

## **Characteristics of Centenarians in the Irish Hip Fracture Database**

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### **Abstract**

#### ***Aim***

Hip fractures are common amongst older people and result in significant morbidity and mortality. The Irish Hip Fracture Database (IHFD) collects data, from the 16 trauma orthopaedic units in Ireland, on patients aged 60 years and older who sustain hip fractures. This study aims to describe the characteristics of those patients aged 100 years and older in this database.

#### ***Methods***

A retrospective analysis of the IHFD from 2012 to 2017. Characteristics of those patients aged 100 years and over were collected and analysed.

#### ***Results***

57 patients were identified for inclusion, 52 (91%) of which were women. Mean age was 101, while mean length of stay was 22.6 days. 51 (89%) fractures were due to low velocity trauma, consistent with likely high rates of osteoporosis in this group. The great majority underwent operative intervention. 50 (88%) were discharged alive. Fracture type varied widely. Only 24 (42%) patients were documented to have been seen by a geriatrician during admission. There were low reported rates of co-morbid medical conditions, likely due to lack of recorded data, rather than true low rates of co-morbidities in this group.

#### ***Discussion***

This study provides insight into this distinct group of people, with important implications for future healthcare planning and budgeting.

## Introduction

Hip fractures are devastating injuries which result in excess mortality and disability<sup>1,2</sup>. The Irish Hip Fracture Database (IHFD) is a clinically-led, web-based national clinical audit and was established to record the case-mix, care standards and outcomes of patients over the age of 60 who present to 16 trauma centres in Ireland. By providing continuous feedback to the hospitals, the audit encourages improvements in compliance with care standards. The IHFD was established by joint collaboration between the Irish Institute of Trauma and Orthopaedic Surgery (IITOS) and the Irish Gerontological Society (IGS) and in 2013 the National Office of Clinical Audit (NOCA) took over operational governance of the audit<sup>3</sup>. The term centenarian refers to those people aged 100 years and over. The Central Statistics Office (CSO) of Ireland recorded 456 centenarians in Ireland in the most recent census in 2016<sup>4</sup>. The proportion of older individuals is projected to increase in coming years. The aim of this study was to quantify patients aged 100 years and older in the IHFD and to describe the characteristics of this cohort.

## Methods

Data collection for the IHFD is conducted locally at each site by an audit coordinator. The cases are entered retrospectively from patient records into the IHFD portal on the Hospital In-Patient Enquiry (HIPE) system, which is managed by the Healthcare Pricing Office (HPO). This data is then merged with a hospital admission episode and the data gets validated by NOCA<sup>5</sup>.

A retrospective analysis was conducted of 15,603 data entries in the IHFD from 2012 to 2017. Data on patients aged 100 years and older was extracted and baseline characteristics recorded which included age, sex, and co-morbidities where documented. Comorbid conditions are recorded in the IHFD as that extrapolated from HIPE. We also assessed in-patient mortality, length of stay, trauma and injury types, surgery performed, peri-operative assessment by medical and physical therapy staff and discharge destination. Data is also presented on patients aged 99 years and younger for comparison.

Statistical analysis was performed using R version 4.0.3. Descriptive statistics were used to analyse the characteristics of centenarians. This group was compared to patients aged 99 years and younger. Deviation from the mean for gender and length of stay/ITU days was analysed using the Mann-Whitney U test. Categorical data was compared using Fisher's exact test.

In order to comply with the General Data Protection Regulation (GDPR), it was necessary to group some results together (any result where fewer than 5 patients are reported). Statistical analysis was done prior to this grouping of data.

## Results

57 patients aged 100 years and over were identified in the IHFD between the years 2012 to 2017 (range 100-105). The characteristics of these patients can be seen in table 1. Note when reviewing table 1, that results which were grouped for GDPR compliance are indicated in parenthesis under the heading "Other". Co-morbid conditions experienced by fewer than 5 patients were omitted from table 2. Those listed in table 2 therefore represent the most commonly reported conditions.

52 (91%) centenarians were women, while 5(9%) were men – a significantly higher proportion than the younger patients. There were relatively similar numbers of fractures each year, with a peak of 14 fractures in 2015 and a low of 9 fractures in 2012. The average length of stay of centenarians was slightly longer than younger patients at 22.6 days, but this was not significant. In total centenarians occupied 1,287 days, 13 of which were intensive care unit days. In-hospital mortality amongst this cohort was 12% (n=7), which is significantly higher than the average across the database (n=681, 4%).

The majority of traumas were low velocity (n=51/89%). Most of the fracture types were either displaced intracapsular (n=17/29%) or intertrochanteric (n=26/42%) – the other fracture types are listed in table 1. The great majority of patients proceeded to surgery, the details of which can also be found in table 1.

With regard to peri-operative care, 24(42%) of the patients were seen by a geriatrician during their admission, 11(19%) of these were seen pre-operatively. 5(9%) patients had an abbreviated mental test (AMT) score recorded. 19(33%) patients were mobilised on the day of, or day after surgery. This is significantly less than the proportion of younger patients mobilised. 15(26%) were assessed by physiotherapy on the day of or day after surgery.

There was a significant difference in discharge destination between centenarians and younger patients. However, when comparing new nursing home admissions to all other discharge destinations, the proportion is relatively similar (9% of centenarians compared to 6% of younger patients) and the difference is not statistically significant.

**Table 1:** Clinical data (Results which were grouped for GDPR compliance are indicated in parenthesis under the heading “Other”)

		Centenarians (n=57)	Non-centenarians (n=15546)	P-value (<0.05)
Gender	Men Women	5 (9%) 52 (91%)	4788 (31%) 10758 (69%)	0.006
Age	Mean Range	101 100-105	78 1-99	NA
Mortality	Survived to discharge Death	50 (88%) 7 (12%)	14865 (96%) 681 (4%)	0.012
Length of stay	Mean Total	22.6 1287	19.6 304070	0.972
Intensive care days	Total	13	4116	0.388
Trauma type	Low velocity Other (incl. high velocity, unknown, not documented and no data)	51 (89%) 7 (11%)	14020 (90%) 1526 (10%)	0.203
Fracture type	Intracapsular Intertrochanteric Other (incl. not documented) No data	20 (35%) 26 (46%) 11 (19%) 0 (0%)	7013 (45%) 5485 (35%) 2855 (19%) 193 (1%)	0.449
Pathological fractures	Malignant Non-pathological Other (incl. atypical, other and no data)	0 (0%) 51 (89%) 6 (11%)	290 (2%) 13084 (84%) 2172 (14%)	0.916
AMT performed	Yes No Patient refused Not documented or no data	5 (9%) 38 (67%) 0 (0%) 14 (24%)	1316 (8%) 10606 (68%) 51 (<1%) 3573 (23%)	0.853
Pre-operative medical assessment	Geriatrician Medical physician Other (incl. not seen, not documented or no data)	11 (19%) 11 (19%) 36 (62%)	1865 (12%) 2356 (15%) 11325 (73%)	0.069 (assessment vs no assessment)
Assessment by geriatrician during admission	Yes No Not documented or no data	24 (42%) 15 (26%) 18 (32%)	5691 (36%) 5521 (36%) 4334 (28%)	0.201
Grade of geriatrician performing assessment	Consultant Other Not documented or no data	21 12 23	4749 (30%) 2325 (15%) 8472 (55%)	0.427
Operation	Internal fixation: dynamic hip screw Internal fixation: IM nail Hemi-arthroplasty Total hip replacement Other (incl. no operation, other, not documented, no data)	20 (35%) 13 (23%) 19 (33%) 0 (0%) 5 (9%)	3745 (24%) 3165 (20%) 6623 (43%) 550 (4%) 1463 (9%)	0.866
Mobilised day of or day after surgery	Yes No Not documented or no data	19 (33%) 16 (28%) 22 (39%)	8151 (53%) 2396 (15%) 4999 (32%)	0.004
Physiotherapy assessment day of or day after surgery	Yes Other (incl. no, not documented or no data)	15 (26%) 42 (74%)	5445 (35%) 10101 (65%)	0.761
Discharge destination	New admission to nursing home Return to nursing home  Other (incl. rehabilitation, convalescent care or home to private residence)  Other (incl. other and no data)	5 (9%) 10 (17%)  5 (9%)  37 (65%)	934 (6%) 408 (3%)  4868 (31%)  9336 (60%)	0.001  (0.393 for new admission to nursing home vs any other destination)

**Table 2: Co-morbid medical conditions.**

<b>Condition</b>	<b>No of patients</b>	<b>% of patients</b>
<b>Cardiovascular</b>		
Hypertension	10	18%
Hypotension	7	12%
Congestive heart failure	6	11%
<b>Respiratory</b>		
Lower respiratory infection	11	19%
<b>Genitourinary</b>		
Urinary tract infection	8	14%
Acute kidney failure	6	11%
Chronic kidney disease	6	11%
<b>Neurological</b>		
Dementia	17	30%
Delirium	5	9%
<b>Haematological</b>		
Anaemia	5	9%

## **Discussion**

This study sheds light on the characteristics of a group of patients aged 100 years and older who have sustained a hip fracture. The data are notable for the high rate of mortality in this group, as evidenced by the 3-fold higher death rate. This has implications for future healthcare planning and budgeting as the number of patients aged 100 years and older increases.

Importantly, the data indicates that with the exception of mortality, outcomes among centenarians are relatively similar to younger patients. In addition, the majority of centenarians survived to discharge and did not have a significantly longer length of stay, validating active management in this cohort.

Centenarians who were women were more likely to have a hip fracture compared to men than younger women. This may be related to the fact that women are more likely to reach the age of 100 in Ireland than men<sup>4</sup>. In addition, women lose bone density at a faster rate than men, which may also contribute to this discrepancy<sup>6</sup>.

With regard to perioperative care, just under half of centenarians had a documented assessment by a geriatrician in the peri-operative period. Best practice guidance would suggest that all frail, older patients should have comprehensive geriatric assessment performed during admission to improve outcomes, reduce delays to surgery, minimise delirium, promote early mobilisation and reduce subsequent falls<sup>7</sup>. There was a low rate of delirium screening based on the number of recorded AMT scores. It should be further noted that the AMT is not a good screening test for delirium and has been replaced by the 4AT in more recent iterations of the IHFD. Additionally, a significantly smaller proportion of centenarians were mobilised on the day of or day after surgery. It is not entirely clear why this is, though it may reflect the frailty status of these patients. Extrapolating from the data on place of residence, more centenarians were care home residents pre-admission, which would suggest a higher level of frailty in this group. Nevertheless, further work should try to identify the reasons why these patients are not mobilised early and, if possible, to improve practice around early mobilisation. The data provides evidence that ongoing work is required to ensure that all frail, older adults presenting with hip fractures may benefit from structured orthogeriatric care. It is noteworthy that during the study period, many of the trauma centres in Ireland did not have dedicated orthogeriatric services. Since 2018 however, there has been development of many services throughout the country. Future studies may focus on the differences this has made to the care of patients with hip fractures.

Most traumas were low velocity, which suggests a high rate of osteoporosis and other diseases of bone predisposing to fractures in this cohort. Osteoporosis is a condition commonly known to be associated with ageing, with 29% of male centenarians and 56% of female centenarians suffering from this condition<sup>8</sup>. A high number of patients in this cohort also resided in nursing homes. It has been shown that rates of osteoporosis in female nursing home residents over the age of 85 may be in excess of 85%<sup>9</sup>. It is therefore important to screen and commence appropriate treatment for patients at risk to prevent serious injury.

The patients in this cohort had low rates of co-morbid medical conditions, based on data obtained from HIPE records. 17 of 57 patients had a diagnosis of dementia recorded, which is low for a group of centenarians<sup>10</sup>. 5 had reported delirium, which is low even for a cohort of hospitalised patients with hip fractures<sup>11</sup>. Less than 5 patients had osteoporosis listed as a co-morbidity, which reflects the generally poor documentation, recognition and treatment of this condition even after a major fracture such as hip fracture.

The findings of this study are broadly in line with a number of other European studies looking at hip fractures in centenarians. Hip fractures in centenarians are associated with excess mortality compared to hip fractures in younger patients<sup>12,13,14</sup>. An Italian study also indicated higher mortality compared to centenarians admitted for other reasons<sup>15</sup>. The proportion of patients with hip fractures who were aged 100 and over was also similar to that in a Danish study using a similar national database<sup>13</sup>.

This study has a number of limitations. Firstly, despite the large number of patients in the database, the sample size of centenarians is small, meaning that there may be differences between centenarians and younger patients which are not detected in this study. The small sample size has also limited our ability to report full results, due to the requirement to comply with GDPR. In addition, mortality data is reported as an absolute number rather than being linked to specific cases. It has therefore not been possible to perform multivariate or regression analyses on the data. There is also no data available for the period following discharge, which means it has only been possible to report in-hospital mortality. With regard to reporting of co-morbid medical conditions, it is likely that the low rates of co-morbid medical conditions and conditions associated with ageing is due to failure to document diagnoses to the HIPE database, rather than this cohort truly having low rates of these conditions, representing a further limitation. Despite these limitations, the study has several strengths. This was a nationwide, population-based cohort. Data collection was comprehensive, and quantity of missing data was broadly similar between centenarians and younger patients, making inferences more reliable. The study provides evidence that centenarians with hip fractures in Ireland receive good care but provides insight into areas which can be improved – for example, early mobilisation and structured orthogeriatric assessment, which may help to reduce in-hospital mortality.

It is hoped that this data will add to the growing body of data on older adults with traumatic injury and will assist with future planning of services that cater to the needs of the oldest old to improve outcomes for this particularly vulnerable group.

**Declaration of Conflicts of Interest:**

Nothing to declare.

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