The annual report from the Danish Fracture Database (DFDB) 2014 is the second of its kind. It contains data based on almost 25,000 fracture related surgeries, of which approximately 20,000 are primary surgeries registered at www.dfdb.dk. The purpose of DFDB is web based quality monitoring of fracture related surgery and today these efforts are joined by 19 orthopaedic departments in Denmark. The effort to monitor quality of fracture related surgery in Denmark is unique and important: Unique because DFDB is the fracture register with the highest national coverage in the world and important given the high number of surgeries performed each year probably making fracture surgery/traumatology one of the busiest specialties within orthopaedic surgery. Previously it has not been possible to assess nationwide quality of all fracture related surgeries.

We wish to thank all the participating surgeons and departments taking part in this unique and important task. It is truly inspirational to realize the unity DFDB has brought into orthopaedic traumatology in Denmark. Also the continued support from The Danish Orthopaedic Society (DOS) and Danish Orthopaedic Trauma Society (DOT), and the possibility to present the annual report at the DOS Congress is much appreciated.

The annual report is structured differently compared to last year’s report: Except for the first general section and the department specific section the report is based on report of data for each anatomic region, e.g. proximal humerus, distal radius, and proximal femur. This is an attempt to make it easier navigating the report and to make it more valuable to the readers. Please give us your feedback after studying the report – the process to improve is ongoing. The decision this year to print the annual report in English is primarily based on the interest in DFDB from our neighboring countries.

A basic principle surrounding DFDB is that surgeons reporting to the database should get feedback concerning the quality of treatment. This is delivered via e-mail and entails surgeon specific (only to be seen by the individual surgeon), department specific (the surgeon can only see data from his/her own department), and nationwide feedback on the rate of reoperations performed. The level of detail send by e-mail can be configured by the surgeon when logged in to DFDB. It is our hope that with time this feedback from DFDB can support surgeons in making decisions about best practice in fracture related surgery.

In Sweden a fracture register has been established too (www.frakturregistret.se). DFDB has engaged in cooperation with colleagues in Sweden and Norway to establish a core dataset of common parameters that will make it possible to join data and efforts across Scandinavia. Further, the efforts to become a national clinical quality monitoring database are ongoing. Finally, a platform to scan, trace and monitor orthopaedic implants has been introduced and taken in to use at one department. The scanned implants are linked together with the registrations in DFDB. It is a hope that the needed and important task of monitoring quality of specific implants and groups of implants can soon be undertaken in DFDB.

We hope to see more departments join DFDB in the future.

Hvidovre, d. 2. oktober, 2014

Anders Troelsen, Michael Brix, Kirill Gromov
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About the Danish Fracture Database

**Background and recent development**

The aim of the Danish Fracture Database is to monitor the quality of surgical fracture treatment by assessing the rate of revision surgery both in general and for each fracture type specifically. This assessment results in a potential quality improvement through focus on specific fracture types where the quality of treatment is not considered high enough. Lastly, epidemiologic research in fracture surgery will contribute to identify surgical and fracture related prognostic factors for a good or poor outcome of surgery. The use of DFDB provides each participating department the possibility to monitor own data and thus the quality of their fracture treatment. The educational level of both the surgeon and the supervisor is registered and can therefore also be monitored. During the past year, there has been a marked escalation of data entry. The number of departments contributing to the database has increased from 9 to 19, giving an increase in the number of included patients from approximately 11,000 in 2013 to 25,000 in 2014.

**Secretariat and daily operations**

Each participating department has a controller in daily charge of complete reporting. The daily operation is also supported by a secretariat, which was established last year at the Department of Orthopaedic Surgery, Hvidovre Hospital. The secretariat consists of an administrator, Alina Hansen, and a statistician, Thomas Kallemose. Together the developers of DFDB and the secretariat has the responsibility and right to development and changes of the registry in cooperation with the provider Procordo Aps.

**Steering Committee**

The idea behind DFDB and the registry’s recent progress are attributed to Michael Brix and Anders Troelsø. Kirill Gromov contributed substantially to the registry’s developmental phase. Michael, Anders and Kirill are today a part of the DFDB steering committee and are responsible for the registry’s overall administration, quality monitoring, and research. In addition, each participating department is represented in the steering committee. Both DOT (Danish Orthopaedic Trauma Society) and DOS (Danish Orthopaedic Society) are also represented in the steering committee. A minimum of one annual meeting is held in order to correct inexpediencies, increase the usability, and optimize the database through the members’ feedback.
In this annual report from DFDB we present a general overview of registered data as well as data for specific anatomical regions. The general overview covers basic demographics (age, gender and ASA score) for all primary surgeries as well as reoperations. Anatomical distribution of registered primary surgeries and reoperations as well as indications for reoperations are described. We describe the educational level of the primary surgeon and level of supervision for primary surgeries. Finally anatomical distribution for primary surgeries for all separate departments participating in the DFDB collaboration is described.

For definitions and specifications of the different parameters please see Appendix 1.

Demographics
84% of primary procedures were due to adult fractures and 16% due to pediatric fractures. Age distribution was biphasic, with first peak at age 0-20 and second peak at age 70-90. More males were surgically treated for fractures when age <50, while more females were surgically treated for fractures when age >50. 76% of patients with primary surgeries had an ASA score 1-2 while 79% of patients with reoperations had ASA score 1-2. 55% of all registered patients were female.

Anatomical distribution
Proximal femur (33%), distal radius (15%), and malleoli (12%) were the 3 most frequent operated regions for primary adult surgical procedures. Radius/ulna (58%), humerus (23%), and tibia (9%) were the 3 most frequently operated regions for primary paediatric surgical procedures.

Reoperations
Proximal femur (26%), malleoli (19%), and distal radi-
Data limitations

There are some limitations to the data in this report. Essential limitations are:

1) Data completeness for treatment of primary fractures
2) Data completeness for reoperations

Initially, after full implementation of DFDB at the orthopaedic departments in Hvidovre and Odense, an evaluation of data validity and data completeness for treatment of primary fractures and reoperations was performed (Gromov 2013). Two plausible factors to limit data completeness were identified: 1) that the registry had only been implemented for few months, and 2) that both departments are large, with regularly 50-90 possible surgeons. The results of the study showed that the validity of data (the percentage of data that was correct when compared to the best external data source outside of DFDB) was 90-100% for all parameters, and most above 97%. The total degree of completeness for data entry of primary fracture treatment was 88% and for reoperations it was 77%. Thus, there was, at an early point in time after initiation of DFDB, a satisfactory degree of data validity and data completeness under the prevailing circumstances. Similar evaluations of data completeness should be performed continuously.

In addition to reoperations that are not registered at participating departments, data may lack for reoperations performed at non-participating departments. The extent of this phenomenon can be investigated by using data from the National Patient Registry (NPR). For this report data was not extracted from NPR with regards to knowing the “true” number of reoperations, and thus the rates of reoperations and survival curves are underestimated. Nonetheless these rates and curves are presented to illustrate the potential of data analysis using DFDB.

Fracture diagnosis in Danish National Patient Registry (NPR) have been investigated by Andersen et al. The overall validity of data was 86%. The NPR diagnosis code was correct in 94% of all cases and the NPR anatomic region was correct in 99% of all cases. In 91% of all cases the operation code was correct and the anatomic region for the operation was correct in 99% of all cases.

NPR coding will be used in the future for continuous completeness monitoring of DFDB data.

Data was extracted from DFDB on August 11th 2014.

References


Participating departments

October 1, 2014, the following 19 departments took part in DFDB:

Aabenraa Hospital
Aalborg University Hospital
Aarhus University Hospital
Bispebjerg Hospital
Copenhagen University Hospital, Hvidovre
Farsø
Herlev Hospital
Hillerød, Nordsjællands Hospital
Holbæk Hospital
Horsens Hospital
Kolding Hospital
Køge Hospital
Nykøbing F. Hospital
Odense University Hospital
Rigshospitalet
Slagelse Hospital
Sydvestjysk Hospital Esbjerg
Vejle Hospital
Viborg Hospital
General overview of data

The graphs in this section cover general areas such as surgery type distribution, primary indication for re-operation, and the primary surgeon. The section uses data from all participating departments.

Fracture types distribution
(24508)

Surgery type distribution
(22396)
Anatomical distribution
Reoperations
Adults
(2011)

Anatomical distribution
Primary surgery
Pediatric
(2955)
Primary indication for reoperation
Pediatric (167)

Number of patients

- Infection
- Muscle and soft-tissue revision
- Neuroradiological complication
- Not identified preoperatively
- Suboptimal osteosynthesis
- Secondary fracture displacement or osteosynthesis failure
- Pseudarthrosis / delayed union
- Pain or discomfit from osteosynthesis
- Bone necrosis

ASA-score for surgery types
Adults (19009)

Number of patients

- Primary (16999)
- Reoperation (2010)
Time of primary surgery

Adults
(17000)

Time of primary surgery

Pediatric
(2954)
Primary surgeon for surgery types

Pediatric

(3118)

Primary (2951)
Reoperation (167)

Number of patients

Time of primary surgery
Surgeons level of education

Adults

(16955)

Intern (46)
1 year resident (3225)
2 year resident (2233)
3 year resident (2317)
4-5 year resident (2402)
Attending (4842)
Traumatologist (1890)

Number of patients

Time of day
Level of supervision for interns and residents
Adults
(11711)

Below attending (2401)
Attending or above (4818)
Unsupervised (4492)

Number of patients

Level of supervision for interns and residents
Pediatric
(2485)

Below attending (415)
Attending or above (774)
Unsupervised (1296)
Survival for primary surgery with reoperation due to any reason as endpoint
All procedures
(22514)

Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware
All procedures
(21860)
Department specific data

This section provides department specific data for 16 departments. No data is presented for departments who joined the DFDB after data was extracted for this annual report.

Aabenraa Hospital

Anatomical distribution for Aabenraa
Primary surgery
Adults
(1310)

Anatomical distribution for Aabenraa
Primary surgery
Pediatric
(231)
Anatomical distribution for Aalborg
Primary surgery

Adults
(10)

Number of patients

- Femur: 10%
- Proximal tibia: 40%
- Tibia shaft: 30%
- Distal tibia: 10%
- Malleoli: 10%

Pediatric
(1)

- Humerus: 100%
Anatomical distribution for Bispebjerg
Primary surgery

**Adults**
(374)

Number of patients

- **Proximal humerus**
- **Humeral shaft**
- **Distal humerus**
- **Proximal antebrachium**
- **Antebrachium**
- **Distal radius**
- **Proximal femur**
- **Femur**
- **Proximal tibia**
- **Tibia shaft**
- **Distal tibia**
- **Malleoli**
- **Foot**
- **Clavicle**

- **Number of patients:**
  - 0
  - 0.5
  - 1.0
  - 1.5

**Proximal humerus:** 2%  2%  2%
**Humeral shaft:** 14%
**Distal humerus:** 2%
**Proximal antebrachium:** 6%
**Antebrachium:** 2%
**Distal radius:** 2%
**Proximal femur:** 5%
**Femur:** 2%
**Proximal tibia:** 3%
**Tibia shaft:** 2%
**Distal tibia:** 1%
**Malleoli:** 1%
**Foot:** 6%

**Anatomical distribution for Bispebjerg**
Primary surgery

**Pediatric**
(2)

Number of patients

- **Radius-Ulna**
- **Tibia-Fibula**

- **Number of patients:**
  - 0.0
  - 0.5
  - 1.0
  - 1.5

**Radius-Ulna:** 50%
**Tibia-Fibula:** 50%
Anatomical distribution for Hvidovre
Primary surgery
Adults
(3294)

Anatomical distribution for Hvidovre
Primary surgery
Pediatric
(951)
Anatomical distribution for Herlev
Primary surgery
Adults
(671)

Anatomical distribution for Herlev
Primary surgery
Pediatric
(127)
Anatomical distribution for Hillerød Primary surgery

Adults (331)

- Proximal humerus: 34%
- Distal humerus: 15%
- Hand: 8%
- Proximal radius: 2%
- Distal radius: 2%
- Proximal femur: 4%
- Distal femur: 4%
- Patella: 3%
- Distal tibia: 3%
- Malleolus: 2%
- Clavicle: 3%
- Femur: 2%
- Tibia: 1%
- Radius: 1%
- Ulna: 1%

Number of patients

- 0
- 10
- 20
- 30
- 40
- 50
- 60
- 70
- 80
- 90
- 100
- 110
- 120
- 130
- 140
- 150
- 160
- 170
- 180
- 190
- 200

Anatomical distribution for Hillerød Primary surgery

Pediatric (78)

- Humerus: 55%
- Radius/Ulna: 31%
- Femur: 1%
- Tibia/Fibula: 13%

Number of patients

- 0
- 10
- 20
- 30
- 40
- 50
- 60

Hillerød, Nordsjællands Hospital
Anatomical distribution for Holbæk
Primary surgery
Adults
(335)

Number of patients
0  50  100  150  200

Proximal humerus 11%
Humeral shaft 2%
Distal humerus 8%
Proximal antebrachium 3%
Antebrachium 4%
Distal radius 1%
Hand 2%
Proximal femur 40%
Femoral shaft 1%
Patella 2%
Proximal tibia 6%
Tibia shaft 8%
Distal tibia 3%
Malleolus 2%
Foot 14%
Clavicle 1%

Anatomical distribution for Holbæk
Primary surgery
Pediatric
(90)

Number of patients
0  20  40  60  80

Humerus 29%
Radius/Ulna .64%
Tibia/Fibula 6%
Foot 1%
Anatomical distribution for Horsens
Primary surgery
Adults
(220)

Anatomical distribution for Horsens
Primary surgery
Pediatric
(47)
Anatomical distribution for Kolding
Primary surgery
Adults
(1761)

Anatomical distribution for Kolding
Primary surgery
Pediatric
(409)

Kolding Hospital
Anatomical distribution for Køge
Primary surgery
Adults
(1479)

Number of patients

Anatomical distribution for Køge
Primary surgery
Pediatric
(266)
Anatomical distribution for Nykøbing F
Primary surgery
Adults
(187)

Anatomical distribution for Nykøbing F
Primary surgery
Pediatric
(31)
Anatomical distribution for Odense
Primary surgery

**Adults**
(2685)

<table>
<thead>
<tr>
<th>Anatomical Site</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximal humerus</td>
<td>27%</td>
</tr>
<tr>
<td>Humeral shaft</td>
<td>10%</td>
</tr>
<tr>
<td>Distal humerus</td>
<td>8%</td>
</tr>
<tr>
<td>Proximal antebrachium</td>
<td>5%</td>
</tr>
<tr>
<td>Antebrachium</td>
<td>5%</td>
</tr>
<tr>
<td>Distal radius</td>
<td>14%</td>
</tr>
<tr>
<td>Hand</td>
<td>4%</td>
</tr>
<tr>
<td>Foot</td>
<td>2%</td>
</tr>
<tr>
<td>Clavicle</td>
<td>0%</td>
</tr>
<tr>
<td>Scapula</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Pediatric**
(347)

<table>
<thead>
<tr>
<th>Anatomical Site</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humerus</td>
<td>56%</td>
</tr>
<tr>
<td>Radius-Ulna</td>
<td>19%</td>
</tr>
<tr>
<td>Femur</td>
<td>9%</td>
</tr>
<tr>
<td>Tibia-Fibula</td>
<td>9%</td>
</tr>
<tr>
<td>Hand</td>
<td>5%</td>
</tr>
<tr>
<td>Foot</td>
<td>2%</td>
</tr>
</tbody>
</table>

---

*Odense University Hospital*
Anatomical distribution for Rigshospitalet
Primary surgery
Adults
(1076)

Anatomical distribution for Rigshospitalet
Primary surgery
Pediatric
(119)
Anatomical distribution for Slagelse
Primary surgery
Adults
(1933)

Number of patients
0 200 400 600 800 1000
Proximal humerus Humeral shaft Distal humerus Proximal antebrachium Antebrachium Distal radius Hand Proximal femur Acetabulum Femur Distal femur Patella Proximal tibia Tibia shaft Distal tibia Malleoli Foot Clavicle
0% 0% 2% 3% 1% 19% 18% 30% 0% 2% 2% 2% 3% 3% 1% 12%

Anatomical distribution for Slagelse
Primary surgery
Pediatric
(339)

Number of patients
0 50 100 150 200 250
Humerus Radius/Ulna Femur Tibia/Fibula Hand Foot
22% 50% 16% 10% 2% 1%
Anatomical distribution for Esbjerg
Primary surgery
Adults
(748)

Anatomical distribution for Esbjerg
Primary surgery
Pediatric
(129)
**Method of osteosynthesis proximal humerus fractures**

(654 patients)

- Arthroplasty: 33%
- Plate: 69%
- Other: 8%

**Indication for reoperations of proximal humerus fractures**

(61 patients)

- Infection: 20%
- New fracture: 2%
- Subclinical fracture dislocation or osteosynthesis failure: 8%
- Pseudarthrosis / delayed union: 8%
- Pain or dislocation from osteosynthesis: 28%
- Bone necrosis: 3%
- Hematoma: 3%
Primary surgeons for proximal humerus fractures
(661)

Level of supervision for proximal humerus fractures
(626)
Level of supervision for interns and residents
proximal humerus fractures

(130)

- Below attending (1)
- Attending or above (114)
- Unsupervised (15)

Surgical delay for proximal humerus fractures

(449)

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason proximal humerus fractures (709)

Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware proximal humerus fractures (695)
Fracture classification for proximal humerus fractures

(661)
Method of osteosynthesis humeral shaft fractures (215)

- External fixation: 6%
- Intramedullary nailing: 29%
- Plate: 73%
- Other: 2%

Indication for reoperations of humeral shaft fractures (31)

- Muscle and soft-tissue revision: 3%
- Neurovascular complication: 3%
- New fracture: 3%
- Suboptimal osteosynthesis: 6%
- Secondary fracture, displacement: 23%
- Pseudarthrosis, delayed union: 42%
- Pain or discomfort from osteosynthesis: 19%
Primary surgeons for humeral shaft fractures
(216)

<table>
<thead>
<tr>
<th>Level of supervision</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year resident</td>
<td>1%</td>
</tr>
<tr>
<td>2 year resident</td>
<td>3%</td>
</tr>
<tr>
<td>3 year resident</td>
<td>3%</td>
</tr>
<tr>
<td>4-5 year resident</td>
<td>6%</td>
</tr>
<tr>
<td>Attending</td>
<td>57%</td>
</tr>
<tr>
<td>Traumatologist</td>
<td>29%</td>
</tr>
</tbody>
</table>

Level of supervision for humeral shaft fractures
(211)

<table>
<thead>
<tr>
<th>Level of supervision</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 year resident</td>
<td>0%</td>
</tr>
<tr>
<td>4-5 year resident</td>
<td>0%</td>
</tr>
<tr>
<td>Attending</td>
<td>15%</td>
</tr>
<tr>
<td>Traumatologist</td>
<td>8%</td>
</tr>
<tr>
<td>Unsupervised</td>
<td>77%</td>
</tr>
</tbody>
</table>
Level of supervision for interns and residents

humeral shaft fractures

(39)

Number of patients

<table>
<thead>
<tr>
<th>Supervision Level</th>
<th>1 year resident</th>
<th>2 year resident</th>
<th>3 year resident</th>
<th>4-5 year resident</th>
</tr>
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<tbody>
<tr>
<td>Below attending</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Attending or above</td>
<td>86%</td>
<td>88%</td>
<td>100%</td>
<td>85%</td>
</tr>
<tr>
<td>Unsupervised</td>
<td>14%</td>
<td>12%</td>
<td>0%</td>
<td>8%</td>
</tr>
</tbody>
</table>

Surgical delay for humeral shaft fractures

(117)

Hours

<table>
<thead>
<tr>
<th>Time Interval</th>
<th>0</th>
<th>24</th>
<th>48</th>
<th>72</th>
<th>96</th>
<th>120</th>
<th>144</th>
<th>168</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion</td>
<td>27%</td>
<td>24%</td>
<td>13%</td>
<td>15%</td>
<td>12%</td>
<td>4%</td>
<td>5%</td>
<td></td>
</tr>
</tbody>
</table>

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware among humeral shaft fractures.

**Survival for primary surgery with reoperation due to any reason among humeral shaft fractures**

(250)

**Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware among humeral shaft fractures**

(246)
Fracture classification for humeral shaft fractures

(218)

Number of patients

<table>
<thead>
<tr>
<th>12A</th>
<th>12B</th>
<th>12C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Method of osteosynthesis distal humerus fractures

- Arthroplasty: 5%
- External fixation: 7%
- Plate: 73%
- Screw(s): 10%
- Other: 5%

Indication for reoperations of distal humerus fractures

- Infection: 16%
- Muscle and soft-tissue revision: 4%
- Neurovascular complication: 2%
- New fracture: 4%
- Suboptimal osteosynthesis: 4%
- Secondary fracture dislocation or osteosynthesis failure: 18%
- Pseudarthrosis / delayed union: 8%
- Pain or discomfort from osteosynthesis: 44%
Primary surgeons for distal humerus fractures

Level of supervision for distal humerus fractures
Level of supervision for interns and residents
distal humerus fractures
(125)

Number of patients

1 year resident 2 year resident 3 year resident 4-5 year resident

Below attending (16) Attending or above (69) Unsupervised (40)

Surgical delay for distal humerus fractures
(234)

Hours

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason
distal humerus fractures
(324)

Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
distal humerus fractures
(305)
Fracture classification for distal humerus fractures
(288)

Number of patients

Fracture types:
- 13A
- 13B
- 13C

13A: 3
13B: 2
13C: 3

Total:
- 0
- 50
- 100
- 150
- 200
Method of osteosynthesis proximal antebrachium fractures (546)

![Bar chart showing method of osteosynthesis for proximal antebrachium fractures.](chart)

- Plate: 32%
- Screw(s): 6%
- Wire(s): 51%
- Other: 11%

Indication for reoperations of proximal antebrachium fractures (103)

![Bar chart showing indications for reoperations.](chart)

- Infection: 11%
- Muscle and soft tissue revision: 2%
- New fracture: 3%
- Suboptimal osteosynthesis: 5%
- Secondary fracture dislocation: 10%
- Pseudarthrosis / delayed union: 7%
- Pain or discomfort from osteosynthesis: 63%
Primary surgeons for proximal antebrachium fractures (551)

Level of supervision for proximal antebrachium fractures (541)
Level of supervision for interns and residents proximal antebrachium fractures (402)

Number of patients

- Below attending (81)
- Attending or above (170)
-Unsupervised (151)

Surgical delay for proximal antebrachium fractures (476)

Hours

Proportion of patients operated in 24 hour intervals
Survival for primary surgery with reoperation due to any reason proximal antebrachium fractures (643)

Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware proximal antebrachium fractures (585)
Fracture classification for proximal antebrachium fractures

(553)

Number of patients

0 100 200 300 400 500

1 2 3

1 2 3

21A 21B 21C
Method of osteosynthesis antebrachium fractures

- External fixation: 7%
- Plate: 88%
- Other: 5%

Indication for reoperations of antebrachium fractures

- Infection: 15%
- Neurovascular complication: 4%
- Suboptimal osteosynthesis: 7%
- Secondary fracture dislocation or osteosynthesis failure: 7%
- Pseudarthrosis / delayed union: 15%
- Pain or discomfort from osteosynthesis: 52%
Primary surgeons for antebrachium fractures
(237)

Level of supervision for antebrachium fractures
(235)
Level of supervision for interns and residents
antebrachium fractures
(167)

Surgical delay for antebrachium fractures
(206)
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware antebrachium fractures

(275)

Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware antebrachium fractures

(262)
Fracture classification for antebrachium fractures

(237)

Number of patients

1 2 3

22A 22B 22C
Method of osteosynthesis distal radius fractures (2514)

- Plate: 92%
- Other: 8%

Indication for reoperations of distal radius fractures (140)

- Infection: 3%
- Muscle and soft tissue revision: 4%
- Neurovascular complication: 9%
- Suboptimal osteosynthesis: 15%
- Secondary fracture dislocation: 21%
- Pseudarthrosis / delayed union: 4%
- Pain or discomfort: 43%
- Hematoma: 2%
- Other: 3%
Primary surgeons for distal radius fractures (2553)

Level of supervision for distal radius fractures (2515)
Level of supervision for interns and residents
distal radius fractures
(1761)

Surgical delay for distal radius fractures
(2210)
Survival for primary surgery with reoperation due to any reason distal radius fractures (2717)

Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware distal radius fractures (2665)
Fracture classification for distal radius fractures

(2563)
Method of osteosynthesis hand fractures
(1425)

Hand Indication for reoperations of hand fractures
(48)
Level of supervision for interns and residents

Hand fractures (776)

- Below attending (103)
- Attending or above (295)
- Unsupervised (378)

<table>
<thead>
<tr>
<th>Level of Supervision</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intern</td>
<td>67%</td>
</tr>
<tr>
<td>1 year resident</td>
<td>34%</td>
</tr>
<tr>
<td>2 year resident</td>
<td>45%</td>
</tr>
<tr>
<td>3 year resident</td>
<td>31%</td>
</tr>
<tr>
<td>4-5 year resident</td>
<td>13%</td>
</tr>
<tr>
<td>Attending or above</td>
<td>44%</td>
</tr>
<tr>
<td>Unsupervised</td>
<td>43%</td>
</tr>
<tr>
<td>Below attending</td>
<td>56%</td>
</tr>
<tr>
<td>Attending or above</td>
<td>42%</td>
</tr>
<tr>
<td>Unsupervised</td>
<td>19%</td>
</tr>
<tr>
<td>Below attending</td>
<td>0%</td>
</tr>
</tbody>
</table>

Surgical delay for hand fractures (1167)

- Proportion of patients operated in 24 hour intervals

<table>
<thead>
<tr>
<th>Hours</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>34%</td>
</tr>
<tr>
<td>24</td>
<td>23%</td>
</tr>
<tr>
<td>48</td>
<td>14%</td>
</tr>
<tr>
<td>72</td>
<td>13%</td>
</tr>
<tr>
<td>96</td>
<td>8%</td>
</tr>
<tr>
<td>120</td>
<td>5%</td>
</tr>
<tr>
<td>144</td>
<td>4%</td>
</tr>
<tr>
<td>168</td>
<td>3%</td>
</tr>
</tbody>
</table>

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware hand fractures

Survival for primary surgery with reoperation due to any reason hand fractures

(1494)

(1488)
Fracture classification for hand fractures

(1445)

- Number of patients:
  - 0
  - 200
  - 400
  - 600
  - 800
  - 1000

- Wrist bones:
  - 5%

- 1. metacarpal:
  - 12%

- 1. proximal phalanx:
  - 3%

- 1. distal phalanx:
  - 1%

- 2-5 metacarpal:
  - 45%

- 2-5 proximal phalanx:
  - 18%

- 2-5 middle phalanx:
  - 10%

- 2-5 distal phalanx:
  - 6%
Method of osteosynthesis proximal femur fractures (5653)

Indication for reoperations of proximal femur fractures (510)
Level of supervision for interns and residents
proximal femur fractures
(4692)

Surgical delay for proximal femur fractures
(5382)
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware proximal femur fractures (5891)
Fracture classification for proximal femur fractures
(5658)

Number of patients

31A  31B  31C

1  2  3

1  2  1

0  500  1000  1500  2000  2500  3000  3500
Method of osteosynthesis acetabulum fractures
(274)

- External fixation: 8%
- Plate: 58%
- Screws: 31%
- Other: 3%

Indication for reoperations of acetabulum fractures
(58)

- Infection: 48%
- Suboptimal osteosynthesis: 10%
- Secondary fracture dislocation: 12%
- Pain or discomfort from osteosynthesis: 7%
- Arthroplasty dislocation: 10%
- Pseudarthrosis / delayed union: 5%
- Bone necrosis: 2%
- Hematoma: 5%
Primary surgeons for acetabulum fractures
(275)

- 1% 1 year resident
- 6% 3 year resident
- 39% Attending
- 55% Traumatologist

Level of supervision for acetabulum fractures
(275)

- 0% 1 year resident
- 0% 4-5 year resident
- 9% Attending
- 19% Traumatologist
- 71% Unsupervised
Level of supervision for interns and residents
acetabulum fractures
(34)

<table>
<thead>
<tr>
<th>Number of patients</th>
<th>1 year resident</th>
<th>2 year resident</th>
<th>3 year resident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below attending</td>
<td>17%</td>
<td>0%</td>
<td>4%</td>
</tr>
<tr>
<td>Attending or above</td>
<td>67%</td>
<td>100%</td>
<td>92%</td>
</tr>
<tr>
<td>Unsupervised</td>
<td>17%</td>
<td>0%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Surgical delay for acetabulum fractures
(227)

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware due to acetabulum fractures

(317)
Method of osteosynthesis femur fractures

Number of patients

External fixation

Intramedullary nail(s)

Plate

Other

7%

69%

20%

4%

Indication for reoperations of femur fractures

Number of patients

Infection

Muscle and soft tissue revision

Suboptimal osteosynthesis failure

Secondary fracture displacement, delayed union

Pain or discomfort from osteosynthesis

Hematoma

10%

13%

9%

28%

23%

4%
Primary surgeons for femur fractures

Number of patients

- Intern: 1%
- 1 year resident: 14%
- 2 year resident: 9%
- 3 year resident: 14%
- 4-5 year resident: 20%
- Attending: 28%
- Traumatologist: 14%

Level of supervision for femur fractures

Number of patients

- 2 year resident: 1%
- 3 year resident: 7%
- 4.5 year resident: 24%
- Attending: 14%
- Traumatologist: 53%
- Unsupervised: 1%
Level of supervision for interns and residents femur fractures (281)

<table>
<thead>
<tr>
<th>Intern</th>
<th>1 year resident</th>
<th>2 year resident</th>
<th>3 year resident</th>
<th>4-5 year resident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below attending (36)</td>
<td>Attending or above (173)</td>
<td>Unsupervised (72)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Surgical delay for femur fractures (375)

<table>
<thead>
<tr>
<th>Hours</th>
<th>0-24</th>
<th>24-48</th>
<th>48-72</th>
<th>72-96</th>
<th>96-120</th>
<th>120-144</th>
<th>144-168</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>58%</td>
<td>28%</td>
<td>8%</td>
<td>3%</td>
<td>2%</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason 
femur fractures 
(460)

Survival for primary surgery with reoperation due to any reason 
except pain and discomfort from surgical hardware 
femur fractures 
(446)
Fracture classification for femur fractures

(397)
Method of osteosynthesis distal femur fractures (236)

- External fixation: 8%
- Plate: 80%
- Screws: 7%
- Other: 5%

Indication for reoperations of distal femur fractures (71)

- Infection: 7%
- New fracture: 4%
- Suboptimal osteosynthesis: 7%
- Secondary fracture dislocation or osteosynthesis failure: 18%
- Pseudarthrosis / delayed union: 20%
- Pain or discomfort from osteosynthesis: 44%
Primary surgeons for distal femur fractures (240)

<table>
<thead>
<tr>
<th>Level of supervision</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year resident</td>
<td>5%</td>
</tr>
<tr>
<td>2 year resident</td>
<td>9%</td>
</tr>
<tr>
<td>3 year resident</td>
<td>15%</td>
</tr>
<tr>
<td>4-5 year resident</td>
<td>20%</td>
</tr>
<tr>
<td>Attending</td>
<td>32%</td>
</tr>
<tr>
<td>Traumatologist</td>
<td>23%</td>
</tr>
</tbody>
</table>

Level of supervision for distal femur fractures (240)

<table>
<thead>
<tr>
<th>Level of supervision</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 year resident</td>
<td>1%</td>
</tr>
<tr>
<td>4-5 year resident</td>
<td>2%</td>
</tr>
<tr>
<td>Attending</td>
<td>18%</td>
</tr>
<tr>
<td>Traumatologist</td>
<td>21%</td>
</tr>
<tr>
<td>Unsupervised</td>
<td>57%</td>
</tr>
</tbody>
</table>
Level of supervision for interns and residents
distal femur fractures
(147)

- Below attending (12)
- Attending or above (103)
- Unsupervised (32)

Surgical delay for distal femur fractures
(212)

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason
distal femur fractures

(317)

Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
distal femur fractures

(286)
Fracture classification for distal femur fractures

Number of patients

Fracture type:
- 33A: 3 patients
- 33B: 2 patients
- 33C: 3 patients

Total: 8 patients
Method of osteosynthesis patella fractures
(201)

<table>
<thead>
<tr>
<th>Suture(s)</th>
<th>Wire(s)</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>7%</td>
<td>87%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Indication for reoperations of patella fractures
(55)

<table>
<thead>
<tr>
<th>Infection</th>
<th>New fracture</th>
<th>Suboptimal osteosynthesis</th>
<th>Secondary fracture dislocation or osteosynthesis failure</th>
<th>Pseudarthrosis / delayed union</th>
<th>Pain or discomfort from osteosynthesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>15%</td>
<td>2%</td>
<td>16%</td>
<td>4%</td>
<td>62%</td>
<td>15%</td>
</tr>
</tbody>
</table>
Primary surgeons for patella fractures

- 1 year resident: 20%
- 2 year resident: 20%
- 3 year resident: 16%
- 4-5 year resident: 12%
- Attending: 24%
- Traumatologist: 10%

Level of supervision for patella fractures

- 1 year resident: 1%
- 2 year resident: 2%
- 3 year resident: 2%
- 4-5 year resident: 13%
- Attending: 27%
- Traumatologist: 49%
- Supervised: 0%
Level of supervision for interns and residents
patella fractures
(179)

Surgical delay for patella fractures
(176)
Survival for primary surgery with reoperation due to any reason patella fractures
(247)

Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware patella fractures
(216)
Fracture classification for patella fractures
(201)

Number of patients

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>34A</td>
<td>1</td>
</tr>
<tr>
<td>34B</td>
<td>2</td>
</tr>
<tr>
<td>34C</td>
<td>3</td>
</tr>
</tbody>
</table>

Diagram showing the distribution of patients across different categories.
Proximal tibia

Method of osteosynthesis proximal tibia fractures
(557)

- External fixation: 21%
- Plate: 71%
- Screws: 6%
- Other: 2%

Indication for reoperations of proximal tibia fractures
(85)

- Infection: 26%
- Muscle and soft tissue revision: 1%
- Neurovascular complication: 1%
- New fracture: 12%
- Suboptimal osteosynthesis: 6%
- Secondary fracture displacement: 4%
- Pseudarthrosis / delayed union: 48%
- Pain or discomfort from osteosynthesis: 6%
- Pan or dislocation from osteosynthesis: 2%
Primary surgeons for proximal tibia fractures
(559)

Level of supervision for proximal tibia fractures
(552)
Level of supervision for interns and residents
proximal tibia fractures

Below attending (13)
Attending or above (213)
Unsupervised (60)

1 year resident 2 year resident 3 year resident 4-5 year resident

12% 66% 76% 86% 70%
1% 1% 12% 1% 29%

Surgical delay for proximal tibia fractures

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason proximal tibia fractures
(662)

Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware proximal tibia fractures
(623)
Fracture classification for proximal tibia fractures

(560)
Method of osteosynthesis tibia shaft fractures

<table>
<thead>
<tr>
<th>Method</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>External fixation</td>
<td>23%</td>
</tr>
<tr>
<td>Intramedullary nail</td>
<td>61%</td>
</tr>
<tr>
<td>Plate</td>
<td>15%</td>
</tr>
<tr>
<td>Other</td>
<td>1%</td>
</tr>
</tbody>
</table>

Indication for reoperations of tibia shaft fractures

<table>
<thead>
<tr>
<th>Indication</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infection</td>
<td>12%</td>
</tr>
<tr>
<td>Muscle and soft-tissue revision</td>
<td>1%</td>
</tr>
<tr>
<td>New fracture</td>
<td>1%</td>
</tr>
<tr>
<td>Suboptimal osteosynthesis</td>
<td>10%</td>
</tr>
<tr>
<td>Secondary fracture dislocation</td>
<td>15%</td>
</tr>
<tr>
<td>Pseudarthrosis/delayed union</td>
<td>20%</td>
</tr>
<tr>
<td>Pain or discomfort from osteosynthesis</td>
<td>39%</td>
</tr>
<tr>
<td>Bone necrosis</td>
<td>1%</td>
</tr>
</tbody>
</table>
Primary surgeons for tibia shaft fractures

(457)

Number of patients

0 50 100 150 200 250

1 year resident 2 year resident 3 year resident 4-5 year resident Attending Traumatologist

9% 11% 19% 22% 25% 14%

Level of supervision for tibia shaft fractures

(454)

Number of patients

0 50 100 150 200 250 300 350

2 year resident 3 year resident 4-5 year resident Attending Traumatologist Unsupervised

0% 0% 8% 27% 16% 49%
**Level of supervision for interns and residents**

**Tibia shaft fractures**

(401)

**Number of patients**

- 0
- 50
- 100
- 150
- 200
- 250

**Hours**

- 0
- 24
- 48
- 72
- 96
- 120
- 144
- 168

- **Below attending (49)**
- **Attending or above (246)**
- **Unsupervised (106)**

**Surgical delay for tibia shaft fractures**

(412)

- 60%
- 20%
- 9%
- 4%
- 3%
- 2%
- 1%

**Proportion of patients operated in 24 hour intervals**
Survival for primary surgery with reoperation due to any reason
tibia shaft fractures

Probability

Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware
tibia shaft fractures

Probability
Fracture classification for tibia shaft fractures
(458)

Number of patients

42A 42B 42C
Method of osteosynthesis distal tibia fractures
(207)

Indication for reoperations of distal tibia fractures
(49)
Level of supervision for interns and residents
distal tibia fractures

(115)

- Below attending (10)
- Attending or above (73)
- Unsupervised (32)

(Number of patients)

<table>
<thead>
<tr>
<th>Intern</th>
<th>1 year resident</th>
<th>2 year resident</th>
<th>3 year resident</th>
<th>4-5 year resident</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>0%</td>
<td>5%</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td>71%</td>
<td>24%</td>
<td>24%</td>
<td>71%</td>
<td>43%</td>
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<tr>
<td>100%</td>
<td>5%</td>
<td>5%</td>
<td>59%</td>
<td>51%</td>
</tr>
<tr>
<td>0%</td>
<td>0%</td>
<td>10%</td>
<td>5%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Surgical delay for distal tibia fractures

(181)

<table>
<thead>
<tr>
<th>Hours</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>46%</td>
</tr>
<tr>
<td>24</td>
<td>18%</td>
</tr>
<tr>
<td>48</td>
<td>13%</td>
</tr>
<tr>
<td>72</td>
<td>12%</td>
</tr>
<tr>
<td>96</td>
<td>4%</td>
</tr>
<tr>
<td>120</td>
<td>4%</td>
</tr>
<tr>
<td>144</td>
<td>4%</td>
</tr>
<tr>
<td>168</td>
<td>3%</td>
</tr>
</tbody>
</table>

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason distal tibia fractures
(282)
Fracture classification for distal tibia fractures

(209)

Number of patients

43A 43B 43C

1 1 3

2 2 2

3 1 1

0 100 200 300 400 500

Fracture classification for distal tibia fractures

(209)
Method of osteosynthesis malleoli fractures (2037)

- External fixation: 8%
- Plate: 74%
- Screws: 13%
- Other: 5%

Indication for reoperations of malleoli fractures (377)

- Infection: 20%
- Muscle and soft tissue revision: 2%
- Neurovascular complication: 0%
- New fracture: 0%
- Suboptimal osteosynthesis: 15%
- Secondary fixation, dislocation, or osteosynthesis failure: 10%
- Pseudarthrosis/delayed union: 5%
- Pain or discomfort from osteosynthesis: 48%
Primary surgeons for malleoli fractures (2007)

<table>
<thead>
<tr>
<th>Level of Supervision</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intern</td>
<td>0%</td>
</tr>
<tr>
<td>1 year resident</td>
<td>22%</td>
</tr>
<tr>
<td>2 year resident</td>
<td>16%</td>
</tr>
<tr>
<td>3 year resident</td>
<td>16%</td>
</tr>
<tr>
<td>4-5 year resident</td>
<td>16%</td>
</tr>
<tr>
<td>Attending</td>
<td>22%</td>
</tr>
<tr>
<td>Traumatologist</td>
<td>9%</td>
</tr>
</tbody>
</table>

Level of supervision for malleoli fractures (2022)

<table>
<thead>
<tr>
<th>Level of Supervision</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year resident</td>
<td>1%</td>
</tr>
<tr>
<td>2 year resident</td>
<td>2%</td>
</tr>
<tr>
<td>3 year resident</td>
<td>3%</td>
</tr>
<tr>
<td>4-5 year resident</td>
<td>12%</td>
</tr>
<tr>
<td>Attending</td>
<td>21%</td>
</tr>
<tr>
<td>Traumatologist</td>
<td>7%</td>
</tr>
<tr>
<td>Unsupervised</td>
<td>55%</td>
</tr>
</tbody>
</table>
Level of supervision for interns and residents for malleoli fractures (1842)

- Intern 1 year resident: 31%, 28%, 33%
- 2 year resident: 41%, 33%, 46%, 48%
- 3 year resident: 6%
- 4-5 year resident: 0%
- Below attending (374)
- Attending or above (651)
- Unsupervised (817)

Surgical delay for malleoli fractures (1867)

- Proportion of patients operated in 24 hour intervals:
  - 0-24 hours: 51%
  - 24-48 hours: 25%
  - 48-72 hours: 10%
  - 72-96 hours: 6%
  - 96-120 hours: 4%
  - 120-144 hours: 3%
  - 144-168 hours: 1%
Survival for primary surgery with reoperation due to any reason malleoli fractures (2485)

Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware malleoli fractures (2325)
Fracture classification for malleoli fractures
(2048)

Number of patients

0 2000

1500

1000

500

0 20 44A 44B 44C

1

2

3

2

1

1

2

1

Number of patients
Method of osteosynthesis foot fractures
(400)

- K-wire: 22%
- Plate: 42%
- Screw(s): 29%
- Other: 8%

Indication for reoperations of foot fractures
(45)

- Infection: 20%
- Muscle and soft-tissue revision: 13%
- Suboptimal osteosynthesis: 11%
- Secondary fracture displacement or osteosynthesis failure: 4%
- Pain or discomfort from osteosynthesis: 49%
- Bone necrosis: 2%
Primary surgeons for foot fractures
(404)

Level of supervision for foot fractures
(401)
Level of supervision for interns and residents
foot fractures
(94)

- Below attending (12)
- Attending or above (48)
- Unsupervised (34)

Surgical delay for foot fractures
(248)

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware.

Survival for foot fractures:
- 447 cases

Survival for foot fractures with reoperation due to any reason except pain and discomfort from surgical hardware:
- 430 cases
Fracture classification for foot fractures

(405)

- Calcaneus: 44%
- Talus: 12%
- Medial: 11%
- Metatarsal: 23%
- Proximal phalanx: 8%
- Distal phalanx: 2%
**Method of osteosynthesis shoulder fractures**

<table>
<thead>
<tr>
<th>Method</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate</td>
<td>89%</td>
</tr>
<tr>
<td>Other</td>
<td>11%</td>
</tr>
</tbody>
</table>

**Indication for reoperations of shoulder fractures**

<table>
<thead>
<tr>
<th>Indication</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infection</td>
<td>1%</td>
</tr>
<tr>
<td>Nervovascular complication</td>
<td>1%</td>
</tr>
<tr>
<td>Suboptimal osteosynthesis</td>
<td>4%</td>
</tr>
<tr>
<td>Secondary fracture dislocation or pseudarthrosis</td>
<td>21%</td>
</tr>
<tr>
<td>Pseudarthrosis / delayed union</td>
<td>13%</td>
</tr>
<tr>
<td>Pain or discomfort from osteosynthesis</td>
<td>59%</td>
</tr>
</tbody>
</table>
Level of supervision for interns and residents
shoulder fractures

(240)

Surgical delay for shoulder fractures

(358)

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware shoulder fractures (613)

Survival for primary surgery with reoperation due to any reason shoulder fractures (652)
Fracture classification for shoulder fractures

Number of patients

Clavicle Scapula

95%

5%
Method of osteosynthesis humerus fractures (668)

- K-wire(s): 91%
- Screw(s): 6%
- Other: 3%

Indication for reoperation of humerus fractures (40)

- Infection: 2%
- Neurovascular complication: 5%
- Suboptimal osteosynthesis: 65%
- Secondary fracture dislocation or osteosynthesis failure: 18%
- Pain or discomfort from osteosynthesis: 10%
Primary surgeons for humerus fractures
(688)

Level of supervision for humerus fractures
(672)
level of supervision for interns and residents
humerus fractures

(511)

<table>
<thead>
<tr>
<th>Level of Supervision</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below attending (67)</td>
<td></td>
</tr>
<tr>
<td>Attending or above (174)</td>
<td></td>
</tr>
<tr>
<td>Unsupervised (270)</td>
<td></td>
</tr>
</tbody>
</table>

Surgical delay for humerus fractures

(648)

<table>
<thead>
<tr>
<th>Hours</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td></td>
</tr>
<tr>
<td>72</td>
<td></td>
</tr>
<tr>
<td>96</td>
<td></td>
</tr>
<tr>
<td>120</td>
<td></td>
</tr>
<tr>
<td>144</td>
<td></td>
</tr>
<tr>
<td>168</td>
<td></td>
</tr>
</tbody>
</table>

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware humerus fractures (801)
Method distribution for humerus fractures

(690)
Method of osteosynthesis radius/ulna fractures
(1262)

Number of patients

Intramedullary nail(s) 53%
K-wire(s) 40%
Other 8%

Indication for reoperation of radius/ulna fractures
(79)

Number of patients

Infection 6%
Muscle and soft-tissue revision 1%
Neurovascular complication 1%
New fracture 8%
Suboptimal osteosynthesis 10%
Secondary fracture displacement 58%
Pseudarthrosis/delayed union 10%
Pain or discomfort from osteosynthesis 10%
Primary surgeons for radius/ulna fractures (1700)

Level of supervision for radius/ulna fractures (1661)
level of supervision for interns and residents
radius/ulna fractures

(1580)

Number of patients

Below attending (298)
Attending or above (428)
Unsupervised (854)

Surgical delay for radius/ulna fractures

(1578)

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason:
radius/ulna fractures
(1924)

Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware:
radius/ulna fractures
(1917)
Method distribution for radius/ulna fractures
(1701)

Number of patients

<table>
<thead>
<tr>
<th>Method</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>3%</td>
</tr>
<tr>
<td>M1</td>
<td>3%</td>
</tr>
<tr>
<td>2D</td>
<td>36%</td>
</tr>
<tr>
<td>3M</td>
<td>45%</td>
</tr>
<tr>
<td>3E</td>
<td>13%</td>
</tr>
</tbody>
</table>
Method of osteosynthesis femur fractures

- Intramedullary nail(s) (48%)
- Plate (10%)
- Screws (21%)
- Other (22%)

Indication for reoperation of femur fractures

- Infection (6%)
- New fracture (6%)
- Suboptimal osteosynthesis (6%)
- Secondary fracture dislocation (6%)
- Pseudarthrosis / delayed union (62%)
- Pain or discomfort from osteosynthesis (6%)
- Bone necrosis (6%)

Number of patients
Primary surgeons for femur fractures

(111)

<table>
<thead>
<tr>
<th>Level of supervision</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year resident</td>
<td>3%</td>
</tr>
<tr>
<td>2 year resident</td>
<td>8%</td>
</tr>
<tr>
<td>3 year resident</td>
<td>20%</td>
</tr>
<tr>
<td>4-5 year resident</td>
<td>6%</td>
</tr>
<tr>
<td>Attending</td>
<td>44%</td>
</tr>
<tr>
<td>Traumatologist</td>
<td>19%</td>
</tr>
</tbody>
</table>

Level of supervision for femur fractures

(109)

<table>
<thead>
<tr>
<th>Level of supervision</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 year resident</td>
<td>1%</td>
</tr>
<tr>
<td>4-5 year resident</td>
<td>4%</td>
</tr>
<tr>
<td>Attending</td>
<td>25%</td>
</tr>
<tr>
<td>Traumatologist</td>
<td>10%</td>
</tr>
<tr>
<td>Unsupervised</td>
<td>61%</td>
</tr>
</tbody>
</table>
level of supervision for interns and residents
femur fractures
(67)

Surgical delay for femur fractures
(95)
Survival for primary surgery with reoperation due to any reason femur fractures (139)

Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware femur fractures (129)
Method distribution for femur fractures

(111)
Method of osteosynthesis tibia/fibula fractures

<table>
<thead>
<tr>
<th>Method</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intramedullary nail(s)</td>
<td>12%</td>
</tr>
<tr>
<td>K-wire(s)</td>
<td>18%</td>
</tr>
<tr>
<td>Plate</td>
<td>6%</td>
</tr>
<tr>
<td>Screw(s)</td>
<td>54%</td>
</tr>
<tr>
<td>Other</td>
<td>10%</td>
</tr>
</tbody>
</table>

Indication for reoperation of tibia/fibula fractures

<table>
<thead>
<tr>
<th>Indication</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infection</td>
<td>4%</td>
</tr>
<tr>
<td>Not healed preoperatively</td>
<td>4%</td>
</tr>
<tr>
<td>Suboptimal osteosynthesis</td>
<td>11%</td>
</tr>
<tr>
<td>Secondary fracture dislocation</td>
<td>41%</td>
</tr>
<tr>
<td>Pain or discomfort from osteosynthesis</td>
<td>41%</td>
</tr>
<tr>
<td>Pain or discomfort from osteosynthesis</td>
<td></td>
</tr>
</tbody>
</table>
Primary surgeons for tibia/fibula fractures

Number of patients

1 year resident: 14%
2 year resident: 9%
3 year resident: 11%
4-5 year resident: 18%
Attending: 37%
Traumatologist: 11%

Level of supervision for tibia/fibula fractures

Number of patients

1 year resident: 0%
2 year resident: 1%
3 year resident: 1%
4-5 year resident: 6%
Attending: 25%
Traumatologist: 6%
Unsupervised: 61%
level of supervision for interns and residents

tibia/fibula fractures

(200)

Number of patients

<table>
<thead>
<tr>
<th>Level of Supervision</th>
<th>1 year resident</th>
<th>2 year resident</th>
<th>3 year resident</th>
<th>4-5 year resident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below attending</td>
<td>27%</td>
<td>53%</td>
<td>69%</td>
<td>29%</td>
</tr>
<tr>
<td>Attending or above</td>
<td>33%</td>
<td>41%</td>
<td>26%</td>
<td>2%</td>
</tr>
<tr>
<td>Unsupervised</td>
<td>33%</td>
<td>6%</td>
<td>5%</td>
<td>69%</td>
</tr>
</tbody>
</table>

Surgical delay for tibia/fibula fractures

(245)

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason
tibia/fibula fractures
(325)

Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
tibia/fibula fractures
(317)
Method distribution for tibia/fibula fractures
(266)
Method of osteosynthesis hand fractures

(124)

Number of patients

<table>
<thead>
<tr>
<th>Method</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>K-wire(s)</td>
<td>100</td>
</tr>
<tr>
<td>Other</td>
<td>14</td>
</tr>
</tbody>
</table>

Indication for reoperation of hand fractures

(4)

Number of patients

<table>
<thead>
<tr>
<th>Indication</th>
<th>Number of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suboptimal osteosynthesis</td>
<td>50</td>
</tr>
<tr>
<td>Secondary fracture dislocation or osteosynthesis failure</td>
<td>25</td>
</tr>
<tr>
<td>Bone necrosis</td>
<td>25</td>
</tr>
</tbody>
</table>
level of supervision for interns and residents
hand fractures
(110)

Number of patients

Intern 1 year resident 2 year resident 3 year resident 4-5 year resident

Below attending (17) Attending or above (43) Unsupervised (50)

Surgical delay for hand fractures
(141)

Hours

Number of patients

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason hand fractures

(172)

Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware hand fractures

(172)
Method of osteosynthesis foot fractures

(26)

K-wire(s) 77%
Plate 12%
Other 12%

Indication for reoperation of foot fractures

(1)

Muscle and soft tissue revision 100%
Primary surgeons for foot fractures
(28)

Level of supervision for foot fractures
(28)
level of supervision for interns and residents
foot fractures

(17)

Number of patients

Below attending (1)
Attending or above (6)
Unsupervised (10)

Surgical delay for foot fractures

(25)

(Proportion of patients operated in 24 hour intervals)
Survival for primary surgery with reoperation due to any reason
foot fractures
(35)

Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
foot fractures
(35)
<table>
<thead>
<tr>
<th>Registered parameter</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patient related parameters</strong></td>
<td></td>
</tr>
<tr>
<td>CPR</td>
<td>Unique ID</td>
</tr>
<tr>
<td>Gender</td>
<td>Male / Female</td>
</tr>
<tr>
<td>Age</td>
<td>Years</td>
</tr>
<tr>
<td>ASA score*</td>
<td>1/2/3/4</td>
</tr>
<tr>
<td><strong>Trauma related parameters</strong></td>
<td></td>
</tr>
<tr>
<td>Operated side</td>
<td>Left / Right</td>
</tr>
<tr>
<td>Date and Time of the radiological exam**</td>
<td>Time of the day and date</td>
</tr>
<tr>
<td>Major Trauma ***</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Gustillo Type</td>
<td>Closed / 1 / 2 / 3a / 3b / 3c</td>
</tr>
<tr>
<td>Neurovascular status</td>
<td>Unimpaired / dyesthesia / paraesthesia / lack of pulse</td>
</tr>
<tr>
<td>Pathologic fracture****</td>
<td>Yes / No</td>
</tr>
<tr>
<td><strong>Surgery related parameters</strong></td>
<td></td>
</tr>
<tr>
<td>Date and Time of surgery</td>
<td>Time of the day and date</td>
</tr>
<tr>
<td>Procedure Type</td>
<td>Primary / secondary / planned*****</td>
</tr>
<tr>
<td>Fracture Type</td>
<td>Adult / pediatric / periprosthetic</td>
</tr>
<tr>
<td>Fracture Diagnosis</td>
<td>AO Müller / Rorabeck / Vancouver classification</td>
</tr>
<tr>
<td>Method of osteosynthesis</td>
<td>Locking plate, non-locking plate, screw (one or more), K-wire, steel wire, cable, threaded wire, intramedullary nail, elastic nail, external fixation (bars), external fixation (ring), hemi arthroplasty, total arthroplasty, sliding hip screw, intramedullary nail with sliding screw (short), intramedullary nail with sliding screw (long), Hook plate, removal of hardware, fracture reduction w/o osteosynthesis, Hook pins, Polyfix, arthroplasty reduction, locking attachment plate, syndesmotic screw(s), ASLS screw for intramedullary, none of the above.</td>
</tr>
<tr>
<td><strong>Supplemental surgical procedures</strong></td>
<td>Arthrodesis, bone resection, osteotomy, bone suture, Bone transplant (autograft), Bone transplant (allograft), Bone transplant (substitute), Amputation, fasciotomy, soft-tissue debridement, brissement, hematoma evacuation, tendon surgery, nerve or vascular surgery, ligament surgery, none of the above, reaming, nerve decompression, secondary suture, meniscal / labral suture, meniscal / labral resection, prosthesis exchange, VAC therapy, skin transplant, joint reduction, arthroscopic assistance.</td>
</tr>
<tr>
<td>Antibiotic prophylaxis</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Use of tourniquet</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Educational level of the surgeon</td>
<td>Intern, 1st year resident, 2nd year resident, 3rd year resident, 4-5th year resident, attending, traumatologist******</td>
</tr>
<tr>
<td>Educational level of the supervisor if present</td>
<td>Intern, 1st year resident, 2nd year resident, 3rd year resident, 4-5th year resident, attending, traumatologist******</td>
</tr>
</tbody>
</table>
** American Society of Anaesthesiologist (ASA) score

** Date and time of the radiological examination that provided indication for surgery

*** Major trauma was defined as when a trauma team was assembled upon arrival of the patient to the hospital

**** Pathologic fracture as suspected on radiological exam

***** A primary surgical procedure is defined as the first surgical procedure due to a fracture. A planned secondary procedure is defined as a surgical procedure that is a part of the primary treatment plan following primary surgery. A reoperation is defined as a surgical procedure that is not a part of an initial treatment plan following primary surgery

****** Traumatologist: attending in orthopaedic surgery with at least 2 years of trauma subspecialization.

<table>
<thead>
<tr>
<th>Indications for reoperation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infection</td>
</tr>
<tr>
<td>Muscle- and soft-tissue revision</td>
</tr>
<tr>
<td>Neurovascular complication</td>
</tr>
<tr>
<td>New fracture</td>
</tr>
<tr>
<td>Not identified intraoperative fracture</td>
</tr>
<tr>
<td>Suboptimal osteosynthesis</td>
</tr>
<tr>
<td>Secondary fracture dislocation or osteosynthesis failure</td>
</tr>
<tr>
<td>Pseudoarthrosis</td>
</tr>
<tr>
<td>Bone necrosis</td>
</tr>
<tr>
<td>Pain or discomfort from osteosynthesis</td>
</tr>
</tbody>
</table>

Indications for reoperation that are registered by the surgeon in DFDB when reoperation is registered.
The report is published in collaboration with the Department of Orthopaedic Surgery, Hvidovre Hospital