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The **National Hip Fracture** Database
National Report 2012 - Supplement

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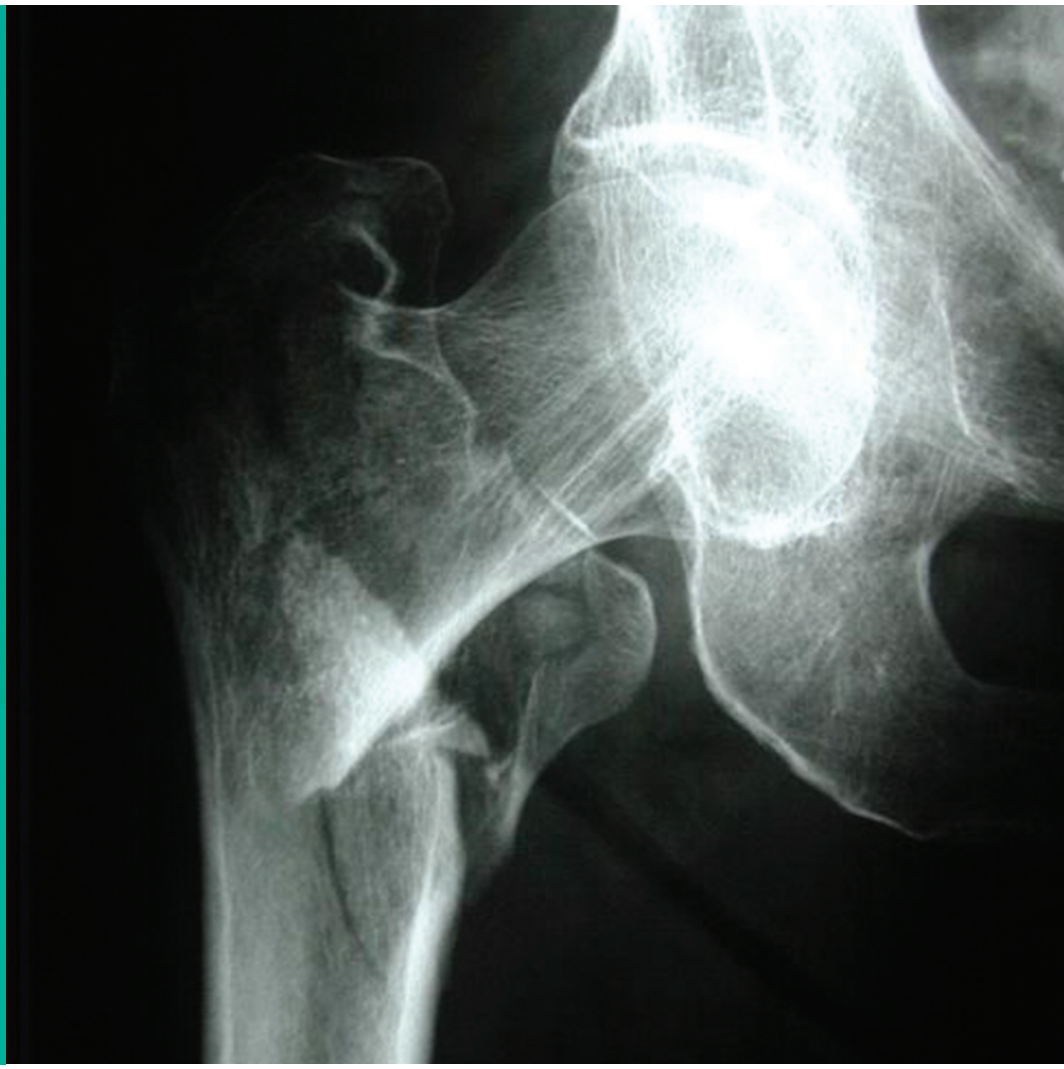

The **National Hip Fracture** Database National Report 2012 - Summary

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To speed search for individual hospital results in the e version of the Report, go to 'Edit' at the top of the report, then 'Find'. Type in the three letter hospital code, and it will be highlighted in yellow wherever it appears.

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This report and the NHFD National Report 2012 are also available online at **www.nhfd.co.uk**

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The National Hip Fracture Database in 2013

Hip fracture, which usually results from the combination of a fall and pre existing osteoporosis, is the most common serious injury of older people, with around 76,000 cases occurring per year across the UK. Many patients are already frail. Mortality is high, residual disability common, and care costly. Although there is good evidence on best practice in surgical, medical and rehabilitation care following hip fracture, such care and its outcomes – in terms of return home and also of mortality – continue to vary.

The National Hip Fracture Database (NHFD) was developed over the years 2004 to 2007 as a collaboration between the British Orthopaedic Association (BOA) and the British Geriatrics Society (BGS), building on the work of established large scale hip fracture audits in Sweden and Scotland and making use of web technology developed for the Myocardial Infarction National Audit Project. It is the first national clinically led, web based audit of hip fracture care and secondary prevention.

The aim of the NHFD is to improve care. Data is collected on case mix, care processes and outcome, and care measured against six standards laid out in the 2007 BOA/BGS Blue Book on the Care of Fragility Fracture Patients[1]. These are: prompt admission to orthopaedic care; surgery within 48 hours and within normal working hours; nursing care aimed at minimising pressure ulcer incidence; routine access to orthogeriatric medical care; assessment and appropriate treatment to promote bone health; and falls assessment. In 2009 the NHFD was recognised by the Departments of Health as a National Clinical Audit, and in 2012 became part of the Falls and Fragility Fracture Audit Programme, managed by the Royal College of Physicians (London) on behalf of the Healthcare Quality Improvement Partnership.

The NHFD provides support for participating units seeking to improve care. The audit offers continuous and benchmarked feedback of data on case mix, care processes, and such outcomes as length of acute stay and mortality. The NHFD's central staff offers advice and support on data collection and data quality, and a telephone helpline to assist clinical and audit staff on the practicalities of audit participation. In addition the NHFD website provides much useful information in the form of the database of clinical literature and other relevant documentation to support improvements in care. The NHFD'S regional meetings have proved popular. They are well attended and effective in bringing audit participants together to hear about, discuss and share good practice in hip fracture care.

As previous NHFD National Reports have shown, many clinical teams have used the synergy of audit, feedback and standards locally in clinical change or service development initiatives prompted and monitored by the NHFD, often with very substantial and quantifiable improvements. These include reduced mortality and reductions in length of stay, often arising from care pathway redesign and improved collaboration between surgeons, anaesthetists and ortho geriatricians; and substantial efficiency savings that are in keeping with an important point made in the BOA/BGS Blue Book:
'Looking after hip fracture patients well is cheaper than looking after them badly'.

As a result of this combination of local initiatives and support from a national audit there has been over the years a broad improvement at national level in compliance with the six Blue Book standards.

Standard	2009	2010	2011	2012
1. Admission to orthopaedic ward within 4 hours	N/A	55%	56%	52%
2. Surgery within 48 hours and during working hours	75%	80%	87%	83%
3. Patients developing pressure ulcers	N/A	6%	3.7%	3.7%
4. Pre-operative assessment by an orthogeriatrician	24%	31%	37%	43%
5. Discharged on bone protection medication	N/A	57%	66%	69%
6. Received a falls assessment prior to discharge	44%	63%	81%	92%

Table 1: Compliance with Blue Book Standards

(Disappointingly, however, most recent data shows a loss of momentum in early care. Changes in accident and emergency targets appear to have led to a fall off in admission to orthopaedic care within four hours; and the Best Practice Tariff standard of surgery within 36 hours may have had the unintended consequence of reducing compliance with the Blue Book standard of 48 hours.)

Since 2010 the Best Practice Tariff (BPT) initiative has provided for English NHFD participants an incentive to meet the BPT standards. These are specified in chart 1 below and are in many respects comparable with those of the Blue Book. The steady rise in compliance over eight successive quarters is impressive, particularly the rise in the provision of orthogeriatric care, as greater access to specialist medical expertise appears to reduce non surgical complications and improve on ward multidisciplinary rehabilitation – with greatest benefit to the previously frailer patients.

Quarter by quarter BPT criteria compliance and BPT achievement: 2010/2011

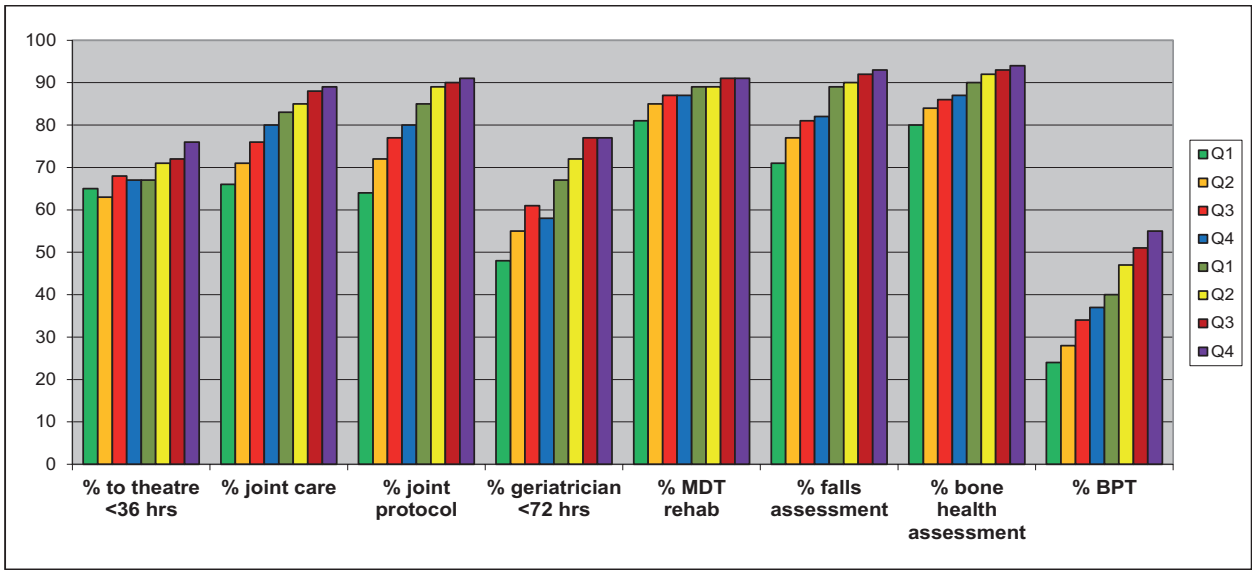


Chart 1: Compliance with Best Practice Tariff standards

Current participation figures for the NHFD are as follows:

- All 184 eligible hospitals in England, Wales and Northern Ireland are registered with NHFD
- All are currently submitting data
- An average of c. 5300 cases are now submitted per month
- Since its launch in September 2007 the NHFD has documented 250,000 cases – making it by far the largest hip fracture audit in the world.

The steady expansion of the NHFD, together with achievements such as those noted above, has been documented over the years in successive National Reports; and a series of NHFD presentations at scientific meetings across the UK, in Europe and more widely across the world. This has led to substantial interest in the concept of web based, clinically led hip fracture audit on a national scale.

In Ireland, the Irish Hip Fracture Database is now active. In Australia and New Zealand a number of individual hospitals are implementing the NHFD model, and funded development work to establish a single Australia and New Zealand hip fracture database is well advanced. Work is in hand in Hong Kong, and also in Canada, to develop large scale hip fracture audit on the NHFD model.

The Supplement to the NHFD 2012 National Report: main points

This Supplement to the National Hip Fracture Database 2012 National Report[2] extends the findings of that Report and should be read in conjunction with it. Using data recently made available from analyses carried out by the Royal College of Surgeons Clinical Effectiveness Unit (RCS CEU), and by Quantics Consulting, the Supplement focuses on three important aspects of hip fracture care:

- Overall length of NHS stay following admission for hip fracture. This includes the immediate admission to acute surgical care, and subsequent NHS in patient care during which patients are undergoing rehabilitation, awaiting community support and rehabilitation services enabling them to return home, or awaiting care home placement. The variation between hospitals in average overall length of stay – ranging from 12.5 to 44.5 days: a more than three fold difference – raises serious concerns about the effectiveness and cost effectiveness of post acute care which the NHFD proposes now to address.

- Trend data on hip fracture care in a large series of patients cared for over four years in hospitals with sustained NHFD participation and high levels of case ascertainment (i.e. providing data to NHFD on all, or a very high proportion of, hip fracture patients admitted), which shows continuing improvements in care and a further reduction in mortality.

- Data on standardised (i.e. case mix adjusted) mortality, with details of how outlier (i.e. statistically defined excess mortality giving rise to cause for concern) status is determined, and how the NHFD response to such concerns.

Background to the Supplement

The NHFD 2012 National Report is a 115 page public document published in September 2012 and available for download in its entirety from the NHFD website (www.nhfd.co.uk). It provides a wealth of comparative information on casemix, care and outcome on 59,365 cases from 180 hospitals in the form of 52 charts and 18 tables, together with considerable commentary and technical and statistical detail, and is therefore of interest to clinicians and managers in participating hospitals, to regional health authorities, and to commissioners of care.

This Supplement uses the data collated for the NHFD 2012 National Report (59,365 cases admitted to 180 hospitals between 1st April 2011 and 31st March 2012). However, the findings of the Supplement incorporate additional analysis involving hip fracture incidence data and data derived from the Hospital Episode Statistics (HES) database. The data linkage work involved was carried out by the RCS CEU in a separately funded project with two principal aims.

The first was to clarify the incidence of hip fracture, which historically had relied upon a range of estimates from various sources, thus creating a 'denominator problem' which placed severe limitations on the work and findings of the NHFD. Only by establishing a robust denominator could the NHFD's ascertainment rates (the ratio of cases documented in relation to the total of cases occurring) at both hospital and national level be reliably determined. The success of this work adds greatly to the credibility of the NHFD and to the validity of its inter hospital comparisons of care and outcomes.

The second aim was to establish the overall NHS length of stay ('superspell') for patients admitted with hip fracture. The NHFD, since its launch, had succeeded in documenting acute length of stay quite well, and indeed, probably as a result of concomitant improvements in care, showed a 5% reduction in acute length of stay – from 21.2 to 20.2 days – between the National Reports of 2011 and 2012.

However, the NHFD's data capture on subsequent NHS stay has been poor so far, and as a result overall length of stay has, until this work by the RCS CEU, remained obscure. The true rate of return home – understandably a matter of great importance to patients and their carers – was therefore in many cases very difficult to establish. And since the major factor in the overall cost of hip fracture care is dominated by length of stay, the robust determination of this is important for economic reasons. Length of stay may reasonably be regarded as a surrogate measure of the overall costeffectiveness of hip fracture care, and is therefore of growing importance in the current context of financial constraint throughout the NHS.

Although the NHFD documents hip fracture care in England, Wales, and Northern Ireland, the RCSCEU use of HES data meant that the work was confined to cases occurring in England. A full account of this project, which successfully addressed complex challenges in data linkage in order to match patient records in both the NHFD and the HES datasets, was reported in late 2012. Relevant sections are to be found in Appendix A.

The NHFD first reported trend data in its 2011 National Report. With the audit's coverage still expanding, it was considered important to attempt to measure, over three years and in a large group of cases treated in hospitals with sustained NHFD participation and high levels of caseascertainment, trends in compliance with clinical standards and – more importantly – mortality. In this work, carried out by Quantics Consulting, a statistically significant reduction in mortality was documented.

A further analysis comparing mortality of patients seen by an ortho geriatrician prior to surgery with those not seen was of considerable interest, and appears to support the case for ortho geriatrician involvement in the care of hip fracture patients. Chart 2 below shows the rise in the proportion of patients seen by an ortho geriatrician (green shading); and, in patients seen by an orthogeriatrician, a steeper fall in raw (green line) and casemix adjusted (interrupted green line) mortality compared with patients undergoing routine care (red lines).

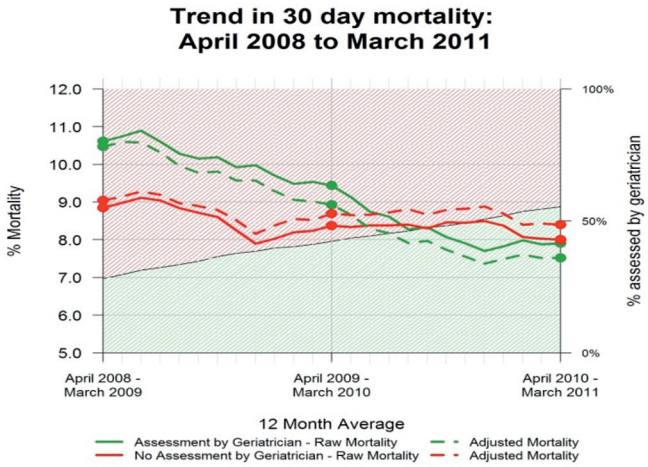


Chart 2 : Trend in 30 day mortality 2008 2011

The Supplement includes an update of the trend data report, now extending over the four years 2008 to 2012. (See page 15)

Finally, the Supplement reports on standardised (i.e. case mix adjusted) 30 day mortality data following hip fracture, in the form of a funnel plot[3] (see page 17), and showing mortality variance across 156 hospitals. With hospital mortality currently much in the news, such detailed reporting of condition specific standardised mortality in the form of a funnel plot – which offers statistically sound methods of identifying outlying units raising concerns that merit further investigation. In addition, measures have been developed by the NHFD to clarify underlying factors and thus enable clinical teams to take remedial action.

Overall length of stay: some issues in post-acute care

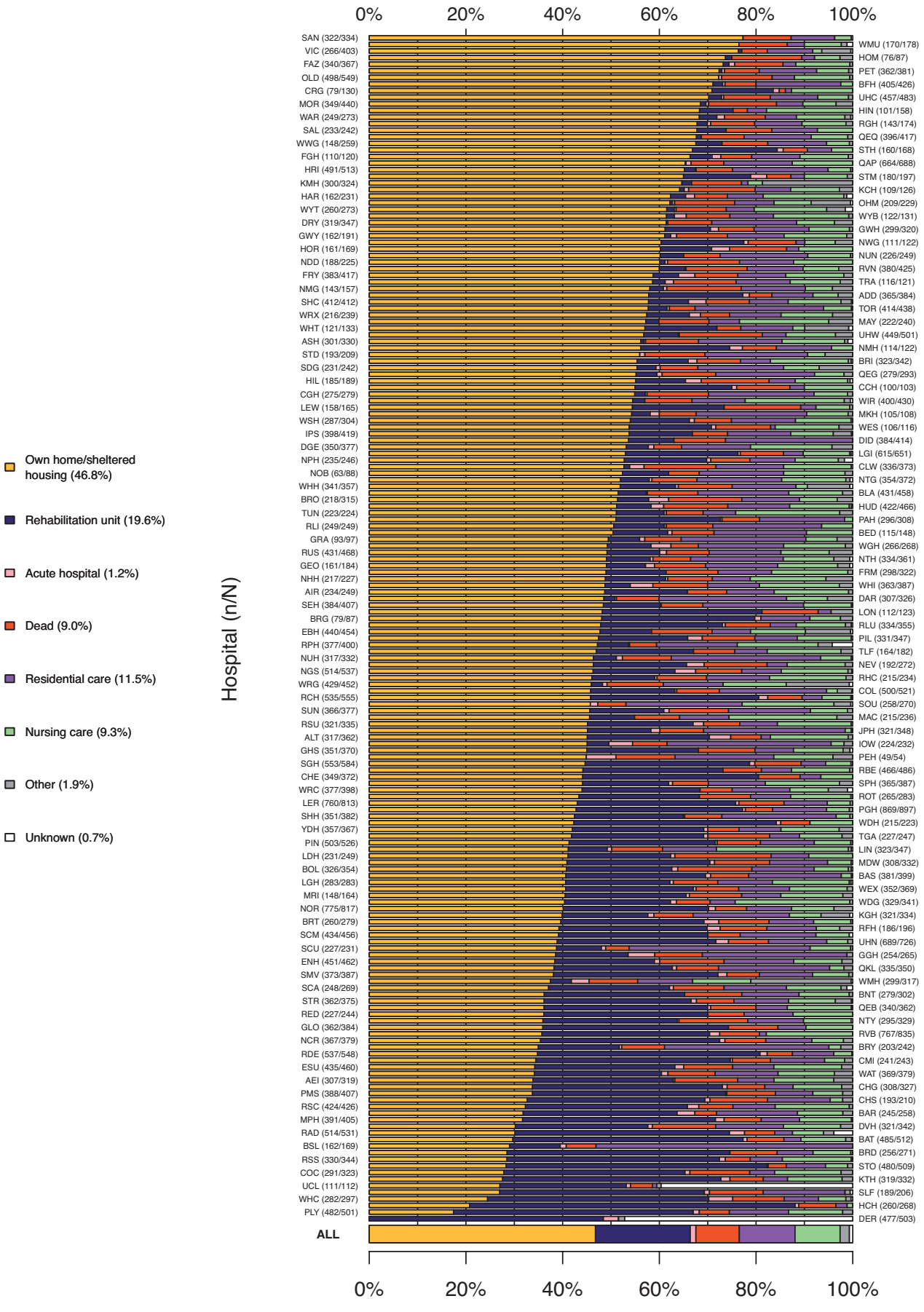
Since the NHFD was launched its main emphasis has been on the acute care and immediate secondary prevention of hip fracture. Understandably, busy trauma units have given priority to early and effective surgical care, the medical care of often frail older patients, and early rehabilitation. Audit data collectors, usually based in the trauma unit, have ready access to information on acute care, and data completeness and quality are accordingly generally high. Although the dataset allows for, and the audit encourages, follow up at 30 and 120 days, data capture has been poor – averaging c. 32% for the former and c. 24% for the latter.

For many patients, acute care following hip fracture is only part of the story. Though an early and safe return home is a the ambition of the great majority of hip fracture patients admitted from home, the journey home may be extended and also complicated. And though pressure on acute sector beds and a continuing need to clear them for incoming patients play a large part in the thinking of clinicians and managers in the acute sector, there has been a relative lack of interest in the post acute care of hip fracture patients in the NHS, and hitherto only limited information about such care. Chart 3 below, taken from the 2012 National Report, goes only some way to address this, and shows wide variation in patients' destinations on discharge from acute care.

Although c. 75% of all cases documented in the Report are admitted from home, the average proportion of patents discharged directly home from acute care by individual participating hospitals ranges from over 75% to well under 20%, with average rate of direct discharge home of under 50%. In terms of patient preference, such disparities might be hard to defend.

Many factors may combine to influence the likelihood or otherwise of an early and safe return home from acute care following a hip fracture. Early surgery and good medical care, together with multidisciplinary rehabilitation to restore mobility and self care, are important, and all can and should be delivered in the acute care phase. When this happens, the ready availability of support and continued rehabilitation at home – though not widely available – makes early return home far more likely. Ideally, the close collaboration of health and social services in the community would make such support and rehabilitation easily accessible everywhere.

Chart 3 : Discharge destination from acute care



Excludes patients discharged after 31/03/2012

The variation in discharge patterns between hospitals shown in chart 3 probably reflects to a varying degree some or all of these, as well as another factor – probably under recognised – namely the variable availability and staffing of downstream beds. Post acute in patient rehabilitation, preferably in the care of a multidisciplinary team led by an orthogeriatrician, will be of great benefit for the frailest patients from home – in effect offering them a last chance to return there. If, however, downstream inpatient care is available without rehabilitation opportunities, such care may be detrimental, with loss of function, morale and – in the worst case – possibly the unnecessary loss of a cherished home.

In chart 3, destinations on discharge from acute care include, in addition to the return home experienced by c. 47% of patients, further NHS rehabilitation care, return to (or admission to) nursing home care, and return to (or admission to) residential care with institutional outcomes often the least preferable for patients and their families.

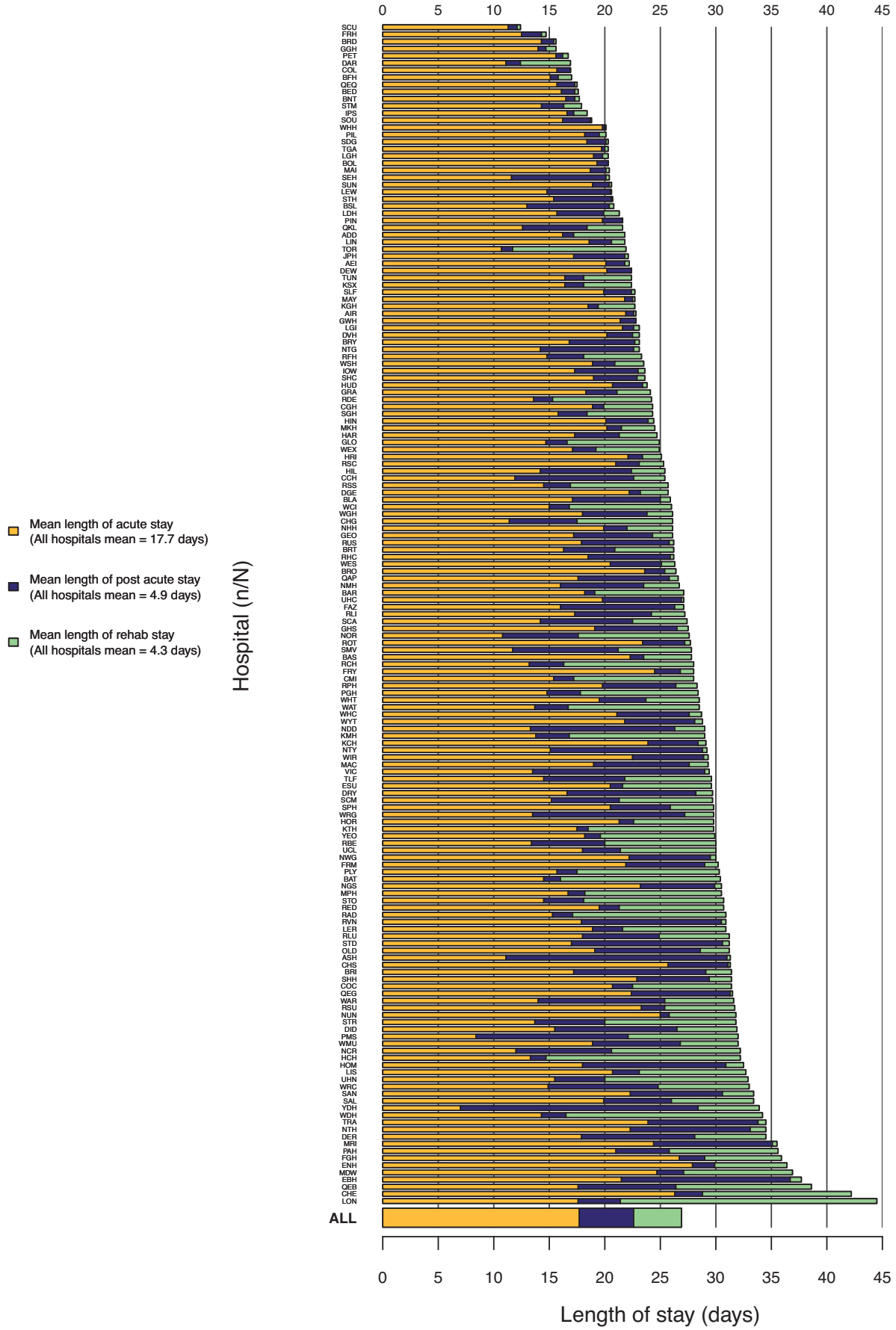
In the interests of optimising patient care, and in particular ensuring that patients from home have maximal opportunity to return there, further work by the NHFD is required. The unnecessary loss of home, followed by permanent admission to costly nursing care, could be seen by patients and their families as a disappointment if not a tragedy, and in many cases one with serious financial implications. The robust documentation of variance in progression from home to permanent nursing home care via a hip fracture is therefore now a high priority.

There is already anecdotal evidence of the existence of a postcode lottery in such outcomes, and relevant evidence from a comparative study that included outcomes of acute care following unscheduled (i.e. emergency) admission of patients aged 85 and over. This study showed a fourfold variation across English PCTs in the likelihood of an admission from home resulting in a care home outcome[4] As hip fracture patients are likely to be a particularly disadvantaged group within this broader category in terms of previous frailty and the severity of the injury causing the admission, it is highly probable that an indefensible postcode lottery for older hip fracture patients exists, with patients comparable in their social conditions and clinical and fitness terms being greatly disadvantaged simply by where they live.

As chart 3 shows, around 20% of patients discharged from acute care proceed to further NHS care in a post acute setting. The data linkage work on HES and NHFD data carried out by the RCS CEU set out to document across participating hospitals the average length and composition of ‘superspell’ episodes – comprising acute, post acute and rehabilitation care.

Chart 4 shows overall duration of NHS stay ranging from 12.4 to 44.5 days, a more than three fold variation.

Chart 4 : Overall length of NHS stay ('superspell')



This variation clearly has economic as well as human consequences. The early costs of hip fracture care – arising mainly from surgery and anaesthesia, and high peri operative dependency – are substantial but, as a proportion of the overall costs of care, they fall rapidly as length of stay extends. As a result, quite early on the dominant component of such costs is that of occupied bed days. The implications of this at a time of growing pressures on NHS budgets are clear: the cost effectiveness of hip fracture, particularly in the post acute phase, varies substantially, and as a function of the structure of care rather than in response – as will be clear from the above – to the clinical needs of patients.

It is worth emphasising again that good care – in the form of prompt surgery supported by good medical care and active rehabilitation, with ready access to community services that facilitate early discharge home – is patient focused, responds to clinical need, meets the legitimate goals of patients and their carers, and costs less. Again, 'Looking after hip fracture patients well is cheaper than looking after them badly.'

Trend data: rising care standards and falling mortality

The 2011 NHFD National Report published trend data from 28 hospitals with sustained NHFD participation and high rates of case ascertainment. The care of 30,022 patients treated over a period of three years was documented and analysed, and showed statistically significant rises in the provision of pre operative assessment by a geriatrician, of early surgery (within 36 hours), and of secondary prevention in the form of bone protection medication and falls assessment. Of most interest was a continuing significant fall in mortality from 9.4% in 2008 to 8.0% in 2011.

The purpose of this exercise, at an earlier stage in the development of the NHFD, was to explore the impact of committed participation in the audit. Hip fracture care is essentially complex, and relies on effective collaboration between different disciplines and specialties within a clinical team. Given the stimulus of standards and continuous feedback on how these are being met, together with the use of the audit to prompt and monitor clinical and service initiatives – the results of which had already been demonstrated on a much smaller scale in reports from individual hospitals – this continuous, large scale analysis was encouraging in its scope and results.

Chart 5 below reports similarly on trends in care, secondary prevention and mortality over a four year period from April 2008 to March 2012. In this instance, an analysis of over 37,000 cases from 27 hospitals with good data completion and case ascertainment again shows continuing statistically significant improvements in care and secondary prevention; and a continuing statistically significant fall in mortality. Detailed methodology is provided in Appendix C.

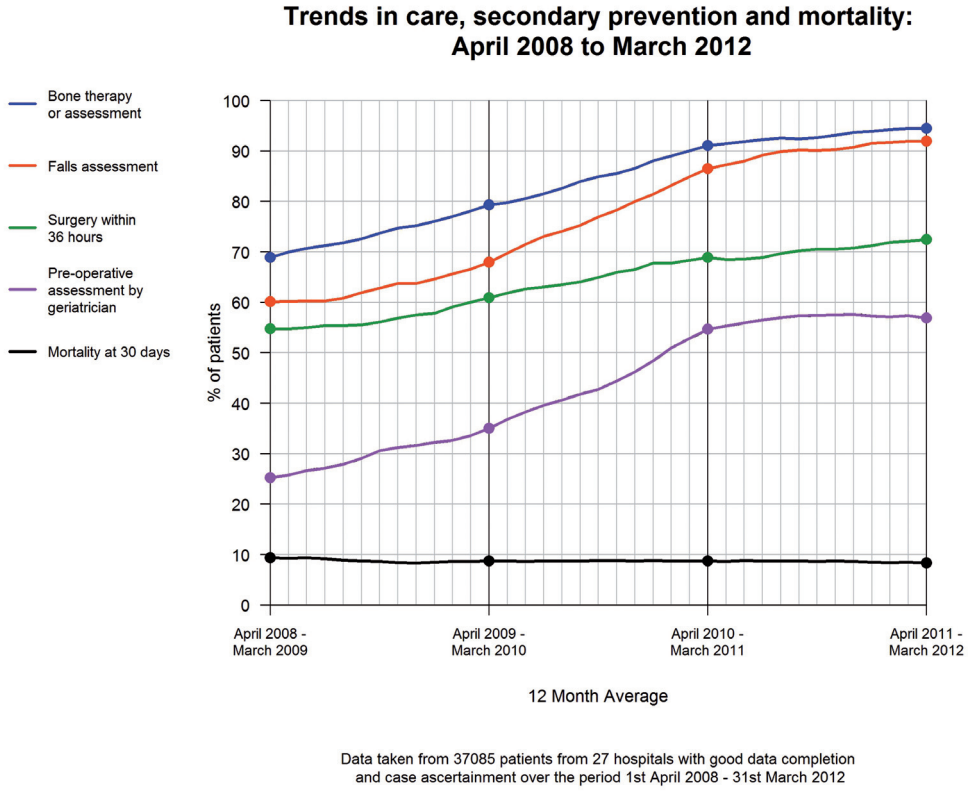


Chart 5 : Trend analysis 2008-2012

Case mix adjusted mortality and outlier management

While weaknesses in the NHFD's data capture of later stages of care at 30 and 120 days, mortality data – individually case-matched with national mortality statistics – is highly reliable. Mortality, widely recognised as a very important indicator of the quality of care, and currently the focus of much official and media attention, requires, in the case of hip fracture care, to be case-mix adjusted. The vast majority of hip fracture patients are old or very old, and a proportion of them are very frail. Individual hospitals deal with patient populations with substantially varying degrees of frailty and hence differing risks in terms of reported mortality.

Case-mix adjustment, or standardisation, allows a fairer comparison of inter-hospital mortality differences. It accounts for differences in the patient populations between hospitals. The funnel plot below shows both the raw mortality rate and case-mix adjusted mortality rate for each hospital. The interrupted curved lines denote statistically determined thresholds above which are 'alert' and then 'alarm' zones. It will be clear that, while the vast majority of hospitals cluster around the 'average' line (8.1%), for some hospitals standardisation may shift performance above or below these thresholds. And it should be noted that even very few additional deaths may trigger 'alert' or 'alarm' status. The majority of outlying Trusts in the 'alert' funnel would have been within the 'normal' funnel, but for one to two additional deaths. Those in the 'alarm' area of the plot have experienced in the region of eight to ten additional deaths.

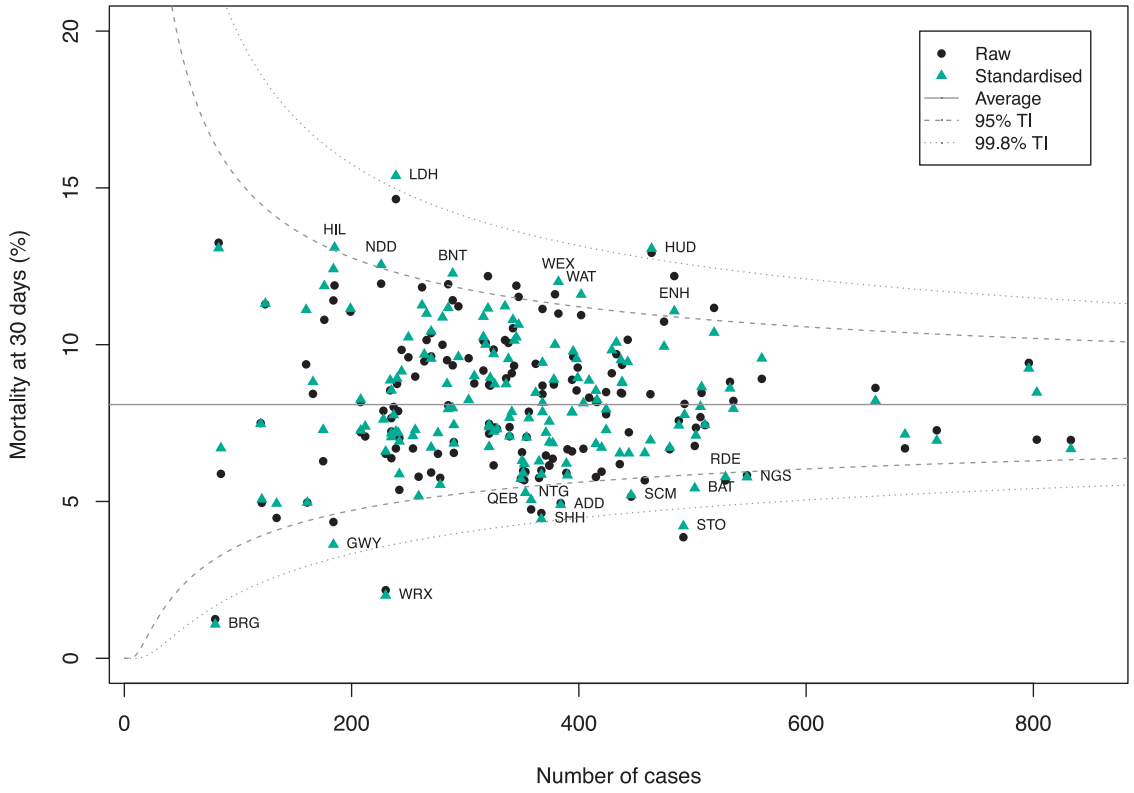


Chart 6 : Casemix adjusted 30 day mortality funnel

Where cause for concern arises, hospitals are invited to check their data, and a further process in the management of such 'outliers' involves discussion with senior NHFD clinicians; and, if indicated, an analysis of case-mix, care process and mortality outcomes. This, an essentially diagnostic process, samples a group of patients that have a similar case-mix to the outlier from the wider NHFD reporting database, and subsequently compares the sample with the outlier in terms of care processes that may be associated with excess mortality.

This approach is seen as helpful and supportive in identifying remediable causes of poor performance. It is noteworthy that previously outlying hospitals have been able to address problems, reduce mortality and thus avoid outlier status in subsequent reports.

Conclusions and future plans

This summary report has:

- Identified wide variation in NHS 'superspell' for hip fracture, and hence concerns about the economic and humane consequences arising in the post-acute care of patients with hip fracture.

- Demonstrated continuing improvements in care together with falling mortality in a trend data analysis now including over 37,000 cases and extending over four years.

- Used condition-specific and statistically robust methods to identify hospitals showing outlier status in terms of mortality following hip fracture; and demonstrated successful outlier management methods that have addressed underlying problems and reduced mortality.

At a recent meeting of the Programme Board of the Falls and Fragility Fracture Audit Programme, an NHFD proposal to document costly and clinically unacceptable variation in post-acute care was accepted. This will involve improved follow-up, and further use of superspell data to clarify variation in important outcomes, such as rates of return home, and of admission to permanent nursing home care following hip fracture in patients admitted from home (with the use of case-mix adjustment in such outcomes where possible).

While the challenges of improving post-acute care are recognised as substantial, greatly improving its documentation will provide a basis for comparisons that will be of interest not only to patients and their carers, but to acute and post-acute clinical teams, and to agencies commissioning hip fracture care – agencies which are likely to value cost-effectiveness, especially when it is linked to higher quality care.

Though the post-acute care of hip fracture is complex, heterogeneous, and more complicated because it often crosses agency boundaries, comparisons that include the robust documentation of indefensible variation may raise awareness; and, since the Care Quality Commission can now hold health and social care jointly to account, previous discussions with CQC on the use of hip fracture as a tracer condition to assess the effectiveness of their collaboration in the care of a common, welldefined and costly injury might usefully be revived.

In addition, in order to address the dearth of large-scale and inclusive studies of anaesthetic care in hip fracture patients, the NHFD will carry out later in 2013 a sprint audit (the pilot phase of which has already been completed) in order to characterise existing practice over several thousand cases, with casemix-adjusted 30 day mortality as a key outcome.

The recently published National Institute for Health and Clinical Excellence (NICE) Clinical Guidance 124 'The Management of Hip Fracture in Adults'[5] sets out standards of care, the impact of which will be greatly enhanced if compliance with them can be monitored. The NHFD now plans to work with NICE to develop an audit of the Clinical Guidance 124 standards.

Appendix A

Superspell Analysis – Methodology

The following is reproduced from 'Estimating case-ascertainment and length of acute/post acute hospital stay for patients with a hip fracture'. A report produced by Dr Jenny Neuburger and Dr David Cromwell of The Clinical Effectiveness Unit, the Royal College of Surgeons of England.

Introduction

This report describes work undertaken for the National Hip Fracture Database (NHFD) by the Clinical Effectiveness Unit (RCS). The aim of the work was[…]to develop a method of defining total length of NHS inpatient stay ("super-spell"), so that the NHFD can reliably report the whole period of acute and post-acute care that follows from a hip fracture.

[An] issue raised in the 2011 NHFD report was the fairness of comparisons of length of stay between hospitals. Concerns were raised about the consistency of the reporting of post-acute length of stay when it was not provided within the hospital trust, for example when patients were transferred to community hospitals run by the Primary Care Trust (PCT). Improved linkage with the HES database was proposed as a way to better document the total length of NHS inpatient stay.

Data used in the analysis

The work was based on data from two distinct datasets. The first dataset was an extract from the NHFD which contained records on patients who had a hip fracture between 1 October 2009 and 30 September 2010. The second was an extract of Hospital Episode Statistics (HES) data from the copy of the whole HES inpatient database held by the CEU. The extract contained data for the three financial years between 2008/9 and 2010/11 on patients who had a diagnosis of a lower-limb fracture (ICD-10 code S72) or who were present in the extract from the NHFD (same HESID).

The analysis was performed using the HES extract on its own and using the part of the HES extract that could be linked to the NHFD data. The linkage of the two datasets was facilitated by the Health and Social Care Information Centre (HSCIC). They included in the NHFD extract supplied to the CEU the anonymised patient identifier (HESID) that was associated with each individual patient in the NHFD. The HESID allocated to the patients corresponded to the HESID version within the CEU HES extract.

The recording of patient care in the NHFD and HES datasets

The NHFD dataset is structured so that a single record holds all the information on the hip fracture suffered by a patient and the treatment given. The record holds information on both the acute period of care (eg, the surgery) and any post-acute period of care (eg, rehabilitation). This means that the majority of records correspond to an individual patient. Patients unfortunate enough to suffer two hip fractures at different times will have two separate records.

The HES database is structured around episodes of care. Each individual record corresponds to the time a patient is managed by the same consultant while a day case or during a hospital admission. In many cases, an episode of care will last the whole of a patient's inpatient stay within a hospital. However, there are patients who have multiple episodes of care during the same admission, and they will have a record for each episode. To distinguish admissions from episodes of care, the HES database labels a person's complete

admission as a "spell". Multiple records for the same patient will also arise if they are admitted or treated as a day case on more than one occasion. The records related to an individual can be identified because they should all be allocated the same unique anonymised patient identifier (the HESID).

The identification of acute and post-acute periods of care within HES is complex. The two periods should be distinguishable as separate episodes of care if they occur during the same hospital admission. However, it is also possible that the entire period of continuous inpatient care was not within one hospital. A person may be transferred for post-acute care to another hospital in the same NHS trust or to another NHS trust such as a community hospital run by a Primary Care Trust (PCT). It has become customary to label as a "super-spell" the entire length of the NHS inpatient care, including transfers between NHS hospitals.

Super-spells can be defined for patients by linking together their episodes of care that cover a continuous time period.

Matching patient records in the NHFD and HES

The principal concern that arises when using HES to define the expected level of activity at NHS hospitals, relates to the potential problems of poor quality data. Data quality can be compromised by the omission of information on diagnoses or procedures performed, and by the mis-coding of either diagnoses or procedures. While HES is subject to extensive data cleaning by the HSCIC, these activities cannot address either of these problems. Ideally, HES data should be compared to hospital medical records, but it is outside the scope of this study. Instead, we relied on comparing how well the data in the HES extract agreed with the NHFD data. This evaluation addressed two issues:

1. could the hospital admission defined in the NHFD be matched to the corresponding spell in HES, and

2. how consistent were the NHFD and the HES extracts in relation to the type of hip fracture recorded and the surgical procedure (if performed)

This evaluation was based on the linked NHFD-HES dataset. The process of creating this is described in this section, together with the results for the first part of the evaluation.

The process of finding the information in HES that corresponded to the data in the NHFD proceeded in two steps. First, a linked NHFD-HES dataset was produced by matching the patient IDs in the two datasets. We then identified the spell in HES that corresponded to the hospital admission described in the NHFD record.

The second step involved identifying the HES spell that matched the NHFD hospital admission based on the hospital admission date or operation date. To allow for some discrepancies in the recording of dates[1], we defined that a HES and NHFD record described the same hospital admission if any of the following four criteria were met:

[1] Discrepancies could arise for various reasons including: different definitions for events (thus leading to different dates), or data entry errors

1) the admission date for the HES spell was the same as that for the NHFD record;

2) the admission date for the HES spell differed by one day from the admission date in the NHFD record;

3) the episode start date for a HES episode within a spell was the same as the admission date in the NHFD record; or

4) the date of the primary operation in the HES spell was the same as the operation date in the NHFD record.

Using these criteria, 40,094 (99.4%) records from the 40,353 NHFD records in the linked dataset could be matched to a HES spell. Over 80% of these matches were for records with exactly the same date of admission, while for 97% of records, the difference in admission dates was within one day (see Table A1). The high level of agreement demonstrates that, as a minimum, both the NHFD and HES capture information on the same episodes of care.

Table A1 Number of NHFD records matched to a HES spell, NHFD-HES linked dataset

	Number	%
Admission date for HES spell same as NHFD admission date	32,536	81.2
Admission date for HES spell different by one day	6,512	16.2
Start date for episode in HES spell same as NHFD admission date	340	0.9
Operation date in HES spell same as NHFD operation date	706	1.8
Total number of matched records	40,094	100.0
Number of NHFD records without a matched HES spell	*259*	-

Length of stay and super-spells

In the 2011 NHFD report, three distinct periods of length of stay were described in relation to a person's continuous care within an NHS hospital. These were the number of acute days, calculated from admission to A&E to discharge from the orthopaedic ward. If the admission time to A&E was missing, the admission time to the orthopaedic ward was used instead.

(1) the number of post-acute days, calculated as the difference between discharge time from orthopaedic ward and the discharge time from the NHS trust.

(2) the total NHS inpatient length of stay which combines continuous periods of acute and postacute periods across all NHS hospitals. This is calculated as the difference between admission to A&E and final discharge time an NHS hospital, including transfers. This period has been referred to as a "super-spell".

The total NHS length of stay may occur within the same NHS hospital, within the same NHS trust but in different hospitals, and within several NHS trusts, with a patient being transferred from (say) an acute hospital to a local PCT-run community hospital. To date, the length of acute stay in the orthopaedic ward has been generally well recorded in the NHFD, as is post-acute stay within the same trust. However, care elsewhere in the NHS – for example, in a PCT-run community hospital – has been poorly recorded in the NHFD so far.

Distinguishing between acute and post-acute care in HES

Because HES captures all inpatient admissions as well as information on transfers (discharge destinations, and source of admission), several methods have been proposed to create super spells and thereby estimates of total NHS inpatient length of stay. The HSCIC developed a method that used the following fields to link spells: destination of discharge/source of admission (codes 49-53); method of admission (81); and date of discharge and admission, allowing a difference of up to two days between discharge from the first trust and admission to the next. Dr Foster have used a similar approach in their methodology to derive HSMR mortality indicators.

We chose to estimate acute and post-acute inpatient stays from the HES data using as similar a definition to the NHFD approach as possible. The acute stay was calculated as the number of days from admission up until the start date for any episode that followed the final acute episode in the hospital spell (or the date of discharge of the last acute episode). For this purpose, an acute episode was identified as any episode for which the contracted specialty of the consultant was trauma & orthopaedics (code 110 in specialty classification) or A & E (code 180), or within which a hip procedure was carried out (using OPCS-4.4 procedure codes).

In HES, a post-acute stay within the NHS trust was identified as any episode lasting more than a day in the same hospital spell, or following a transfer to a hospital within the same trust, that followed on from the final acute episode. The rules used are described in Appendix A3. Finally, the NHS inpatient length of stay was calculated as the total number of days between the admission and the final discharge date from an NHS trust, including any transfers to different hospitals within the same trust, or transfers to another NHS trust (including PCT-run community hospitals). The HES fields destination of discharge and source of admission plus method of admission were used to identify transfers.

There has been a move to generate "unbundled" healthcare resource groups (HRGs) for care by a specialist rehabilitation consultant or within a discrete rehabilitation ward or unit. This has created financial incentives for NHS trusts to improve coding quality, since the payment for rehabilitation as an additional element of care requires the episode to contain an appropriate OPCS-4.4 code. In particular, episodes of care can provide information using:

- Speciality codes to designate post-acute care such as 314 for rehabilitation, 318 for intermediate care and 430 for geriatric care.

- OPCS-4.4 procedures codes to designate post-acute care: U50 to U54 are related to rehabilitation, and X60 is related to rehabilitation assessment.

However, when a patient is not admitted to a rehabilitation unit, or where rehabilitation treatment is undertaken without transfer to a specialist consultant or unit, such activity will not be coded, according to NHS coding rules.

We examined the potential benefits of using data on the speciality responsible for the care of a patient, and their procedure data to identify phases of post-acute care but did not use this information in the algorithm finally used to calculate length of stay.

Patterns of length of stay within HES and the NHFD

The overall mean length of acute stay estimated from the two data sources was very similar using the linked dataset. It was 16.9 days based on the NHFD cases, and was 16.9 days for the matched HES cases. However, the overall mean for all cases in HES was 17.7, which suggests some tendency toward exclusion of patients with long acute lengths of stay from the NHFD. Overall, the agreement between the two estimates at a hospital levels was reasonable (Figure 5).

The mean length of total stay (acute and post-acute) within an NHS trust was estimated to be 21.4 days in the NHFD, and 21.9 days in HES for the matched records. As before, the overall mean for all HES admissions for the same period was again slightly higher at 22.7 days. Figure 6 shows the means for each hospital based on the NHFD against those based on HES, and again reveals reasonable agreement between the two data sources, albeit slightly worse than the estimates of acute lengths of stay.

The mean length of total inpatient stay (super-spell), within the NHS, was 26.0 days based on the NHFD, and 26.7 days based on HES for the matched records. This estimate from the NHFD was based on a smaller sample than the other length of stay estimates, due to missing information on the date of discharge from the NHS, the fraction of which varied systematically between hospitals. As a result, hospital estimates of mean super-spell length of stay from the NHFD were unreliable, since they were based on a small number of cases. The mean for the whole HES sample was 27.3 days, and the median was 18 days.

Appendix B

Hospitals included in trend data analysis

	Cases submitted 2008/09	Cases submitted 2009/10	Cases submitted 2010/11	Cases submitted 2011/12
AEI	311	302	327	319
BAR	251	205	203	258
BAS	347	379	342	399
BOL	332	319	324	354
BRD	321	304	310	271
CMI	284	271	247	243
DER	476	439	444	503
GLO	254	357	401	384
IPS	427	410	432	419
MDW	307	318	344	332
MPH	366	352	382	405
MRI	159	166	166	164
NMH	128	130	142	122
NTH	348	301	329	361
PIL	270	309	297	347
QAP	612	661	654	688
QEG	290	287	287	293
QKL	260	318	321	350
RBE	443	455	436	486
RFH	132	205	202	196
SCM	383	346	403	459
SCU	249	239	230	231
SLF	247	235	214	206
UHC	446	511	472	483
UHN	804	776	659	726
WAR	314	303	289	273
WHC	307	322	316	297

Appendix C

Trend Analysis – Methodology

This report describes trends in hip fracture outcomes from April 2008 to March 2012. Specifically five key outcomes are examined:

- 30 day mortality,
- surgery within 36 hours,
- preoperative assessment by geriatrician,
- bone therapy assessment or treatment,
- falls assessment.

The results are based on data from 27 hospitals. These hospitals were selected because they had good case mix ascertainment for the whole 4 year period (case mix ascertainment was determined by comparing the number of hip fractures entered into the NHFD to HES data on hip fractures).

All the key outcomes improved over the time period:

- 30 day mortality decreased from 9.4% to 8.3%,
- surgery within 36 hours increased from 54.8% to 72.5%,
- preoperative assessment by geriatrician increased from 25.2% to 56.9%,
- bone therapy assessment or treatment increased from 68.9% to 94.5%, and
- falls assessment increased from 60.1% to 92.0%.

Outcomes

The key outcomes were measured as follows:

- **30 day mortality** Percentage of patients who died within 30 days of admission. Calculated for all eligible cases that were matched to mortality information.
- **Surgery within 36 hours** Time to surgery is measured by the time from A&E admission to surgery. Calculated for all eligible cases for which time to surgery was available.
- **Preoperative assessment by geriatrician** Percentage of hip fracture cases where the patient received an assessment from a geriatrician. Calculated for all eligible cases where the preoperative medical assessment field was available.

- **Bone therapy assessment or treatment Percentage** of hip fracture cases where the patient
    - was already receiving antiresorptive therapy
    - began receiving antiresorptive therapy
    - was assessed, or
    - was scheduled for assessment or DXA scan

  Calculated for all eligible cases where the antiresorptive therapy field was available.

- **Falls assessment** Percentage of hip fracture cases where the patient received a specialist falls assessment. Calculated for all cases where the falls assessment field was available.

Methods

Moving average graph

For each of the key outcomes a moving average was calculated for 12 month periods. The first 12 month period is April 2008 – March 2009, the second is May 2008 – April 2009 and so on up to April 2011 – March 2012. A 12 month period is used to account for any seasonal effects (e.g. more hip fractures in winter).

Assessment of trends

Logistic regression was used to evaluate the trend for each of the key outcomes. The logistic regression examines the admission day and the outcome for each hip fracture case. The results indicate whether there is a relationship between admission day and the outcome. A p-value less than 0.05 suggests that there is such a relationship.

Results

All of the key outcomes improve from April 2008 to March 2012. Specifically:

- 30 day mortality decreases from 9.4% to 8.3%,
- surgery within 36 hours increases from 54.8% to 72.5%,
- preoperative assessment by geriatrician increases from 25.2% to 56.9%,
- bone therapy assessment or treatment increases from 68.9% to 94.5%, and
- falls assessment increases from 60.1% to 92.0%.

Logistic regression indicated that there is evidence of a trend for each outcome. For surgery within 36 hours, preoperative assessment by a geriatrician, bone therapy assessment or treatment and falls assessment there is strong evidence of a trend (the p-values are all less than 0.001). For mortality at 30 days there is also evidence of a trend (in this case the p-value is 0.04).

The results summarise the outcomes for all patients from the 27 included hospitals. The results do not take account of differences between hospitals. There is some variation in the outcomes between hospitals. The results are also specific to patients treated in the 27 included hospitals. The results may over-estimate the trends, as hospitals with good case mix ascertainment may be more committed to improving hip fracture care.

Summary of results

Table C1: Summary of results for 30 day mortality

	2008-2009 (N=8332)	2009-2010 (N=9477)	2010-2011 (N=9177)	2011-2012 (N=9522)
30 day mortality (%)	9.4	8.7	8.7	8.3
Change in % from 2008-09 [99% confidence interval] (p-value)	-	-0.6 [-1.8, 0.5]	-0.6 [-1.8, 0.5]	-1.0 [-2.1, 0.1]
Change in % from 2009-10: [99% confidence interval] (p-value)	-	-	0.0 [-1.1, 1.1]	-0.4 [-1.4, 0.7]
Change in % from 2010-11: [99% confidence interval] (p-value)	-	-	-	-0.4 [-1.4, 0.7]

Table C2: Summary of results for surgery within 36 hours

	2008-2009 (N=8185)	2009-2010 (N=9342)	2010-2011 (N=9029)	2011-2012 (N=9369)
Surgery with 36 hours	54.8	60.9	68.9	72.5
Change in % from 2008-09 [99% confidence interval] (p-value)	-	6.1 [4.2, 8.0]	14.1 [12.2, 16.0]	17.7 [15.8, 19.5]
Change in % from 2009-10: [99% confidence interval] (p-value)	-	-	8.0 [6.2, 9.8]	11.6 [9.8, 13.3]
Change in % from 2010-11: [99% confidence interval] (p-value)	-	-	-	3.6 [1.8, 5.3]

Table C3: Summary of results for preoperative assessment by geriatrician

	2008-2009 (N=8504)	2009-2010 (N=9641)	2010-2011 (N=9306)	2011-2012 (N=9610)
Preoperative assessment by geriatrician (%)	25.2	35.1	54.7	56.9
Change in % from 2008-09 [99% confidence interval] (p-value)	-	9.8 [8.1, 11.6]	29.5 [27.7, 31.3]	31.6 [29.9, 33.4]
Change in % from 2009-10: [99% confidence interval] (p-value)	-	-	19.6 [17.8, 21.5]	21.8 [20, 23.6]
Change in % from 2010-11: [99% confidence interval] (p-value)	-	-	-	2.2 [0.3, 4]

Table C4: Summary of results for falls assessment

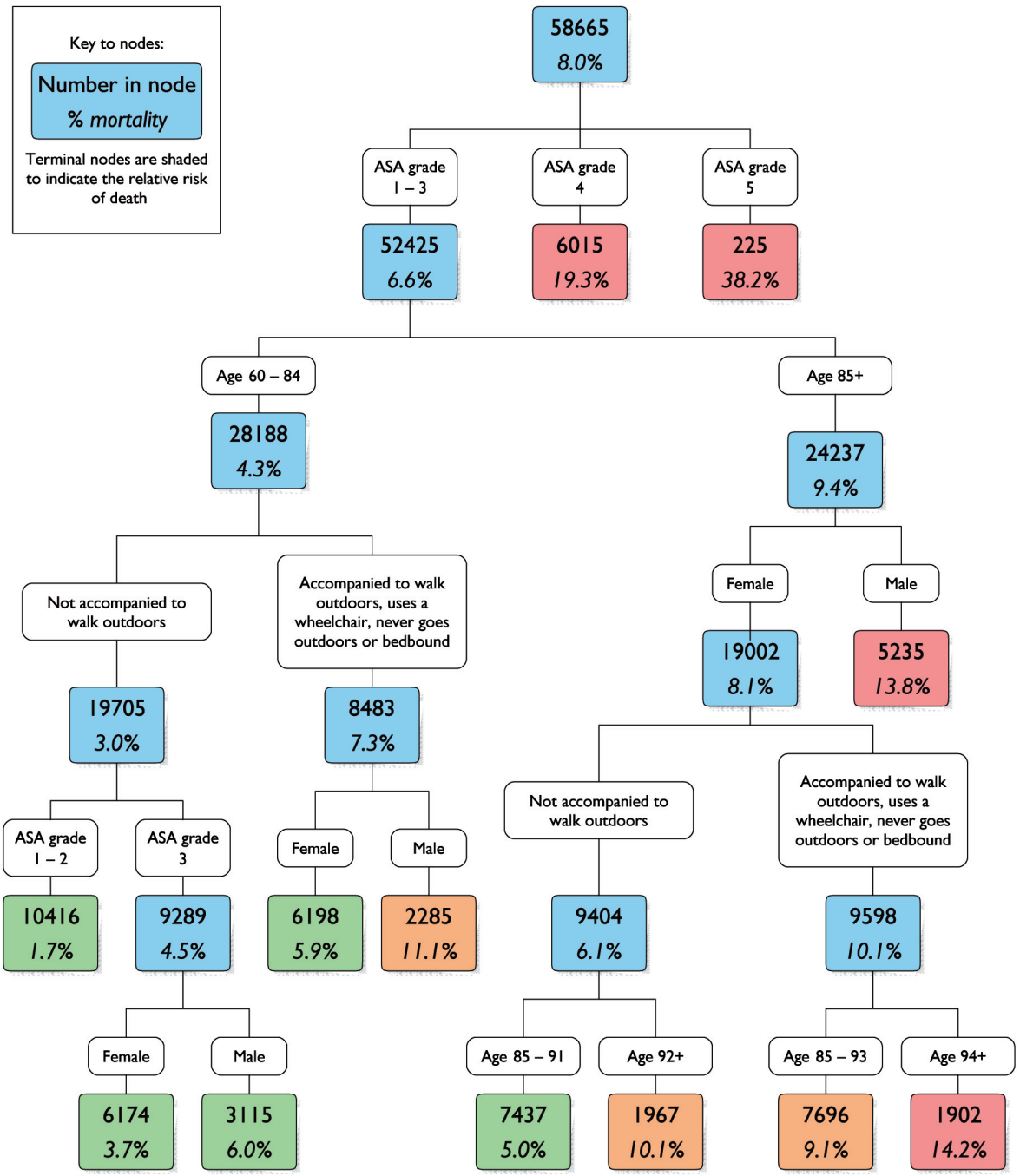
	2008-2009 (N=8290)	2009-2010 (N=9515)	2010-2011 (N=9250)	2011-2012 (N=9572)
Falls assessment (%)	60.1	68.0	86.5	92.0
Change in % from 2008-09 [99% confidence interval] (p-value)	-	7.9 [6.0, 9.7]	26.4 [24.7, 28.1]	31.9 [30.3, 33.4]
Change in % from 2009-10: [99% confidence interval] (p-value)	-	-	18.5 [17, 20.1]	24 [22.6, 25.4]
Change in % from 2010-11: [99% confidence interval] (p-value)	-	-	-	5.5 [4.3, 6.6]

Table C5: Summary of results for bone therapy assessment or treatment

	2008-2009 (N=8121)	2009-2010 (N=9593)	2010-2011 (N=9304)	2011-2012 (N=9609)
Bone therapy assessment or treatment (%)	68.9	79.3	91.1	94.5
Change in % from 2008-09 [99% confidence interval] (p-value)	-	10.4 [8.7, 12.1]	22.2 [20.6, 23.7]	25.6 [24.1, 27]
Change in % from 2009-10: [99% confidence interval] (p-value)	-	-	11.8 [10.5, 13.1]	15.2 [14, 16.4]
Change in % from 2010-11: [99% confidence interval] (p-value)	-	-	-	3.4 [2.4, 4.4]

Appendix D

Classification tree[6] for mortality at 30 days



Appendix E

Hospitals included in mortality analysis

Addenbrooke's Hospital, Cambridge	ADD
Airedale General Hospital	AIR
Alexandra Hospital, Redditch	RED
Altnagelvin Area Hospital	ALT
Arrowe Park Hospital, Wirral	WIR
Barnet Hospital	BNT
Barnsley Hospital	BAR
Basildon and Thurrock University Hospital	BAS
Bassetlaw Hospital	BSL
Birmingham Heartlands Hospital	EBH
Bradford Royal Infirmary	BRD
Bristol Royal Infirmary	BRI
Bronglais Hospital, Aberystwyth	BRG
Broomfield Hospital	BFH
Chase Farm Hospital	CHS
Cheltenham General Hospital	CHG
Chesterfield Royal Hospital	CHE
Colchester General Hospital	COL
Conquest Hospital, Hastings	CGH
Countess of Chester Hospital	COC
County Hospital, Hereford	HCH
Croydon University Hospital	MAY
Cumberland Infirmary, Carlisle	CMI
Darent Valley Hospital, Dartford	DVH
Darlington Memorial Hospital	DAR
Derriford Hospital, Plymouth	PLY
Diana Princess of Wales Hospital, Grimsby	GGH
Doncaster Royal Infirmary,	DID
East and North Herts Hospital	ENH
East Surrey Hospital, Redhill	ESU
Eastbourne Hospital	DGE
Fairfield Hospital, Bury	BRY
Frenchay Hospital, Bristol	FRY
Frimley Park, Camberley	FRM
George Eliot Hospital, Nuneaton	NUN
Glan Clwyd Hospital, Rhyl	CLW
Gloucestershire Royal Hospital, Gloucester	GLO
Good Hope Hospital, Birmingham	GHS
Gwynnedd Ysbyty, Bangor	GWY
Harrogate District Hospital	HAR
Hillingdon Hospital	HIL
Homerton Hospital, London	HOM
Horton Hospital, Banbury	HOR
Huddersfield Royal Infirmary	HUD
Hull Royal Infirmary	HRI
Ipswich Hospital	IPS
James Cook University Hospital, Middlesbrough	SCM
Royal Devon & Exeter Hospital, Exeter	RDE
Royal Free Hospital, London	RFH
Royal Hampshire County Hospital, Winchester	RHC
Royal Lancaster Infirmary	RLI
Royal Liverpool University Hospital	RLU
Royal Preston Hospital	RPH
Royal Shrewsbury Hospital	RSS
Royal Surrey County Hospital, Guildford	RSU
Royal Sussex County Hospital, Brighton	RSC
Royal United Hospital, Bath	BAT
Royal Victoria Hospital, Belfast	RVB
Royal Victoria Hospital, Newcastle	RVN
Russells Hall Hospital, Dudley	RUS
Salford Royal Hospital	SLF
Salisbury District Hospital	SAL
Sandwell General Hospital	SAN
Scarborough General Hospital	SCA
Scunthorpe General Hospital	SCU
South Tyneside District Hospital, South Shields	STD
Southampton General Hospital	SGH
Southend Hospital	SEH
Southport District General Hospital	SOU
St Helier Hospital, Carshalton	SHC
St Mary's Hospital, Isle of Wight	IOW
St Mary's Hospital, Paddington	STM
St Peter's Hospital, Chertsey	SPH
St Richard's Hospital, Chichester	STR
Stafford Hospital, Stafford	SDG
Stepping Hill Hospital, Stockport	SHH
Stoke Mandeville Hospital, Aylesbury	SMV
Sunderland Royal Hospital	SUN
James Paget University Hospital, Great Yarmouth	JPH
John Radcliffe Hospital, Oxford	RAD
Kettering General Hospital	KGH
King's Mill Hospital, Sutton in Ashfield	KMH
Kingston Hospital	KTH
Leeds General Infirmary	LGI
Leicester Royal Infirmary	LER
Leighton Hospital, Crewe	LGH
Lincoln County Hospital	LIN
Luton and Dunstable Hospital	LDH
Macclesfield General Hospital	MAC
Maelor Hospital, Wrexham	WRX
Manchester Royal Infirmary	MRI
Manor Hospital, Walsall	WMH
Medway Maritime Hospital	MDW
Morriston Hospital, Swansea	MOR

Musgrove Park Hospital, Taunton	MPH
Nevill Hall Hospital, Abergavenny	NEV
New Cross Hospital, Wolverhampton	NCR
Newham General Hospital, London	NWG
Nobles Hospital, Isle of Man	NOB
Norfolk and Norwich University Hospital	NOR
North Devon District Hospital, Barnstaple	NDD
North Hampshire Hospital, Basingstoke	NHH
North Middlesex University Hospital	NMH
North Tyneside General Hospital, North Shields	NTY
Northampton General Hospital	NTH
Northern General Hospital, Sheffield	NGS
Northwick Park Hospital. London	NPH
Peterborough District Hospital	PET
Pilgrim Hospital, Boston	PIL
FPinderfields General Hospital, Wakefield	PIN
Poole General Hospital	PGH
Queen Alexandra Hospital, Portsmouth	QAP
Queen Elizabeth Hospital, Birmingham	QEB
Queen Elizabeth Hospital, Gateshead	QEG
Queen Elizabeth Hospital, King's Lynn	QKL
Queen Elizabeth Hospital, Woolwich	GWH
Queen Elizabeth the Queen Mother Hospital, Margate	QEQ
Queen's Hospital, Burton-upon-Trent	BRT
Queen's Hospital, Romford	OLD
Rotherham District General Hospital	ROT
Royal Albert Edward Infirmary, Wigan	AEI
Royal Berkshire Hospital, Reading	RBE
Royal Blackburn Hospital	BLA
Royal Bolton Hospital	BOL
Royal Derby Hospital	DER
Tameside General Hospital, Manchester	TGA
The Great Western Hospital, Swindon	PMS
The Princess Alexandra Hospital, Harlow	PAH
The Royal Cornwall Hospital, Treliske	RCH
Torbay District General Hospital	TOR
Trafford General Hospital, Manchester	TRA
Ulster Hospita	NUH
University Hospital Aintree	FAZ
University Hospital Coventry	UHC
University Hospital Of North Durham, Darlington	DRY
University Hospital of North Staffordshire, Stoke-on-Trent	STO
University Hospital of North Tees, Stockton-on-Tees	NTG
University Hospital of Wales, Cardiff	UHW
University Hospital, Lewisham	LEW
University Hospital, Nottingham	UHN
Wansbeck Hospital	ASH
Warrington Hospital	WDG
Warwick Hospital	WAR
Watford General Hospital	WAT
West Suffolk Hospital, Bury St. Edmunds	WSH
West Wales General Hospital, Carmarthen	WWG
Weston General Hospital, Weston-Super-Mare	WGH
Wexham Park Hospital, Slough	WEX
Whipps Cross University Hospital	WHC
Whiston Hospital, Prescot	WHI
Whittington Hospital, London	WHT
William Harvey Hospital, Ashford	WHH
Worcestershire Royal Hospital, Worcester	WRC
Worthing & Southlands Hospital	WRG
Wythenshawe Hospital, Manchester	WYT
York Hospital	YDH

All hospitals not named in this table were excluded from mortality analysis due to insufficient case submissions or case ascertainment of < 80%

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Royal College of Physicians
Setting higher medical standards

British Orthopaedic Association

HQIP
Healthcare Quality Improvement Partnership

BRITISH GERIATRICS SOCIETY

The **National Hip Fracture** Database National Report 2012 - Supplement

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