Established in 1871
Swiss Medical Weekly
Formerly: Schweizerische Medizinische Wochenschrift
The European Journal of Medical Sciences

Original article | Published 25 October 2013, doi:10.4414/smw.2013.13878
Cite this as: Swiss Med Wkly. 2013;143:w13878

Should patients with a hip or femur fracture sustained abroad be repatriated for surgery?

A study from Switzerland

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Abstract

OBJECTIVE: To investigate the clinical outcome of patients with hip or femur fractures sustained while travelling, depending on the place where surgery was performed (abroad or in Switzerland).

METHODS: This was an ambispective cohort study of 90 patients in two groups. Outcome measures were: number and type of complications, impairment of walking ability at six months compared to the preoperative state, and chronic pain with ongoing use of analgesic medication at six months

RESULTS: A total of 62 patients were transported to be operated on in Switzerland, and 28 patients received their surgery abroad. Age and gender distribution of the two groups were comparable, as was comorbidity status. A total of 64% of patients operated on abroad suffered one or more complications, as compared with 37% of patients operated on in Switzerland ($p = 0.01$). Logistical regression showed no evidence of an association between the variables investigated as possible confounding factors and the outcome, the place where surgery was performed (abroad or at home), was the only predictor of complications in general and of a reoperation in particular (95% confidence intervals 1.55–13.7 and 1.39–41.25, respectively). When compared with their preoperative state, 89% of patients operated on abroad reported some postoperative walking impairment, compared with 57% of patients operated on in Switzerland ($p = 0.004$). A total of 59% of patients operated on abroad had to use analgesic medication intermittently or regularly six months after surgery, as compared with 35% of patients operated on in Switzerland ($p = 0.03$).

CONCLUSION: Swiss patients with hip or femoral fractures sustained while travelling in a foreign country had fewer complications and a better functional outcome if repatriated and operated on in Switzerland than if operated on abroad. The reasons for this unexpected result remain unclear. Medical, ethnic and psychological factors could well play a part. These results need further clarification and should be tested in larger studies with different pathologies.

Key words: *repatriation; hip fracture; femur fracture; outcome; place of surgery; Switzerland*

Introduction

Swiss people like to travel. In 2009, amidst the looming world financial crisis, the 6.28 million inhabitants of Switzerland over the age of 15 completed 10.2 million international travels, the majority of which were for tourist and recreational purposes. Of these, 3.2 million travels were to destinations in Southern Europe, and 1.2 million travels were to destinations outside of Europe [1]. Of the travellers, a sizeable percentage were 65 years and older, reflecting the fact that older people are healthier and wealthier than in the past [2] and that recreational travelling seems to be a part of their lifestyle [3]. When comparing Swiss federal statistics between 1998 and 2009, the increasing number of travels by older people is easily recognisable [4].

Many of these travellers take out travel insurance covering different travel risks, often including benefits for repatriation in the case of a medical problem. A current compilation shows at least thirteen different insurance companies in Switzerland offering packages which are easily and cheaply obtainable [5].

In the small print regulating repatriation in the case of illness or injury, many insurance companies employ the rather vague terms “repatriation if medically necessary” or “medically advised”, or they demand that cases be processed and decided by their own physicians and call centres [6–9]. Hence, repatriation decisions are always based on a mix of medical and socioeconomical parameters, with the economical interest of the insurance company often competing with medical wisdom [10].

This study was undertaken to investigate whether outcome data of patients with medical problems abroad could shed

new light on repatriation decisions. For this, we looked at Swiss patients who had sustained a femoral neck fracture or femur fracture while travelling abroad. These injuries practically always need surgical intervention, the timeframe for which is somewhat controversial, but is usually given as 6 to 12 hours for femoral head-saving procedures, and 24 to 48 hours for hip replacements and femoral osteosyntheses [11–14]. Typically, a call centre confronted with these pathologies has to make the decision as to whether the patient should be operated on locally, within the recommended timeframe, and then transported back home some time afterwards, or if repatriation should be effected as soon as possible for surgical intervention at home, but with the risk of delayed surgery [15]. For femur fractures, Weber and Matter had already shown in 1997 that there are marked differences in timing and technique of surgical procedures between Switzerland and other countries [10]. However, the question of outcome depending on the place of surgical intervention has, to our knowledge, never been addressed before. It was always assumed that surgery in a dedicated facility abroad, with staff training, equipment and surgical procedures equal to Western European standards could be effected much sooner than surgery after repatriation to Switzerland, and should therefore yield at least comparative outcomes [16].

Material and methods

Study design and setting

We tried to test this assumption by looking at the outcomes of patients with femoral neck fractures and femur fractures, depending on the location of surgical intervention.

To do this, we designed an ambispective, single cohort study done in cooperation with the biggest Swiss air repatriation service (REGA, Swiss Air Ambulance). In 2008, the last year of our data collection, this service conducted just over 1,000 repatriations by jet aircraft and stretcher transports. REGA also provides a 24-hour, physician-staffed call centre for national and international medical emergency calls, follow-up services and transport logistics, providing support to an additional 2,000 patients and relatives in 2008 [17].

The study was approved under a waiver from the Trauma Audit Research Network. All patients gave their written consent before being enrolled. Written consent included participation in a structured interview conducted during repatriation, the permission for a follow-up phone call six months after the event and permission to obtain a copy of the discharge letter from the treating healthcare facility.

Selection of participants

Study participants were recruited from patients repatriated to Switzerland by either REGA jet aircraft or by airline stretcher accompanied by REGA medical personnel between 2003 and 2008. The majority of these repatriations were from Southern Europe or North Africa, with the rest coming from other European countries or from overseas. Participants were either patients who were flown home for operative treatment, or patients who had had their primary surgery abroad and were repatriated some time afterwards. During the repatriation flight, patients were presented with a written explanation and summary of the study goals and asked if they would like to participate. Only patients who gave written consent were enrolled. This excluded patients who were too ill or mentally incapable to give consent. A total of 21 patients had to be excluded from the study subsequently for various reasons, detailed in table 1 below. Complete data sets from 90 patients could be obtained for analysis.

Methods of measurement

A questionnaire was designed for use by medical personnel during the repatriation flight. In it, personnel recorded age and sex of patients, together with patients' answers to questions regarding their health status before trauma: co-morbidities, medications taken, some acitivities of daily living, the use of walking aids, and the percentage of their professional activity (if any).

From the transport data the receiving care facility in Switzerland was identified and subsequently contacted to obtain every patient's discharge letter. From information contained in these letters, the interval between trauma and surgery could be extracted. Furthermore, the number of days in hospital both abroad and in Switzerland was noted. Not all hospitals provided data, therefore we could not obtain surgical and/or length-of-stay data for all patients.

For patients operated on abroad, the place of surgery was further differentiated between countries that belong to the "Mediterranean circle" (Europe South / North Africa) and countries lying outside of this region (Europe Rest / Overseas).

From the information on comorbidity, a pretrauma CIRS score (Cumulative Illness Rating Scale [18]) was calculated as a means of classifying patients' overall health status.

Six months after trauma, a telephone interview using a structured questionnaire was conducted with all patients. The interview again contained questions regarding activities of daily living (ADL), need for continued pain medication, return to work (if applicable), and a question regarding complications incurred during the hospital stay and the six months between the accident and the interview. If a patient reported any complication – even those he or she thought subjectively of as such – the type of complication was also noted by the interviewer. However, complications were only admitted into the statistical database if they could be objectively verified (e.g. by a patient's discharge letter, by rehospitalisation or reoperation etc.). Patients who could not be reached on several attempts, or who had died during the six-month interval, as reported by relatives, were excluded from the study.

Outcome measures

Outcome measures were: number and type of complications, impairment of walking ability at six months, as compared to the pre-operative state, and chronic pain with ongoing use of analgesic medication at six months.

Statistical analysis

Characteristics of patients operated on abroad and patients operated on in Switzerland were compared with descriptive

analyses. Differences between both groups were tested for statistical significance by χ^2-test. The significance level was defined as $p < 0.05$. Multiple logistic regression was performed to assess the impact of place of surgery on the occurrence of complications, on the need of re-operation and on walking impairment after six months, respectively, after control for potentially confounding variables (age, country, type of fracture, restriction in ADL). These potential confounders were chosen for various reasons: age and type of fracture have often been shown to have an influence on outcome [e.g. 26, 28, 29, 30], ADL have been used for decades in clinical medicine to record and grade functional status [19], and the parameter "country" was included to test for differences between the two groups of foreign countries (Europe South / North Africa vs Europe Rest / Overseas).

Results

Tables 1 and 2 show the characteristics of the two patient groups. Of 111 patients initially recruited for the study, a total of 90 patients could be followed up to the end and were subsequently studied. Three patients died during the six month follow-up period (table 1). All three deaths were reported by relatives who answered the phone instead of the patient when we tried to reach him or her for the follow-up interview at six months. The three patients had all been operated on in Switzerland. Their deaths were, however, attributed by the reporting relatives to additional pathologies (e.g. subsequent injury or accident); none was directly related to the operation or the time in hospital. Table 1 also shows that many of the patients operated on in Switzerland who had to be excluded from the study were much older than the average.

Of the 90 patients included in the study, 62 patients were transported to be operated on in Switzerland, while 28 patients received their surgery abroad and were transported back home some time afterwards. The two groups were comparable in gender distribution. Age distribution differed slightly. Patients 75 years and older had a greater chance of having their surgery abroad. However, this difference did not reach significance level ($p = 0.09$, table 2). This tendency was obviously due in part to the recommendations given to patients by the REGA call center which was concerned about the danger of additional complications should surgery not be performed rapidly. The same tendency could be observed in the patients not included in the study (table 1). However, age was no predictor of outcome, as can be seen in table 6. According to REGA, recommendation practices have since changed, not using patient age as an independent factor any more.

It could also be shown that patients who had suffered their injury in southern Europe or North Africa were significantly less often operated on abroad ($p = 0.006$, table 2).

Table 1: Patient groups and reasons for patient exclusion.

	Surgery abroad	**Surgery in CH**
No. of patients enrolled (2003–2008)	32	79
Mean age (yr)	73.6	65.8
Reasons for patient exclusion (n):		
Not contacted at 6 months	3	10
Multiple injuries	0	2
Under 18 ys	0	2
Insufficient documentation	1	0
Died within follow-up period	0	3
Patients excluded from study (n):	**4**	**17**
Mean age (yr)	68	83
Patients included in study (n):	**28**	**62**
Mean value age (yr)	73.5	67

Table 2: Patient characteristics and place of surgical intervention.

		Surgery abroad		**Surgery in CH**		**p**
		n	**%**	**n**	**%**	
Sex	F	18	64	35	56	
	M	10	36	27	44	
Age	<65 yr	5	18	21	33	
	65–74 yr	8	29	23	37	0.09
Region	Europe South / North Africa	12	43	46	73	
	Europe other / Overseas	16	57	17	27	0.006
Type of fracture	Med hip neck	9	32	25	40	
	Pertroch femur	15	54	24	39	
	Femur shaft	4	16	13	21	0.41
Reduction in ADL	Homework/garden	6	21	16	25	0.68
	Climbing stairs	3	11	20	32	0.03
	Bathing/dressing	2	7	13	21	0.11
	Kneel/bend	8	29	18	29	1
	Bathing/dressing	2	7	13	21	0.11
Walking ability before accident	Impaired	3	21	11	17	
Walking aid before accident	Yes	1	4	9	14	0.13

This also reflects certain recommendation and decision practices, which are by no means unique or particular to Switzerland [10].

Parameters concerning activities of daily living (ADL) were evaluated in an abbreviated form. From the Barthel catalogue of ADL [19], patients were asked about their ability to do house or garden work, to climb stairs, to kneel or bend, and to bathe and dress themselves. Patients who were flown back for surgery had a significantly impaired ability to climb stairs (p = 0.03, table 2). In all other ADL, the two groups were comparable (table 3).

Regarding overall health status prior to surgery, both groups were also comparable (table 4).

Time intervals between trauma and surgery differed substantially between the two groups, the patients in the "operated on abroad" group receiving their surgical intervention much sooner (mean value (MV) 1.5 days, standard deviation (SD) 1.6) than those in the "operated on at home" group (MV 3.2 days, SD 3.4, table 4). It should be noted that in the "surgery in Switzerland" group two patients received surgery as late as 12 and 20 days after trauma respectively. In one case, this was the consequence of MRSA quarantine measures in Switzerland, in the other, the patient had to have his aortic valve replaced prior to hip surgery. Interestingly enough, both patients recovered to their pre-operative physical status within six months after surgery, as reported by themselves during the interview.

Of the patients operated on abroad, 64% suffered one or more complications, as compared to 37% of patients operated on in Switzerland. This was statistically significant (p = 0.01, table 5). When looking at the type of complication, the need for a second surgical intervention emerged as a major event (25% of patients operated on abroad vs 8% of patients operated on in Switzerland, p = 0.03, table 5). However, this result must be interpreted with some caution: the sample size of this data subset was very small, possibly influencing statistical power. Logistic regression showed no evidence of an association between the variables investigated as possible confounding factors and the outcome; the place where surgery was performed (abroad or at home) was the only predictor of complications in general and of a re-operation (odds ratio 4.5, 95% confidence interval (CI) 1.55–13.7 and odds ratio 7.45, 95% CI 1.39–41.25 respectively, table 6).

When looking at walking ability six months after surgery, 89% of patients operated on abroad reported some level of impairment as compared to their pre-operative walking ability. Of the patients operated on in Switzerland, only 57% reported a walking impairment. This was significant (p = 0.004, table 5). Again, logistic regression showed that the place of surgery was the only predictor (odds ratio 3.93, 95% CI 1.10–14.11, table 6). As well as that, at six months 56% of patients operated on abroad walked with a walking aid, compared to 34% of patients operated on in Switzerland. This difference fell just short of significance level (p = 0.06, table 5).

Of the patients operated on abroad, 59% had to use analgesic medication intermittently or regularly at six months, compared to 35% of patients operated on in Switzerland. Again, this was statistically significant (p = 0.03, table 5).

Table 3: Type of fracture, surgical intervention and complications.

	Femur shaft		**Med hip neck**		**Pertroch femur**	
	Surgery abroad	**Surgery in CH**	**Surgery abroad**	**Surgery in CH**	**Surgery abroad**	**Surgery in CH**
No. of patients	4	12	9	27	15	23
Type of intervention:						
Hip replacement (partial or total)			78%	52%		17%
Screw osteosynthesis	25%	8%	22%	22%	13%	4%
Plate osteosynthesis	25%	33%				9%
Dynamic hip screw					40%	13%
Gamma nail/PFN					47%	43%
Other nail	50%					
Cerclage		8%				
Unknown		50%		26%		13%
Complications:	75%	33%	67%	37%	60%	39%
Reoperation	75%	8%	22%	7%	13%	9%
Perioperative	0%	0%	33%	11%	13%	17%
Other	0%	25%	11%	19%	33%	13%

Table 4: Comorbitity before surgical intervention.

	Surgery abroad			**Surgery in CH**		
	Mean	**Range**	**SD**	**Mean**	**Range**	**SD**
CIRS*	3.8		2.7	2.4		2.2
ADL score**	6.1		1.8	6.6		2.8
Days to surgery	1.5	0–6	1.6	3.2	1–20	3.4
Hosp. days abroad	8.2	3–22	4.7	1.7	1–5	1.1
Hosp. days in Switzerland	8.4	1–108	6.6	14.0	4–42	8.1
Hosp. days total	16.6			15.7		

* CIRS values are between 0 and 56, with 56 meaning highest comorbidity

** ADL scores are between 4 and 12, with 12 meaning highest dependence on help

Time to definitive surgical intervention

Total length of hospital stay

Discussion

The finding that patients who were transported back to Switzerland for surgery had a better outcome than patients operated on abroad was unexpected, especially because this was not only true for complications but also for functional status and chronic pain.

Prior to their accident, all patients in our study were in relatively good health (as expressed in their CIRS score, see table 3), and were physically quite independent when compared with typical profiles of Swiss patients with similar pathologies [20]. They were also younger. Busato and coworkers reported mean values for age in their patients with hip fractures of 79.5 and 81.7 years, respectively [21]. Our subgroup of patients with hip fractures had a mean value for age of 70.4 years. This could of course be expected, since we were looking at a population fit enough to travel abroad for recreation. These differences in age and health status meant that chances for a good outcome were possibly higher.

The incidence of hip fractures (neck and pertrochanteric) varies considerably in different parts of the world [22–24], over time [25], and also depends on socioeconomic factors [2]. In Switzerland, 7% of men and 22.6% of women over the age of 50 will suffer a femoral neck fracture some time in their future [26]. The Swiss Federal Office of Health (Bundesamt für Gesundheit BAG) estimates the incidence of hip fractures (osteoporotic and other) per 1,000 person years to be between 0.32 for women and 0.33 for men over 50 and 36.51 for women and 23.67 for men over 90 [27].

In contrast, the incidence for femoral shaft fractures is much lower and seems to have remained more or less constant over time [28–30].

These injuries often lead to a marked decrease in patients' quality of life. A recent outcome study by Pretto and coworkers showed, as other researchers had already shown for other countries, that Swiss patients suffering from a hip fracture sustained and treated in Switzerland could expect a marked decrease in quality of life and an increase in morbidity and mortality. A total of 17% of previously community dwelling patients had to enter a nursing home as a direct result of their injury, and 30% of patients reported a post-operative impairment in their ability to perform activities of daily living [31].

It is therefore no wonder that in the case of a hip or femur fracture sustained abroad, every effort is made to turn the odds as much in the patient's favour as possible. However, the discussion on what these efforts should be remains controversial. On one hand, literature favours a certain time frame for definitive surgical intervention [9–12]. So, from a strictly surgical point of view, surgery abroad seems to make sense, as long as surgical skills, technical equipment and hygienic conditions similar to those in Western Europe can be offered [8]. On the other hand, patients and their relatives are weary of treatment under unknown and unfamiliar conditions, and psychological and social factors will certainly influence outcome.

Our study does not reveal the underlying causes for the unexpected results concerning outcome. Different explanations could exist, of which the two most probable are discussed here:

First: Studies describe differences in treatment and outcome of hip and femur fractures, even when just comparing different European countries, that are obviously bigger and more relevant than the medical community, or insurance companies for that matter, might like to think [32, 33, 10]. Anecdotical evidence provided during the telephone inter-

Table 5: Outcome six months after surgery.

		Surgery abroad		Surgery in CH		p
		n	%	n	%	
Overall complications		18	64	23	37	0.01
Reoperation		7	25	5	8	0.03
Walking ability impaired		24	89	35	57	0.004
Uses walking aid		15	56	21	34	0.06
Analgesics	None	11	41	39	65	
	Sometimes	10	37	8	13	
	Regularly	6	22	13	22	0.03

Table 6: Predictors of complications (multivariate analysis with logistic regression.

		Overall complications		Reoperation needed		Walking impaired at six months	
		Odds ratio	CI 95%	Odds ratio	CI 95%	Odds ratio	CI 95%
Place of surgery	Switzerland	1.00	Ref.	1.00		1.00	
	Abroad	4.50	1.55–13.07	7.58	1.39–41.25	3.93	1.10–14.11
Age	<65 yr	1.00		1.00		1.00	
	65–74 yr	1.34	0.43–4.21	1.43	0.24–8.45	0.99	0.30–3.28
	75 yr and older	0.55	0.16–1.89	0.40	0.05–2.95	1.27	0.35–4.67
Countries	Europe Rest / Overseas	1.00		1.00		1.00	
	Europe South / North Africa	1.38	0.51–3.71	0.72	0.15–3.38	0.34	0.11–1.06
Type of fracture	Femur shaft	1.00		1.00		1.00	
	Med hip neck	1.10	0.32–3.72	0.23	0.04–1.40	0.35	0.09–1.39
	Pertroch femur	1.15	0.34–3.91	0.22	0.04–1.30	0.62	0.15–2.58
Reduction in ADL	No	1.00		1.00		1.00	
	Yes	1.37	0.53–3.53	1.12	0.26–4.91	2.62	0.90–7.65

views suggests that the level of nursing care and hygienic standards was often below what patients were used to from a Swiss hospital. More than once, patients told stories about "not being washed for several days" or "not getting food". These problems were by no means limited to hospitals in Southern Europe or North Africa. This does not necessarily explain surgical complications like implant problems or nonunion, leading to a second intervention. However, it could play a part in functional outcome or the persistence of pain. There are for instance studies linking the development of post-operative chronic pain to the quality of perioperative pain management [34, 35].

Second: Ethnological and psychological factors influence surgical outcome in ways not yet fully understood. Recent research on these topics cites factors like anxiety, depression, distress and the feeling of not being in control as influencing objective medical results in a negative way [36–41]. One can only speculate about the influence of language barriers, cultural misunderstandings and ensuing mutual distrust. In an interesting study in Sweden, Krupic and coworkers could show how ethnicity and its associated factors influenced surgical and functional outcome, even when all patients (immigrants and Swedes), from an objective medical point of view, received comparable treatment within the same medical system [34].

Whatever the reasons for complications, they obviously outweighed the "time to surgery" advantage that all patients in our study who were operated on abroad had over their counterparts operated on after a repatriation transport back to Switzerland (see table 4). In this context it is interesting to note that patients who were flown back prior to surgery spent on average only 1.7 days in a hospital abroad. This proves that repatriations could be organised and effected swiftly enough.

Another interesting finding illustrated in table 4 was the fact that surgery abroad by no means shortened overall hospital stay. Patients operated on abroad and then transported back home at a later date were always admitted to a hospital in Switzerland and never discharged home or to a rehabilitation unit directly after transport. Therefore, both patient groups spent about the same number of days in hospital, with a possible tendency towards a shorter overall hospital stay for patients operated on in Switzerland (MV 15.7 days for patients operated on in Switzerland vs 16.6 days for patients operated on abroad, see table 4). The only difference was in the number of days spent in a hospital abroad versus the days spent in a Swiss hospital.

Limitations

This was a antispective, descriptive, but not randomised study. The study sample as a whole was small. As well as that, it has to be noted that we only studied patients who were brought back to Switzerland by airoplane. This might influence patient selection, since it could be argued that patients who, owing to the lack of insurance or other financial coverage, face a long, tedious and painful land transport might more readily opt for a surgical intervention abroad, before being transported back home, whereas patients with the option of a speedy air repatriation might prefer repatriation. However, there exist no data to either support or reject this assumption. Anyhow, air repatriation remains the only option for patients being taken home from outside Europe.

We could describe the different pathologies and the surgical interventions for each case, as well as the ensuing complications (see table 3). However, owing to the small numbers, a statistical analysis of the subgroups was not possible. Likewise we had no information on the skill and experience of the surgeons or the staff training or hospital equipment abroad. While it is accepted that all of these factors influence outcome, we could not describe or further differentiate them.

An advantage of our study is that it did not focus on surgical outcome at the time of hospital discharge, but rather on patient outcome and quality of life six months later.

Conclusion

Patients with hip or femoral fractures sustained in a foreign country had fewer complications and a better functional outcome if repatriated and operated on in Switzerland than if operated on abroad. The reasons for this unexpected result remain unclear, although medical, ethnical and psychological factors could well play a part. In our study, the shorter time delay to surgery did not play in favour of patients operated on abroad. Surgery abroad did not shorten patients' overall hospital stay. Our study sample was small and possibly influenced by socioeconomic factors and better overall health status (people healthy and wealthy enough to travel). Our results need to be tested in a larger study and also with different types of injuries or pathologies, before definitve statements on repatriation decisions and recommendations for treatment abroad can be made.

Funding / potential competing interests: Our research received no funding. The main author reports no competing interests. Author Albrecht works for REGA. Author Roggenmoser had previously worked for REGA.

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References

1 Bundesamt für Statistik. Erhebung zum Reiseverhalten 2010. BFS – Statistisches Lexikon der Schweiz. www.bfs.admin.ch

2 Höpflinger F. Vieillir avec ou sans handicap. Evolution et scénarios pour la Suisse, in: Perrig-Chiello P., Stähelin H.B. (Hgg.), La Santé. Cycle de vie, société et environnement, Lausanne: Réalités sociales, 2004.

3 Wanner P, Sauvain-Dugerdil C, Guilley E, Hussy C. Alter und Generationen. Das Leben in der Schweiz ab 50 Jahren. Volkszählung 2000. Bundesamt für Statistik Bern, 2005.

4 Bundesamt für Statistik. Erhebung zum Reiseverhalten 1999. BFS-Statistisches Lexikon der Schweiz. www.bfs.admin.ch

5 comparis.ch. Database for Travel Insurance in Switzerland, 2012 www.comparis.ch/reiseversicherung/angebot.aspx

6 AXA Versicherungen AG. Allgemeine Vertragsbedingungen, 2011.

7 KPT/CPT. Reise- und Ferienversicherung. Allgemeine Versicherungsbedingungen, Ausgabe 07.12

8 Die Mobiliar. Kundeninformationen und allgemeine Bedingungen, Ausgabe 04.2012

9 eti/tcs. Allgemeine Geschäftsbedingungen des ETI Schutzbriefes. Ausgabe Mai 2010

10 Kramer W, Domres B, Dürner P, Stockert K. Evaluation of Repatriation Parameters: An Analysis of Patient Data of the German Air Rescue. Aviation, Space, and Environmental Medicine 1996;67(9):885–9.

11 Müller-Mai C, Schulze-Raestrup U, Ekkernkamp A, Smektala R. Frühkomplikationen nach Versorgung der Schenkelhalsfraktur. Einfluss des Operationszeitpunktes – Analyse von 30.254 Fällen der externen Qualitätssicherung in Westfalen-Lippe. Der Chirurg. 2006;77(1):61–9.

12 Weber E, Matter P. Fixation von Femurschaftfrakturen aus schweizerischer Sicht. Swiss Surg. 1997;3:55–60.

13 Kostuj T, Smektala R, Schulze-Raestrup U, Müller-Mai C. Pertrochantäre Frakturen: Welchen Einfluss haben Operationszeitpunkt und Implantatwahl auf das Outcome? Der Unfallchirurg 2011; Nov 16 (epub ahead of print).

14 Neumaier M, Vester H, Martetschläger F, Freude T, Scherer MA, Stöckle U. Optimaler Zeitpunkt zur prothetischen Versorgung von Schenkelhalsfrakturen. Der Chirurg. 2011;82(10):921–6.

15 Kramer W. Internationale Flugrettung. ZaeFQ. 1999;93:513–7.

16 Toft L, Landström PO. Kollumsfraktur spikas som regel pa plats Ambulansflyg skulle bli orimligt dyrt. Läkartidningen. 2002;99(3):206–7.

17 Schweizerische Rettungsflugwacht. Jahresbericht 2008. www.rega.ch/pdf/medien/PDF_Jahresbericht08_de.pdf

18 Miller MD, Paradis CF, Houck PR, Mazumdar S, Stack JA, Rifai AH, Mulsant B, Reynolds CF 3rd. Rating chronic medical illness burden in geropsychiatric practice and research: application of the Cumulative Illness Rating Scale. Psychiatry Res. 1992;41:237–48.

19 Mahoney FI, Barthel D. "Functional evaluation: The Barthel Index." Maryland State Medical Journal 1965;14:56–61.

20 Michel JP, Hoffmeyer P, Klopfenstein C, Bruchez M, Grab B, d'Epinay CL. Prognosis of functional recovery 1 year after hip fracture: typical patient profiles through cluster analysis. J Gerontol A Biol Sci Med Sci. 2000;55:M508–15.

21 Busato A, Widmer M, Matter P. Variation in incidence of orthopaedic surgery between populations with basic or basic plus supplementary health insurance in Switzerland. Swiss Med Wkly. 2011;141:w13152

22 Schwartz AV, Kelsey JL, Maggi S, Tuttleman M, Ho SC, Jonson PV, et al. International variation in the incidence of hip fractures: cross-national project on osteoporosis for the World Health Organization Program for Research on Aging. Osteoporos Int. 1999;9(3):242–53.

23 Kannus P, Parkkari J, Sievänen H, Heinonen A, Vuori I, Järvinen M. Epidemiology of hip fractures. Bone. 1996;18(1 Suppl):57S–63S.

24 Cheng SY, Levy AR, Lefaivre KA, Guy P, Kuramoto L, Sobolev B. Geographic trends in incidence of hip fractures: a comprehensive literature review. Osteoporos Int. 2011;22(10):2575–86.

25 Chevalley T, Guilley E, Herrmann FR, Hoffmeyer P, Rapin CH, Rizzoli R. Incidence of hip fracture over a 10-year period (1991-2000): reversal of a secular trend. Bone. 2007;40(5):1284–9.

26 Lippuner K,Johansson H,Kanis JA,Rizzoli R. Remaining lifetime and absolute 10-year probabilities of osteoporotic fracture in Swiss men and women. Osteoporos Int. 2009;20:1131–40.

27 Schwenkglenks M, Lippuner K. Epidemiologische Grundlagen: Osteoporose. Datengrundlage für das Osteoporose-Projekt der Bundesämter für Gesundheit und für Sozialversicherung, Bern. BAG-Projekt 03.000803, 2004.

28 Feldstein AC, Black D, Perrin N, Rosales AG, Friess D, Boardman D, et al. Incidence and demography of femur fractures with and without atypical features. J Bone Miner Res. 2012;27(5):977–86.

29 Weiss RJ, Montgomery SM, Al Dabbagh Z, Jansson KA. National data of 6409 Swedish inpatients with femoral shaft fractures: stable incidence between 1998 and 2004. Injury. 2009;40(3):304–8.

30 Salminen ST, Pihlajamäki HK, Avikainen VJ, Böstman OM. Population based epidemiologic and morphologic study of femoral shaft fractures. Clin Orthop Relat Res. 2000;(372):241–9.

31 Pretto M, Spirig R, Kaelin R, Muri-John V, Kressig RW, Suhm N. Outcomes of elderly hip fracture patients in the Swiss healthcare system: A survey prior to the implementation of DRGs and prior to the implementation of a Geriatric Fracture Centre. Swiss Med Wkly. 2010;140:w13086

32 Heikkinen T, Parker M, Jalovaara P. Hip fractures in Finland and Great Britain – a comparison of patient characteristics and outcomes. International Orthopaedics. 2001;25:349–54.

33 Cserhàti P, Fekete K, Berglund-Rödén M, Wingstrand H, Thorngren KG. Hip fractures in Hungary and Sweden – differences in treatment and rehabilitation. International Orthopaedics. 2002;26:222–8.

34 Curatolo M. Adding regional analgesia to general anaesthesia: increase of risk or improved outcome? Eur J Anaesthesiol. 2010;27(7):586–91.

35 Gerbershagen HJ, Dagtekin O, Rothe T, Heidenreich A, Gerbershagen K, Sabatowski R, et al. Risk factors for acute and chronic postoperative pain in patients with benign and malignant renal disease after nephrectomy. Eur J Pain. 2009;13(8):853–60.

36 Mavros MN, Athanasiou S, Gkegkes ID, Polyzos KA, Peppas G, Falagas ME. Do Psychological Variables Affect Early Surgical Recovery? PLoS One. 2011;6(5):e20306

37 Krupic F, Eisler T, Garellick G, Kärrholm J. Influence of ethnicity and socioeconomic factors on outcome after total hip replacement. Scand J Caring Sci. 2012 May 23. doi: 10.1111/j.1471-6712.2012.01013.x. [Epub ahead of print]

38 Judge A, Arden NK, Cooper C, Kassim Javaid M, Carr AJ, Field RE, Dieppe PA. Predictors of outcomes of total knee replacement surgery. Rheumatology (Oxford). 2012 Apr 24. [Epub ahead of print]

39 Powell R, Johnston M, Smith WC, King PM, Chambers WA, Krukowski Z, McKee L, Bruce J. Psychological risk factors for chronic post-surgical pain after inguinal hernia repair surgery: a prospective cohort study. Eur J Pain. 2012;16(4):600–10.

40 Lopez-Olivo MA, Landon GC, Siff SJ, Edelstein D, Pak C, Kallen MA, et al. Psychosocial determinants of outcomes in knee replacement. Ann Rheum Dis. 2011;70(10):1775–81.

41 Látos M, Barabás K, Lázár G, Marofka F, Szederkényi E, Szenohradszky P, Csabai M. Psychological factors of successful kidney transplantations. The effects of anxiety and intrapsychic integration of the organ on recovery. Orv Hetil. 2012;153(15):592–7.