

# HIP FRACTURE TREATMENT : OUTCOME AND SOCIO-ECONOMIC ASPECTS. A ONE-YEAR SURVEY IN A BELGIAN UNIVERSITY HOSPITAL

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**Between October 1, 1997 and September 30, 1998, 201 consecutive hip fractures in patients over the age of 50 were registered according to the SAHFE (Standardised Audit of Hip Fractures in Europe) protocol. The mean age was 81.3 years ; 75% were females, more than 40% were admitted from an institution and fewer than 10% were completely fit. Almost 60% of the fractures occurred in the trochanteric region while less than 40% were intracapsular.**

**All fractures but one were operated on, according to a standardised protocol. More than half the patients were treated with a dynamic hip screw, more than 30% with a cemented biarticulated hemiarthroplasty and fewer than 15% with cannulated screws. The mean admission time in the orthopedic department was 18.7 days and was poorly correlated with the type of surgery or with the place to which the patients were discharged. After hospitalisation, most patients admitted from an institution went back to that institution. More than one-third of the patients admitted from their home went back home but over 40% used rehabilitation facilities.**

**After four months, 32 patients had died, 27 were lost to follow-up and six had been reoperated. Of the independent patients, at least 24% were institutionalised and more than 60% lived at home. Although hip fractures in the elderly are expensive and debilitating, adequate operative treatment and rehabilitation can reduce costs by limiting the hospital stay, lowering reoperation rates and by favouring reintegration into their prefracture surroundings.**

## INTRODUCTION

Belgium has an extensive social security system. State health insurance is compulsory and covers

most medical costs for 98.3% of the population. For a population just over 10.2 million inhabitants, health care is provided by 37,097 practicing physicians (15,648 general practitioners, 3842 trainees and 17,967 specialists including 766 orthopaedic surgeons). There are 285 hospitals with a total number of 74,456 beds. Brussels, the capital, has 5653 practicing doctors and 45 hospitals (9079 hospital beds) for 954,000 inhabitants (13, 14, 25).

Rehabilitation units are specialised in rehabilitation of cardiopulmonary diseases, locomotor or neurological conditions, palliative care and chronic or psychogeriatric disorders. These units are supported by the state health insurance system, and patients pay only a small percentage of the costs by themselves (table I). They accept only patients discharged from a hospital and only for a limited period of three months. In 1995, 4392 rehabilitation beds were available and one-fourth of them (1072 beds) were allocated to locomotor rehabilitation (25). Some rehabilitation centers offer specialised, intensive, multidisciplinary rehabilitation and aim for social and professional reintegration. The elderly who are unable to live on their own or with

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Table I. — State insurance reimbursement rates and patient's costs (outside private practice) for hip fracture surgery, implants and institutional care in Belgium during the survey period (Euros)

Surgical interventions <sup>1</sup>	Health insurance	Patient's cost	TOTAL
Subtrochanteric hip fracture fixation	340	0	340
Intertrochanteric hip fracture fixation	340	0	340
Subcapital or transcervical hip fracture fixation	340	0	340
Hemiarthroplasty	400	0	400
Total hip arthroplasty	649	0	649
<b>Implants<sup>2</sup></b>			
Dynamic hip screw	264	62	326
Three cannulated screws	318	75	393
Cemented bipolar hemiarthroplasty	1 260	322	1 582
Hybrid total hip arthroplasty	1 323	792	2 115
Long gamma nail	406	988	1 394
Cemented reconstruction hemiarthroplasty	1 260	1 122	2 382
<b>Admission fee per day<sup>3</sup></b>			
Academic hospital	311	12	323
Peripheral hospital	273	12	285
Specialised rehabilitation unit	109 - 201	12	121-213
Retirement home	0	33-98	33-98

<sup>1</sup> Reimbursement rate for the surgical procedure, not including anaesthesia or surgical assistance.

<sup>2</sup> Approximate values for materials and implants used during the study.

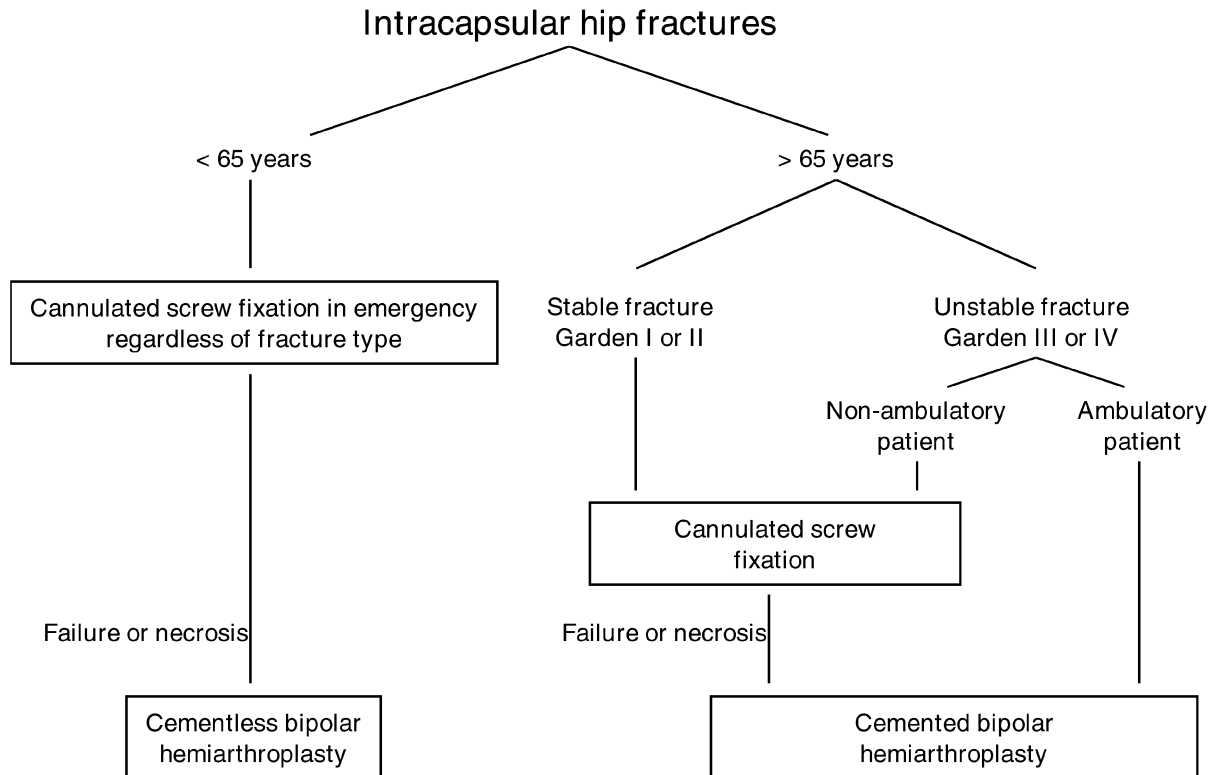
<sup>3</sup> Examples or approximate values, wide variation depending on the institution and facilities.

relatives can stay in nursing or retirement homes. Residence in these homes is not limited in time but is more expensive for the patient (table I). Nursing homes providing health care are subsidised by the national health insurance system (19,782 beds, i.e. 1.95 beds/1000 inhabitants in 1996), whereas retirement homes that cannot provide health care are not (121,729 beds, i.e. 11.9 beds/1000 inhabitants in 1997) (25).

In Belgium, women aged 60 years have a life expectancy of 24 years, and the male population of the same age has a life expectancy of 19.3 years (15); 16.6% of the population is 65 years or older and 3.5% is 80 or older (14, 25). The increasing number of hip fractures in Belgium (28% increase between 1977 and 1982 (16)) is becoming a major concern among orthopaedic surgeons, health care providers and economists. This study was conducted in order to evaluate the epidemiology, the treatment, the length of hospitalisation and the short-term outcome of these fractures over a one-year period in a Belgian academic hospital.

## PATIENTS AND METHODS

At the Academic Hospital of the Vrije Universiteit Brussel, consecutive registration of all hip fractures in patients over the age of 50 was performed according to the SAHFE (Standardised Audit of Hip Fractures in Europe) protocol. Registration began on 1 October 1997 and continued for a one-year period. The academic hospital has a total of 679 beds and is located in a northern suburb of Brussels. The catchment area of the emergency department is estimated at 200,000 people. During the study period, the orthopaedic department had 58 adult and six pediatric beds and was staffed with six orthopaedic surgeons and seven trainees. Orthopaedic trainees were responsible for the registration and clinical follow-up of the hip fracture patients, while a physiotherapist performed telephone interviews. Missing data were supplemented by the hospital computer system when possible. Owing to lack of resources, no house calls or nursing home visits could be organised. Only patients fit enough to come to the clinic or those sent by the nursing homes or rehabilitation units (costs for sending patients to the clinic are charged to the institution) were followed-up clinically. The others or their relatives



*Fig. 1.* — Treatment protocol for intracapsular hip fractures

were contacted by telephone. In total, 201 consecutive patients older than 50 years were registered. After four months 32 patients had died (15.9%), 27 (13.4%) had been lost to follow-up and 142 were reviewed (70.6%).

### Treatment protocol

All subcapital or transcervical hip fractures in patients younger than 65 years were stabilised with three cannulated screws as soon as possible. Temporary trans-tibial traction was the first-line treatment in other hip fractures. The final treatment was discussed during a staff meeting. Operations were performed after proper preoperative evaluation and optimisation of the patient's general health, generally on the next working day. Subcapital and transcervical fractures in patients older than 65 years were treated either with cannulated screws or, more frequently, with a cemented bipolar hemiarthroplasty, depending on the patient's condition and fracture displacement (fig 1). Stable intertrochanteric fractures were fixed with a dynamic hip screw. Unstable intertrochanteric and subtrochanteric fractures in patients up to 75 years were stabilised with a nail or a

95° blade plate. In elderly but mobile patients, the proximal femur was replaced by a cemented reconstruction bipolar hemiarthroplasty with diaphyseal support (fig 2).

Early rehabilitation and social reintegration of elderly individuals with a hip fracture is a major concern in the orthopaedic department. A specially trained "social nurse" discusses rehabilitation options with the hip fracture patients and their relatives immediately after surgery. In accordance with the physiotherapist and the surgeon, the most suitable solution is selected. When rehabilitation in the home environment or with relatives is no longer an option, a standardised form is sent to a rehabilitation center. Depending on the vacancies in these centers and the health status of the patient a date of transfer is planned.

### RESULTS

From 1 October 1997 until 31 September 1998, 201 patients over the age of 50 presenting with a hip fracture were registered according to the SAFHE protocol at the Academic Hospital of the Vrije

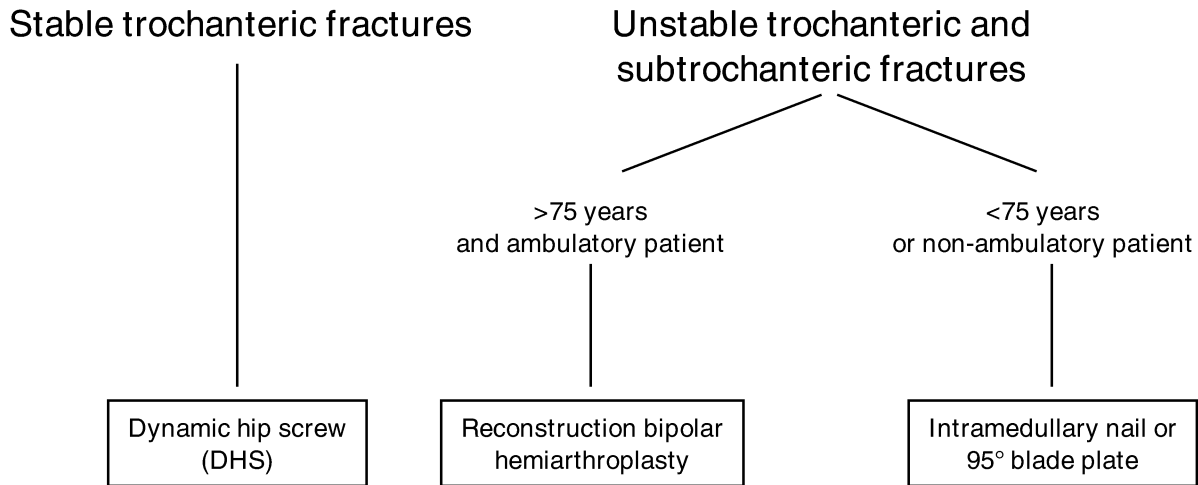


Fig. 2. — Treatment protocol for trochanteric and subtrochanteric hip fractures

Universiteit Brussel : 75% were female, 25% male. The mean age was 81.3 years (SD 8.7, median 82.6, range 52.0 to 97.9 years) (fig 3). Male patients were on average 78.8 years old (SD 9.7), female patients 82.1 years (SD 8.2) ; 60.2% of the patients were over 80 years old. A slight preponderance for the right side was found (53.2%). Over half of the patients were admitted from their own homes, whereas over one-third came from nursing homes or institutional care. Of the non-institutionalised patients, 63.3% lived alone. The others lived with relatives. Before the fracture, half the patients walked alone outdoors (fig 4). Over two-thirds did not require walking aids but 5% were wheelchair or bed bound. Only 7% of the patients were completely fit. One third reported some illnesses without effect on normal daily activity, and 59% had symptomatic illnesses causing minimal (34%) or mild (25%) restrictions in activities of daily living. Only 1% of the patients were moribund.

The vast majority of hip fractures were traumatic ; metastatic fractures only accounted for 1.5%. The fracture pattern is shown in fig 5. About 37% of the hip fractures were intracapsular, 58% were in the trochanteric region and less than 5% were subtrochanteric. Almost 80% of the displaced subcapital fractures were treated with a cemented bipolar hemiarthroplasty. All but one of the undisplaced subcapital fractures were treated with screw fixa-

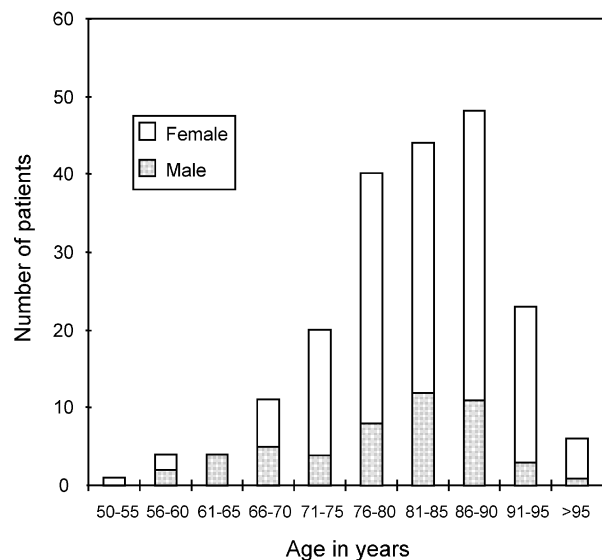


Fig. 3. — Age and sex distribution of all patients over 50 years of age admitted with a hip fracture between 1 October 1997 and 30 September 1998.

tion. Half of the hip fractures were treated with a dynamic hip screw. This represents 87.2% of the fractures in the trochanteric region. Intramedullary nailing was used in less than 4% of the cases. Cemented bipolar hemiarthroplasties with diaphyseal support were implanted in six patients with complex inter- or subtrochanteric fractures. Only one primary total hip arthroplasty was performed

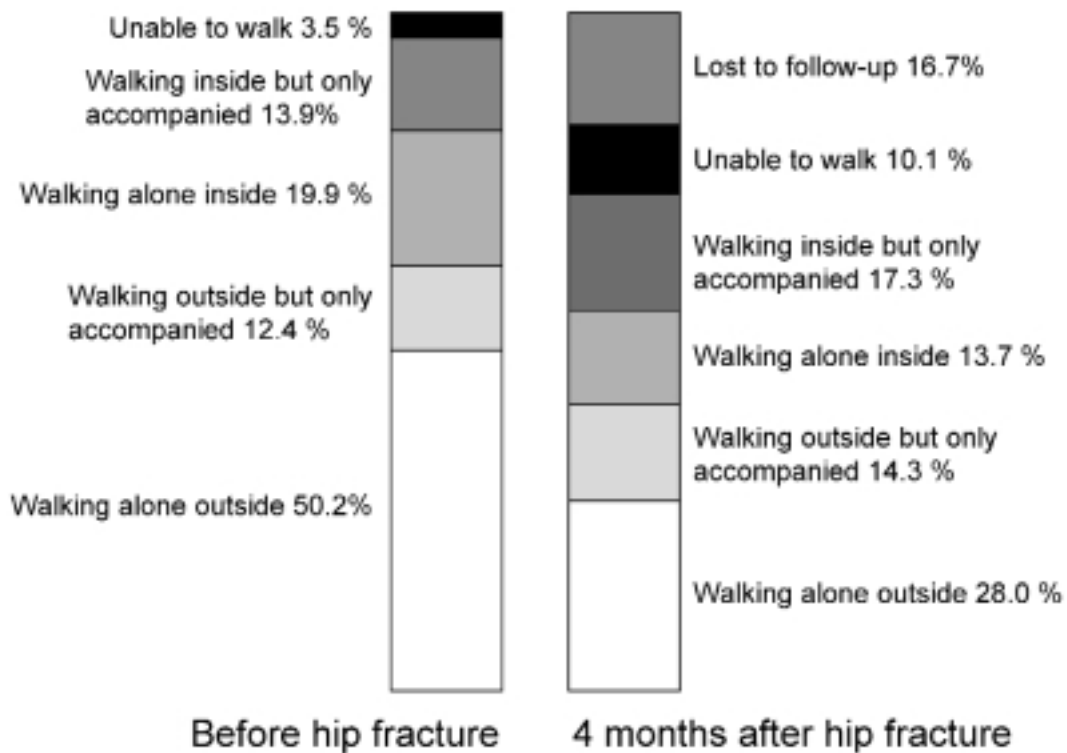


Fig. 4. — Walking ability of patients prior to and four months after hip fracture

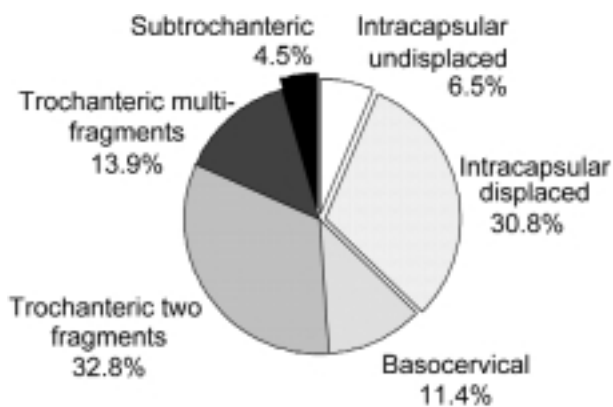


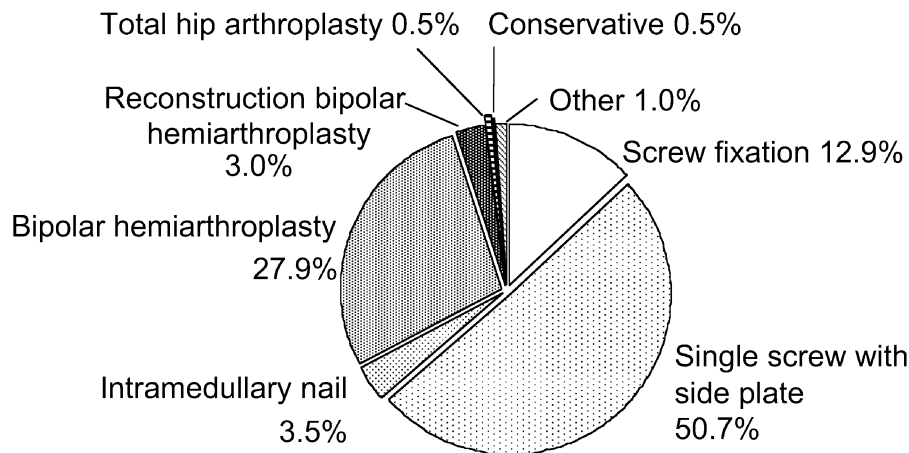
Fig. 5. — Fracture types of all patients over 50 years

for a hip fracture associated with osteoarthritis of the hip. One stable undisplaced subcapital fracture was treated conservatively (fig 6).

The mean and median times from admission to surgery were 1.8 days (SD 1.6) and 1 day (min-max 0-12 days) respectively. The mean and median times in the orthopaedic department were 18.7 days

(SD 7.0) and 18 days (range 3 to 54 days) respectively. Figure 7 shows an overview of the mean hospital stay in relation to the operation type or the place to which patients were discharged, as well as a global estimated cost for surgery, anaesthesia and hospital stay. After hospitalisation in the orthopaedic department, 19.9% of the patients went back home, 2.5% to sheltered housing, 32.3% to a nursing or retirement home, 28.9% to a rehabilitation unit and 10.9% to another acute ward, geriatric department or hospital. Of these, 5.5% died in the hospital.

Six patients were re-operated within four months. Four were re-operated after screw fixation of a subcapital fracture. In one case osteosynthesis was repeated for an additional fracture. Three other cases were re-operated for fracture displacement; two with a cemented bipolar hemiarthroplasty, while the last patient just had his osteosynthesis material removed. One patient was re-operated after intramedullary nailing to reposition a distal locking screw. The only patient treated with a total



*Fig. 6.* — Type of treatment performed for a hip fracture

hip arthroplasty had to undergo revision due to instability.

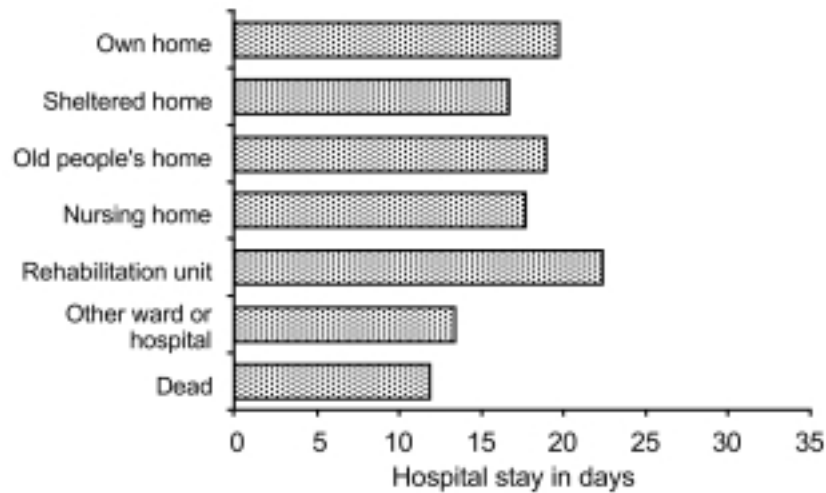
After four months, about one-third of the total number of patients registered lived at home, 27.9% in institutions and 8.5% in a hospital. Twenty-seven patients were lost to follow-up, and 32 died (respectively 13.4% and 15.9% of the registered patients). The pattern of living before the hip fracture, on discharge from the hospital and four months after the fracture is shown in a Lundadia-gram (fig 8). It is obvious that patients who were institutionalised prior to their hip fractures remained institutionalised. For this reason it is more interesting to analyse patients admitted from their homes. In the majority of cases, they were either discharged to their own homes again or to rehabilitation units (respectively 35.9% and 43.7% of the remaining patients) (fig 9). Of those patients admitted from their homes, who were discharged to their homes and survived for the first four months, at least 77.1% managed to stay home. But at least 11.4% of them were institutionalised. At least 59.1% of the patients admitted from their homes, who were discharged to rehabilitation units and still alive four months after the fracture, were living at home, but at least a fourth of them were institutionalised. Overall, at least 61.5% of those patients admitted from home and living four months after their fractures were able to return home, but at least 24.0% of them were institutionalised.

Walking ability at four months' follow-up is shown in fig 4. At least 40% of the survivors were able to walk outside, but at least 10% were unable to walk at all. The use of walking aids increased compared to the pre-fracture status. Only 25.6% of the survivors walked without aids, 26.8% used one walking aid and 20.2% used a walker. At the four months' follow-up at least 53.0% of the survivors experienced no pain or slight intermittent pain, but at least 8.3% experienced severe or constant pain (fig 10).

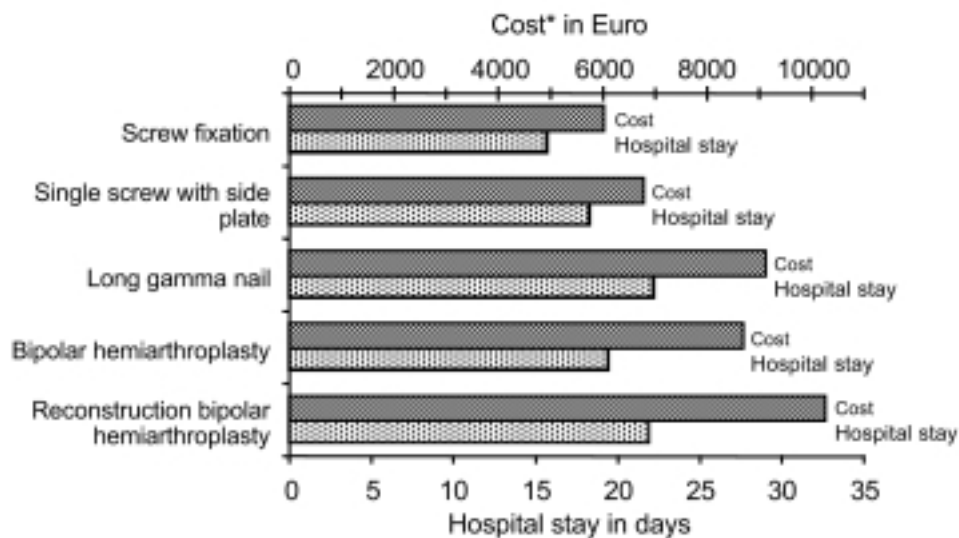
## DISCUSSION

Belgium has no single patient identification number, and address changes or deaths are recorded only when reported to the hospital. Tracing patients who did not keep their appointments at the clinic was difficult, time-consuming and often impossible. For this reason 13.4% of the patients were lost to follow-up after four months. Since one can assume that people who were lost to follow-up are less fit, less mobile or deceased, our results are expected to be optimistic. This study was conducted in one single academic hospital in the capital and for a one-year period only. Although we suspect the treatment of hip fractures to be similar in most Belgian orthopaedic departments, this was not investigated. Moreover, social and family

## Hospital stay in relation to the place patients are discharged to



## Hospital stay and cost of hip fracture treatment

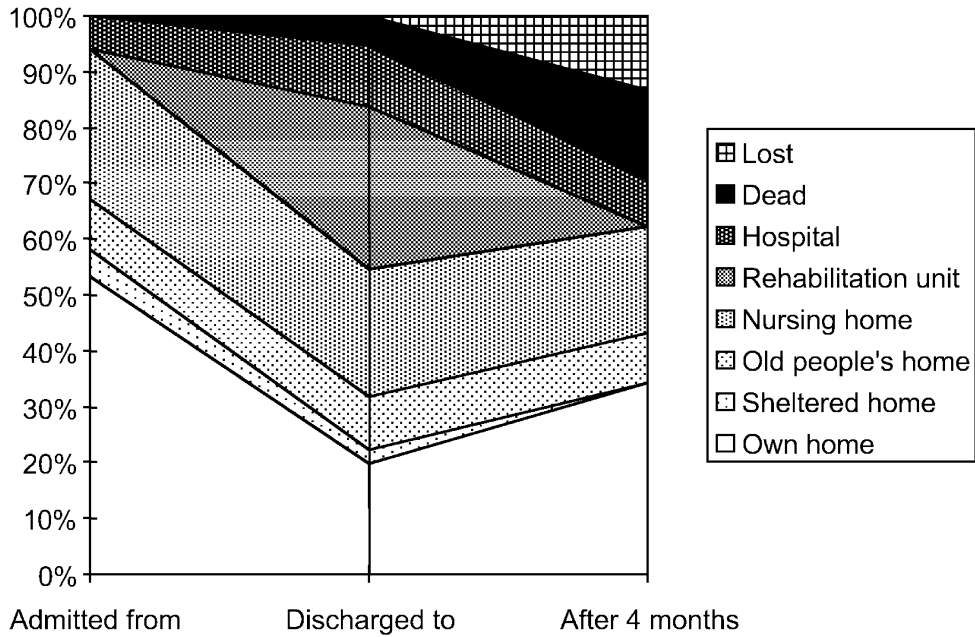


**Fig. 7.** — Hospital stay and approximate cost of hip fracture treatment in relation to the type of treatment and to the place to which the patients were discharged. \* Cost in Euros including hospital stay, surgical treatment, assistance during surgical treatment, anaesthesia and implanted material. Medication, physiotherapy during hospital stay and rehabilitation after discharge from the orthopaedic ward are not included.

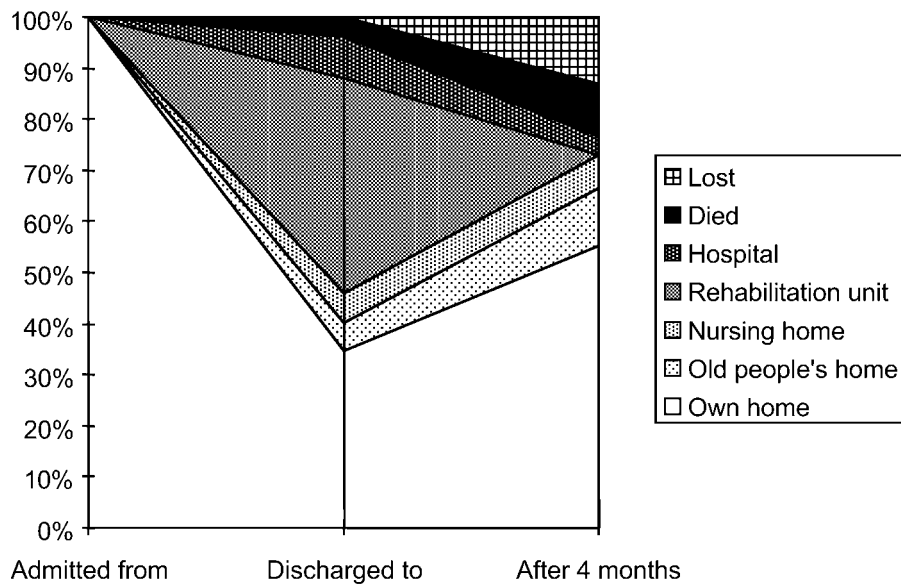
structures as well as the availability of rehabilitation facilities differ in the capital compared to more rural areas. For these reasons, it is not possible to extrapolate the results of this study to the whole country.

### Treatment options

Hip fractures are best treated according to strict guidelines (figs 1, 2). However, each case must be considered individually, and treatment options



**Fig. 8.** — Lundadiagram of all hip fracture patients over 50 years of age. The living pattern is shown prior to admission, at discharge and at four months' follow-up.



**Fig. 9.** — Lundadiagram of all patients over 50 years of age admitted from their own homes. The living pattern is shown at discharge and at four months' follow-up.

must be adapted to the patient's specific requirements and physiological age. In our treatment protocol, stable intertrochanteric hip fractures are treated routinely with a dynamic hip screw. Unstable

intertrochanteric and subtrochanteric fractures in "young" patients are fixed with an intramedullary nail or 95° blade plate. This preserves the patient's bone stock but makes non-weightbearing often



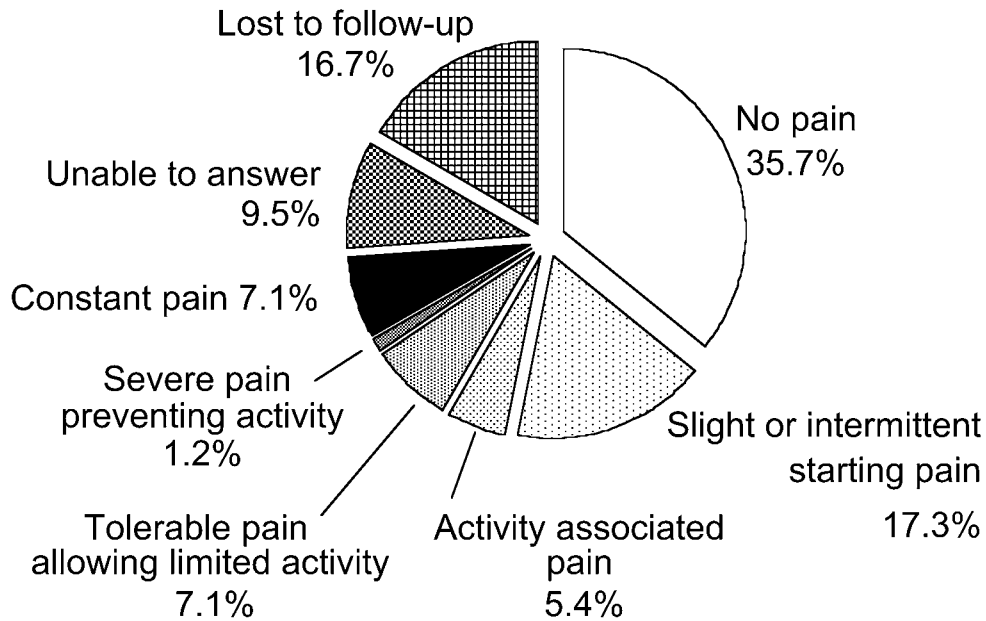


Fig. 10. — Pain experienced by patients four months after hip fracture

mandatory until fracture healing. In “elderly” but ambulatory patients, early weight-bearing and immediate mobilisation are essential. In these cases, the use of a cemented reconstruction bipolar hemiarthroplasty with a diaphyseal support is an attractive alternative to osteosynthesis (7, 8).

The treatment of subcapital hip fractures in patients younger than 65 years of age should aim at preserving the femoral head. In these cases, fracture fixation is performed with three cannulated screws, the haemarthrosis is drained as soon as possible and non-weight bearing is advocated for a period up to three months. If this treatment is unsatisfactory, good results can still be obtained with a bipolar hemiarthroplasty (6) or a total hip arthroplasty (4, 11, 18). Patients over 65 years of age presenting a stable (Garden I or II) subcapital fracture are treated either conservatively or with screw or pin fixation. However, treatment of unstable (Garden III and IV) subcapital hip fractures in an elderly population remains debatable. In our protocol, as in most Belgian hospitals, these fractures are treated either by a hemiarthroplasty (9, 27) or by a total hip arthroplasty (1). Screw or pin fixation of these fractures is less common, as hip replacement

gives satisfactory results (3, 5, 21, 28) with a lower re-operation rate : 15-38% for osteosynthesis (2, 17, 21, 23, 24) compared to 0-10% for hip replacement (3, 5, 21, 28). In this series only one patient with a total hip arthroplasty needed a re-operation for persisting hip instability, and none of the 62 bipolar hemiarthroplasties were re-operated within four months. Despite severe selection criteria four of the 26 patients treated initially with cannulated screws were re-operated within the same follow-up period. Although the operative trauma in subcapital hip fracture fixation is less severe compared to hip replacement, “two-stage surgery” should be avoided, especially in the elderly. Removing patients from their social surroundings as well as consecutive surgical procedures are poorly tolerated. Moreover, as re-operation is often experienced as a failure by the surgeon, the patient and his family, all parties involved tend to accept less satisfactory results. Since in Belgium, hospital stay and rehabilitation are the major costs in hip fracture treatment (table I), a more expensive but reliable technique could prove to be more cost effective than a cheaper alternative with a higher re-operation rate.

## Rehabilitation patterns after a hip fracture

Brussels is a city of 954,000 inhabitants with typical urban surroundings. The elderly tend to move to nursing homes once they are unable to stay on their own. Therefore over 40% of our patients were admitted from institutions. The vast majority of these patients were discharged back to the institution from which they were admitted. For those patients who were still living on their own, an early return to independent living is often difficult, as social workers or nurses cannot ensure 24-hour attendance. Temporary accommodation with relatives during rehabilitation from a hip fracture is often impossible because the majority of the active population lives in small houses or apartments or because both partners pursue a career. This explains the high demand for rehabilitation units especially in larger cities: there are 9.5 rehabilitation beds for 10,000 inhabitants in Brussels, compared to 3.9 in the rest of Belgium (12). In our study over 40% of the patients admitted from their own homes benefited from these facilities.

In our experience, the average hospital stay in the orthopaedic ward was less than three weeks. This is shorter than the average hospital stay mentioned in previous studies in Sweden (28 days (22)), The Netherlands (over 30 days (26)), England (over 30 days (10)), the USA (21 days (19)) or Belgium (33 days (16)). The average stay in the orthopaedic ward is poorly correlated with the type of surgery or with the place to which patients were discharged. Nevertheless, there is a tendency towards a slightly shorter stay for patients with a subcapital fracture treated by osteosynthesis and for those discharged to another ward or hospital (fig 8). Earlier discharge from the hospital is illusory, and the importance of the operative procedure has no major impact on the hospital stay for two reasons. First, most nursing or retirement homes refuse patients with operative wounds or other medical problems, as they lack health care facilities. Second, there is a waiting list of at least one week to enter a rehabilitation unit despite continuous efforts of the social nurse and despite the relatively high number of beds available in our area.

## Situation at four months' follow-up

After four months, at least one out of seven patients had died, over 20% of independent patients were institutionalised and the number of bedridden patients more than doubled. Pain control was very good in at least half the reviewed patients, but 10% experienced severe or constant pain. This reflects the severity of hip fractures in the elderly despite adequate treatment and rehabilitation facilities. On the other hand, over 60% of the independent patients still alive at four months lived at home again and at least 45% of the outside ambulatory patients were able to walk outside again. Moreover, our treatment protocol allowed us to limit the re-operation rate within four months to less than 3.5% of the patients reviewed.

## CONCLUSION

Hip fractures in a geriatric population are invalidating and expensive as they are associated with a high morbidity and tend to shift patients from a certain degree of independence to a lower one. In our opinion the goal of hip fracture treatment is early rehabilitation associated with minimal mortality and morbidity and a low re-operation rate. This should allow the maximum number of patients to regain their prefracture status as soon as possible.

In the orthopaedic department of the Vrije Universiteit Brussel, hip fractures account for 17.8% of the hospitalisation capacity despite an "early discharge policy". We believe that admission to the orthopaedic wards should be reduced to a minimum in order to avoid "overloading" of these departments and to control costs as the number of cases is increasing steadily. Moreover, classic orthopaedic wards do not offer ideal surroundings to prepare elderly patients to reintegrate into their previous lifestyles. Better collaboration between the orthopaedic and geriatric departments is needed to deal with the high number of associated medical conditions efficiently as only seven percent of our patients had no concomitant medical problems. More specialised orthogeriatric wards as suggested by Parker *et al* (20), combined with more "elderly

friendly” surroundings, might improve the in-hospital stay and lower complication rates.

Easily accessible rehabilitation units equipped with adequate medical supervision as well as sufficient nursing and rehabilitation staff could allow shorter hospital admissions and limit costs. Moreover, some of these units could be integrated in nursing homes in order to avoid repeated changes in surroundings for institutionalised patients. Easily accessible service flats with variable degrees of social and material support could be a viable alternative in order to assist hip fracture patients to achieve independent living rather than relegating them to institutional care.

Hip fracture treatment in the elderly is becoming a major concern. It might not be a “technico-surgical” challenge as such, but it will rather become a “medico-economical” challenge. This “medico-economical” challenge can only be overcome if patients can regain their prefracture independence as soon as possible. This is the primary goal, and every effort should be directed towards that goal.

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