

## Pressure ulcer risk in hip fracture patients

Ronald H Houwing<sup>1</sup>, Marja Rozendaal<sup>2</sup>, Wendeline Wouters-Wesseling<sup>2</sup>, Erik Buskens<sup>3</sup>, Paul Keller<sup>4</sup> and Jeen R E Haalboom<sup>5</sup>

<sup>1</sup>Department of Dermatology, Deventer Ziekenhuis, <sup>2</sup>Numico Research, Department of Clinical Nutrition and Diets, P.O. Box 7005, 6700 CA Wageningen, <sup>3</sup>Julius Center for Health Sciences and Primary Care, University Medical Center, Utrecht, <sup>4</sup>Department of Surgery, St. Antonius Ziekenhuis, Nieuwegein, <sup>5</sup>Department of Internal Medicine, University Medical Center, Utrecht, the Netherlands  
Correspondence RHH: houwingr@dz.nl  
Submitted 02-06-28. Accepted 04-01-22

**ABSTRACT** Hip fracture patients have a high risk of pressure ulcers (PU). We followed 121 hip fracture patients for the development of pressure ulcers and evaluated a risk assessment tool for sensitivity and specificity. More than half of the patients presented with PU, mostly stage I. Risk factors for PU were high age and the length of time on the operating table. The risk assessment tool had a low predictive value, however. It is thus hard to predict which patients will develop PU and which will not. Accordingly, we propose maximum preventive measures against PU for all patients presenting with hip fractures.

Pressure ulcers (PU) are frequently seen in hip fracture patients. Early studies noted a high prevalence, but these were difficult to compare due to differences in the definition of PU (Table 1) (Ferris 1983, Versluisen 1986, Jensen and Juncker 1987).

PU causes much suffering and high costs (Boereboom et al. 1991, Kanuus et al. 1996). Pressure ulcers result from a combination of factors,

including those affecting the susceptibility of the skin, such as low vascular supply and nutritional deficiencies. In addition, the presence of constant pressure, the imposition of shear force or friction to the skin and reduced mental awareness are recognized risk factors (NPUAP 1996).

In this prospective study, we have investigated the incidence of PU in patients after a hip fracture. Our aim was to obtain more information on the incidence and moment of onset of PU in hip fracture patients. By using a risk assessment tool for PU, we hoped to predict what kind of patients are at higher risk of developing PU and to determine what kind of preventive measures could be taken to reduce the likelihood of PU occurring (Haalboom et al. 1999).

### Patients and methods

The study was performed in three general hospitals, i.e., Deventer Hospital (Deventer), Rijnstate Hospital (Arnhem) and St. Antonius Hospital (Nieuwegein), the Netherlands. Consecutive patients admitted with a hip fracture were invited to take part in the study. Exclusion criteria were terminal care and metastatic hip fracture. The study protocol was approved by the Ethics Committees of the three hospitals. Written informed consent was obtained from each patient. If the mental capability of the patient to decide on participation was uncertain, the legal representative of the patient was asked for consent. Measures

Table 1. Incidence of PU in earlier studies

Reference	% PU <sup>a</sup>	Notes
Ferris 1983	47	stage 1 not included
Versluisen 1986	43	23% PU stage 1
Jensen & Juncker 1987	30	stage 1 not included

<sup>a</sup> Stage 2 or more

Table 2. General characteristics and differences between patients who developed PU and those who did not

	Entire study group (n = 121) Mean (SD)	PU (n= 64) Mean (SD)	Non-PU (n = 57) Mean (SD)	P-value
Sex Males	26	15	11	
Females	95	49	46	
Mean age	80 (8)	82 (8)	78 (9)	0.03 <sup>a</sup>
Mean body mass index (kg/m <sup>2</sup> )	24.2 (3.2)	23.7 (3.1)	24.5 (3.3)	0.2 <sup>b</sup>
Mean pressure ulcer risk score	10.4 (2.3)	11.0 (2.1)	9.7 (2.3)	0.001 <sup>a</sup>
Mean duration of operation (h)	1.44 (0.40)	1.52 (0.41)	1.36 (0.38)	0.04 <sup>a</sup>
Maximum stage PU				
0	57 (47%)			
1	40 (33%)			
2	24 (20%)			
Number of days between				
accident and admission	0.4 (1.7)	0.3 (1.3)	0.5 (2.2)	0.3 <sup>a</sup>
accident and operation	1.0 (2.3)	1.1 (2.2)	1.0 (2.4)	0.2 <sup>a</sup>
admission and operation	0.7 (1.5)	0.6 (0.8)	0.7 (1.9)	0.5 <sup>a</sup>
operation and the first day of PU	4.4 (3.8)			

<sup>a</sup> Mann-Whitney U test  
<sup>b</sup> t-test

for pressure ulcer prevention, such as pressure reducing mattresses and beds, regular reposition and mobilization, were provided in all hospitals according to the Dutch consensus protocol for the prevention of pressure ulcers (Haalboom and Bakker 1992).

All patients were investigated by medical staff for the presence of pressure ulcers on a daily basis, from admission to discharge. The four-stage classification system of pressure ulcers according to the Treatment Guidelines of the European Pressure Ulcer Advisory Panel was used (NPUAP 1996). Specific instructions were given for recognition of stage 1 (non-blanching erythema of intact skin) pressure ulcers: only when the erythema did not disappear after diascopy with a plastic tongue depressor was it classified as stage 1. Time of onset, location and size of PU were recorded. Clinical data such as diagnosis, date of operation, date of the incident fracture, type of operation, time on the operating table, medication, medical history and pressure ulcer prevention procedures were collected.

The likelihood of developing pressure ulcers was assessed using the risk assessment scale described by the Dutch Consensus Meeting (CBO) (Haalboom and Bakker 1992). 10 items considered to have an influence on the development of PU were scored from 0 (low risk) to 2 points (high risk). The

higher the sum, the higher the risk of developing PU.

Statistical evaluation was performed using the Mann-Whitney or t-test. Statistical analysis was performed using SPSS for Windows, version 10 (SPSS Inc., IL, USA).

## Results

179 patients were approached about participation. 58 patients were not included due to the various exclusion criteria. Informed consent was obtained from 121 patients (Table 2). 64 (53%) of the 121 patients developed PU, but only of stages 1 and 2.

Patients with PU were significantly older, were at a significantly higher risk according to the risk assessment tool used, and the time spent on the operating table had been longer. There was no statistically significant difference between patients with and without pressure ulcers regarding the time elapsed between the accident and the admission or operation (Table 2). Only 1 patient developed PU before the day of operation. A prolonged length of time on the operating table was associated with higher incidence of PU, but statistically the kind of surgical technique, whether internal fixation (n = 70) or hemiarthroplasty (n = 51), had no influence on the likelihood of developing PU.

Table 3. Individual determinants of the pressure ulcer risk score

	Score 0		Score 1		Score 2		Score 3	
	n	% PU	n	% PU	n	% PU	n	% PU
Medication	3	33	111	53	6	50	1	100
Mobility	2	50	14	43	24	38	81	59
Mental condition	62	35	42	67	16	69	0	0
Neurology	90	52	25	52	5	60	0	0
Circulation	49	43	59	59	5	80	0	0
Nutritional status	90	49	28	66	1	0	0	0
Incontinence	26	46	9	33	79	54	3	100
Diabetes	109	51	3	100	6	67	2	50
Temperature	40	58	73	52	4	25	1	0
Age	1	0	1	0	12	33	107	56

Most PU developed during the first 4 days after the operation. Most of the ulcers were smaller than 15 cm<sup>2</sup> and their location was in accordance with known high risk areas such as sacral region (16%), trochanters (26%) and heels (43%). The risk assessment tool was unable to predict the likelihood of developing PU (Table 3).

## Discussion

Despite the use of preventive measures and early mobilization after surgery, there is still a high incidence of PU as found in earlier studies (Ferris 1983, Versluisen 1986, Jensen and Juncker 1987). These studies are hard to compare due to a discrepancy in the definition of the stages of pressure ulcers used. Definitions of PU as proposed by both the National and European Pressure Ulcer Advisory panels (Table 1) should be followed (NPUAP 1996).

The risk assessment tool used has low discriminative capability, as seen also in a previous study (Schoonhoven et al. 2002). We can only improve prediction by additional research focused on factors actually associated with formation of PU.

A prolonged stay in an emergency and radiology department is a risk factor for the development of PU, as is a prolonged surgical procedure (Mullineaux 1993, Grous et al. 1997). We recommend that the use of pressure-reducing mattresses should start immediately at admission, and the use of pressure-reducing operating table overlays, special adjustments for heel protection (heels being responsible for more than 40% of the pressure

ulcers in this study) and of pressure-reducing positions during operation.

Since a risk assessment tool appears to be of limited value, and as the incidence of PU is high, our advice would be to give all hip fracture patients maximum preventive treatment against PU including beds and mattresses, regular reposition, mobilization and nutritional supplements.

The study was sponsored by Numico Research. We thank Dr. APPM Driessen for his helpful comments. We also thank Johan Wilms of Deventer Ziekenhuis, Deventer, Dr. van Ramshorst of St. Sint Antonius Ziekenhuis, Nieuwegein, and Eliza Jolink, Bea Zomer Ziekenhuis Rijnstate, Arnhem for their assistance in performing the study.

Boereboom F T, de Groot R R, Raymakers J A, Duursma S A. The incidence of hip fractures in The Netherlands. *Neth J Med* 1991; 38 (1-2): 51-8.

Ferris B. Decubitus ulceration following prosthetic implantation for t traumatic subcapital fractured neck of femur. A preventable condition? *Br J Clin Pract* 1983; 37 (5): 175-7.

Grous C A, Reilly N J, Gift A G. Skin integrity in patients undergoing prolonged operations. *J Wound Ostomy Continence Nurs* 1997; 24 (2): 86-91.

Haalboom J R E, Bakker H. Herziening consensus preventie en behandeling decubitus *Ned tijdschr Geneesk* 1992; 136: 1306-8.

Haalboom J R E, den Boer J, Buskens E. Risk assessment tools in the prevention of pressure ulcers. *Ostomy Wound Manage* 1999; 45: 20-34.

Jensen T T, Juncker Y. Pressure sores common after hip operations. *Acta Orthop Scand* 1987; 58 (3): 209-11.

Kannus P, Parkkari J, Sievanen H, Heinonen A, Vuori I, Jarvinen M. Epidemiology of hip fractures. *Bone* (1 Suppl) 1996: 1857S-63S.

Mullineaux J. Cutting the delay reduces the risk. Assessment of the risk of developing pressure sores among elderly patients in A&E. *Prof Nurse* 1993; 9 (1):22-30.

National Pressure Ulcer Advisory Panel (NPUAP). Etiology, assessment, and early intervention. *Dermatol Nurse* 1996; 8: 41-7.

Schoonhoven I, et al. Prospective cohort study of routine use of risk assessment scales for prediction of pressure ulcers. *BMJ* 2002; 325: 797. Url:<http://bml.com/cgi/content/full/325/7368/797>.

Versluysen M. How elderly patients with femoral fracture develop pressure sores in hospital. *Br Med J (Clin Res Ed)* 1986; 292 (6531): 1311-3.