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# Improvements in pain relief, handling time and pressure ulcers through internal audits of hip fracture patients

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## Improvements in pain relief, handling time and pressure ulcers through internal audit of hip fracture patients

The aim of this project was to improve the outcome of hip fracture patients by optimizing preoperative pain relief, diminishing the time from admission to operation and reducing the occurrence of pressure ulcers. A retrospective study of all medical records of hip fracture patients from the last 4 months in 1998 was compared with prospective registrations during the same period in 1999 and 2000 after the introduction of quality improvements. The number of patients who waited for more than 1 hour to get pain relief was almost halved after improvements. In 1998, close to half of the patients had to wait more than 24 hours for an

operation. After attention was given to quality improvements, 36% of the patients in 1999 and 34% of the patients in 2000 had to wait more than 24 hours. In addition, 18% of the patients in 1999 and 24% of the patients in 2000 vs. 11% in 1998 were operated on within 12 had to wait more than 24 hours. Pressure ulcers were considerably reduced. In total, 19% of the patients in 1998, 8% in 1999 and 4.5% in 2000 had pressure ulcers at discharge from the hospital. The outcome for hip fracture patients was improved through attention to quality improvements with all staff involved and focused on these patients.

**Keywords:** audit, hip fracture, nursing, pain relief, pressure ulcer, handling time.

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## Introduction

The importance of an urgent operation of a hip fracture patient is well known (1, 2). If the fracture is stabilized within 24 hours the outcome is potentially improved (3–5). In order to avoid complications, considerable nursing care is needed from the time the patient is admitted to the Acute & Emergency unit (A & E), through surgery, and on the ward before discharge. During hospitalization, prevention is needed against wound infection, pressure ulcers, thrombosis, pneumonia, urinary infection and mental confusion (6). In 1859, Florence Nightingale (7) wrote that it was unprofessional nursing if the patient developed pressure ulcers. Today it is obvious that a multiprofessional responsibility for the prevention of pressure ulcers is an important quality issue; however, nursing care has a major influence on outcomes (8). Patients who are confused develop significantly more pressure ulcers than patients orientated to time and place (9). Furthermore there are

various risk assessment scales, but none is ideal (10). Clinical judgement may be an effective alternative to existing assessment tools, but it requires an experienced nurse (11). Patients at risk who are nursed on an interface-pressure-decreasing mattress have a significantly reduced risk of occurrence and severity of pressure ulcers (12). An early and active rehabilitation initiated by nurses is cost-effective from a humanitarian as well as an economic perspective. This project aimed at improving the care of hip fracture patients by optimizing pain relief, diminishing the time from admission to operation and preventing pressure sores through the use of a systematic internal audit.

The number of hip fracture patients world-wide was estimated at 1.66 million in 1991. With an ageing population in Asia, Africa and South America, the number of hip fracture patients is expected to increase to about 6.3 million by the year 2050 (13). It is important to optimize treatment now, in order to be able to control resource consumption in the years to come. Hip fracture patients are resource consuming and occupy around one-quarter of orthopaedic beds (14, 15). In recent decades the number of elderly in Europe and in the USA has increased and the number of hip fracture patients has risen. The total number of hip fracture patients over 80-year-old has doubled in Sweden (15, 16). As the number of elderly is estimated to

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rise during the next decades, the number of hip fracture patients is also expected to increase (17).

It is common that older patients with hip fractures are affected by complications (18). They also have other diseases, which can initiate several problems and a need for treatment at different levels of care. To characterize and optimize the treatment outcome of hip fracture patients, a national register of hip fracture treatment in Sweden, called *Rikshöft*, was started in 1988 (15, 19). International interest in this national audit resulted in the start of the project Standardized Audit of Hip Fractures in Europe (SAHFE) in 1996 (20). The audit has spread all over the European Community, particularly in Scotland where most of the hospitals register. Hospitals in Australia, Japan and USA now participate in SAHFE as well. In the autumn of 1997, the Swedish Association of County Councils and the National Board of Health and Welfare initiated a project with the purpose of implementing modern principles and methods for quality improvements with the help of Swedish national quality registers. This project was called *Q-reg 99*. It was based on experience from benchmarking in Northern New England, USA (21, 22). The project was further developed in Lund and is the basis for this report.

## Aim

The aim of this study was to improve the outcome of hip fracture patients through optimized preoperative pain relief, diminish the time from admission to operation and reduce the occurrence of pressure ulcers.

## Materials and methods

During the period 1 September–31 December 31, 1998, the Department of Orthopaedics at Lund University Hospital, Lund, Sweden, treated 165 patients (mean age 79.3 years, SD 11.3, 74% women) with a hip fracture. During the same period in 1999, 157 patients with a hip fracture were treated (mean age 80.3 years, SD 11.0, 73% women), and in 2000, 161 patients (mean age 80.7 years, SD 9.3, 76% women).

### Data collection

Data were collected within the national register *Rikshöft*-SAHFE. In our project the possibility of registering optional questions was used. We studied all the medical records from 1998 except for seven ( $n = 158$ ) that could not be retrieved, and compared them with the results of the patients prospectively registered during 1999 ( $n = 157$ ) and 2000 ( $n = 161$ ).

We studied the time of first pain relief administered after the fracture, the time from admission to operation, occurrence and type of pressure sores at admission and at discharge. Patients previously given continuous pain relief

in the form of pills or pump were excluded from statistics on pain relief after the fracture. Patients already in hospital and patients who were operated on electively with undisplaced intracapsular fractures because of late admission or because of threatening destruction related to malignant secondary bone tumours were excluded from statistics on pain relief and time of operation. Patients with a hip fracture who were operated by the orthopaedic department but nursed by other departments were excluded from the study. The pressure ulcers were graded in Correspondence the classification established by the European Pressure Ulcer Advisory Panel (EPUAP) (23).

Grade I Nonblanchable erythema of intact skin.

Grade II Partial thickness skin loss involving epidermis, dermis or both, resulting in an abrasion or crater.

Grade III Full thickness skin loss and extension into subcutaneous tissue but not through underlying fascia.

Grade IV Extensive destruction, tissue necrosis, or damage to muscle, bone or tendon.

### Quality improvements

Between 1998 and 1999 actions to improve care were taken in Lund. New routines at the A & E were introduced, a new waiting room for bedridden patients was opened, and all memos concerning patients with hip fractures were revised, leading to new pain relief methods at the A & E. The new waiting room was better supervised and the personnel were informed to avoid prolonged pressure while the patients waited on trolleys. The pain relief consisted of more routine administrations, and above all, more repeated feedback from the patients. The detailed care process of a patient with a hip fracture through the hospital was described. As a result, patients with a hip fracture were given a higher priority at the X-ray unit. Furthermore, new mattresses were put on all orthopaedic beds (including the surgical tables). The mattresses were three layered with 2 cm supersoft cold-formed foam, 4 cm pressure relieving flexifoam and 6 cm bottom cushioning, cold-formed foam which, together with the hygienic surface, gives effective pressure relief. The previous mattresses consisted of one layer foam. The slow recovery polyether foam mattresses on the surgical tables were newly introduced. Previously, no special mattresses had been used. All Registered Nurses and auxiliary nurses at the orthopaedic department were given information and education about hip fractures, pressure ulcers and general handling of the patients. This education was provided with the assistance of a specialized teacher from the Department of Nursing at Lund University.

### Statistical analysis

The patient's age is presented as mean age  $\pm$  SD. For statistical evaluation, the chi-square test with Yate's correction is used. All statistically significant results are given in

the tables.  $p < 0.05$  was considered significant. Some of the patients with pressure ulcers at admission had more than one pressure ulcer, for example, both on heels and buttocks. In those particular cases we have only made calculations on the most serious pressure ulcer in order to describe the total number of patients with a pressure ulcer in some location.

**Ethical approval**

This registration of data was approved by the National Bureau for Computerized Registration. The procedures of the study are part of ordinary hospital routines. No individual participant can be identified.

**Results**

In 1998, information about the first pain relief after admission could be found in 149 of 158 medical records. In 1999 this information was registered in 139 of 157 records and in 2000 in 147 of 161 records. In 1998, 41% of the patients waited for more than 1 hour for pain relief compared with 22% of the patients in 1999 and 35% in 2000. The number of patients who waited for more than 1 hour for pain relief was almost halved after improvements and the number of patients receiving pain relief before admission to hospital decreased during 1999 and 2000 (see Table 1).

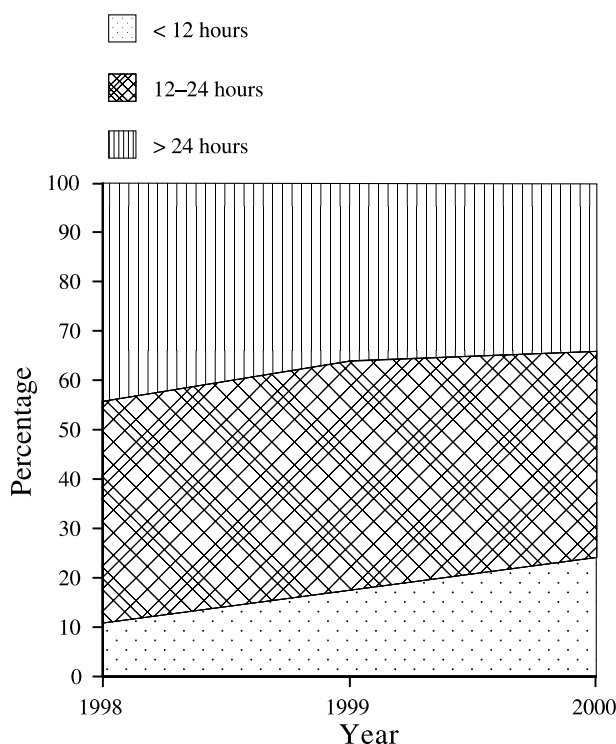
Close to half of the patients, 44%, had to wait for more than 24 hours from admission to surgery in 1998. After the quality improvements, 36% of the patients waited for more than 24 hours in 1999 and in 2000, 33% of the patients waited for more than 24 hours. A statistically significant number of patients (25%,  $p < 0.01$ ) were operated on within 12 hours in 2000 compared with 11% of the patients in 1998 (see Fig. 1).

In 1998 nearly every fifth hip fracture patient had some grade of pressure sores and 5% of these were of grade 3. A statistically significant improvement was found in 1999 ( $p < 0.01$ ) and 2000 ( $p < 0.001$ ) compared with 1998 (See

**Table 1** Number and percentage of patients divided by time of first pain relief

	Year		
	1998 <i>n</i> = 149 <i>n</i> (%)	1999 <i>n</i> = 139 <i>n</i> (%)	2000 <i>n</i> = 147 <i>n</i> (%)
Before admission	27 (18)	21 (15)	16 (11)
<1 hour	61 (41)	87 (63)***	79 (54)*
>1 hour	61 (41)	31 (22)**	52 (35)

\* $p < 0.05$  vs. 1998; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .



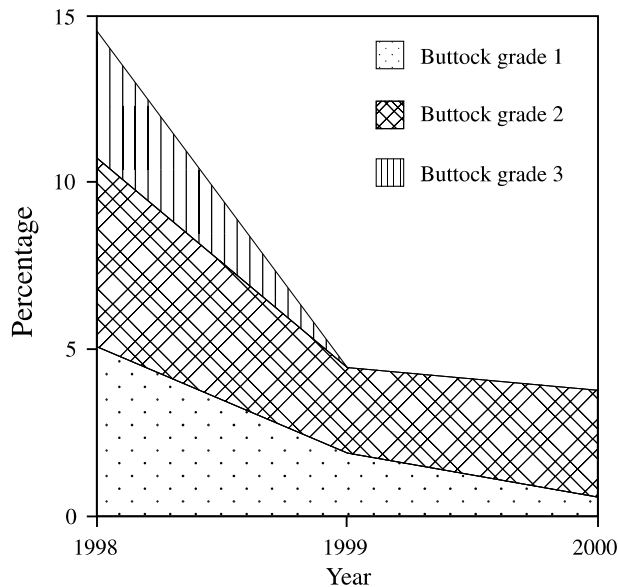
**Figure 1** Percentage of patients operated divided by time from admission to operation. The increase of patients operated within 12 hours was significant ( $p < 0.01$ ) from 1998 to 2000.

**Table 2** Number and percentage of patients with pressure ulcers on discharge from hospital

Location	Grade	Year		
		1998 <i>n</i> = 158 <i>n</i> (%)	1999 <i>n</i> = 155 <i>n</i> (%)	2000 <i>n</i> = 158 <i>n</i> (%)
On buttocks	1	8 (5.1)	3 (1.9)	1 (0.6)*
	2	9 (5.7)	4 (2.6)	5 (3.2)
	3	6 (3.8)	0	0
	Total	23 (14.5)	7 (4.5)**	6 (3.8)**
On heels	1	8 (5.1)	5 (3.2)	1 (0.6)
	2	2 (1.3)	1 (0.6)	0
	3	1 (0.6)	0	0
	Total	11 (7.0)	6 (3.9)	1 (0.6)**
On other areas	1	1 (0.6)	2 (1.3)	1 (0.6)
	2	4 (2.5)	0	1 (0.6)
	3	1 (0.6)	0	0
	Total	6 (3.8)	2 (1.3)	2 (1.3)
Total		31 (19.6)	12 (7.7)**	7 (4.4)***

\* $p < 0.05$  vs. 1998; \*\* $p < 0.01$ ; \*\*\* $p < 0.01$ .

Table 2). Statistics on the decrease of pressure sores on the buttocks are presented in Fig. 2 as an example of this improvement.



**Figure 2** Percentage of patients with pressure ulcers on buttocks, on discharge from hospital. Pressure ulcers on buttocks decreased from 14.5% in 1998 to 3.8% in 2000 ( $p < 0.01$ ).

## Discussion

From 1998 to 1999 we decreased by nearly half ( $p = 0.001$ ) the number of patients who waited for more than 1 hour from admission to first pain relief. The patients are also given a more effective pain treatment than earlier with the use of opioids combined with paracetamol. This is an advantage to the patient (24, 25). Our goal is that every patient should be offered pain relief within 1 hour. However, we do not give all patients pain relief within 1 hour, as all patients do not meet the requirement of enough pain. Patients with an undisplaced cervical fracture, for example, may not suffer any pain.

Regrettably, the group of patients who were given pain relief within 1 hour decreased in 2000 compared with 1999 as well as the group who were given pain relief before admission to hospital. This may be explained by increased staff turnover at our hospital. The attitudes and subjective norms of the nurses are of importance when we assess the patient's pain (25). Education in pain relief is therefore important. After a day of training and instruction, the nurses gave larger doses of intravenous opioids and the patients experienced less pain (26).

In this study pain was not measured on a VAS scale, which would have given further information. On the other hand repeated questioning of the patient's well-being was performed. Displaced hip fractures have previously been given some form of preoperative traction as pain relief. The use of traction has been shown to prevent pressure ulcer and the patients experienced less pain on the day after injury than the patients in the no-traction group (27). However, other reports have not shown any difference in

the use of analgesics (28), and rather have indicated that skeletal traction is of no advantage to the patients and is only expensive and time-consuming (29, 30). The present clinical practice is to rest the leg on a special pillow with protection for the heel, which has been shown to give equal pain relief.

Despite the increasing lack of theatre sisters we have been able to bring down the waiting time of more than 24 hours from admission to operation, from close to half of the patients to close to one third. This increase in urgency is dependent on the new routines at the operation theatre, and on the staff giving a higher priority to hip fracture patients.

The audit and other quality improvements have led to a statistically significant decrease in pressure ulcers ( $p < 0.001$ ) from 19.6% in 1998 to 4.4% in 2000, and even more important none of the pressure ulcers in 1999 and 2000 were of grade 3 or 4. Furthermore, improvements have led to a statistically significant lower occurrence of pressure ulcers on the buttocks ( $p < 0.01$ ).

Pressure ulcers develop as a result of insufficient or obstructed peripheral circulation, which leads to ischaemia in the tissues. The most common areas for pressure ulcers are the sacrum, heel and hips (31). If a patient develops a pressure ulcer this means not only pain and suffering for the patient, but it also leads to more work for the staff and a considerable strain on the health care system because of a lengthened hospital stay (32). Indig et al. (33) describe how a patient who developed pressure sores stayed on average 33 days longer at a rehabilitation department than a patient without pressure ulcers. Prevention is preferable to treatment, as 70% of all pressure sores have an identifiable cause (34). The risk of developing pressure ulcers while waiting for the doctor is high in A & E. Reducing the delay in waiting time reduces the risk of pressure ulcers (35). The occurrence of pressure ulcers on heels makes it difficult for the patient to wear stable shoes, leading to rehabilitation problems, a lengthened hospital stay and an increased risk of other complications. Mullineaux (35) points out that reducing the delay reduces the risk of developing pressure ulcers, and Hoffman (12) illustrates the improvements gained through the use of pressure-decreasing mattresses.

In this study, the hip fracture patients were given more adequate pain relief, the waiting time for surgery was decreased and the patients were nursed on pressure-decreasing mattresses all according to the literature. The results of our quality improvement have been successful.

In order for health care to cope with the increasing number of patients with hip fracture, it is important to be able to compare results between different hospitals and countries. Through initiatives from the medical profession, national registers have been organized in Sweden for different diagnostic groups. The purpose of the registers is to promote enhancement and quality development within health care. The National Board of Health and Welfare, the

Association of County Councils and the Swedish Medical Association support the quality registers. Through these national quality registers, the Swedish health care system has unique access to data that lack counterparts in most other countries. The registers contain data of diagnoses, treatment and results related to individual patients. Presentation of the data on aggregated levels makes it possible for individual departments to compare the result with the national average.

The feedback from systematic measuring, registering and evaluating provides an incentive for continuous improvement. However, a system that will create results must be open to changes in routines and clinical work (36) and quality indicators should be defined (37). To find suitable quality indicators for nursing a project within the national quality registers such as Q-reg 99 is useful. It is thereby possible to focus on improving aspects of nursing which, when proved useful, can be included in a national audit. As a result of this study the registration of pressure ulcers is now included in the Swedish national audit of patients with a hip fracture. In the near future this will be a very useful source of knowledge about nursing of patients with a hip fracture. For a meaningful audit, terminology definitions must be clearly stated as in the SAHFE (20). In the literature the Joint Commission on Accreditation of Health care Organization (JCAHO) in the USA expresses a clinical indicator as 'a quantitative measure that can be used as a guide to monitor and evaluate the quality of patient care and support service activities' (38).

In this study three consecutive yearly periods of 4 months were chosen in order to obtain a sufficient number of patients for analysis of the chosen quality indicators. There were problems in finding information when the patient was primarily treated at other departments and in the retrospective study the documentation was not always totally satisfactory. However, a pressure ulcer mentioned in the patient's medical record at least denotes an obvious complication. In the retrospective study there might be some underestimation because pressure ulcer grade 1 could have been omitted. Nordell et al. (39) state that satisfactory documentation is a prerequisite in finding factors to prevent falls and fractures. We had difficulties in finding in-depth information about the reasons behind the delay of operations, and it was also hard to find out if the nurse had offered pain relief, which the patient had refused to accept. The doctors hardly ever documented pressure ulcers in the medical records, but the information was found in the nurses' documentation. Even if information can be extracted from the records, a prospective audit is definitely more efficient and can be recommended. The audit should be part of the everyday handling of the patients to achieve continuous improvements.

The quality improvements in Lund were of different kinds. Factors to improve the A & E process of a hip fracture patient were not possible to identify and influence

until we had described the total hip fracture process throughout the hospital. A nurse working together with a teacher from the Department of Nursing provided specific education about pressure ulcers. With frequent turnover of personnel this education is important and must be a continuous part of the nursing routine.

Optimized hip fracture treatment has great implications both for the patient and society. The care of the patient has great importance for the outcome, and delays in operations increase morbidity and mortality. Through focused attention from the staff, improvements have been achieved in the prevention of pressure sores and pain management. This study is an example of audit-driven quality improvements applicable to large-scale medical care. Treatment of hip fracture patients involves several categories of staff at the hospital and later in community care. Furthermore, the increased awareness to optimize the treatment through audit feedback is a working principle of general interest resulting in great socio-economic gains. This principle is applicable to other resource-consuming diagnoses in the elderly.

## Conclusions

By reducing the time that the hip fracture patient spends on hard trolleys in A & E, reducing the waiting time for the operation and giving more adequate pain relief so that the patient can move in bed, a statistically significant prevention of pressure ulcers has been achieved. This study has shown that audits make the staff aware of and improve the quality of care of the hip fracture patient. Quality improvement work with the total involvement and support of all staff leads to an enhanced outcome for the patient. It is important that the nursing staff together with the other professionals and the administrators create the necessary atmosphere for changes to occur. In this project we have shown that our quality improvement work with a special focus on pain relief, handling time and pressure ulcers was successful. In conclusion, a continuous audit with feedback of the results facilitates improvements in patient care.

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