 'unwarranted variation' that is occurring with respect to implant selection and cost. In addition, in this article we have not attempted to directly compare the cost of cemented or uncemented implants. Given the renewed interest in the superiority of cemented or uncemented implants in hip fracture care, this represents an avenue of further investigation to determine the most cost effective implant type.

Whilst interpreting this article it is important to remain cognisant that we have not considered the nuances of procurement processes within individual Hospitals or Healthcare Trusts. Implant procurement deals may involve significant discounts in one area if higher costs are paid or alternative implants are selected. We also do not know if these discounted prices have been taken

into account in our data. However, notwithstanding these nuances of procurement processes, we feel that this article highlights important variation that poses opportunity for significant cost saving and rationalisation of services.

## Conclusion

Here we have highlighted the presence of huge variation in implant selection and procurement costs in hip hemiarthroplasty procedures in England and Wales. We have demonstrated that rationalisation and standardisation of implant selection would provide opportunities for huge cost saving. Furthermore, the differences in implant selection and cost between hospitals do not appear to be evidence based and instead are likely to be driven by established behaviours and marketing factors as previously described in the GIRFT report.<sup>(5)</sup> Efforts to identify the best performing hip hemiarthroplasty implants are on-going through observational registry studies and randomised controlled trials.<sup>(3,4,9)</sup> The evidence synthesised in these studies must be utilised to guide implant selection and this arguably should be on a national, supraregional or regional basis in order to provide improved procurement costs. It is also noteworthy that failure of hospitals to openly publish implant procurement costs, when requested as part of the FOIA, may be counterproductive to achieving competitive pricing. An open market, across all of healthcare procurement must be encouraged in order provide transparency and ensure competitive tendering processes throughout.

Word count:

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