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The impact of injuries on health service resource use and costs in primary and secondary care in the English NHS

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Abstract

Aim:

Injuries in working age adults are common, but few studies examine NHS resource use or costs.

Subject and Methods:

Costing study based on a cohort of 16-70 year olds admitted to hospital following unintentional injury in NHS Trusts in 4 UK centres. Participants completed resource use questionnaires up to 12 months post injury. Primary and secondary care, aids, adaptations, appliances and prescribed medications were costed. Mean costs by injury type and age-group and costs per clinical commissioning group (CCG) were estimated.

Results:

A total of 668 adults participated. Follow-up rates ranged from 77% at one month to 65% at 12 months. The mean cost of injuries over 12 months was £4691 per participant. Costs were highest for hip fractures (£5159), lower limb fractures (£4969), and multiple injuries (£4969). Secondary care accounted for 87% of mean costs across all injuries and primary care for 10%. The mean cost per CCG was £7.3 million (range £1.8 million - £25.6 million). The total cost across all English CCGs was £1.53 billion.

Conclusions:

Unintentional injuries in working age adults result in high levels of NHS resource use and costs in the year following injury. Commissioning effective injury prevention interventions may reduce these costs.

Keywords: costs, service use, unintentional injuries, primary care, secondary care.

Introduction

In 2012 injuries caused over 11,000 deaths in England and Wales(1) and in 2012/13 they were responsible for more than 660,000 admissions to English hospitals, accounting for more than 3 million bed days(2). Every year in the UK, more than 5.8 million people attend an emergency department (ED) following an unintentional injury(3); which account for 760,000 disability adjusted life years lost(4). Injuries are a particular problem in working age adults who comprise 43% of unintentional injury deaths, 45% of hospital admissions and 50% of ED attendances(1-3). Injuries also impact substantially on primary care services; one third of those attending ED following an injury will consult with a GP or practice nurse in the first month after injury and 21% will still be consulting 4 months post injury. Among injured patients admitted to hospital these figures are even higher (58% within in the first month and 36% still consulting 4 months post injury(5)). Recovery can also be prolonged; a recent UK study including people with a wide range of injuries attending ED or admitted to hospital found only 28% were fully recovered at 1 month, 54% at 4 months and 71% at 12 months(6).

Although injuries create an economic burden for society, health services and patients, few UK studies directly report their costs. This prevents prioritisation of injury prevention, limits policy and strategy development and hampers health service planning and commissioning. Two studies have estimated direct medical costs of injury for general injury populations in the UK. The EUROCOST study estimated costs of ED attended and hospital admitted injuries in Europe, including England and Wales using data from 1999(7). Injuries across all age groups and injury intents were included. Admissions for late consequences of injury and medical adverse events were excluded. Costs for ambulance transport, rehabilitation, nursing home care, outpatient care and home care were not estimable. Total costs for ED attendances were €948 million and €965 million for hospital admissions; amounting to 2.5% of the annual total health expenditure for England. The mean cost per patient for an ED attended injury was €156 and €1418 for a hospital admission. Injuries in women incurred higher costs than for men and half of all admission costs were for those aged 65 years and older. Injuries with the highest cost per patient were hip/pelvis/femoral shaft fractures, burns, complex soft tissue injuries of the lower limb, fractures of the knee or lower leg and vertebral column/spinal cord injuries and upper arm fractures(8). The APOLLO project used the EUROCOST methodology in seven EU countries, including Wales, using 2005 data. The total annual cost for admitted patients was €90 million. Findings regarding age and sex were similar to those of the EUROCOST study. Injuries with the highest cost per patient were fractures of the hip, femur, pelvis, ankle and upper arm(9). Both these studies relied on secondary care data, therefore underestimating NHS costs by excluding primary care. Furthermore the injury incidence data and cost data used in these studies are now dated. The analyses presented in this paper report more up to date costs to the NHS of primary and secondary health care service up to one year post injury for a general injury population.

Methods

We report findings from the Impact of Injuries study. The study protocol describes the methods in full (10). Participants comprised adults aged 16-70 years admitted for an unintentional injury to acute NHS hospitals in

Nottingham, Bristol, Leicester and Guildford and recruited either while they were admitted or by posting a questionnaire and consent form within 3 weeks of their injury. People without a permanent address (due to inability to follow-up), those not allowing access to medical records or giving informed consent and those with significant head injuries (loss of consciousness, amnesia or a Glasgow coma scale of < 15) were excluded. Study recruitment lasted from June 2010 to June 2012 (using quota sampling between June 2010 and May 2011 and invitation to all eligible patients from June 2011 due to slower than expected recruitment). Follow-up data collection was completed in July 2013.

Participants completed baseline questionnaires at recruitment and follow-up questionnaires at 1, 2, 4 and 12 months post injury. Questionnaires collected data on socio-demographic and economic characteristics, injury details, use of health services, medication, aids and home adaptations for injury-related reasons, and injury costs incurred by participants. At each follow-up time point, questions on health service use and costs related to the time period since the last questionnaire was completed. Length of stay for the index admission was obtained from medical records. Where participants reported hospital admissions or ED attendances for injury in the one month follow-up questionnaire, we used reasons given to determine whether they were reporting their index admission or attendance or a re-admission or re-attendance.

The cost of drugs used was calculated using standard health economics methods(11) and participant reported data on named drugs and length of drug use. We used the Defined Daily Dose (DDD), or if not available, the Average Daily Quantity (ADQ)(12), both of which are the assumed average maintenance dose per day for a drug used for its main indication in adults(13), to estimate the total number of units per day of each drug. This was multiplied by the maximum number of days recommended by the British National Formulary (BNF)(14) to get a total number of units. The unit cost for each drug was obtained from the BNF and multiplied by the total number of units to estimate total cost.

We assigned costs to resource use based on the PSSRU annual survey of Unit Costs of Health and Social Care(15), the NHS tariff(16), the BNF(14) and a variety of sources to cost aids and adaptations (sources and prices used are shown in tables 1 and 2 online). We multiplied “units” of resources used by “price weights” to give “unit costs”. For instance, one hour of specialist nurse (including travel) costs is £43. Therefore, a 25 minute consultation has a unit cost of £17.92. We took an NHS perspective, which involved accounting for the use of NHS resources only (not including patient or other expenditure). We estimated average costs for each resource used by calculating the total cost for each type of resource and dividing this sum by the total number of participants who completed all follow-up questionnaires (n=328). These are described using means, standard deviations and ranges. We included non-users of the service in the denominator because NHS commissioners are interested in average costs per patient rather than average cost per user (which may be of more interest to service providers) as this allows estimation of costs for a patient population. We also described average costs by type of injury using means, standard deviations and ranges.

We used multiple imputations with chained equations to impute missing costs at 1, 2, 4 and 12 months follow-up. The imputation model included separate costs at each time point for primary care, secondary care, costs of aids, aids and adaptations and medications. The imputation model also included study centre and baseline patient characteristics (age, sex, ethnic group, IMD score, EQ5D utility index, employment, marital status, long standing illness) and characteristics relating to the injury (nights in hospital, type of injury, severity of injury, injury location, injury mechanism, secondary care costs of admission). Fifty imputed datasets were generated.

We estimated costs at Clinical Commissioning Group (CCG) level by calculating 5-year age-specific hospital admission rates(2) for ICD-10 codes V01-X59 based on the total population across all 211 CCGs in England(17), multiplying this rate by the 5-year age-specific population figures for the each CCG and then multiplying this by the average NHS cost for injured participants in each 5-year age band. Then we summed these costs across the age bands to give a total estimated cost per CCG. To ensure average costs reflected the full range of injuries requiring admission to hospital, this analysis only used data from participants recruited from June 2011 onwards, when we stopped using quota sampling and recruited all interested and eligible participants. In addition, as for all cost analyses presented, it is restricted to participants who completed all four follow-up questionnaires (n=207). We described costs at CCG level using the mean, standard deviation and range and illustrated with a histogram.

Results

The study recruited 668 participants. A total of 77% were followed up at one month and 65% at 12 months, with 49% returning all four follow-up questionnaires (figure 1 online). Table 1 shows most participants were aged 25-64 years (73%), 53% were males, 60% were in paid employment and 25% had a limiting long standing illness. Falls (64%) and road traffic injuries (21%) were the most common injury mechanisms. Lower limb (45%) and upper limb fractures (11%) were the most common injury types. Most injuries (70%) were of moderate severity. The median number of nights in hospital at index admission was 6 (IQR 3, 10).

[insert table 1 here]

Use of NHS services in the year after injury is shown in table 2. GP consultations were the most commonly used primary or community care service at all-time points; used by 25% of participants in the first month, and still being used by 34% at 5-12 months post injury. At least 20% of participants used telephone consultations with GPs or practice nurses in the first 2 months post injury. Community physiotherapy was used by between 7% and 17% of participants, most commonly at 3-4 months, with 12% still using community physiotherapy 5-12 months post injury. Overall, 67% of participants used at least one primary care service in the first month, with 61%, 60% and 47% still using services at 1-2, 3-4 and 5-12 months respectively. In terms of secondary care use, 6-12% had a re-attendance at ED and 5-9% had a hospital readmission across the four follow-up time

points. Fracture clinic was the service most commonly used; used by between 34% and 70% of participants, most commonly in the first 4 months, with 34% still attending 5-12 months post injury. Hospital physiotherapy was used by between 23% and 51% of participants, most commonly between 2 and 4 months, with 37% still attending 5-12 months post injury. Overall 80% of participants used at least one secondary care service in the first month, with 89%, 81% and 62% still using services at 1-2, 3-4 and 5-12 months respectively.

[insert table 2 here]

Table 3 shows aids and adaptations were most commonly provided in the first two months post injury; crutches, walking frames and toilet modifications were most commonly used. In the first month, 88% of participants were prescribed medication for their injury, as were 61%, 47% and 35% at 1-2, 3-4 and 5-12 months respectively. Central nervous system and musculoskeletal and joint disease medications were the most commonly prescribed injury-related medications at each time point.

[insert table 3 here]

Average costs by injury type in the 328 participants who returned all the follow-up questionnaires are shown in table 4. The mean cost over 12 months across all services and all injury types was £4691 (SD=£2342). Hip fractures incurred the highest mean cost (£5159), followed by lower extremity fractures (£4969) and multiple injuries (£4969). The highest mean primary care costs were for hip fracture (£1102) and multiple injuries (£527). The highest mean secondary care costs were for lower extremity fractures (£4397) and multiple injuries (£4299). The highest mean aids and adaptations costs were for hip fractures (£167) and multiple injuries (£72). The highest mean medication costs were for spine/vertebrae fractures (£102) and hip fractures (£95). The mean cost (and percentage of total mean cost) across all injuries was £454 (10%) for primary care, £4097 (87%) for secondary care, £67 (1%) for aids and adaptations and £73 (2%) for medication.

[insert table 4 here]

Means costs based on multiply imputed data are shown in table 3 online. These tended to be slightly higher than the costs from the complete case analyses, for example the mean total cost over 12 months across all services was £4881.

Estimating costs per clinical commissioning group

The mean costs by injury type and the total mean costs across all injury types in the 207 participants who completed all follow-up questionnaires and were not recruited using quota sampling are shown in table 4 online, and age-specific national hospital admission rates and CCG population figures used to estimate CCG

costs are shown in table 5 online. The estimated mean total cost for injuries per CCG was £7,265,511 (SD £3,877,346) ranging from a minimum of £1,780,683 to a maximum of £25,563,203 (Figure 2 online). The total estimated cost across all 211 CCGs was £1,533,022,790.

Table 6 online shows the mean costs of injury and national hospital admission rates for injury by age group using the multiply imputed costs of injury. The estimated mean total cost for injuries per CCG was £7,755,634 (SD £4,147,121) ranging from a minimum of £ 1,893,530 to a maximum of £ 27,431,894 (Figure 2a online). The total estimated cost across all 211 CCGs was £1,636,438,260.

Discussion

Main findings

Our study shows injuries in working age adults requiring hospital admission result in high levels of NHS primary and secondary care use during the year following the injury. Service use decreases over time, but 62% of participants were still using secondary care and 47% were still using primary care services for injury-related reasons between 5 and 12 months post injury. The mean cost per participant for an injury was £4691, with hip fractures (£5159), lower extremity fractures (£4969) and multiple injuries (£4969) incurring the highest mean costs. Most of the costs were for secondary care services (87%), but 10% of the costs were incurred in primary care. The estimated mean total cost for injuries per CCG was £7.3 million, ranging from £1.8 million to £25.6 million. The total estimated cost across all CCGs in England was £1.53 billion.

What is already known on this topic

Few studies have directly measured resource use and costs of medically attended injuries in general injury populations in the UK. Previous studies have excluded multiple injuries, focussing on secondary care costs and excluding primary care costs. Hip fractures and lower limb fractures have been found to incur the highest costs(8, 9).

What this study adds

This is the largest study quantifying UK service use and costs to NHS among working age adults following unintentional injury. A major strength of our study is the use of self-reported resource use data allowing us to cost a wide range of primary and secondary care service use. We were also able to identify participants with multiple injuries, readmissions and day-cases. Our study extends the work of the EUROCOST and APOLLO studies whose costing is based only on secondary care resource use and on average resource use by injury type (e.g. average length of stay). Our study includes participants of both sexes, aged 16 to 70 years, with a wide range of unintentional injuries, from multiple English NHS hospitals, so our findings should be generalisable to general injury populations attending or admitted to similar hospitals. The economic analysis followed standard methods for cost analysis(18) and good practice guidelines for costing medications(11). Our findings should

therefore be comparable to other studies using these methods to cost health care resource use for injuries or other conditions.

Limitations of this study

Some types of injury only occurred in a small number of participants (e.g. spine/vertebral injury or other injuries to lower limbs), thus cost estimates are subject to considerable uncertainty. Our follow-up rates were higher than some prospective studies of general injury populations(4, 19, 20) and similar to other studies(21, 22), but it is possible that some response bias occurred. It is also possible that some selection bias occurred if study participants differed from non-participants. We were unable to collect data on characteristics of non-participants, so it is difficult to assess the extent to which this may have occurred. Results from analyses using imputed costs for non-responders to the follow-up questionnaires gave slightly higher cost estimates than those from participants who completed all 4 follow-up questionnaires, reflecting differences in socio-demographic and injury characteristics between these groups.

Where participants reported a hospital admission or ED attendance for their injury in their one month follow-up questionnaire, we used the reasons they gave for the attendance to determine whether this related to their index admission or ED attendance or to re-admission or re-attendance. Where there was uncertainty, we assumed they were reporting the index event. This may have led to underestimation of resource use and costs. We were unable to find any recent data on hospital readmission rates post injury in the UK, but the self-reported readmission rate in the first month post injury (5.1%) is very similar to that reported in a recent Canadian multicentre cohort study in a general injury population (5.9%)(23). Where participants did not report the length of drug use we used the maximum recommended duration from the BNF, or if there was no maximum recommended duration, we assumed participants had used the drug for the entire period covered by that questionnaire. This may have overestimated drug costs, particularly at later time points when the questionnaires covered longer time periods. Given that drug costs comprise only 1-2% of total costs for each injury, this is unlikely to have a major impact on our cost estimates.

Our cost estimates only take account of NHS resource use in the first 12 months post injury. Previous studies have shown that injured working age adults have higher rates of health service use than the general population, in some cases for many years post injury(24), hence our estimates do not represent the total NHS costs of injuries. Our CCG cost estimates are intended to give an indication of the likely scale of costs for CCGs. They are based on the average age-specific cost of an injury across all injuries and the age-specific number of injuries per CCG estimated using national admissions data. We did not use costs for each type of injury for this calculation due to the small number of participants with some types of injuries. Our estimates assume the case-mix of injuries in a CCG is similar to that of our study population and that CCGs have the same age-specific injury rates as those for England as a whole. As our study is based upon UK cost weights our findings are not directly transferrable to other countries. Also, it should be noted that we measured costs in terms of

"resources used" rather than as "spending". Therefore, the study measures economic costs not budget spending. If the results are to inform budgets for injury-related services, then a technique such as Budget Impact Analysis should be employed(25). Finally, there is a large body of literature showing a range of factors in addition to hospital admission, length of stay, injury type and injury severity are associated with recovery from injury, some of which are potentially modifiable(6, 20, 21, 26-36). These factors may also influence the cost of injuries and further research to identify predictors of cost and the impact of potentially modifiable factors on cost is required.

Conclusions

This study has shown high levels of health service use which incur large NHS costs among working age adults in the UK in the first year after injury. These cost data can be used to inform injury prevention policies and strategies and health service planning. There is potential to reduce costs through commissioning and provision of effective injury prevention interventions. Further research is needed to identify factors associated with higher cost injuries and to explore the potential for cost savings by targeting prevention and rehabilitation at modifiable factors associated with higher cost injuries.

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Table 1. Baseline socio-demographic characteristics, pre injury health status and injury characteristics (percentage unless otherwise stated)

Characteristics	Frequency (%)
Study centre	
Nottingham	278 (41.6)
Loughborough	167 (25.0)
Bristol	174 (26.1)
Surrey	49 (7.3)
16-24 years	96 (14.4)
25-44 years	178 (26.7)
45-64 years	310 (46.4)
65+ years	84 (12.6)
Female	316 (47.3)
Male	352 (52.7)
Black or minority ethnic group	34 (5.1)
White	634 (94.9)
Marital status [5]	
Single	189 (28.5)
Married/civil partnership	360 (54.3)
Divorced/widowed	114 (17.2)
Lives alone	120 (18.0)
Employment [8]	
In paid employment	393 (59.6)
Unable to work due to illness or disability	32 (4.9)
Unemployed and looking for work	26 (3.9)
At home and not looking for work	18 (2.7)
Retired	130 (19.7)
Other	61 (9.2)
Median IMD score (IQR) [17]	13.5 (7.4, 22.9)
Body part injured	
Facial/eye fracture/injury	7 (1.1)
Internal organ injury	7 (1.1)
Spinal injury	2 (0.3)
Spine/ vertebrae fracture	21 (3.1)
Pelvis fracture	10 (1.5)
Hip fracture	62 (9.3)
Lower extremity fracture	297 (44.5)
Lower extremity other	27 (4.0)
Upper extremity fracture	75 (11.2)
Upper extremity other injury	15 (2.3)
Superficial injury	10 (1.5)
Other injury	12 (1.8)
Multiple injuries	123 (18.4)
Injury mechanism	
Fall/stumble/trip/jump	425 (63.6)
Traffic injury event (RTA)	142 (21.3)
Struck by object/person	47 (7.0)
Penetrating/piercing injury	16 (2.4)
Physical over exertion	16 (2.4)
Other	22 (3.3)

Location of injury [1]	
Home	142 (21.3)
Work	63 (9.5)
Road	200 (30.0)
Countryside	76 (11.4)
Sports	83 (12.4)
Other	103 (15.4)
Maximum injury severity [2]	
Minor (AIS=1)	44 (6.6)
Moderate (AIS = 2)	471 (70.7)
Serious or greater (AIS ≥3)	151 (22.7)
Median nights in hospital on index admission (IQR) [21]	6 (3,10)
Limiting long standing illness [6]	164 (24.8)
Median EQ5D utility index (IQR) [2]	1 (0.85, 1)

[ ] missing values

Table 2. Use of primary and secondary care services in the first year post injury (percentage)

		<1 month post injury N=513	1-2 months post injury N=478	3-4 months post injury N=452	5-12 months post injury N=421
Primary/community care use					
GP consultation at surgery		130 (25.3)	144 (30.1)	176 (38.9)	143 (34.0)
GP or practice nurse telephone consultation		135 (26.3)	97 (20.3)	53 (11.7)	41 (9.7)
Practice nurse consultation		104 (20.3)	64 (13.4)	55 (12.2)	56 (13.3)
NHS physiotherapist consultation		35 (6.8)	50 (10.5)	76 (16.8)	50 (11.9)
Consultation with other NHS professional*		83 (16.2)	44 (9.2)	55 (12.2)	34 (8.1)
GP consultation at home		22 (4.3)	18 (3.8)	11 (2.4)	7 (1.7)
Community/nurse consultation at home		54 (10.5)	36 (7.5)	23 (5.1)	11 (2.6)
Ambulance service visit		39 (7.6)	20 (4.2)	22 (4.9)	13 (3.1)
Other NHS services at home**		41 (8.0)	40 (8.4)	28 (6.2)	14 (3.3)
Used any primary/community care services		343 (66.9)	291 (60.9)	273 (60.4)	197 (46.8)
Secondary care use	Index admission N=668	<1 month post injury N=513	1-2 months post injury N=478	3-4 months post injury N=452	5-12 months post injury N=421
ED attendance	668 (100.0)	37 (7.2)	56 (11.7)	30 (6.6)	23 (5.5)
Hospital admission	668 (100.0)	26 (5.1)	41(8.6)	22 (4.9)	28 (6.7)
Fracture clinic attendance		310(60.4)	334 (69.6)	247 (54.7)	142 (33.7)
Other outpatient clinic attendance***		94 (18.3)	112 (23.4)	100 (22.1)	115 (27.3)
Hospital physiotherapy attendance		120 (23.4)	204 (42.7)	232 (51.3)	155 (36.8)
Other hospital use****		67 (13.1)	58 (12.1)	73 (16.1)	58 (13.8)

Used any secondary care services	668 (100.0)	413 (80.1)	427 (89.3)	368 (81.4)	262 (62.2)

* psychologist/community mental health nurse/counsellor, other community doctor, occupational therapist

** occupational therapist, physiotherapists and other professionals.

*** burns clinic, hospital day case, other outpatient clinic

****occupational therapist, other services at the hospital

Table 3. Receipt of NHS aids, appliances and adaptations and prescribed medications (percentage).

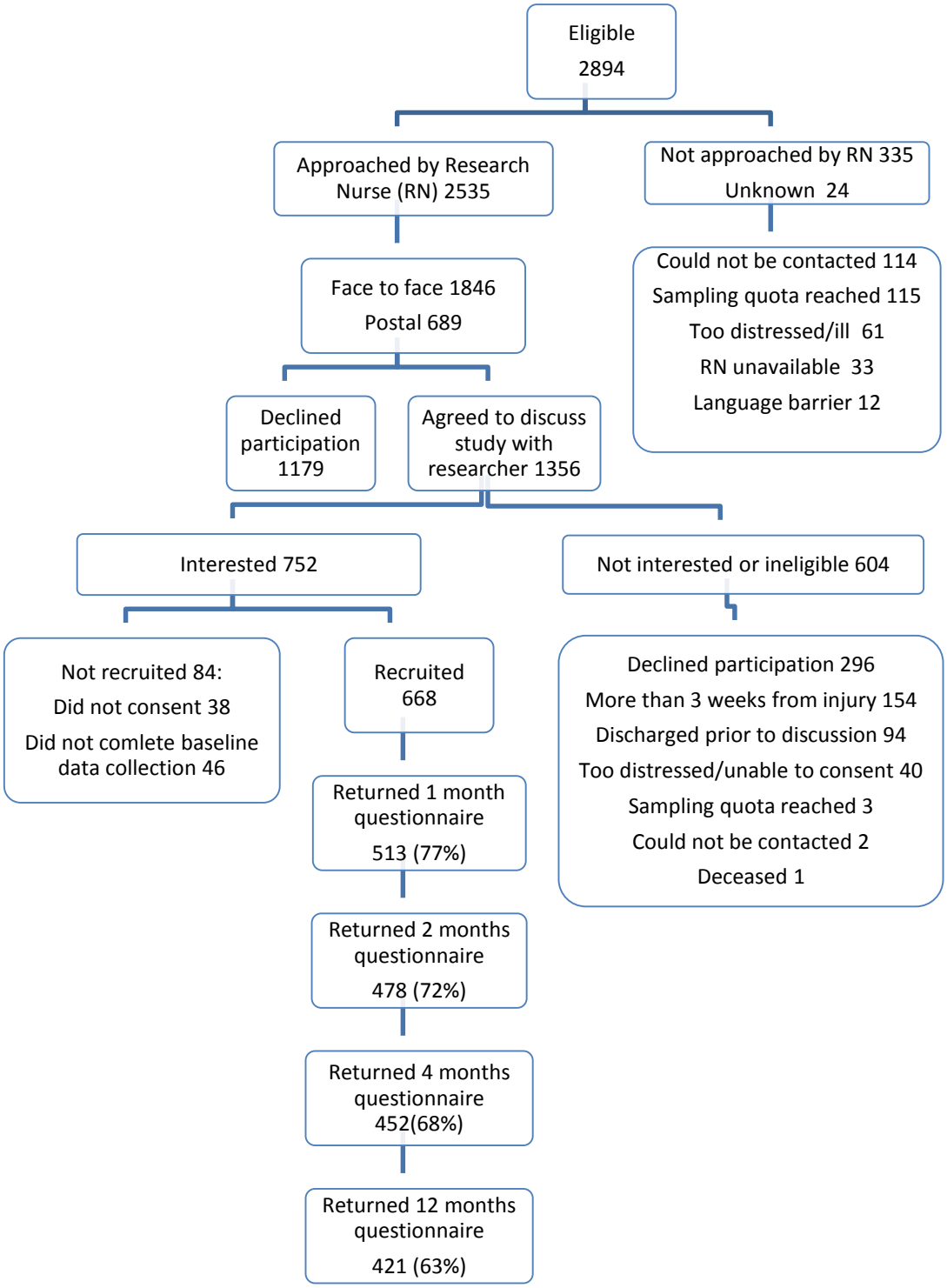
	<1 month post injury N=513	1-2 months post injury N=478	3-4 months post injury N=452	5-12 months post injury N=421
Number of participants receiving aids, adaptations and appliances				
Wheelchair	20 (3.9)	8 (1.7)	6 (1.3)	3 (0.7)
Walking frame	59 (11.5)	29 (6.1)	9 (1.9)	3 (0.7)
Crutches	136 (26.5)	84 (17.6)	49 (10.1)	19 (4.5)
Toilet modifications	45 (8.8)	13 (2.7)	10 (2.2)	8 (1.9)
Stool/chair	26 (5.1)	9 (1.9)	6 (1.3)	1 (0.2)
Other	40 (7.8)	27 (5.6)	24 (5.3)	11 ((2.6)
Received any aids, adaptations or appliances	192 (36.8)	114 (23.8)	68 (15.0)	31 (7.3)
Number of participants prescribed medication by BNF chapter				
Gastro-intestinal system	43 (8.3)	20 (4.2)	12 (2.7)	9 (2.1)
Central nervous system	435 (84.8)	266 (55.6)	187 (41.4)	114 (27.1)
Infections	16 (3.1)	11 (2.3)	10 (2.2)	3 (0.7)
Nutrition and blood	16 (3.1)	17 (3.6)	18 (4.0)	17 (4.0)
Musculoskeletal and joint diseases	124 (24.2)	71 (14.9)	50 (11.1)	44 (10.5)
Other	23 (4.5)	7 (1.5)	13 (2.8)	12 (2.9)
Prescribed any medications	450 (87.7)	290 (60.7)	213 (47.1)	147 (34.9)

Table 4: Mean (standard deviation) health care costs up to 12 months post injury by injury type and resources used (£).*

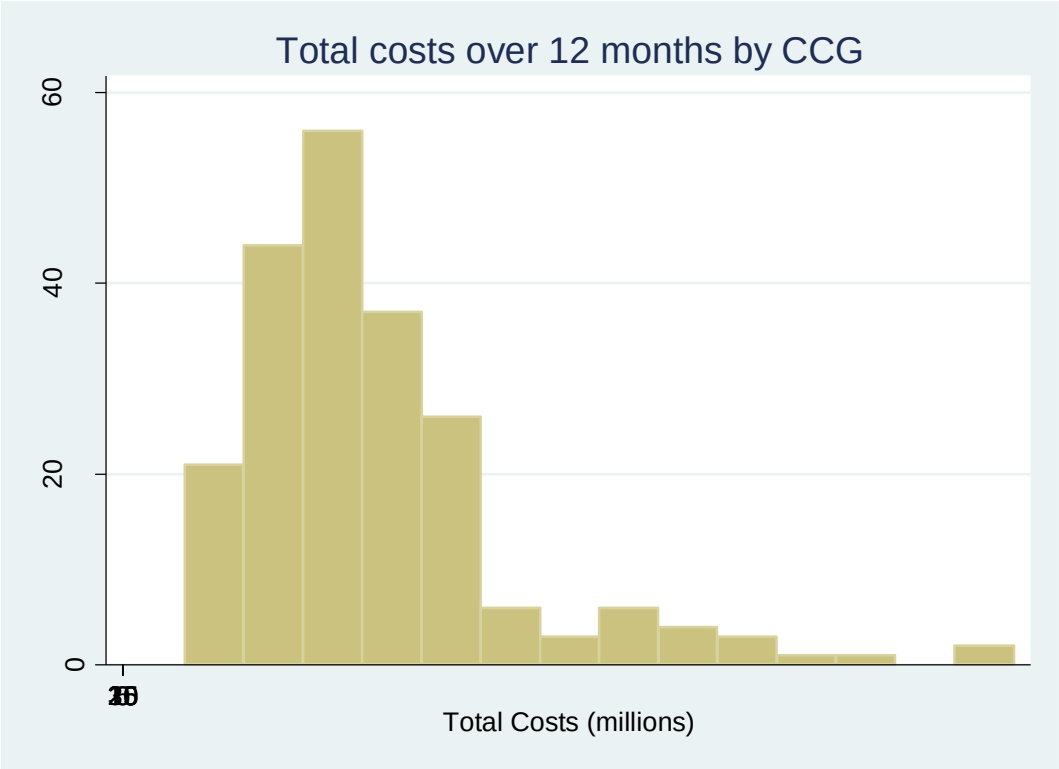
Type of injury (n=328)	Primary care	Secondary care	Aids, appliances and adaptations	Medication	Total cost
Multiple injuries (n=68)	527.0 (808.2)	4298.8 (1652.2)	72.0 (120.1)	71.0 (101.9)	4969.3 (1913.2)
Hip fracture (n=32)	1101.6 (2089.3)	3795.5 (1013.6)	166.6 (223.8)	95.5 (104.0)	5159.1 (2605.1)
Lower extremity fracture (n=146)	413.1 (756.2)	4397.3 (2268.3)	71.7 (123.2)	87.2 (167.2)	4969.3 (2652.2)
Spine, vertebrae fracture (n=10)	286.6 (247.1)	3371.0 (528.8)	18.8 (47.1)	102.5(116.0)	3778.9 (640.6)
Lower extremity other injury (n=10)	431.2 (527.0)	2998.1 (1316.7)	40.4 (57.0)	15.7 (20.6)	3485.4 (1535.7)
Upper extremity fracture (n=42)	153.6 (193.1)	3508.5 (1400.1)	7.5 (28.1)	17.1 (17.2)	3686.8 (1420.6)
Other injuries (n=20)	196.6 (298.9)	3855.7 (2308.6)	11.7 (26.8)	69.2 (98.1)	4133.1 (2462.8)
All injuries (n=328)	454.3 (938.0)	4097.4 (1925.5)	66.6 (128.2)	72.8 (131.1)	4691.1 (2342.0)

*Based on 328 participants who completed all follow-up questionnaires

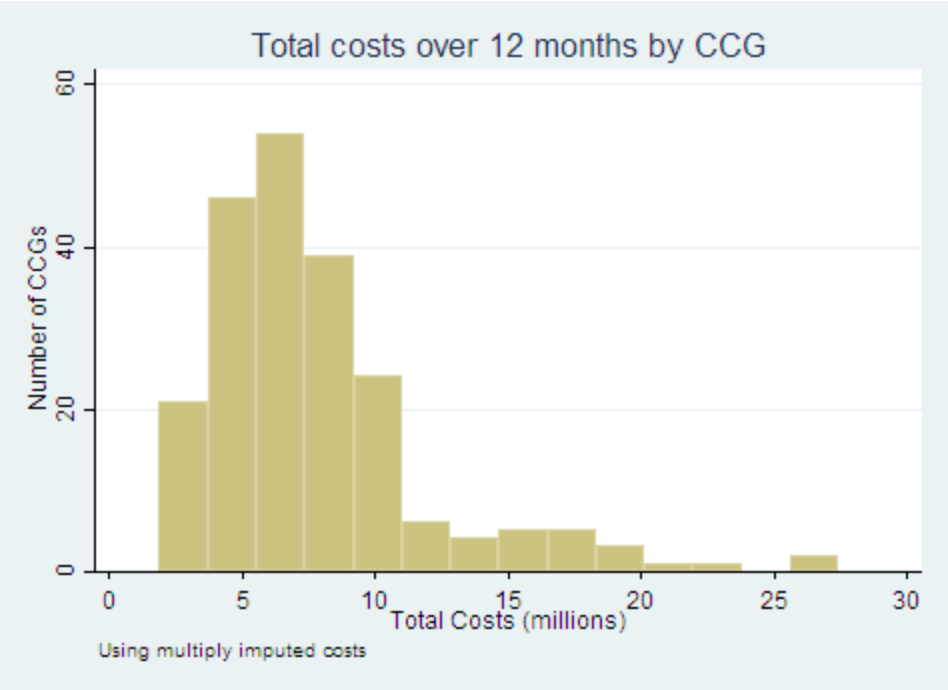
Online figure 1. Flow of participants through study


Eligible
2894
Approached by Research Nurse (RN) 2535
Not approached by RN 335
Unknown 24
Face to face 1846
Postal 689
Could not be contacted 114
Sampling quota reached 115
Too distressed/ill 61
RN unavailable 33
Language barrier 12
Declined participation 1179
Agreed to discuss study with researcher 1356
Interested 752
Not interested or ineligible 604
Not recruited 84:
Did not consent 38
Did not comlete baseline data collection 46
Recruited 668
Declined participation 296
More than 3 weeks from injury 154
Discharged prior to discussion 94
Too distressed/unable to consent 40
Sampling quota reached 3
Could not be contacted 2
Deceased 1
Returned 1 month questionnaire
513 (77%)
Returned 2 months questionnaire
478 (72%)
Returned 4 months questionnaire
452(68%)
Returned 12 months questionnaire
421 (63%)

Online figure 2. Total cost of unintentional injuries in adults aged 16-74 years for clinical commissioning groups (CCGs) in England


Total costs over 12 months by CCG
60
40
20
0
Total Costs (millions)

Online figure 2a. Total cost of unintentional injuries in adults aged 16-74 years for clinical commissioning groups (CCGs) in England. Costs derived from multiple imputation analysis.


Total costs over 12 months by CCG
Number of CCGs
0
20
40
60
0
5
10
15
20
25
30
Total Costs (millions)
Using multiply imputed costs

Online table 1. Prices and sources for costing primary and secondary care resource use

Services	Price £	Source
Secondary care NHS services		
Accident and emergency department attendance leading to admission	146	PSSRU 2012, p.109
Non-elective inpatient stay (0-1 days) Non-elective inpatient stays (≥2 days)	586 2,461	PSSRU 2012, p.109
Day case	680	PSSRU 2012, p.109
Out-patient clinic attendance	139	PSSRU 2012, p.109
Hospital physiotherapy attendance	34	PSSRU 2012, p.213
Hospital occupational therapy attendance	53	PSSRU 2012, p.214
Other hospital services Assumed to be other outpatient procedures	139	PSSRU 2012, p.109
Primary or community NHS services provided at surgery or health centre		
GP consultations: At surgery Telephone consultation	 36 22	PSSRU 2012, p.183
Practice nurse consultation £45 per hour of face-to-face contact. Average length of consultation 15.5 minutes	11.63	PSSRU 2012, p.180
Other community doctor consultation Assumed to be a clinic visit.	53	PSSRU 2012, p.183
Psychologist/community mental health nurse/counsellor consultation	59	PSSRU 2012, p.53
Physiotherapist	47	PSSRU 2012, p.167
Occupational therapist	69	PSSRU 2012, p.168
Other NHS services Calculated using the average price for a contact with the practitioners in the community-based list (10.1 – 10.8c). The duration of contacts was used where provided. Surgery contacts were used for practice nurses and GPs. Where duration of contacts was not provided, the average consultation length of a nurse specialist has been used (15 minutes).	23.33	PSSRU 2012, p.175-183
Primary or community NHS services at home		
GP home visit	92	PSSRU 2012, p.183
Community/District Nurse home visit	39	PSSRU 2012, p.175
Occupational therapist home visit	69	PSSRU 2012, p.168
Physiotherapist home visit	47	PSSRU 2012, p.167

Ambulance service contact to see, treat and convey	227.13	Personal communication[1]
Other NHS services at home Calculated using the average price for a home visit contact with the practitioners in the community-based list (10.1 – 10.8c). The duration of contacts was used where provided. Where duration of contacts was not provided, the average consultation length of a nurse specialist has been used (25 minutes).	35.78	PSSRU 2012, p.175-183

[1] Cost of ambulance services, personal communication, Matthew Williams, East Midlands Ambulance Service NHS Trust, July 2010.

Online table 2. Monetary values assigned to equipment and sources of data used

Category	**Cost**	**Source**
Wheelchair	£172	PSSRU 2012, p. 110[2]
Walking frame	£35	betterlifehealthcare.com[3] Accessed on 2nd of November 2013
Crutches	£20	betterlifehealthcare.com Accessed on 2nd of November 2013
Toilet modifications	£30	PSSRU 2013, p.109
Commode	£85[4] (Range £29-£85)	PSSRU 2013, p.109
Stool/chair provision	148 (Range £14-£148)	PSSRU 2013, p.109
Walking stick	£54 (Range £22-£54)	PSSRU 2013, p.109
Cushion	£10	betterlifehealthcare.com Accessed on 2nd of November 2013
Grabber	£15	betterlifehealthcare.com Accessed on 2nd of November 2013
Bed modifications	£32	PSSRU 2013, p.109
Urine bottle	£10	betterlifehealthcare.com Accessed on 2nd of November 2013
Bathroom aid	£55	PSSRU 2013, p.109
Mobility Scooter	£400	betterlifehealthcare.com Accessed on 2nd of November 2013
Waterproof protection	£10	betterlifehealthcare.com Accessed on 2nd of November 2013
Move bed downstairs	£0	---
Ramp	£656	PSSRU 2012, p.111
Rails and handles	£95	PSSRU 2012, p.111
Other	£0	The remaining data is too varied to price

[2] PSSRU 2012 prices were used when available. When not available, PSSRU 2013 prices were used instead.
[3] For all prices obtained in the bettterlifehealthcare.com website, the most expensive item for the standard product was chosen. All data was Accessed on 2nd of November 2013.
[4] When prices were provided as a range, the upper limit was used to calculate the costs.

Online Table 3: Mean (standard deviation) health care costs up to 12 months post injury by injury type and resources used (£) using multiply imputed data.*

Type of injury (n=668)	Primary care	Secondary care	Aids, appliances and adaptations	Medication	Total cost
Multiple injuries (n=123)	621.2 (946.3)	4516.3 (1983.6)	63.2 (114.5)	80.5 (119.9)	5281.3 (2334.0)
Hip fracture (n=62)	892.4 (1707.0)	3977.6 (1346.6)	122.8 (181.0)	95.6 (140.3)	5088.3 (2372.3)
Lower extremity fracture (n=297)	389.9 (642.6)	4413.7 (2127.3)	60.6 (108.3)	72.6 (134.1)	4936.7 (2420.6)
Spine, vertebrae fracture (n=21)	347.8 (315.0)	5536.4 (5533.2)	21.7 (53.4)	116.8 (140.5)	6022.7 (5649.1)
Lower extremity other injury (n=27)	324.9 (421.6)	3946.4 (2078.2)	44.2 (65.3)	45.8 (78.5)	4361.3 (2154.6)
Upper extremity fracture (n=75)	210.6 (300.0)	3731.8 (1626.1)	13.4 (39.7)	29.9 (46.2)	3985.7 (1703.4)
Other injuries (n=63)	479.0 (1004.6)	3980.6 (2308.7)	17.3 (40.0)	67.1 (92.3)	4543.9 (2641.2)
All injuries (n=668)	463.5 (872.1)	4291.1 (2215.4)	55.6 (109.6)	71.2 (121.1)	4881.3 (2534.6)

*Based on 668 participants who participated at baseline

Online table 4: Mean (standard deviation) health care costs up to 12 months post injury by injury type and resources used (£).*

Type of injury (n=207)	Primary care	Secondary care	Aids, appliances and adaptations	Medication	Total cost
Multiple injuries (n=43)	649.2 (941.9)	4454.7 (1721.7)	80.7(131.3)	85.7 (115.1)	5270.3 (1963.0)
Hip fracture (n=21)	705.1 (1214.5)	3717.86 (919.6)	188.0(228.8)	119.5 (117.9)	4730.5 (1686.1)
Lower extremity fracture (n=94)	457.3 (825.7)	4185.9 (1758.4)	84.2(144.1)	100.5 (194.4)	4827.9 (2163.3)
Spine, vertebrae	394.9 (213.8)	3470.7 (589.4)	21.1 (55.9)	104.3 (133.3)	3991.0 (632.9)

fracture (n=7)					
Lower extremity other injury (n=7)	418.9 (513.7)	2870.3 (1553.1)	47.0(67.4)	19.2 (23.1)	3355.4 (1829.8)
Upper extremity fracture (n=25)	159.8 (194.5)	3508.2 (1631.1)	10.6(35.0)	18.2 (19.0)	3696.8 (1629.3)
Other injuries (n=10)	138.7 (113.4)	3680.6 (2518.6)	14.8(32.6)	54.8 (99.3)	3888.6 (2576.4)
All injuries	467.6(822.0)	4019.3(1704.0)	78.4(143.3)	84.6.(152.0)	4649.8(2046.6)

*Based on 207 participants who were not recruited using quota sampling and who completed all follow-up questionnaires

Online table 5. Mean costs of injury and national hospital admission rates for injury by age group

Age group	Number of hospital admissions for unintentional injury in England in 2012/13	2012 population (000s)	Hospital admission rate for injury per 1000	Mean injury cost* (£)	Estimated total cost for hospital admissions in England in 2012/13
16-19	21,320	2,640,889	8.07	2594	£55,305,721
20-24	31,919	3,621,551	8.81	4066	£129,785,207
25-29	27,747	3,659,577	7.58	4523	£125,500,985
30-34	24,774	3,607,217	6.87	5420	£134,277,978
35-39	22,539	3,423,353	6.58	4689	£105,694,950
40-44	26,623	3,842,716	6.93	4473	£119,083,161
45-49	28,195	3,921,608	7.19	5712	£161,038,759
50-54	27,800	3,523,521	7.89	4810	£133,716,109
55-59	26,246	3,053,669	8.59	4745	£124,538,188
60-64	28,681	3,012,894	9.52	4303	£123,410,499
65-69	33,012	2,792,057	11.82	4325	£142,772,575
70-74	36,609	2,052,433	17.84	4859	£177,898,653

*Based on 207 participants who were not recruited using quota sampling and who completed all follow-up questionnaires

Online table 6. Mean costs of injury and national hospital admission rates for injury by age group using multiply imputed data

Age group	Number of hospital admissions for unintentional injury in	2012 population (000s)	Hospital admission rate for injury per 1000	Mean cost per injury* (£)	Total cost for hospital admissions in England in 2012/13

	England in 2012/13				
16-19	21,320	2,640,889	8.07	4781.8	101,947,976
20-24	31,919	3,621,551	8.81	4843.0	154,583,717
25-29	27,747	3,659,577	7.58	4688.3	130,086,260
30-34	24,774	3,607,217	6.87	5012.2	124,172,243
35-39	22,539	3,423,353	6.58	4551.4	102,584,005
40-44	26,623	3,842,716	6.93	4759.6	126,714,831
45-49	28,195	3,921,608	7.19	5314.9	149,853,606
50-54	27,800	3,523,521	7.89	5220.0	145,116,000
55-59	26,246	3,053,669	8.59	4980.6	130,720,828
60-64	28,681	3,012,894	9.52	4498.6	129,024,347
65-69	33,012	2,792,057	11.82	4984.2	164,538,410
70-74	36,609	2,052,433	17.84	4837.5	177,096,038

*Based on 668 participants who completed baseline questionnaires