Is bigger always better?

A nationwide study of hip fracture unit volume, 30-day mortality, quality of in-hospital care and length of hospital stay

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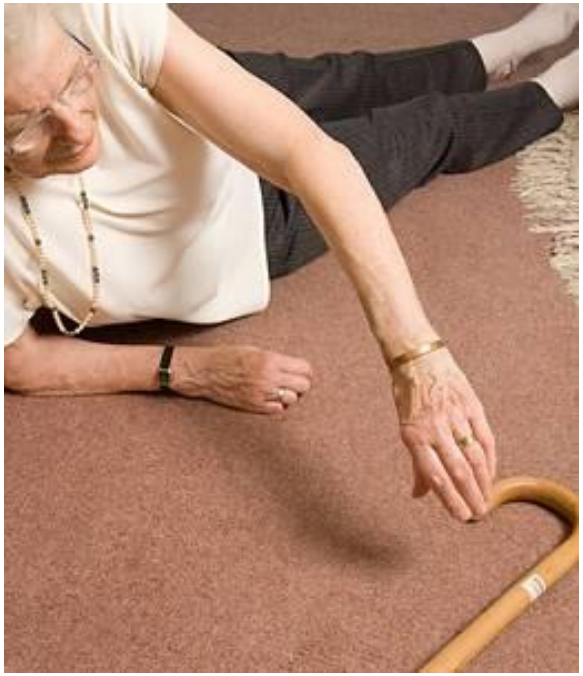
Introduction



Hip fractures are associated with increased mortality, functional impairments and significant health costs[1].

Among patients with hip arthroplasties higher unit volume is associated with lower rates of mortality and hip dislocation[2].

It is unclear whether there are any scale advantages from treating a larger number of patients with hip fracture.

1) Roche JJ, Wenn RT, Sahota O, Moran CG. Effect of comorbidities and postoperative complications on mortality after hip fracture in elderly people: prospective observational cohort study. BMJ 2005 Dec 10;33 1(7529):1.37 4.
2) Shervin N, Rubash HE, Katz JN. Orthopaedic procedure volume and patient outcomes: a systematic literature review. Clin Orthop Relat Res 2007 Apr;457:35-41

Aim

We examined the association between hip fracture unit volume and

- Quality of care reflected by six process performance measures
  1. Systematic pain assessment
  2. Being mobilized within 24 hours postoperatively
  3. Basic mobility assessment
  4. Post discharge rehabilitation program
  5. Treatment to prevent future osteoporotic fracture
  6. Initiation of treatment to prevent future fall accidents

- 30 day mortality
  From day of admission

- Time to surgery (TTS)
  Time in hours from hospital admission to surgery

- Length of stay (LOS)
  Time from hospital admission to hospital discharge

Methods

Random

Prospectively collected data from all Danish hospitals treating patients with hip fracture.

Danish National registries

Population-based data:

Hospital contacts
Vital status
Prescriptions

Unambiguous patient-level record linkage.

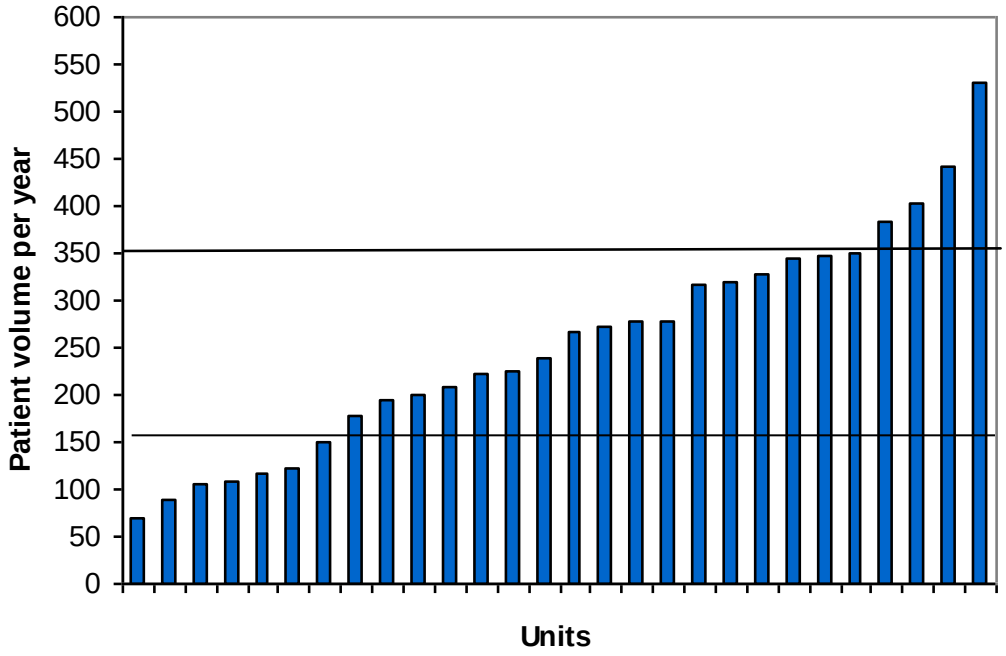
1.3.2010-30.11.2011
N = 12,065

The Danish Multidisciplinary Hip Fracture Registry

- A national clinical registry documenting quality of care reflected by receiving six process performance measures
- A nationwide mandatory quality improvement project.
- Development and implementation of evidence-based quality of care indicators.
- Detailed data on patient characteristics and quality of care.

Hip fracture unit volume

The average number of hip fracture patients treated in the units per year



High volume; 351-530 patient volume per year

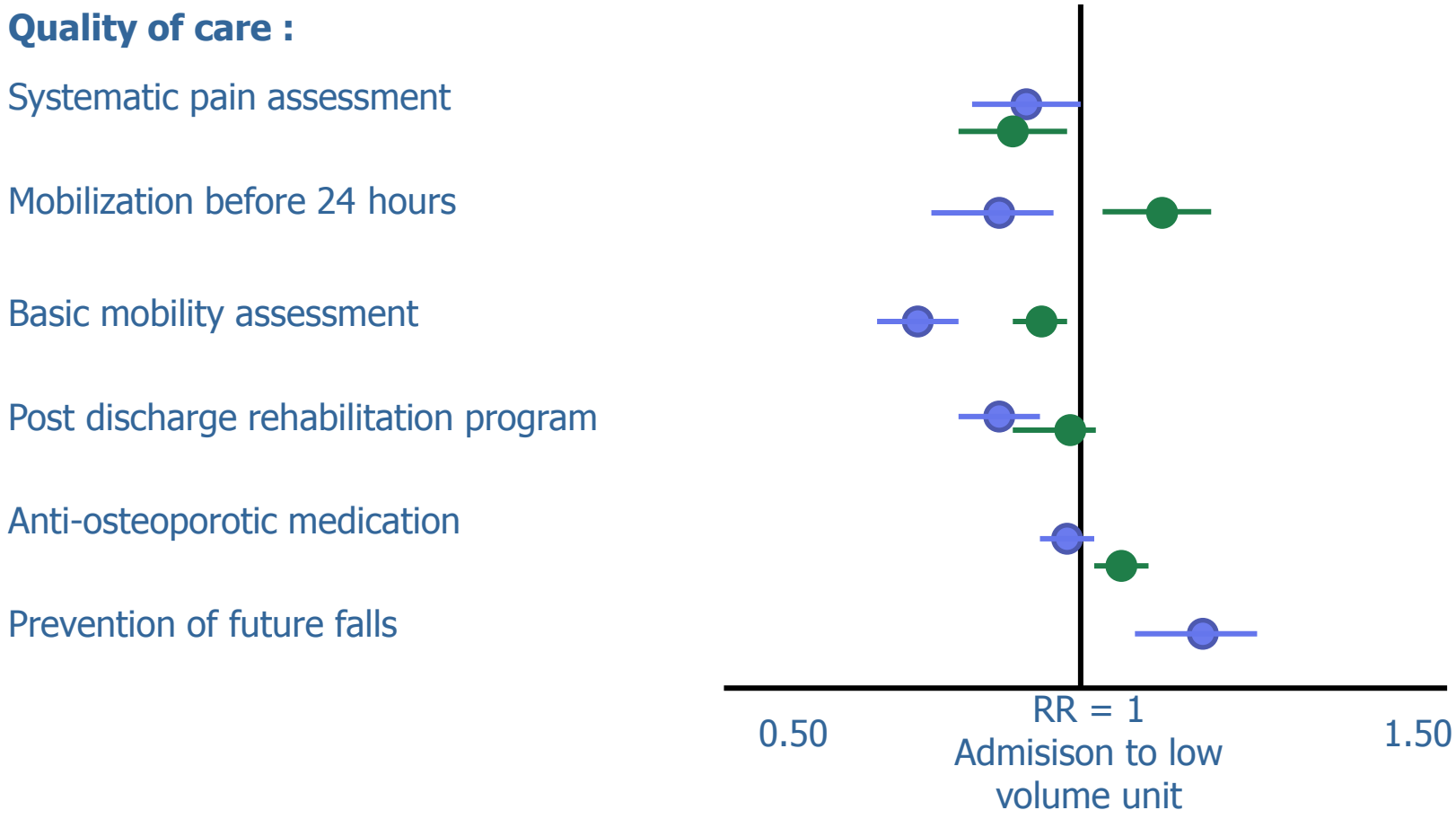
Medium volume; 152-350 patient volume per year

Low volume; 0-151 patient volume per year

Patient volume and quality of care

The blue dot is the relative risk for receiving the process for patients at high volume units
The green dot is the relative risk for receiving the process for patients at medium volume units

Quality of care :



Patient volume and 30 day mortality

	Dead, % (n)		Unadjusted OR (95% CI)	Adjusted* OR (95% CI)
Volume 0-151	**10.5**	(121)	1	1
Volume 152-350	11.0	(861)	1,05 (0,86-1,28)	1,14 (0,95-1,38)
Volume 351-530	**13.2**	(407)	**1,29 (1,04-1,61)**	**1,37 (1,14-1,64)**

*Adjusted for: age, gender, housing, Body Mass Index, Charlson Comorbidity Score, type of fracture, fracture displacement, type of surgery, surgical delay and unit settings.

Patient volume and time to surgery

	Median time In hours	Relativ time unadjusted (95% CI)	Relativ time Adjusted* (95% CI)
Volume 0-151	20.4	1	1
Volume 152-350	21.8	1,12 (1,06-1,18)	1,15 (0,98-1,36)
Volume 351-530	23.0	1,27 (1,20-1,34)	1,25 (0,99-1,58)

* Adjusted for: age, gender, housing, Body Mass Index Charlson Comorbidity Score, type of fracture, fracture displacement, type of surgery and unit setting.

Patient volume and length of stay

Patient volume and length of stay restricted to surgical delay (< 24 hours, 24-48 hours, > 48 hours)

	Relativ time unadjusted(95% CI)	Relativ time adjusted*(95% CI)
< 24 hours, n = 6933		
Volumen 0-151	1	1
Volumen 152-350	1.01 (0.95-1.06)	0.97 (0.81-1.17)
Volumen 351-530	**1.42 (1.33-1.51)**	**1.29 (1.01-1.65)**
24 – 48 hours, n =3791		
Volumen 0-151	1	1
Volumen 152-350	0.99 (0.92-1.07)	0.94 (0.78-1.13)
Volumen 351-530	**1.24 (1.14-1.34)**	1.12 (0.93-1.35)
> 48 hours, n= 1341		
Volumen 0-151	1	1
Volumen 152-350	1.04 (0.96-1.19)	1.03 (0.81-1.31)
Volumen 351-530	1.14 (0.99-1.31)	1.11 (0.87-1.41)

Strengths and limitations

Strengths:

- Populationbased design with prospective data collection
- Complete follow up
- Alternative volume categories provided similar results
- Adjusting for a range of well-established prognostic factors
- Only patients eligible for quality of care processes were included in analyses of volume unit and quality of care

Limitation:

- Unmeasured and residual confounding e.g. lack of information on preoperative functional level, pre-existing dementia or socioeconomic factors

Conclusion

Admission to high volume units were associated with:

- Increased 30 day mortality
- Lower odds for being mobilized within 24 hours postoperatively, for basic mobility assessment and for receiving a post discharge rehabilitation program.
- Longer hospital stay for patients with time to surgery below 24 hours
- Variations in quality of care could explain variations in 30-day mortality between units with low and high patient volume
- Increased time to surgery did not explain the increased length of hospital stay if time to surgical was < 24 hours.