More intramedullary nails and arthroplasties for treatment of hip fractures in Sweden

Register analysis of 144,607 patients 1998–2007

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Abstract

Background and purpose: Surgical methods for treatment of both femoral neck and trochanteric hip fractures vary. We describe the changes in Sweden during 1998-2007 and the regional differences in treatment.

Patients and methods: Data for 144,607 patients were drawn from the National Patient Register.

Results: The share of femoral neck fractures treated with arthroplasty increased from 784 procedures (10%) in 1998 to 4078 (52%), in 2007. The use of intramedullary (IM) nails for pertrochanteric fractures increased from 271 (5%) to 1059 (20%), on the expense of different sliding hip screws. In subtrochanteric fractures IM nails increased from 333 (32%) to 791 (72%). Re-admission within 180 days due to hip complications were more common after internal fixation for femoral neck fractures compared to arthroplasty, and after intramedullary nailing of pertrochanteric fractures compared to sliding hip screw. Treatment varied substantially within Sweden, in particular in the use of IM nails.

Interpretation: An increase in arthroplasties reflects an evidence based treatment rationale for femoral neck fractures, whereas the IM nail increase in pertrochanteric fractures lacks of scientific support. Geographic variations call for a national treatment algorithm. Further clinical trials are needed to solve the treatment issues on per- and subtrochanteric fractures.

Introduction

Intramedullary nails may take an increasing share in treatment of extracapsular fracture in USA (Anglen and Weinstein 2008). Data regarding other countries are scarce. The method is promoted at trauma meetings, although the scientific base is not – yet – convincing (Parker and Handoll 2008). For femoral neck fractures though, an evidence based algorithm is being

formed (Parker and Gurusamy 2006), with an increased use of arthroplasties for at least the elderly.

During the last decade swift changes in the treatment of hip fractures has taken place in Sweden. We describe the trends in the use of treatment methods for hip fractures in Sweden during 1998 – 2007, regional differences and re-admissions.

Material and methods

Data from the National Patient Register was extracted by The Centre for Epidemiology (EpC), a department of the Swedish National Board of Health and Welfare. The analyses are based on the first period of hospital admission due to acute hip fracture, for 144,607 individuals treated 1998 to 2007 in Sweden. Subgroup analyses are made as described in Results below.

The diagnoses were defined by using the ICD 10-system (WHO 2007) and the surgical procedures by the Swedish version of NOMESCO Classification of Surgical Procedures (NCSP) (NOMESCO 2008). Femoral neck fractures are classified as S72.0, pertrochanteric fractures as S72.1 and subtrochanteric as S72.2. The codes we used to define arthroplasty procedures were the NFB-group. Internal fixation for femoral neck fractures was defined as NFJ49 (Hansson hook pins), NFJ79 (Uppsala screws and similar) and NFJ89 (sliding hip screw). Intramedullary nail were searched as NFJ59, whereas extramedullary hip screw and plate was defined as both NFJ69 and NFJ89. Hip complications were defined as M24.3, M24.4 (dislocation), M84.0, M84.1, M84.2 (mal-/nonunion), M87.2 (post-traumatic osteonecrosis), M96.6 (periprosthetic fracture), M96.8, M96.9 (other/unspecified postprocedural musculoskeletal disorders), T81 (complications of procedures), T84 (complications of internal orthopedic prosthetic implants) and T93.1 (sequelae of fracture of the femur).

Information to the National Patient Register is delivered once a year to EpC from the 21 county councils in Sweden, as a disc with one data file for the whole county council. Every discharge during one year corresponds to one record in that file.

Statistical analysis was made with chi-square-test.

Results

For pertrochanteric fractures, the number of intramedullary nails increased from 271 to 1059 (5 to 20%), on the expense of different sliding hip screws or other extramedullary implants. The latter increased from 5374 to 4200 (95 to 80%) (Figure 1). There were no sex or age differences for this fracture type.

The increase of intramedullary nails was more prominent for subtrochanteric fractures. They increased from 333 to 791 (32 to 72%), whereas the extramedullary implants correspondingly decreased from 708 to 311 (68 to 28%) (Figure 2). There was no gender difference, but during the period patients under 70 years got more intramedullary nails compared to those over 80 (59% and 55%; p=0,007).

The surgical treatment for femoral neck fractures shows the most evident change (Figure 3). In 1998 784 operations (10%) classified as arthroplasties, were performed. 7121 internal fixations were performed (90%). 9 years later a majority were treated with arthroplasty, 4078 (52%), in comparison with 3741 (48%) internal fixations.

Women were to a greater extent treated with arthroplasty than men (40% and 30%; p<0,001). The increase in arthroplasty was most pronounced in patients over 65 years, but an increase was seen for those between 55 and 64 years as well (Figure 4).

Regarding the need of re-admission, 33 181 patients with dismissal from hospital after acute hip fracture treatment during January 1st 2005 and June 30th 2007 were analyzed. Patients who

died during hospital stay or were transferred to another hospital department were excluded before the analysis.

Re-admission to any hospital department within 180 days, regardless of diagnosis, was required for 9485 patients (29%). The frequency of re-admission was higher after femoral neck fractures than after extracapsular fractures (p=0.02). Femoral neck fracture patients treated with internal fixation had more re-admissions than those treated with arthroplasty. (Table 1).

Re-admission within 180 days due to hip complications occurred statistically significantly more often after internal fixation for femoral neck fractures compared to arthroplasty, and after intramedullary nailing of pertrochanteric fractures compared to sliding hip screw. Internal fixation for femoral neck fractures showed the overall highest hip related re-admission rate, 9,3%, and sliding hip screw for pertrochanteric fracture the lowest, 3,8% (Table 1).

For 43 269 patients operated for hip fracture during January 1st 2005 and December 31th 2007, a comparison between the 21 county councils in Sweden were made (Figures 5 – 7). We found differences in particular for the use of intramedullary nails for both pertrochanteric fracture (3 to 41%) and subtrochanteric fracture (23 to 90%). The use of arthroplasty for femoral neck fracture varied between 36 and 63%.

The geographic variations were notable also when comparing the need of re-admissions after 180 days. After femoral neck fracture for example, re-admissions caused by any diagnosis varied from 19,5% to 31,0% and re-admission due to hip complication from 3,8% to 10,8%.

Discussion

A change of treatment rationale is in best case an evidence based decision, and in worst case an urge to follow the trend. Mostly, we have to rely on a few studies together with clinical

experience summarized as “common expert opinion”, i.e. to some extent a subjective matter and perhaps arbitrary.

Little is known in detail about the frequency of different surgical methods in a country. The hip fracture studies published agree only on the point that there is a lack of agreement amongst surgeons which method to use. Bhandari et al. (2005) made an international survey and found that for displaced femoral neck fractures, surgeons preferred internal fixation for younger patients and arthroplasty for elderly. For patients between 60 and 80, there were no consensus over the optimum treatment. In England, a telephone interview survey in 2000, showed that for active patients with a displaced femoral neck fracture, internal fixation, bipolar hemiarthroplasty and unipolar hemiarthroplasty was roughly all as common as a first hand choice(Crossman et al. 2002). A Norwegian survey found that one third of the hospitals treated displaced femoral neck fractures with hemiarthroplasty and the rest with internal fixation with screws (Figved et al. 2005).

For extracapsular fractures, the sliding hip screw is still the gold standard according to evidence based guidelines (Parker and Handoll 2008). The theoretical mechanical advantages of intramedullary nails; reducing the distance between the implant and the joint, leading to less bending moment, has not yet been proven in clinical studies (Parker and Handoll, 2008). There might be specific types of fractures best served by an intramedullary nail or a biaxial sliding hip screw and plate, but still without sufficient support of scientific data. Nevertheless we, as Anglen and Weinstein (2008), found an increase in the use of intramedullary nails for extracapsular fracture in common. The latter found by analysis of the database emanating from the American Board of Orthopaedic Surgery that the rate of intramedullary nails went from 3% in 1999 to 67% in 2006, on expense of the sliding hip screw. If not any particular benefits are gained in using an intramedullary nail, cost effectiveness must be considered; the intramedullary nail may cost 3 to 6 times more than a standard sliding hip screw. Our finding

that patients with intramedullary nail had more re-admissions due to hip complications than those treated with sliding hip screw might be biased by the possibility that intramedullary nails were more commonly used in comminuted fractures with higher risk of complications. But another study based on register data found the same as we, Aros et al. (2008) found a higher revision surgery rate for pertrochanteric fractures treated with intramedullary nails and advised against routine use in pertrochanteric fractures

Variations in treatment of femoral neck fractures within a province have been reported from Canada (Jaglal et al.1997; Cree et al. 2002). THA was more often used in hospitals associated with a medical school. During the study period 1981 – 1992, the use of hemiarthroplasty in Ontario increased from 45 to 61% (Jaglal et al., 1997).

Access to the national health data registers, as in our study, provides real data for the whole country. The limitations are the lack of laterality in the register and in particular that the coding systems are too little detailed. In the fracture groups, displacement or comminution is not pinpointed by the diagnosis code.

The validity of national electronic databases has been questioned, for example by Lofthus et al. (2005). Their criticism of the Norwegian Patient Register points out the lack of patient identification number as a major source of error. The Swedish Patient Register uses the unique 10-digit Swedish PNR number, which ensures the tracing of re-admissions and reoperations. Continuous validation of health data registers is essential. For example, in 2008, coprocessing was undertaken between the Swedish Patient Register and the Swedish Hip Arthroplasty Register (Kärrholm et al. 2008). The Hip Arthroplasty Register had a degree of coverage for total arthroplasties of 96%. The coverage in the Patient Register was lower, 91%, to some extent explained by a generally low frequency of reporting from private hospitals to

the Patient Register. We assume that the degree of coverage for hip fractures in the Swedish Patient Register might be better, as the few private hospitals in Sweden do not do emergency procedures.

The rapid change towards primary arthroplasty during the last decade is a new finding. Sernbo found that 2 and 10% respectively were treated with arthroplasties in his nationwide surveys for 1990 and 1998 (Sernbo and Fredin 1993, Sernbo 1999). Sweden has been a stronghold of internal fixation for displaced femoral neck fractures since a couple of promising studies in the 1980's (; Stromqvist et al.1984; Stromqvist et al.1987; Rehnberg and Olerud 1989). Several randomized controlled studies that started in the 1990's, comparing internal fixation with arthroplasty, could confirm the superiority of the latter. These findings are summarized in metanalyses (Bhandari et al. 2003; Parker and Gurusamy 2006; Rogmark and Johnell 2006). Hence there is an evidence base for the observed change in treatment. Our finding, that patients with internal fixation had more readmissions than those treated with arthroplasty, also supports the increasing use of arthroplasties.
For femoral neck fractures, the results are obscured by the fact that the diagnosis code does not discriminate between undisplaced and displaced fractures. Internal fixation is advocated as the treatment of choice for undisplaced fractures (Handoll and Parker 2008) which constitute one third of the group (Thorngren and Hommel 2008), leaving two thirds as displaced. I.e. a use of primary arthroplasty for only half of the fractures as found in our study suggests undertreatment.

Both our study and other highlights obvious differences in treatment between hospitals, counties and nations for hip fractures. Evidence based guidelines are obviously needed to secure a good, equal and cost-efficient care, and such algorithms are evolving in some centers

(Shah et al. 2002; Chilov et al. 2003). The shift towards arthroplasties for displaced femoral neck fractures in Sweden must be seen as a response to several Swedish and international RCT's resulting in a new treatment rationale. Hopefully a similar effort can be made during the next decade to provide a better evidence base to solve the treatment issues for trochanteric fractures.

CR: Planning of the study, analysis of data and preparation of the manuscript. CLS: Planning of the study, data collection and analysis. GG: Planning of the study, preparation of the manuscript.

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Figure 1: Surgical methods for pertrochanteric fracture (S72.1)

NFJ 59 = intramedullary nail; NFJ 69/89 = extramedullary implant

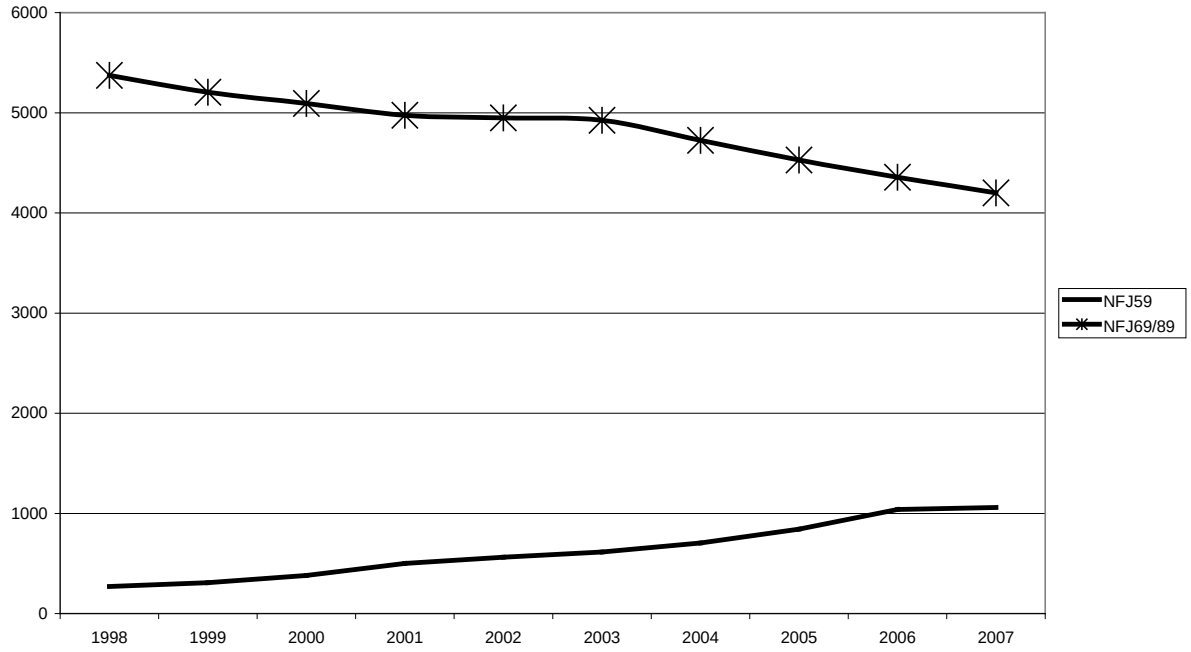


Figure 2: Surgical methods for subtrochanteric fracture (S72.2)

NFJ 59 = intramedullary nail; NFJ 69/89 = extramedullary implant

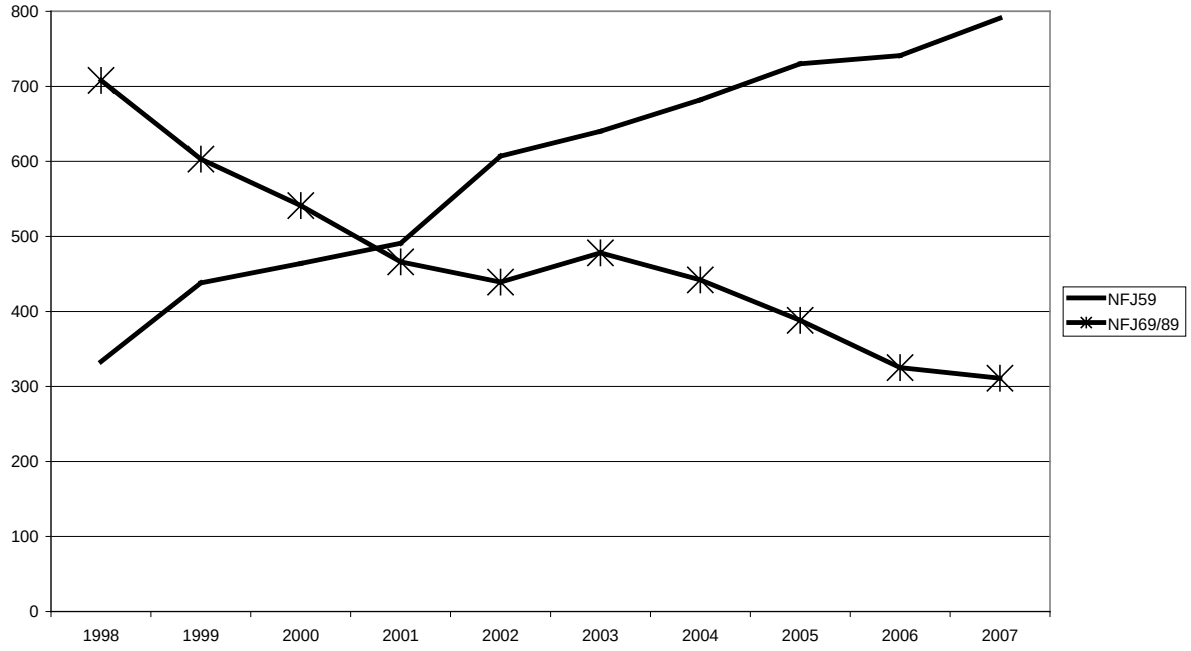


Figure 3: Surgical methods for femoral neck fractures (S72.0)

NFB = arthroplasty; NFJ = internal fixation

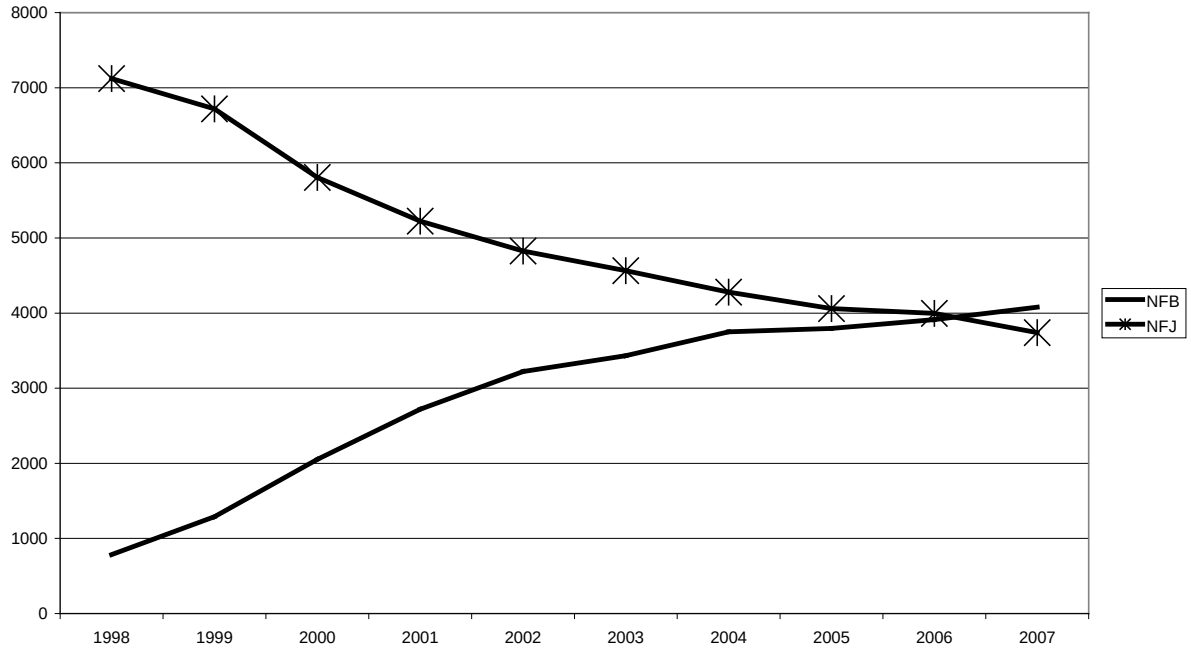
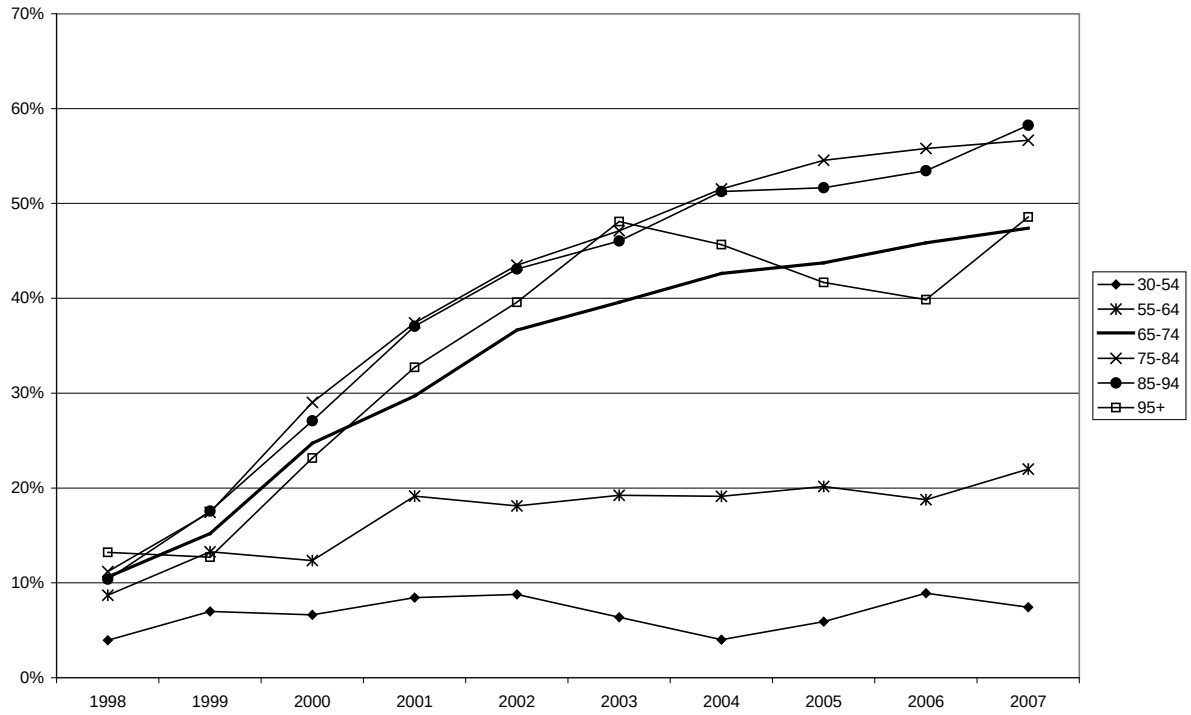


Figure 4: Arthroplasty for femoral neck fractures (S72.0) in age groups (%)



igure 5: Use of arthroplasty for femoral neck fracture (S72.0) in different county councils 2005-2007 (%)

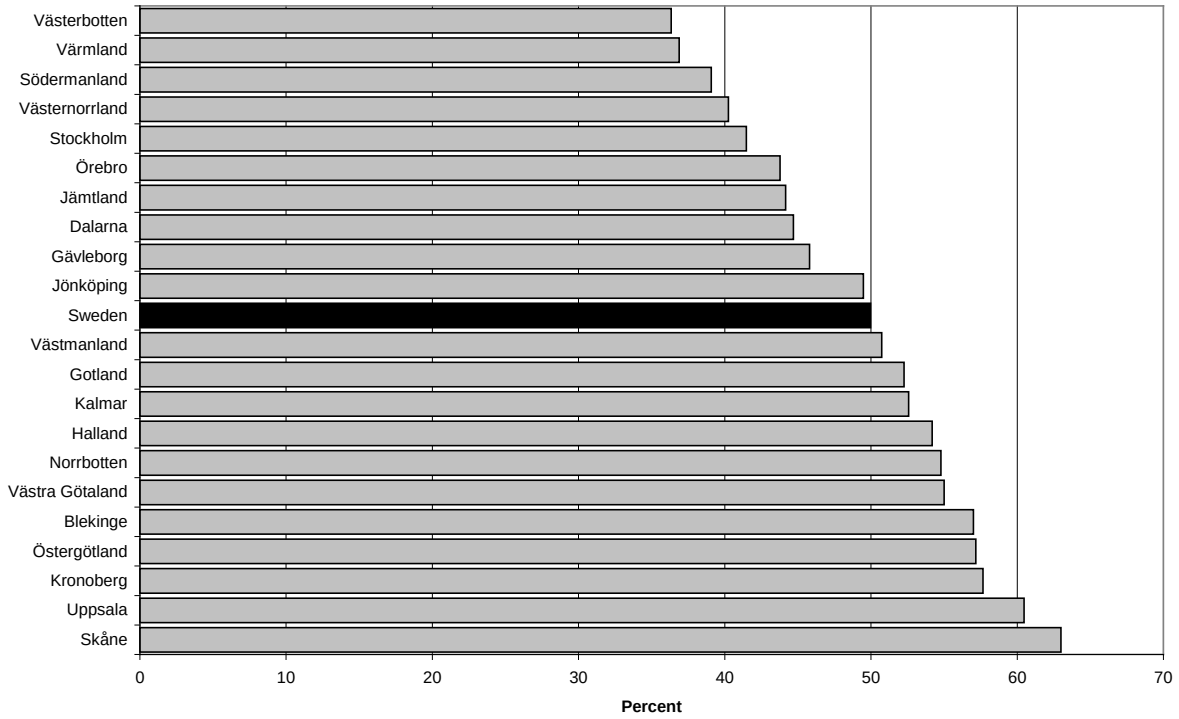


Figure 6: Use of intramedullary nail for pertrochanteric fracture (S72.1) in different county councils 2005-2007 (%)

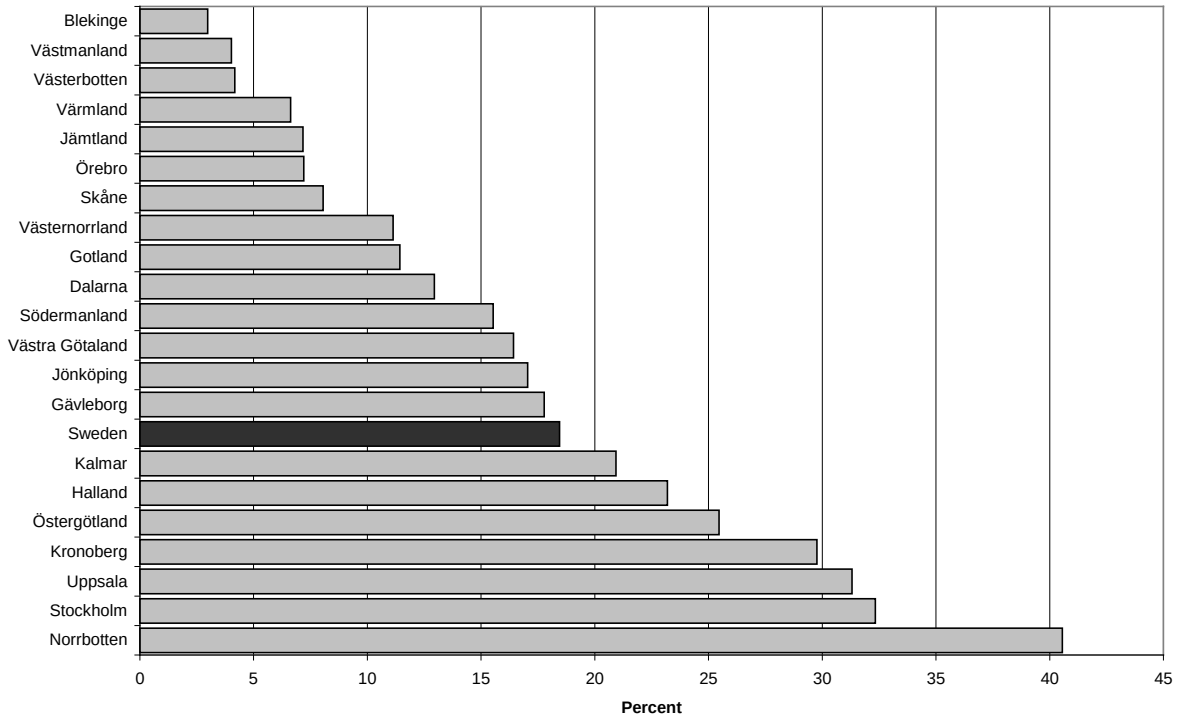


Figure 7: Use of intramedullary nail for subtrochanteric fracture (S72.2) in different county councils 2005-2007 (%)

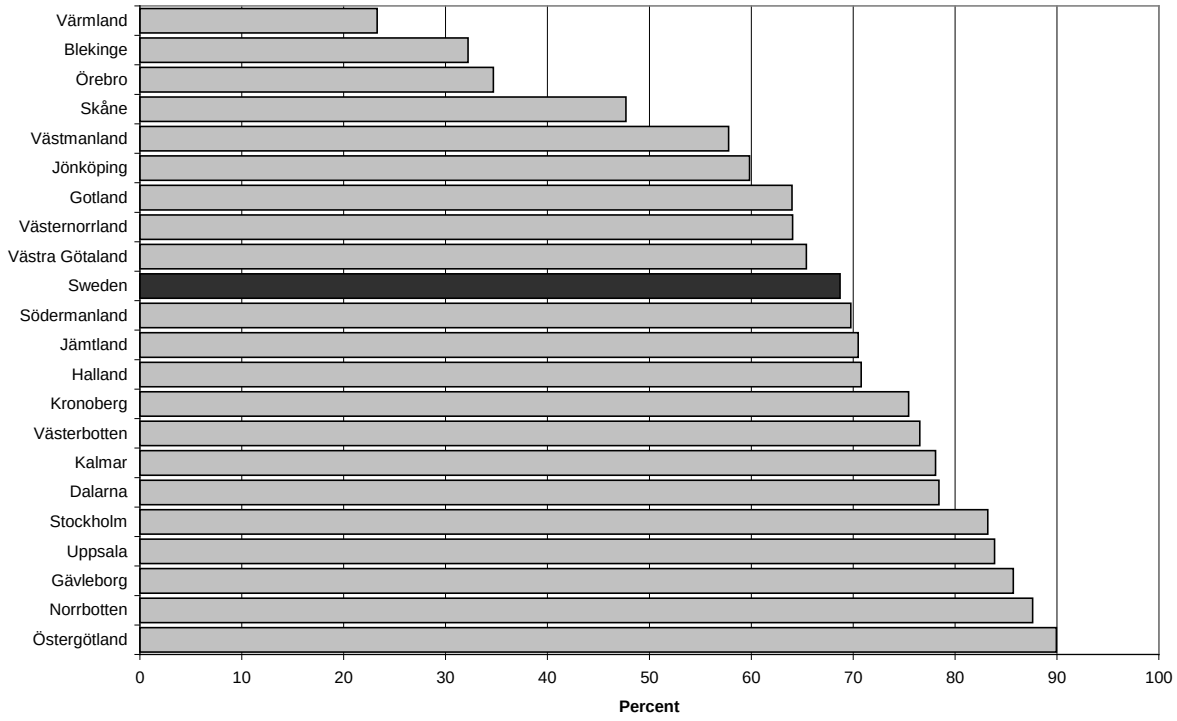


Table 1: Re-admissions to hospital in 180 days 2005 - 2007

IM nail = intramedullary nail

SHS = Sliding hip screw, includes Medoff plate (biaxial sliding plate)

Diagnosis	Alive at hospital dismissal	Method	Alive at hospital dismissal	Re-admitted in 180 days	%	p-value	Re-admission due to hip complica-tion	%	p-value
S72.00	18 196	Arthroplasty	8800	2 466	28	p=0,001	632	7,2	p<0,001
		Internal fixation	9396	2 835	30		877	9,3	
S72.10	12 470	Intramed. nail	6041	1 701	28	n.s.	305	5,1	p<0,001
		SHS	6429	1 786	28		246	3,8	
S72.20	2 515	Intramed. nail	2040	563	28	n.s.	129	6,3	n.s.
		SHS	475	134	28		29	6,1	