

# Multiple modifiable components of hospital service delivery predict hip fracture outcomes in England and Wales: the REDUCE national record-linkage cohort study

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## Background & Aims

Older adults with hip fracture require complex multidisciplinary care which tests the organisational structures within hospitals.

Despite standards and guidelines (1,2) substantial variation remains in hip fracture care delivery across the UK.

- To identify modifiable hospital-level organisational factors that predict adverse patient outcomes following hip fracture, accounting for patient case-mix.
- To use these findings to inform the development of implementation tools to improve national hip fracture service delivery

## Methods

- We used a national record-linkage cohort of 178,757 patients (≥60 years) with a hip fracture in England & Wales (2016–19) (3), and linked patient-level hospital admissions, National Hip Fracture Database (NHFD) and mortality data with 231 metrics from 18 hospital-level organisational audits and reports (Figure 1).
- Multilevel models identified organisational factors, adjusted for patient case-mix (age, sex, ASA grade, fracture type, pre-fracture residence and mobility), associated with patient outcomes, in 172 hospitals across England & Wales:
  - Length of hospital stay ('superspell'\*)
  - All-cause 30 day mortality
  - Emergency 30 day readmission
  - Place of residence on discharge
  - Place of residence at 120 days
  - Mobility recovery at 120 days
  - Days in hospital within a year
  - Health costs within a year
  - Mortality within a year

(\*admission date for index hip fracture to date discharge alive from NHS acute or rehabilitation hospital)

For the Toolkit we sought organisational factors independently associated with ≥1 patient outcome(s), and (a) associated with bed-day and/or cost savings over 1 year, (b) not associated with any adverse patient outcomes, and (c) potentially modifiable.

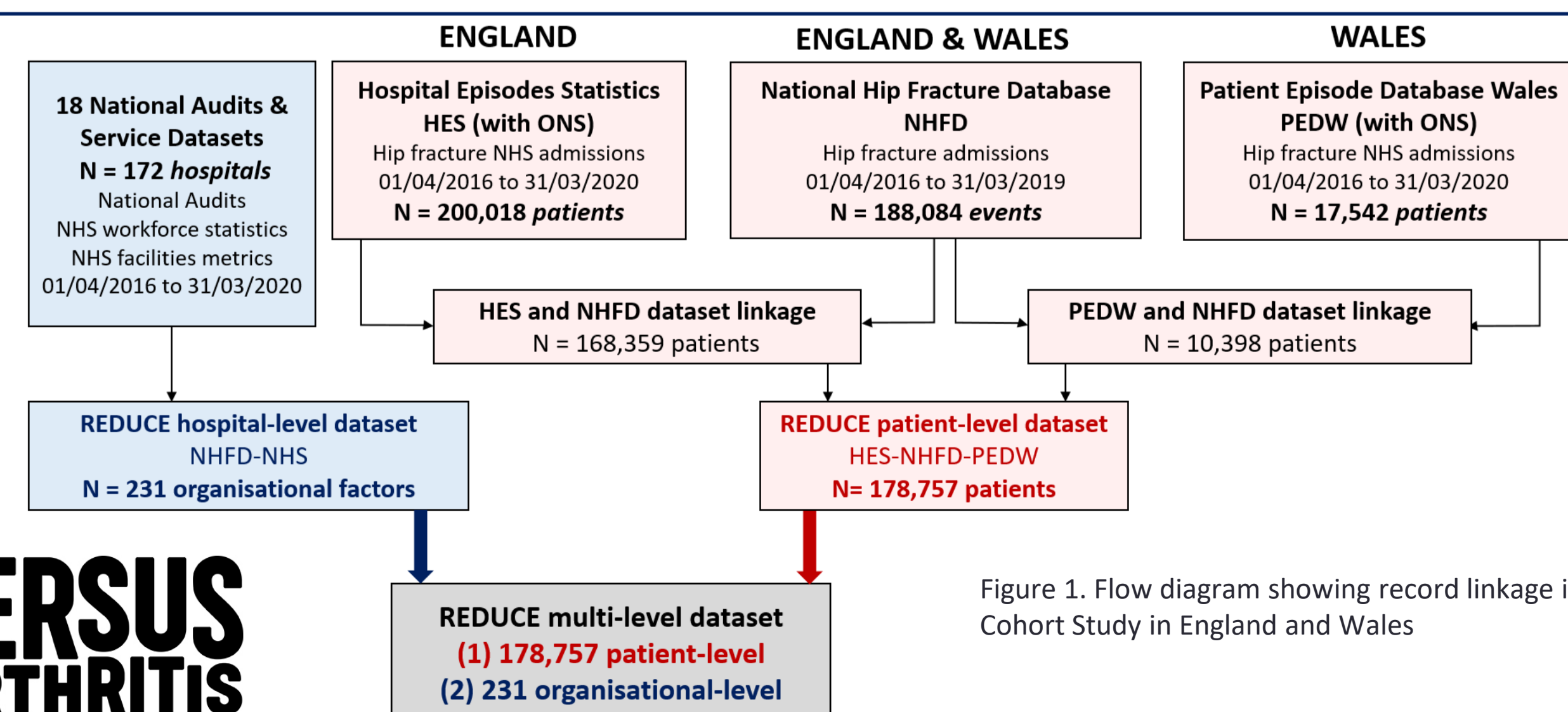


Figure 1. Flow diagram showing record linkage in the Hip Fracture Cohort Study in England and Wales

Table 1. Study population across 172 hospitals in England and Wales

		N (%) (n=178,757)
Country	England	168,359 (94%)
	Wales	10,398 (6%)
Age (years)	60-69	16,062 (9%)
	70-79	41,096 (23%)
	80-89	80,863 (45%)
	90+	40,736 (23%)
Sex	Female	126,278 (71%)
	Male	52,479 (29%)
Pre-fracture residence	Own home/sheltered housing	146,642 (82%)
	Not from own home	32,115 (18%)
Pre-fracture mobility	Freely mobile without walking aids	66,440 (37%)
	Mobile outdoors with 1 or 2 aids/ frame	66,521 (37%)
	Some indoor, or no functional, mobility	45,796 (26%)

Table 2. Between hospital variability in 9 patient outcomes

Outcomes	Overall	Range across 172 hospitals
Length of stay, mean (SD)	21 (20) days	12 - 42 days
30 day mortality, N (%)	13,126 (7.3%)	3.7 - 10.4%
Readmission within 30 days, N (%)	25,239 (15.3%)	3.7 - 30.3%
Discharged to original residence, N (%)	117,384 (72%) <sup>a</sup>	40 - 96%
At original residence at 120 days, N (%)	49,308 (85%) <sup>b</sup>	0 - 100% <sup>d</sup>
Recovered mobility at 120 days, N (%)	25,589 (45%) <sup>c</sup>	0 - 100% <sup>e</sup>
Days in hospital over 1 year, mean (SD)	31.7 (32.1) days	20 - 54 days
Health costs over 1 year, mean (SD)	£14,642 (9,017)	£10,867 - £23,188
Mortality over 1 year, N (%)	50,354 (28.2%)	20 - 35%

<sup>a</sup> of 163,230, <sup>b</sup> of 58,344, <sup>c</sup> of 56,959, <sup>d</sup> 143 hospitals, <sup>e</sup> 140 hospitals

Table 3. Between hospital variability in 9 hip fracture patient outcomes

	Cost saving per patient (1 year)	Bed-day saving per patient (1 year)	Additional benefits
Weekend physiotherapy provision	-£676	-2.32 days	
Orthogeriatrician assessment of all patients within 72 hours of admission	-£529	-	15% lower 1 year mortality
Consultant orthogeriatrician attends clinical governance meeting	-£356	-1.47 days	
>36% patients admitted to orthopaedic ward within 4 hours of presentation to ED	-£339	-	
Prompt post-op. mobilisation of >70% patients	-£346	-1.07 days	
Inpatient delirium assessment of all patients	-£275	-	7% greater discharge home
Lower levels of post-operative delirium (<64%)	-£258	-1.19 days	
All patients receive a bone health assessment during admission	-£157	-	
Dedicated hip fracture ward to which patients can be admitted directly from ED	-	-3.35 days	25% greater return home at 120 days
Fracture Liaison Service in place	-	-1.08 days	5% lower 1 year mortality
NHFD data regularly disseminated to hip fracture ward staff	-	-0.85 days	
>50% patients given nerve block pre-operatively	-	-0.72 days	
>40% eligible patients get total hip replacement	-	-0.67 days	14% greater return home at 120 days

## Results

- Over 1 year patients with mean(SD) age 83(8.6) years, spent 31.7(32.1) days in hospital, costing £14,642 (£9,017), and 50,354 (28.2%) died (Table 1).
- We identified high levels of variability between the 172 hospitals in terms of the 9 patient outcomes (Table 2).
- In total, 46 key organisational factors independently associated with one or more patient outcome, of which 13 were (a) associated with cost and/or bed-day savings over 1 year, (b) consistently associated with other positive patient outcomes, and (c) potentially modifiable.
- These included weekend physiotherapy provision (mean saving per patient/year: £676 [95%CI: £67-1285]), orthogeriatrician assessment (£529 [£148-910]), direct admission to a hip fracture ward (3.4 [-0.36-7.07]days), regular feedback of audit data to staff (0.85 [0.30-1.39]days).

## The Implementation Toolkit & Website (launched Feb 2023)

Our findings informed a new hospital-specific cost-benefit calculator, model business cases for service improvement, specialty checklists, audit and 'how to' guides for complex care delivery.

<https://theros.org.uk/healthcare-professionals/hip-fractures/>

## Conclusions

Patient outcomes and care costs post hip fracture vary substantially between hospitals in England and Wales. We identified multiple, potentially modifiable, organisational factors associated with important patient outcomes post hip fracture. Our freely-available, REDUCE Study Toolkit provides multiple practical approaches for hip fracture service improvement by service managers and clinical leads, and should help reduce variation in hip fracture service delivery.

## References

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