www.dfdb.dk

Annual Report 2014
The Danish Fracture Database

Preface

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.

Steering Committee

The idea behind DFDB and the registry's recent progress are attributed to Michael Brix and Anders Troelsen. 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.

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.

Summary and comments

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 female 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 radius (7%) were the 3 most frequently reoperated anatomical regions in adults. Radius/ulna (47%), humerus (24%), and tibia (16%) were the 3 most frequently reoperated anatomical regions in children. Pain and discomfort due to osteosynthesis material (35%), secondary fracture dislocation (16%), and infection 15%) were the 3 most frequent indications for adult reoperations. Secondary fracture dislocation (40%), suboptimal osteosynthesis (24%), and pain and discomfort due to osteosynthesis material (20%) were the 3 most frequent indications for paediatric reoperations.

Level of education

60% of all primary surgeries were performed by surgeons in training (intern - 5 year resident). Interns, 1 year resident, 2 year resident, and 3 year residents performed more procedures under supervision than without supervision, while 4-5 year residents, attending surgeons, and traumatologist performed more procedures without supervision than with supervision

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

Gromov K, Fristed JV, Brix M, Troelsen A. Completeness and data validity for the Danish Fracture Database. Danish medical journal. 2013 Oct;60 (10):A4712. PubMed PMID: 24083526.

Andersen MJ, Kuhlman M, Brix M, Gromov K, Troelsen A. Validation of fracture treatment codes from the Danish National Patient Registry: Implications for The Danish Fracture Database. DOS Congress 2014.

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

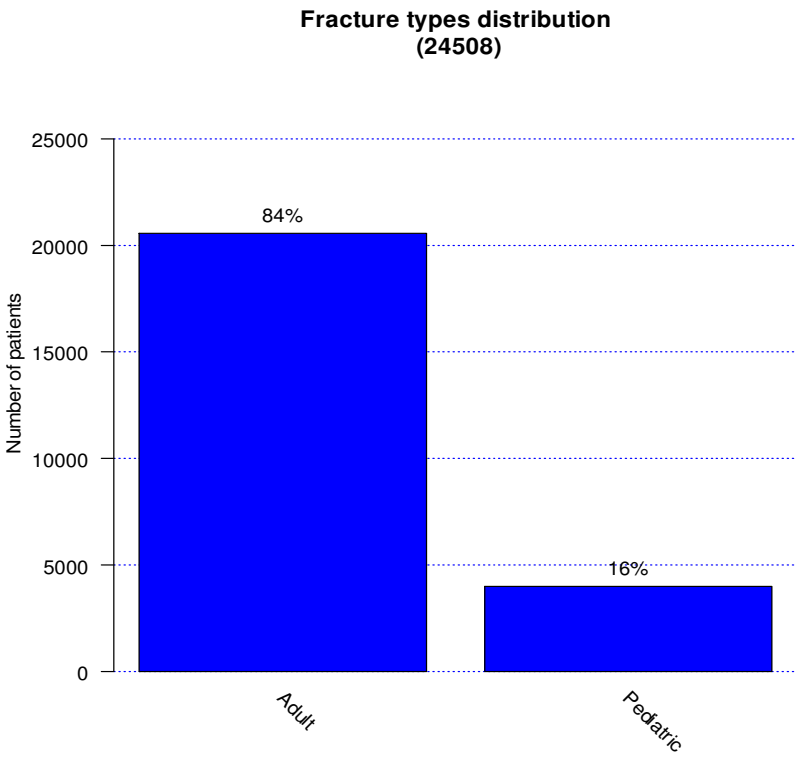
Sydvestjysk Hospital Esbjerg

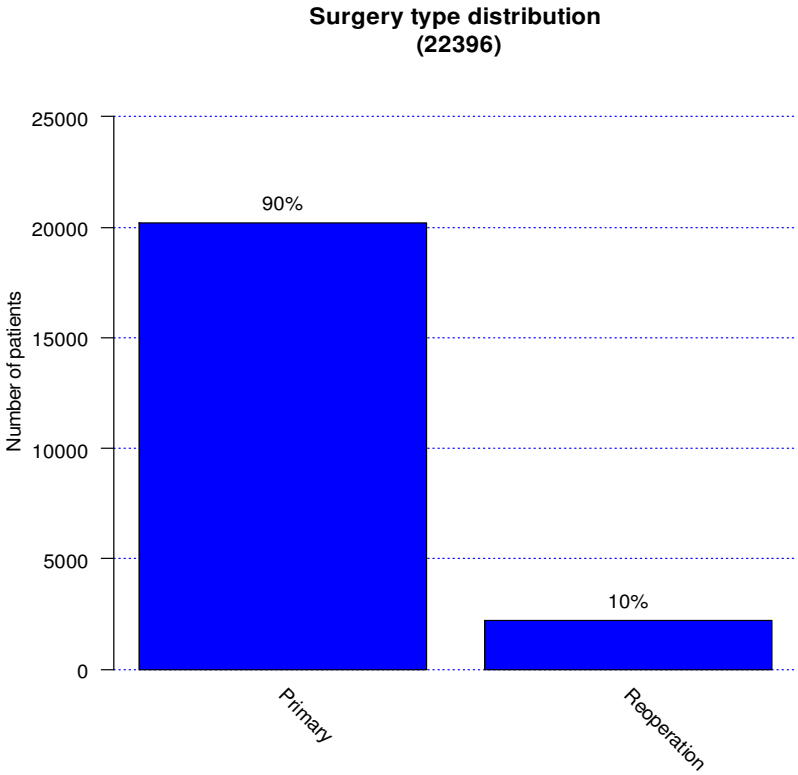
Vejle Hospital

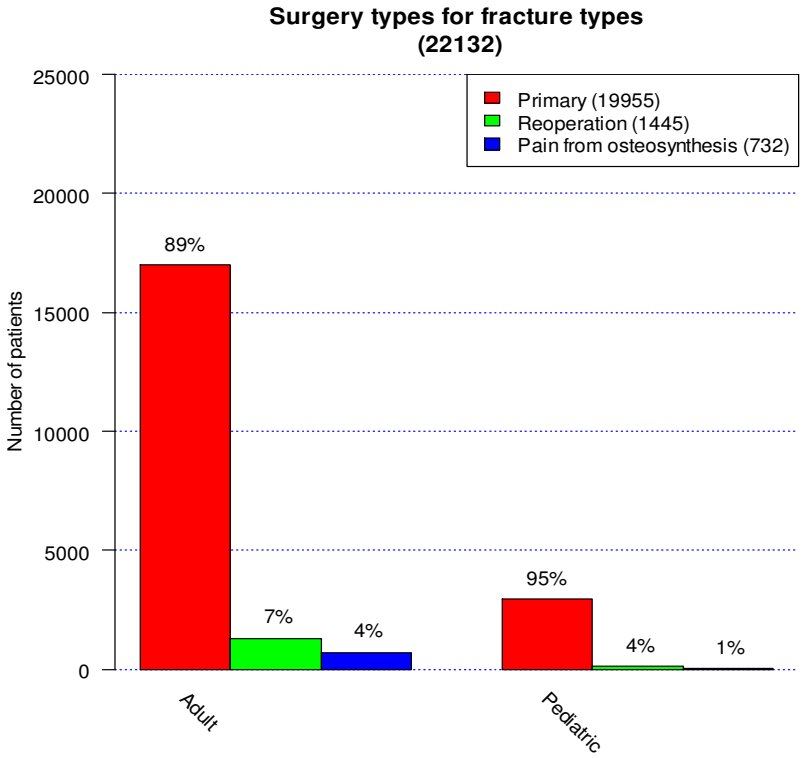
Viborg Hospital

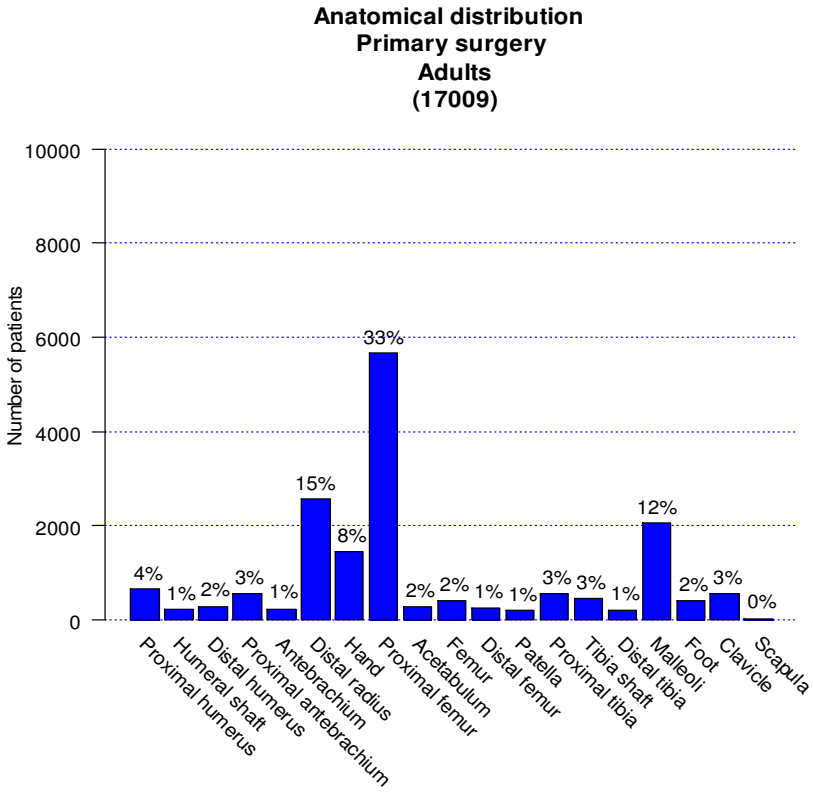
General overview of data

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

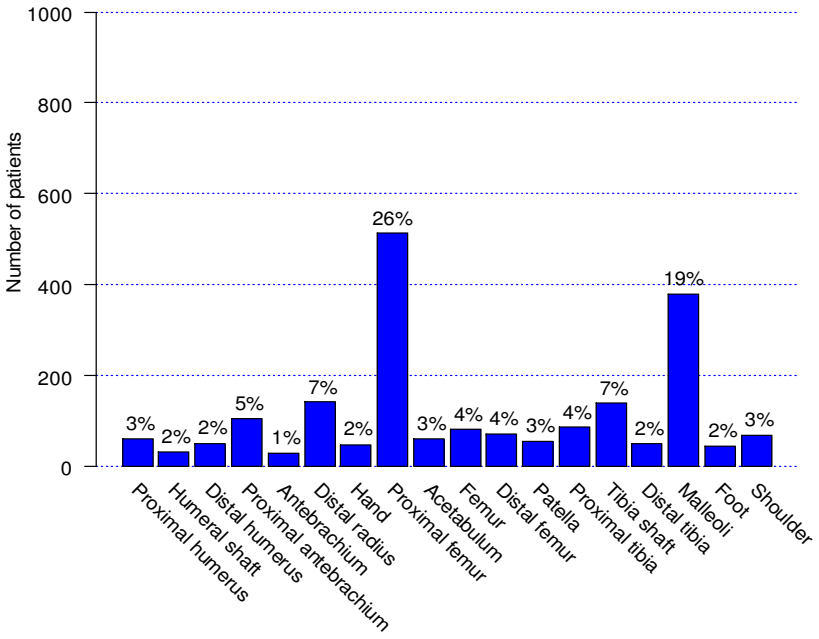




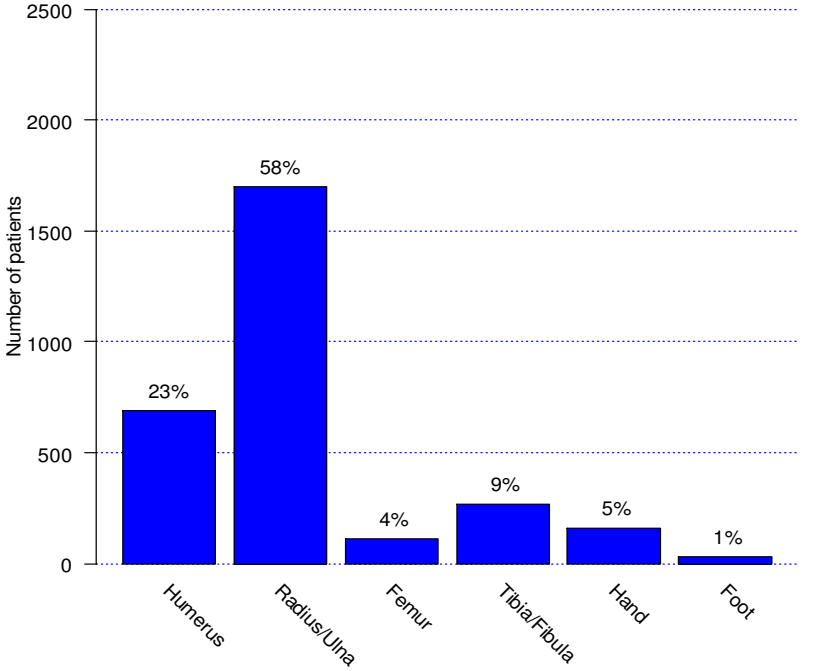

Surgery types for fracture types
(22132)
Primary (19955)
Reoperation (1445)
Pain from osteosynthesis (732)
Number of patients
25000
20000
15000
10000
5000
0
89%
7%
4%
95%
4%
1%
Adult
Pediatric


Anatomical distribution
Primary surgery
Adults
(17009)
Number of patients
10000
8000
6000
4000
2000
0
4%
1%
2%
3%
1%
15%
8%
33%
2%
2%
1%
1%
3%
3%
1%
12%
2%
3%
0%
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
Scapula

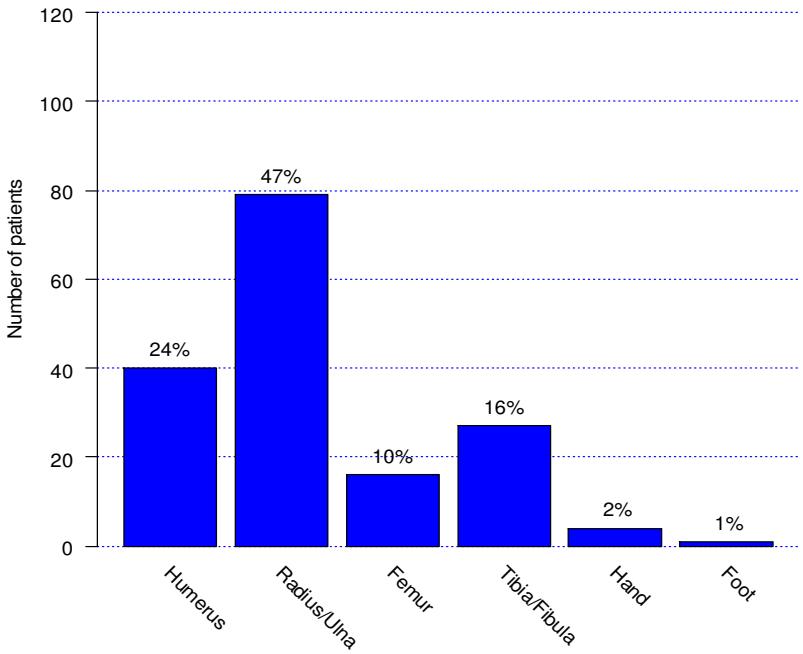
Anatomical distribution
Reoperations
Adults
(2011)



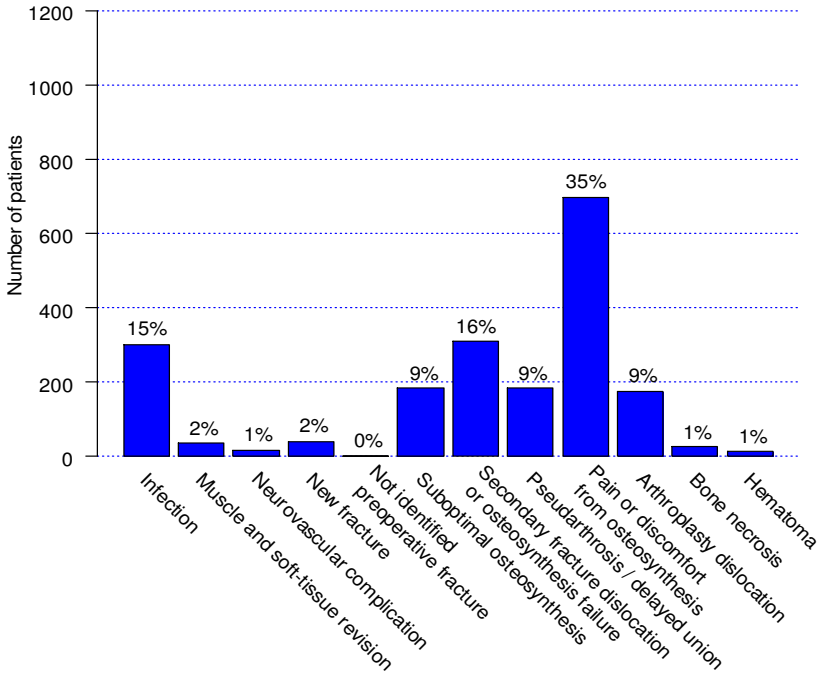
Anatomical distribution
Primary surgery
Pediatric
(2955)



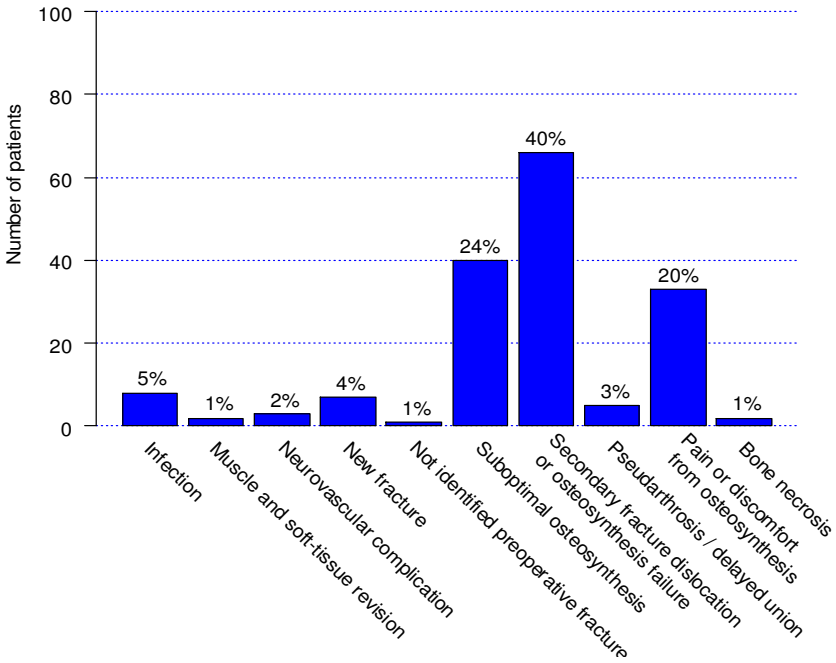
Anatomical distribution
Reoperation
Pediatric
(167)



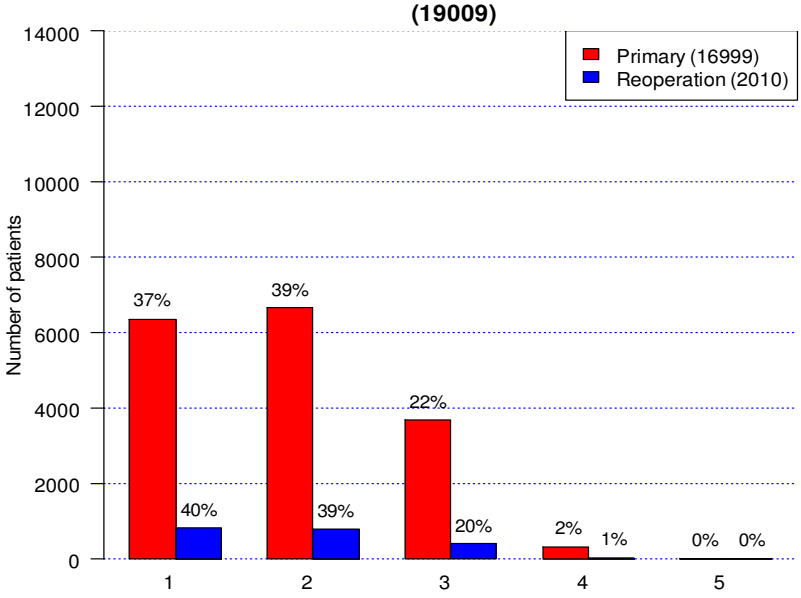
Primary indication for reoperation
Adults
(1995)

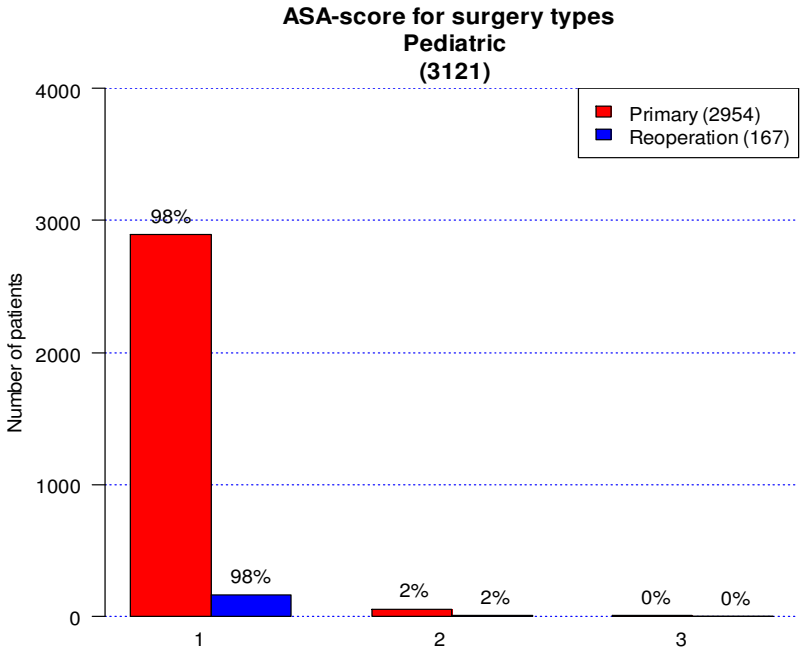


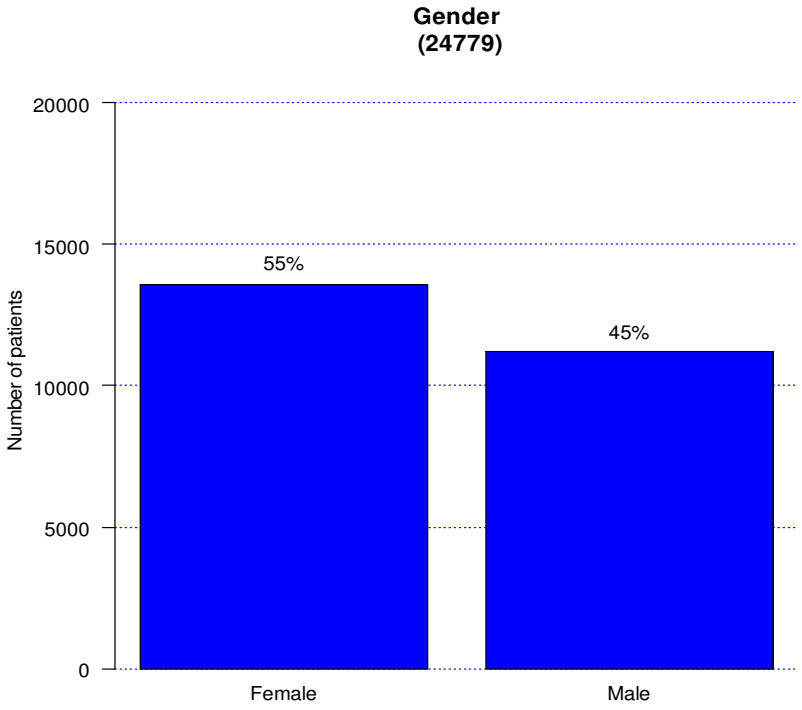
Primary indication for reoperation
Pediatric
(167)

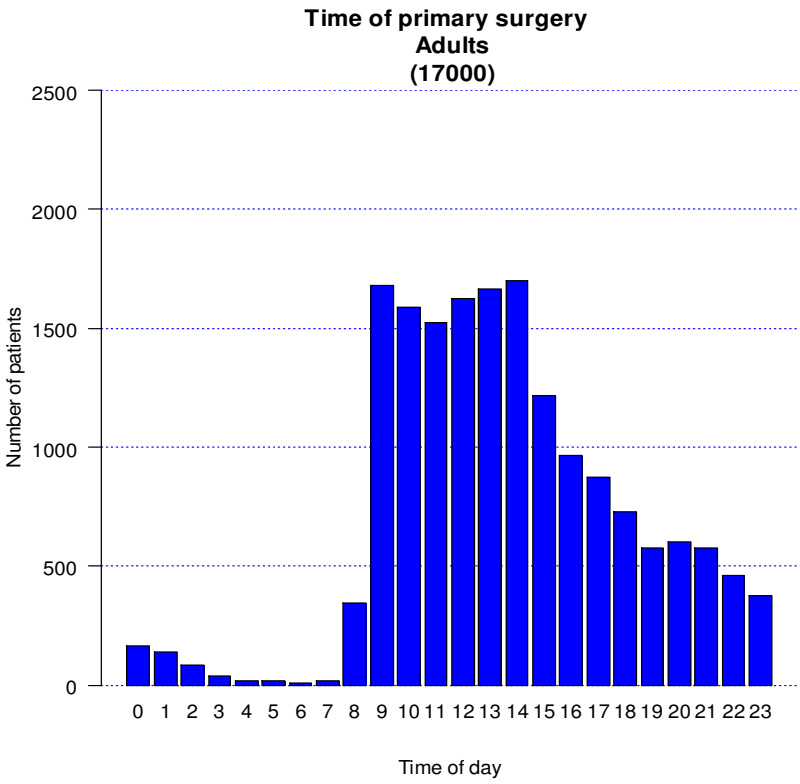


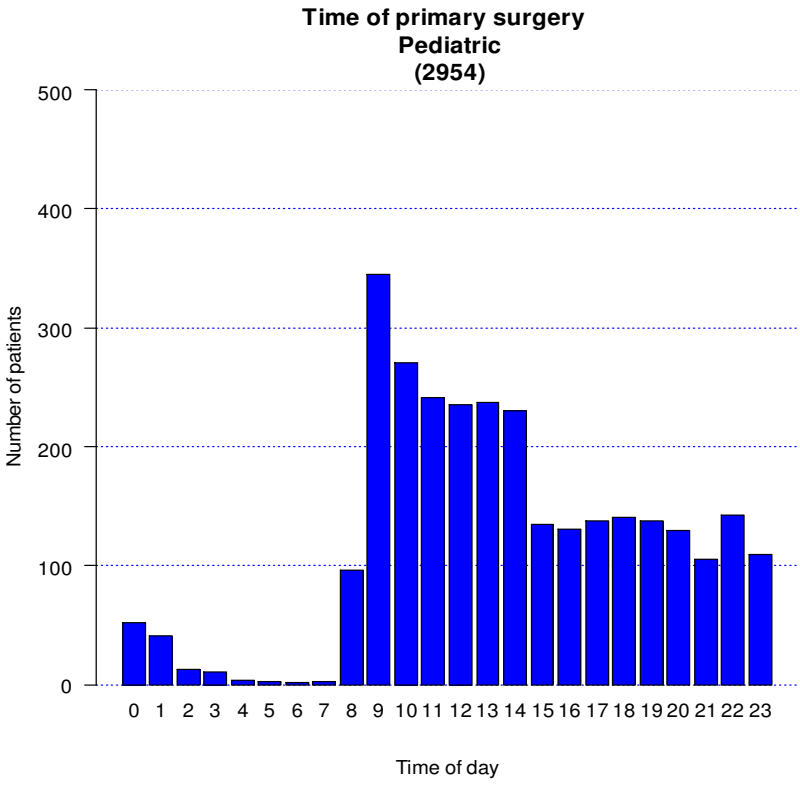
ASA-score for surgery types
Adults
(19009)

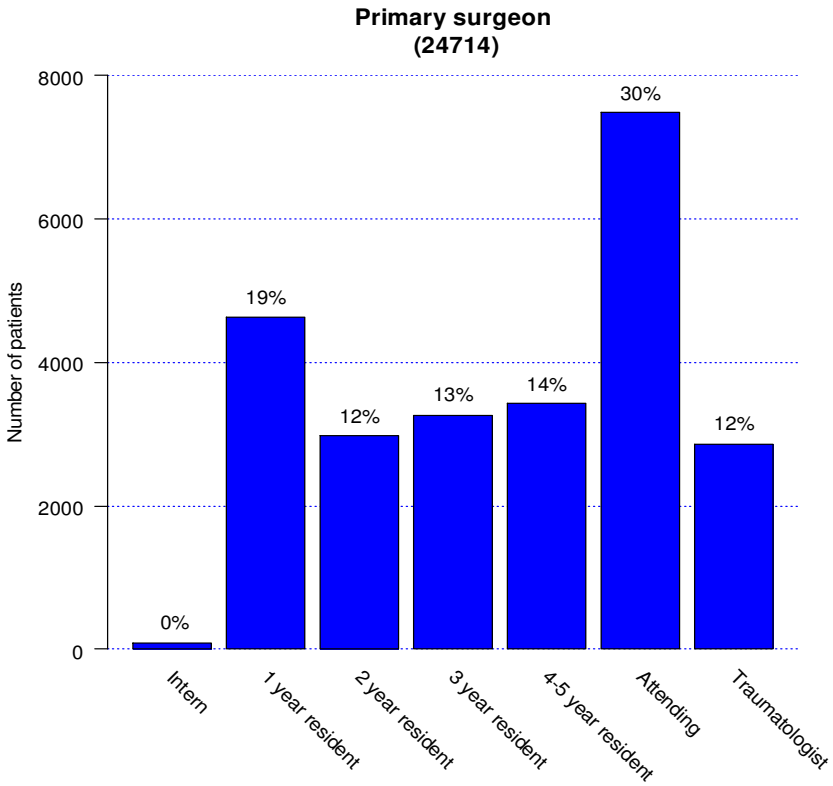


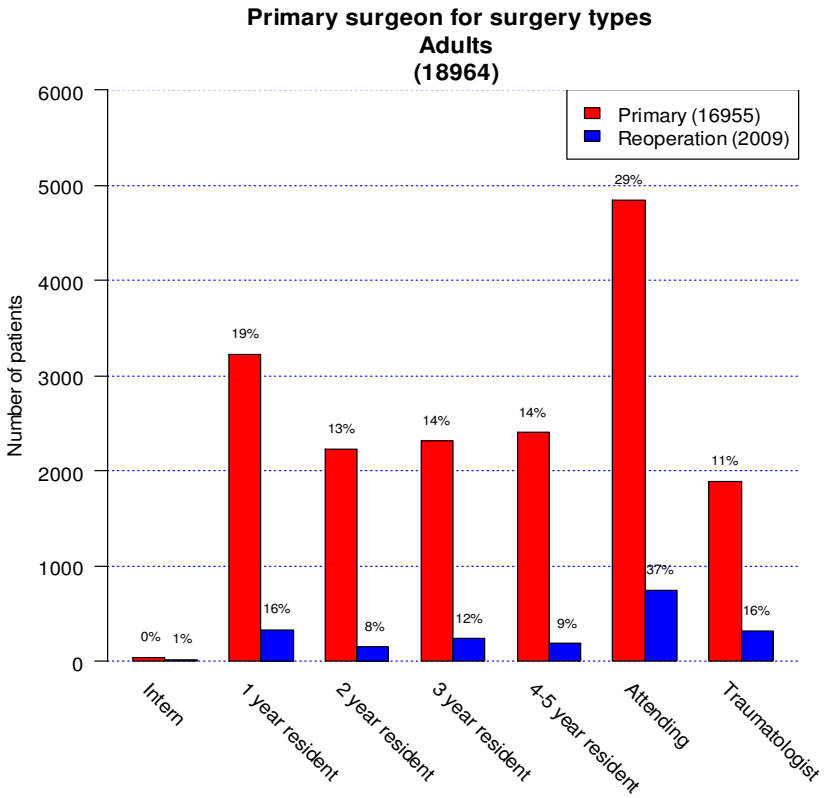

ASA-score for surgery types
Pediatric
(3121)
Primary (2954)
Reoperation (167)
Number of patients
4000
3000
2000
1000
0
98%
98%
2%
2%
0%
0%
1
2
3

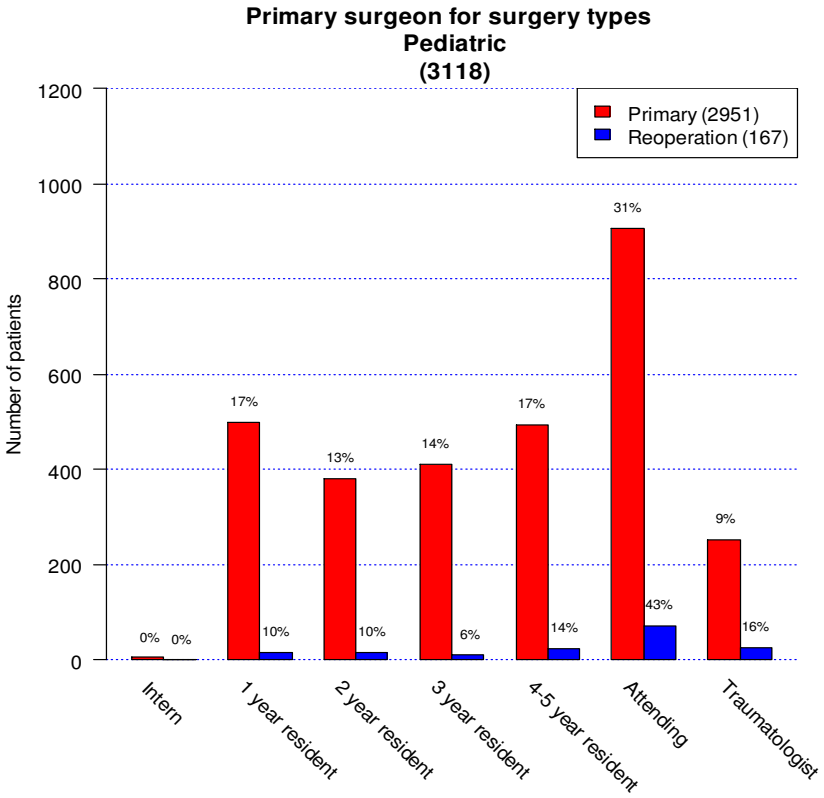

Gender
(24779)
Number of patients
20000
15000
10000
5000
0
55%
45%
Female
Male

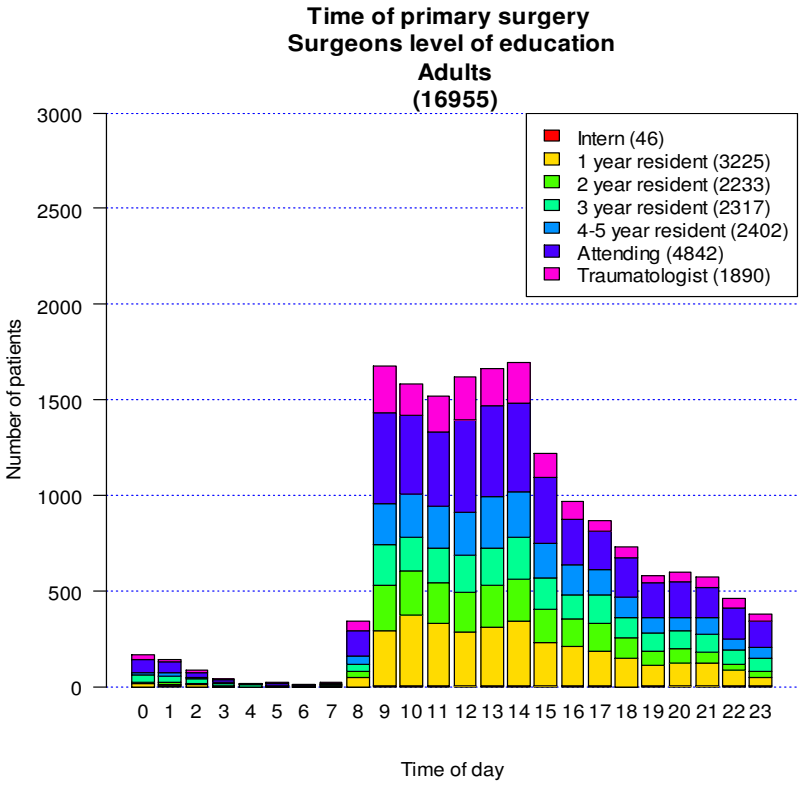

Time of primary surgery
Adults
(17000)
Number of patients
2500
2000
1500
1000
500
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Time of day

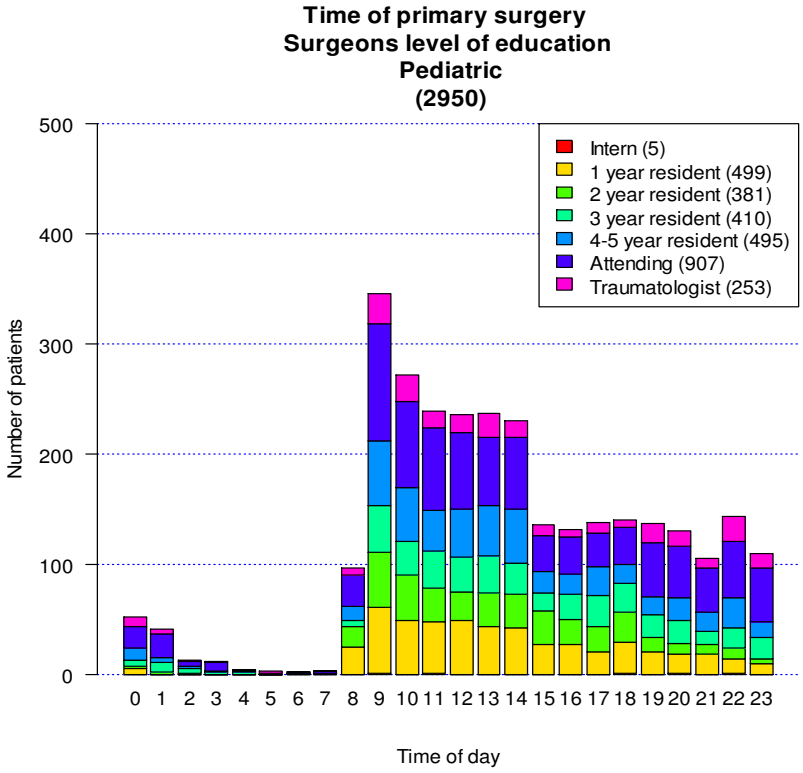

Time of primary surgery
Pediatric
(2954)
Number of patients
500
400
300
200
100
0
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Time of day

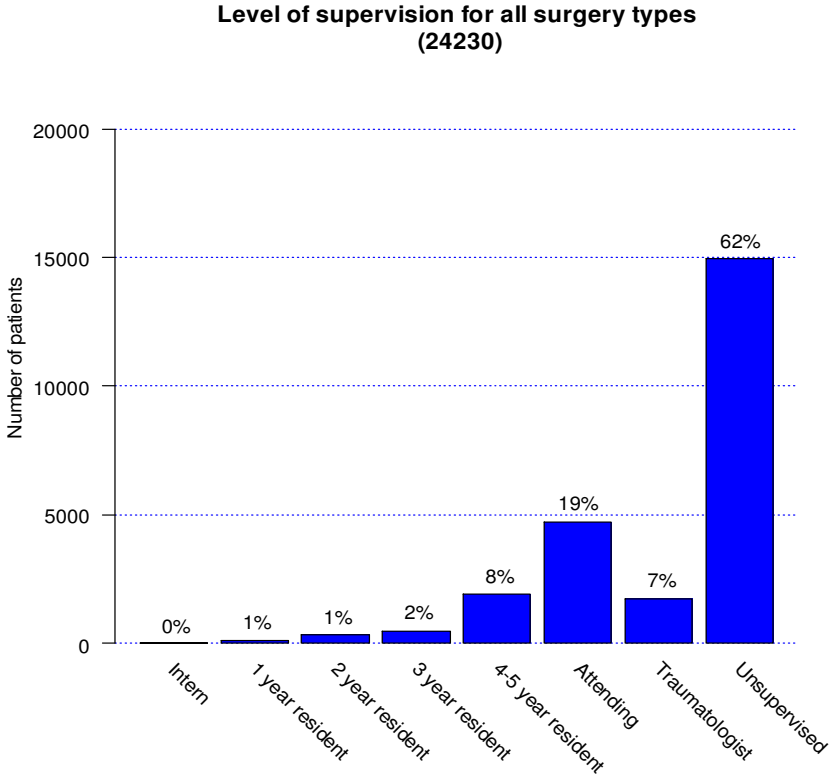

Primary surgeon
(24714)
Number of patients
8000
6000
4000
2000
0
0%
19%
12%
13%
14%
30%
12%
Intern
1 year resident
2 year resident
3 year resident
4-5 year resident
Attending
Traumatologist

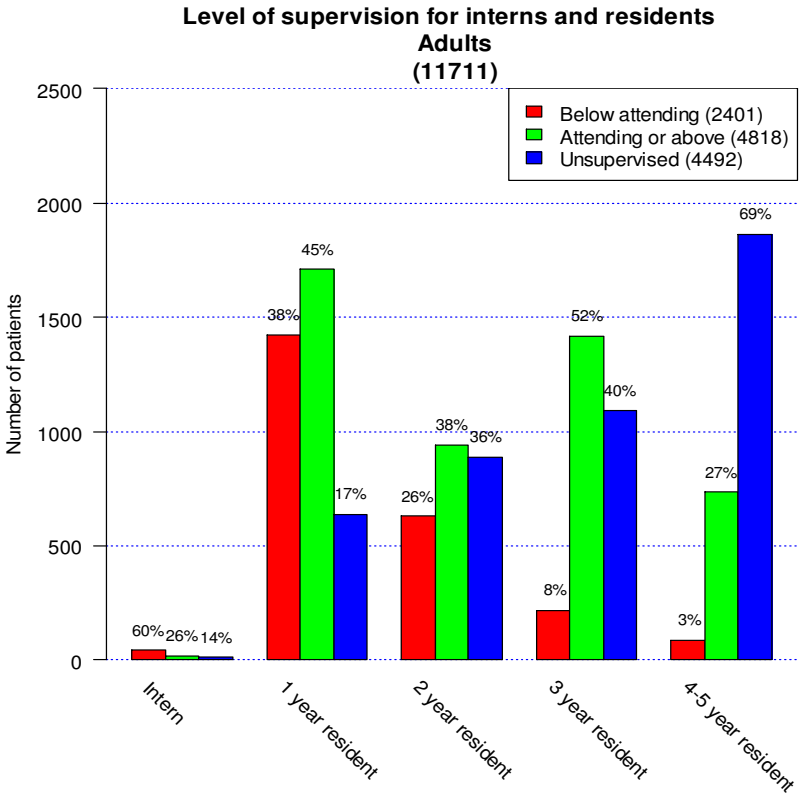

Primary surgeon for surgery types
Adults
(18964)
Primary (16955)
Reoperation (2009)
Number of patients
6000
5000
4000
3000
2000
1000
0
0%
1%
19%
16%
13%
8%
14%
12%
14%
9%
29%
37%
11%
16%
Intern
1 year resident
2 year resident
3 year resident
4-5 year resident
Attending
Traumatologist

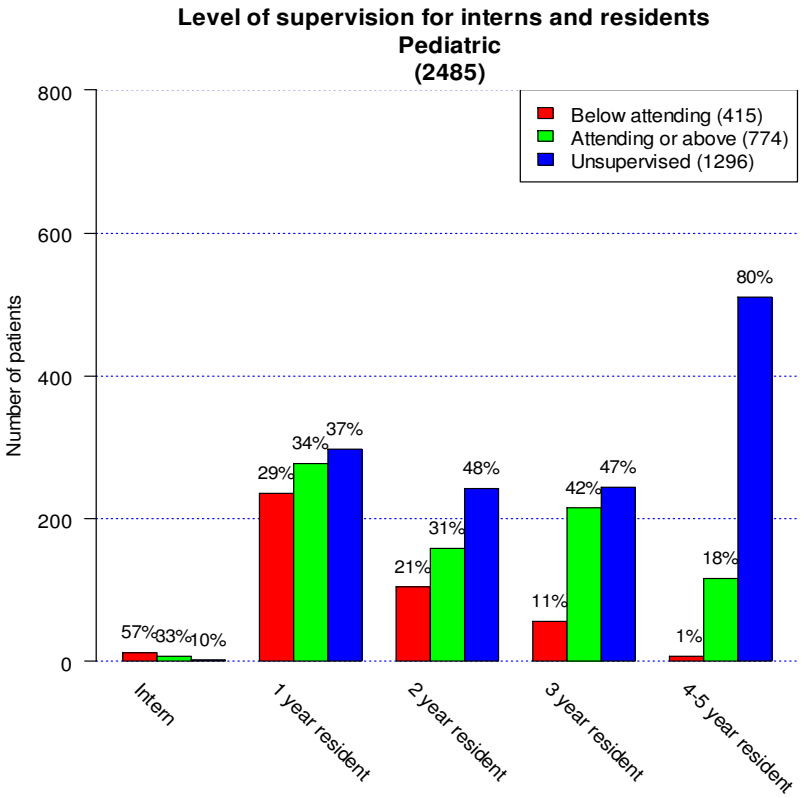

Primary surgeon for surgery types
Pediatric
(3118)
Primary (2951)
Reoperation (167)
Number of patients
0
200
400
600
800
1000
1200
0%
0%
17%
10%
13%
10%
14%
6%
17%
14%
31%
43%
9%
16%
Intern
1 year resident
2 year resident
3 year resident
4-5 year resident
Attending
Traumatologist


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
0
500
1000
1500
2000
2500
3000
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Time of day

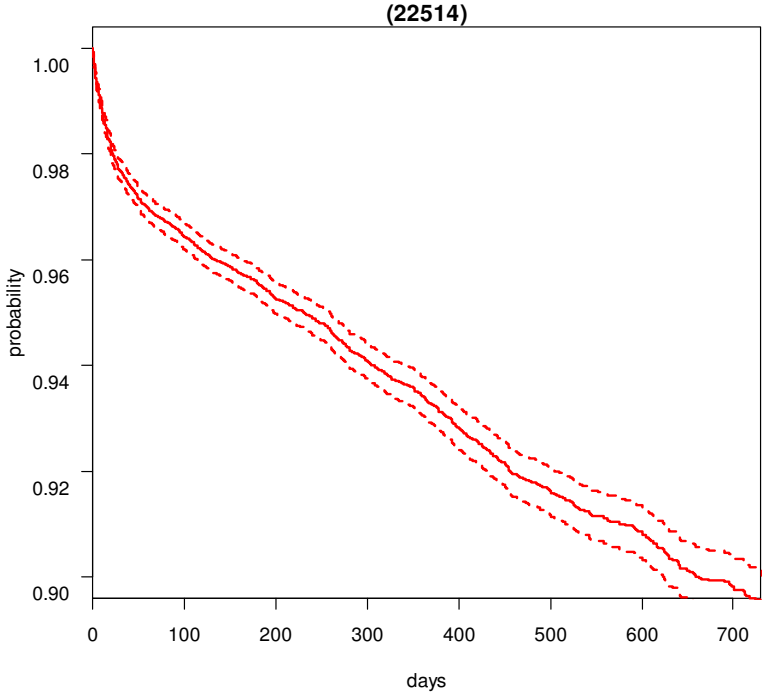

Time of primary surgery
Surgeons level of education
Pediatric
(2950)
Intern (5)
1 year resident (499)
2 year resident (381)
3 year resident (410)
4-5 year resident (495)
Attending (907)
Traumatologist (253)
Number of patients
Time of day


Level of supervision for all surgery types
(24230)
Number of patients
0%
1%
1%
2%
8%
19%
7%
62%
Intern
1 year resident
2 year resident
3 year resident
4-5 year resident
Attending
Traumatologist
Unsupervised

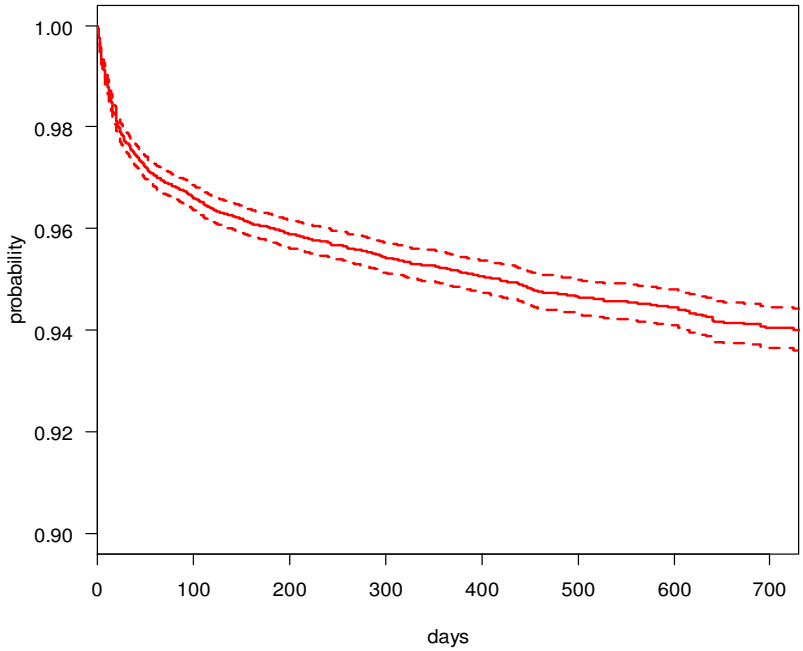

Level of supervision for interns and residents
Adults
(11711)
Below attending (2401)
Attending or above (4818)
Unsupervised (4492)
Number of patients
2500
2000
1500
1000
500
0
60%
26%
14%
38%
45%
17%
26%
38%
36%
8%
52%
40%
3%
27%
69%
Intern
1 year resident
2 year resident
3 year resident
4-5 year resident

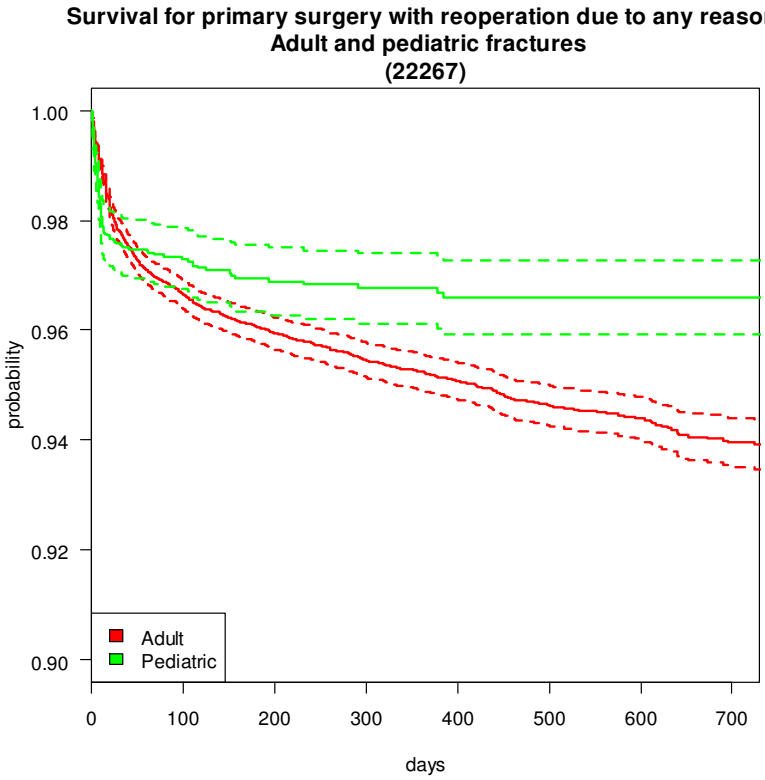

Level of supervision for interns and residents
Pediatric
(2485)
Below attending (415)
Attending or above (774)
Unsupervised (1296)
Number of patients
800
600
400
200
0
57%
33%
10%
29%
34%
37%
21%
31%
48%
11%
42%
47%
1%
18%
80%
Intern
1 year resident
2 year resident
3 year resident
4-5 year resident

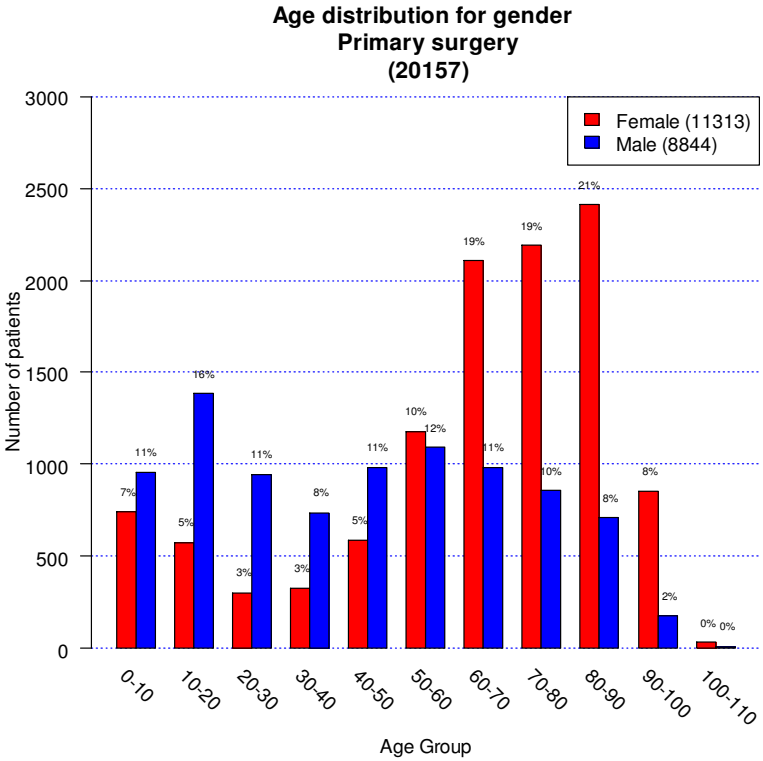
Survival for primary surgery with reoperation due to any reason as endpoint
All procedures
(22514)

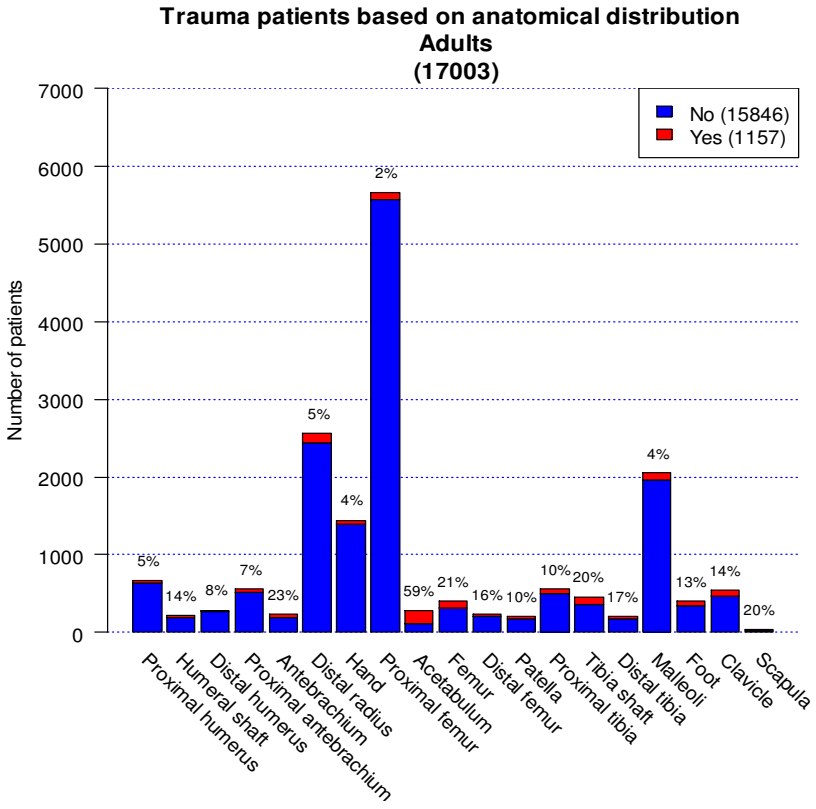


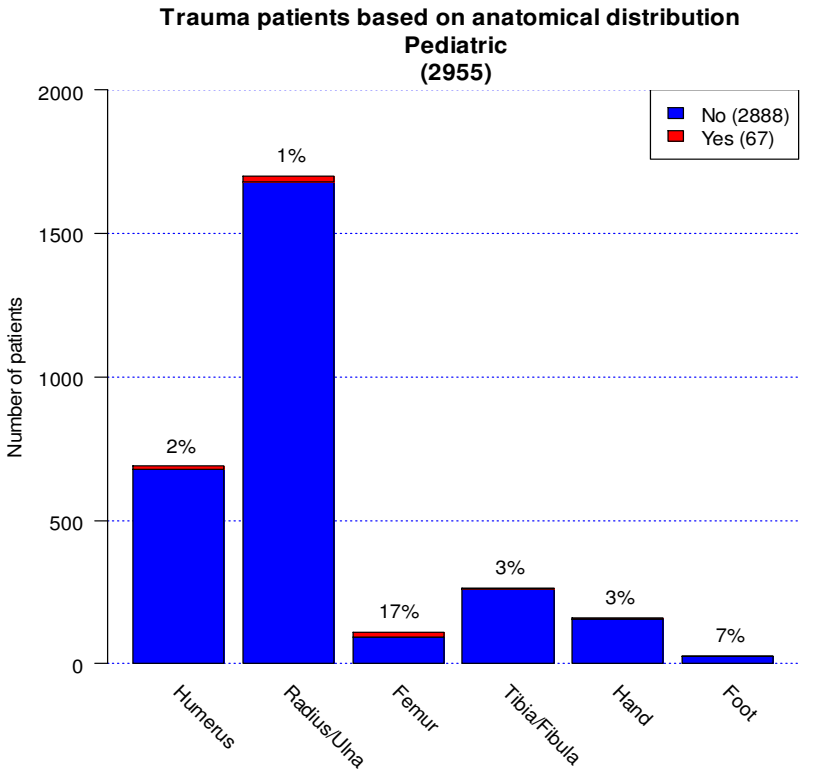
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware
All procedures
(21860)




Survival for primary surgery with reoperation due to any reason
Adult and pediatric fractures
(22267)
probability
1.00
0.98
0.96
0.94
0.92
0.90
Adult
Pediatric
0
100
200
300
400
500
600
700
days


Age distribution for gender
Primary surgery
(20157)
Number of patients
3000
2500
2000
1500
1000
500
0
Female (11313)
Male (8844)
7%
11%
5%
16%
3%
11%
3%
8%
5%
11%
10%
12%
19%
11%
19%
10%
21%
8%
8%
2%
0%
0%
0-10
10-20
20-30
30-40
40-50
50-60
60-70
70-80
80-90
90-100
100-110
Age Group

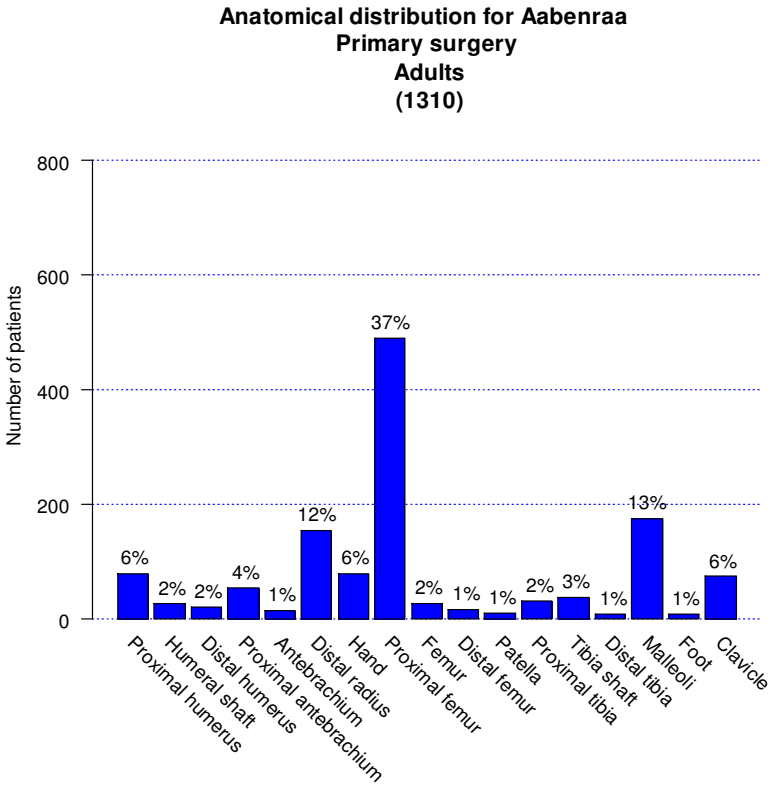

Trauma patients based on anatomical distribution
Adults
(17003)
No (15846)
Yes (1157)
Number of patients
7000
6000
5000
4000
3000
2000
1000
0
5%
14%
8%
7%
23%
5%
4%
2%
59%
21%
16%
10%
10%
20%
17%
4%
13%
14%
20%
Proximal humerus
Humeral shaft
Distal humerus
Proximal antebrachium
Antebrachium
Distal radius
Hand
Proximal femur
Acetabulum
Femur
Distal femur
Patella
Proximal tibia
Tibia shaft
Distal tibia
Malleoli
Foot
Clavicle
Scapula

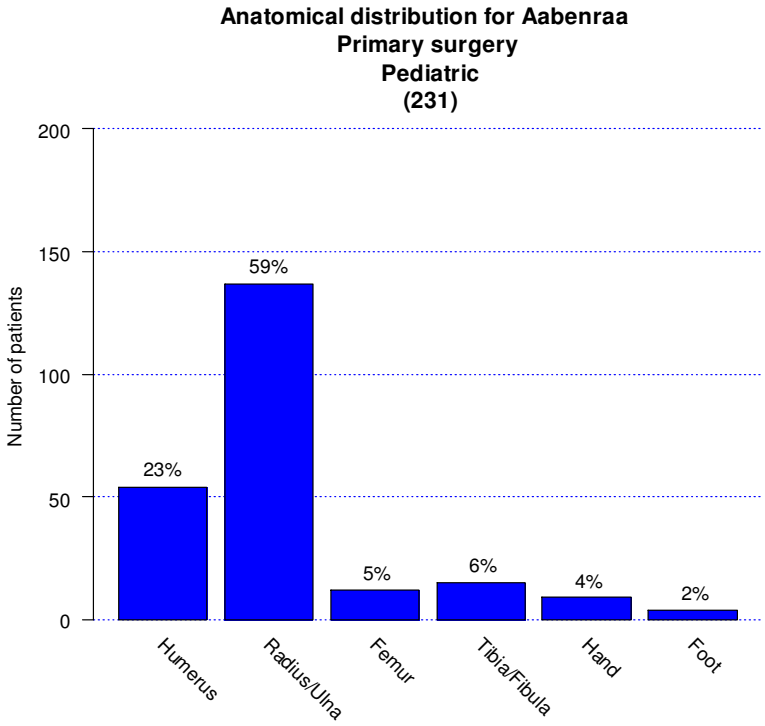

Trauma patients based on anatomical distribution
Pediatric
(2955)
No (2888)
Yes (67)
Number of patients
2000
1500
1000
500
0
2%
1%
17%
3%
3%
7%
Humerus
Radius/Ulna
Femur
Tibia/Fibula
Hand
Foot

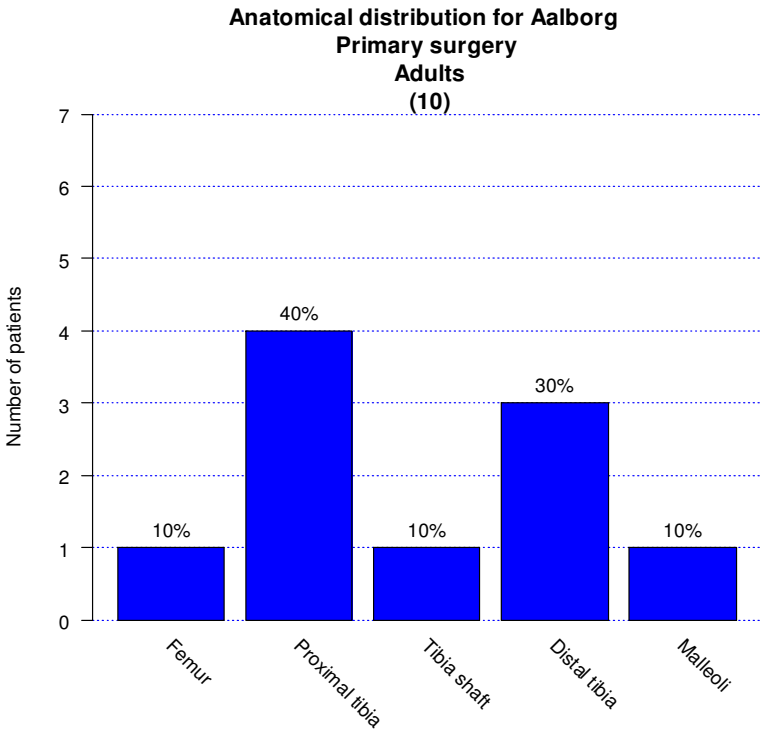
Department specific data

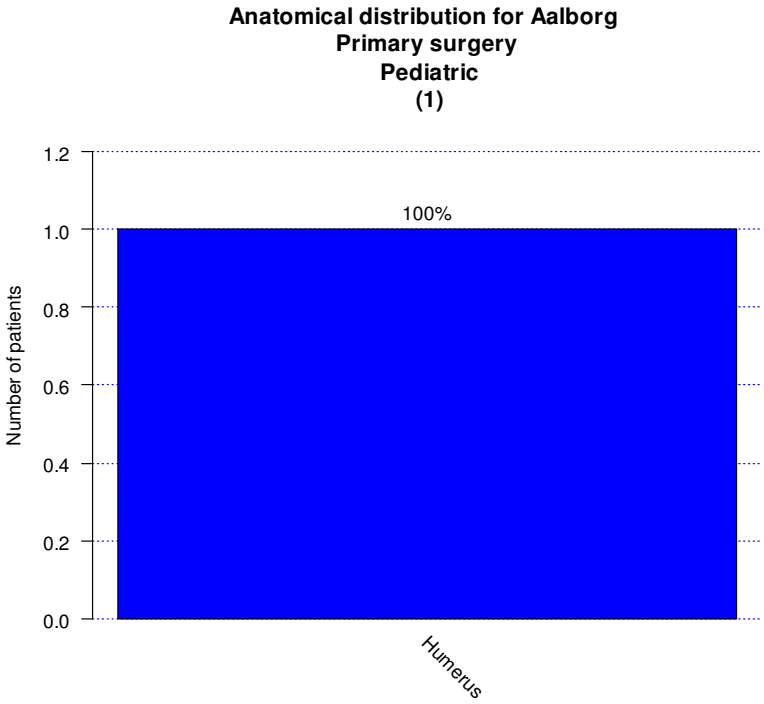
This section provides department specific data for 16 departments. No data is presented for departments who joined the DFDB after data was extracted for this annual report.

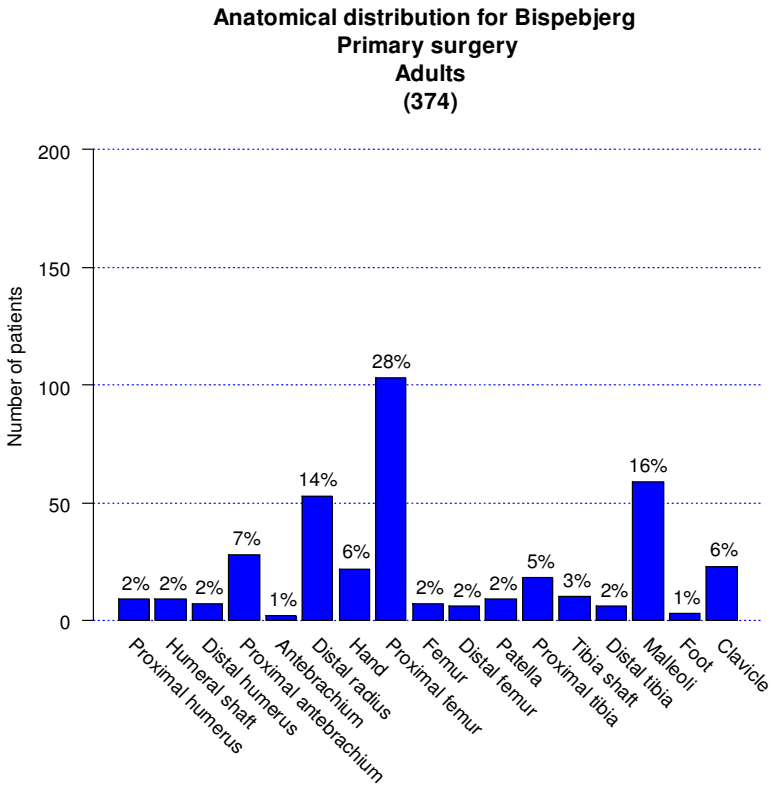
Aabenraa Hospital

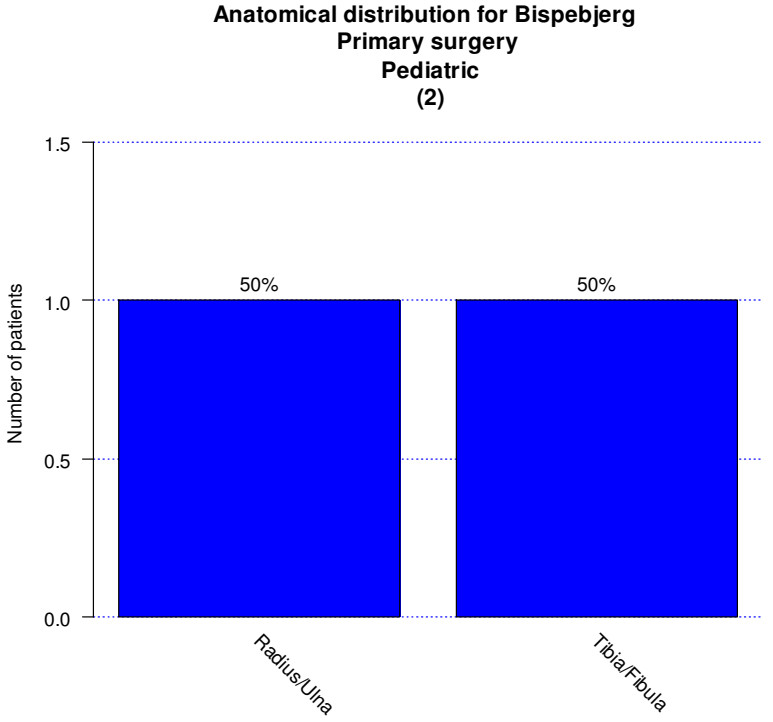




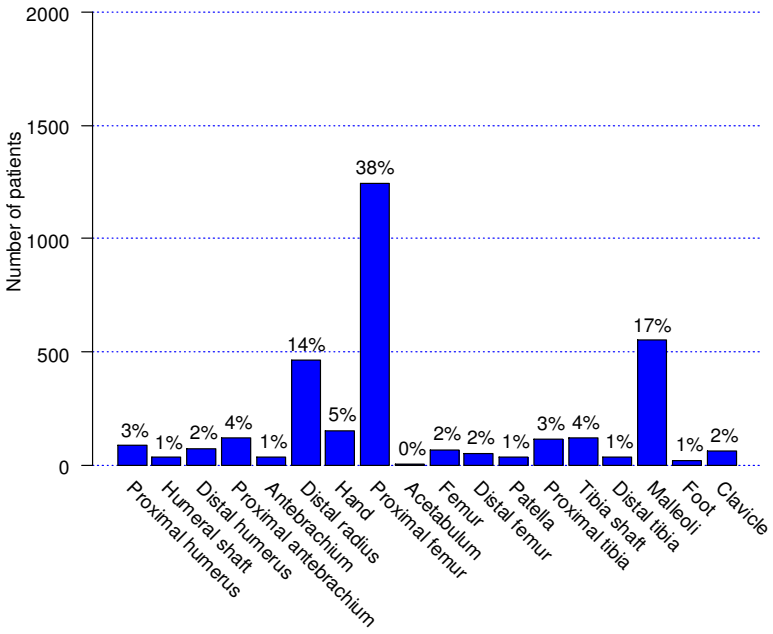

Anatomical distribution for Aalborg
Primary surgery
Adults
(10)
Number of patients
0
1
2
3
4
5
6
7
10%
40%
10%
30%
10%
Femur
Proximal tibia
Tibia shaft
Distal tibia
Malleoli


Anatomical distribution for Aalborg
Primary surgery
Pediatric
(1)
Number of patients
0.0
0.2
0.4
0.6
0.8
1.0
1.2
100%
Humerus

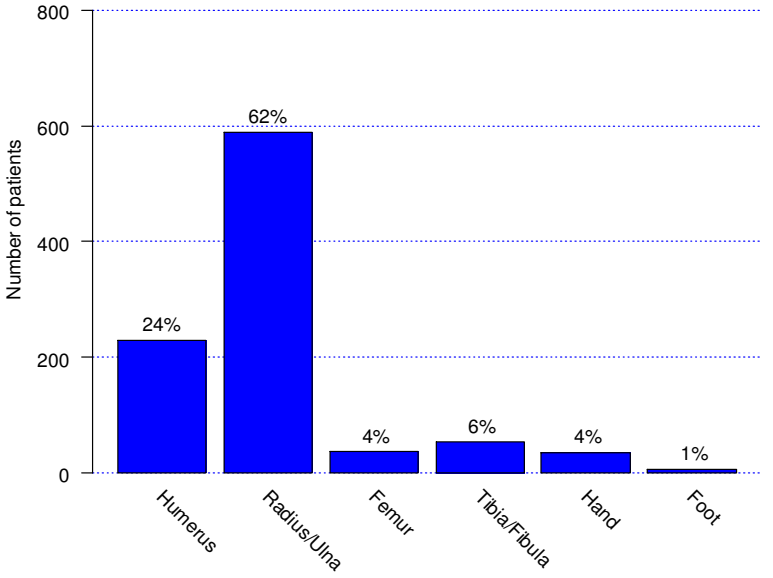

Anatomical distribution for Bispebjerg
Primary surgery
Adults
(374)
Number of patients
200
150
100
50
0
2%
2%
2%
7%
1%
14%
6%
28%
2%
2%
2%
5%
3%
2%
16%
1%
6%
Proximal humerus
Humeral shaft
Distal humerus
Proximal antebrachium
Antebrachium
Distal radius
Hand
Proximal femur
Femur
Distal femur
Patella
Proximal tibia
Tibia shaft
Distal tibia
Malleoli
Foot
Clavicle


Anatomical distribution for Bispebjerg
Primary surgery
Pediatric
(2)
Number of patients
1.5
1.0
0.5
0.0
50%
50%
Radius/Ulna
Tibia/Fibula

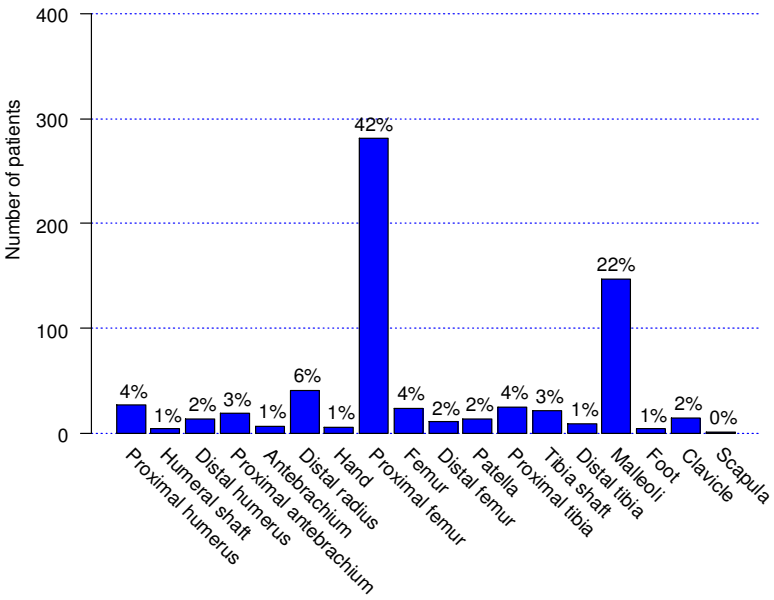
Anatomical distribution for Hvidovre
Primary surgery
Adults
(3294)



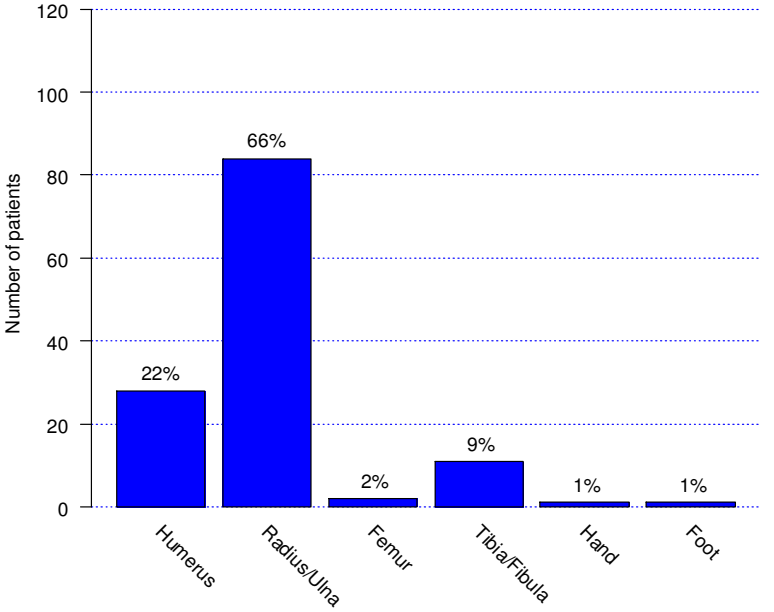
Anatomical distribution for Hvidovre
Primary surgery
Pediatric
(951)

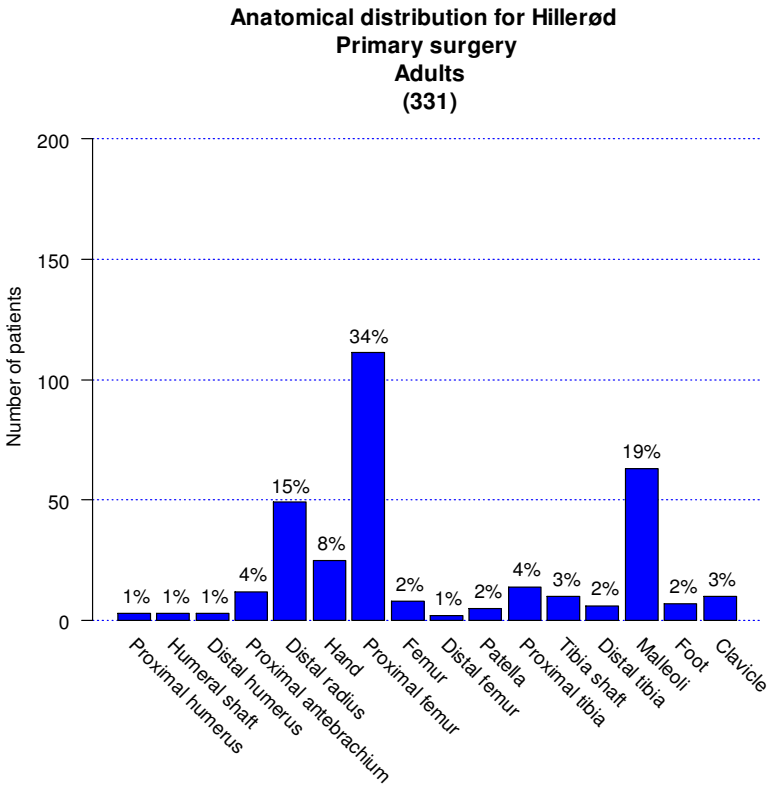


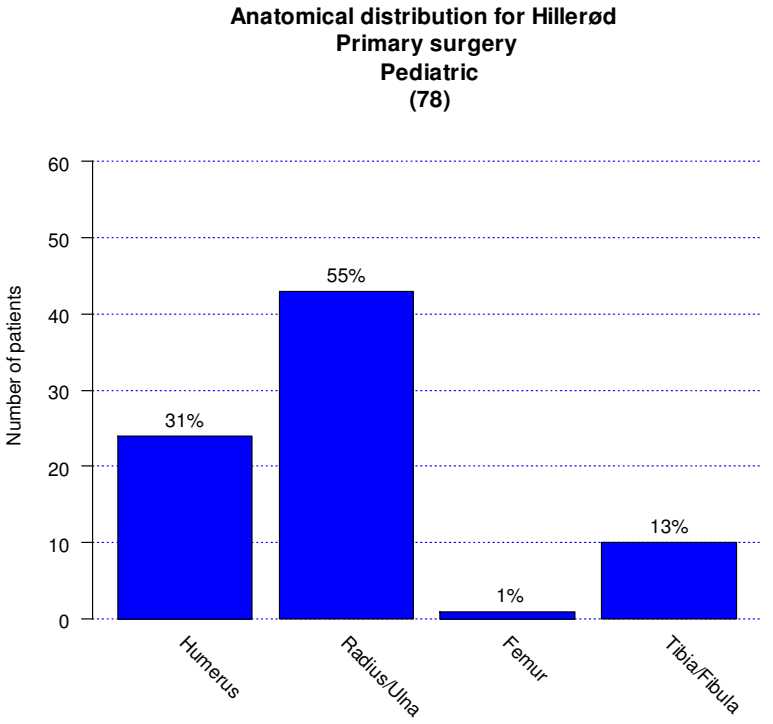
Anatomical distribution for Herlev
Primary surgery
Adults
(671)



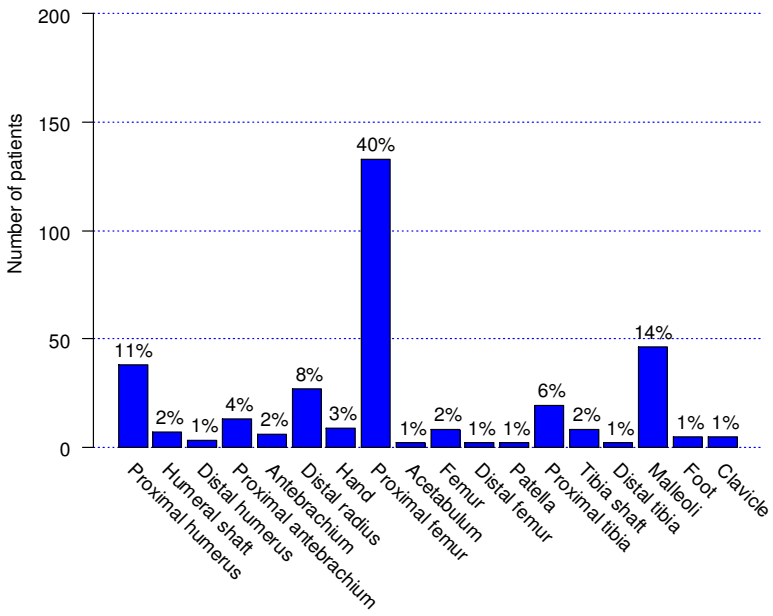
Anatomical distribution for Herlev
Primary surgery
Pediatric
(127)



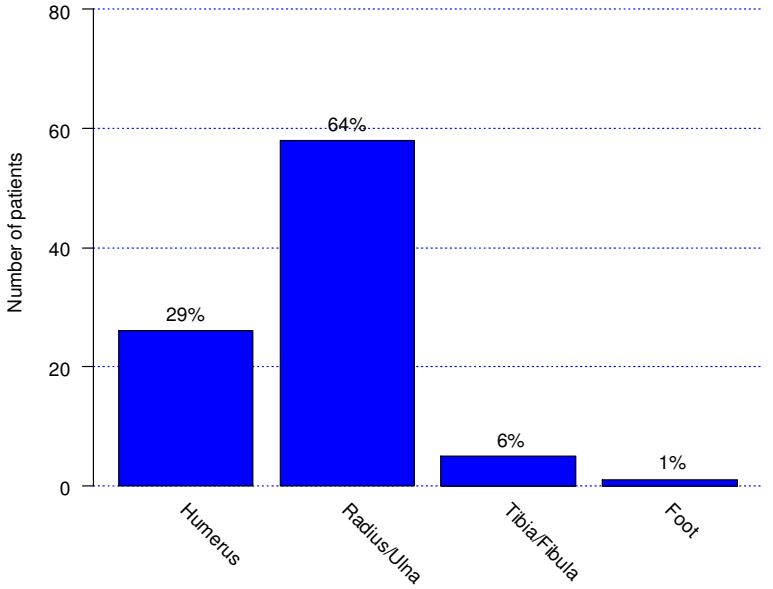

Anatomical distribution for Hillerød
Primary surgery
Adults
(331)
Number of patients
200
150
100
50
0
1%
1%
1%
4%
15%
8%
34%
2%
1%
2%
4%
3%
2%
19%
2%
3%
Proximal humerus
Humeral shaft
Distal humerus
Proximal antebrachium
Distal radius
Hand
Proximal femur
Femur
Distal femur
Patella
Proximal tibia
Tibia shaft
Distal tibia
Malleoli
Foot
Clavicle

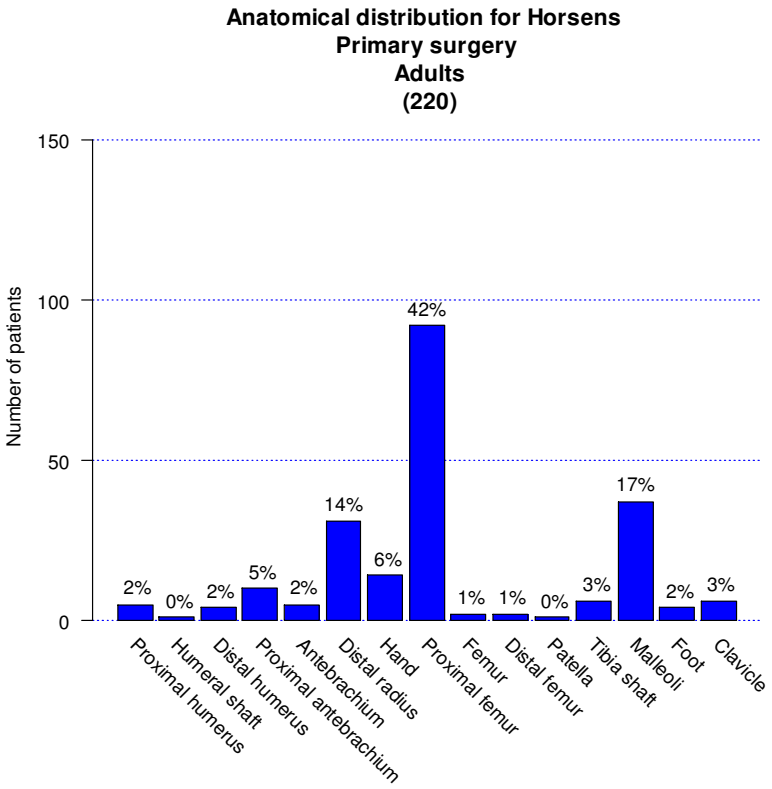

Anatomical distribution for Hillerød
Primary surgery
Pediatric
(78)
Number of patients
60
50
40
30
20
10
0
31%
55%
1%
13%
Humerus
Radius/Ulna
Femur
Tibia/Fibula

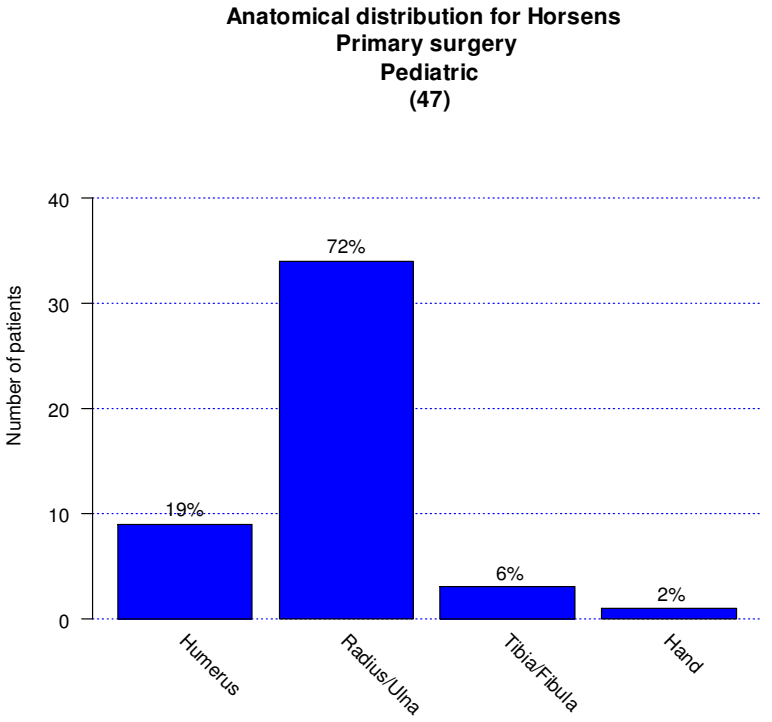
Anatomical distribution for Holbæk
Primary surgery
Adults
(335)

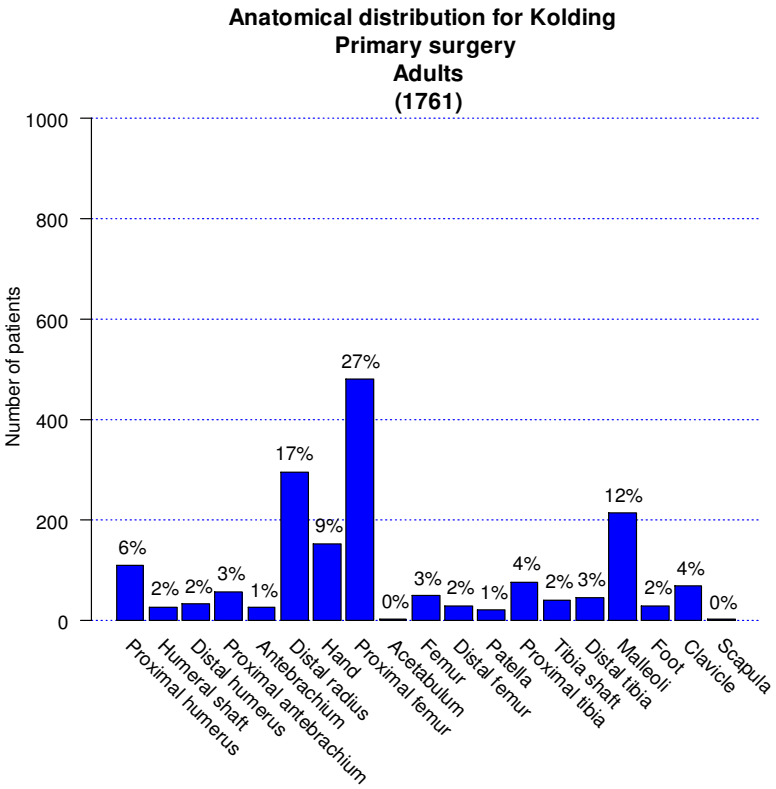


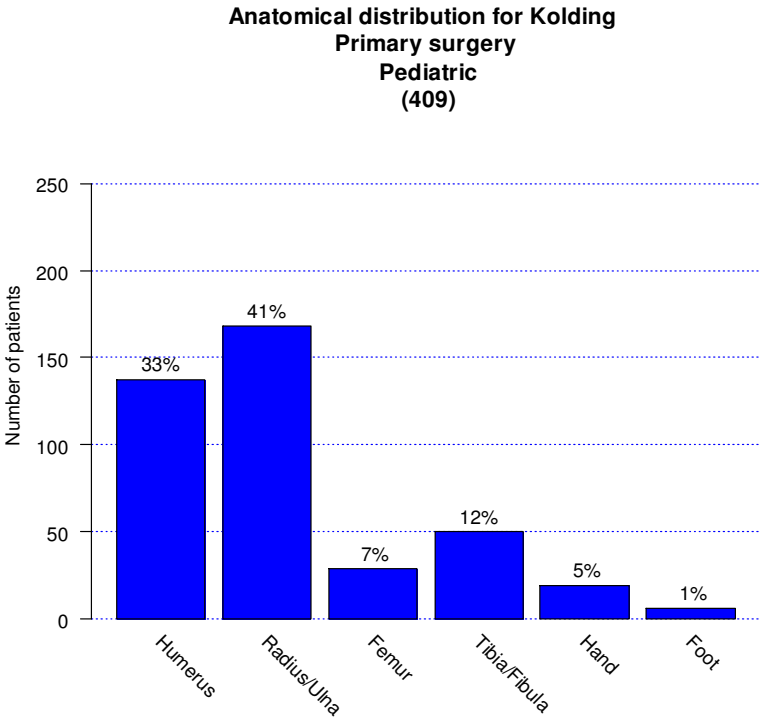
Anatomical distribution for Holbæk
Primary surgery
Pediatric
(90)



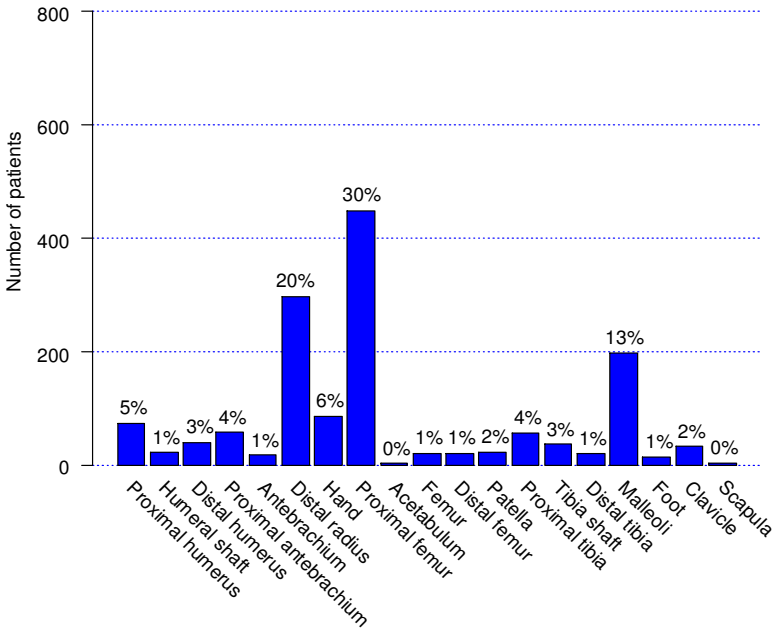

Anatomical distribution for Horsens
Primary surgery
Adults
(220)
Number of patients
150
100
50
0
2%
0%
2%
5%
2%
14%
6%
42%
1%
1%
0%
3%
17%
2%
3%
Proximal humerus
Humeral shaft
Distal humerus
Proximal antebrachium
Antebrachium
Distal radius
Hand
Proximal femur
Femur
Distal femur
Patella
Tibia shaft
Malleoli
Foot
Clavicle


Anatomical distribution for Horsens
Primary surgery
Pediatric
(47)
Number of patients
40
30
20
10
0
19%
72%
6%
2%
Humerus
Radius/Ulna
Tibia/Fibula
Hand

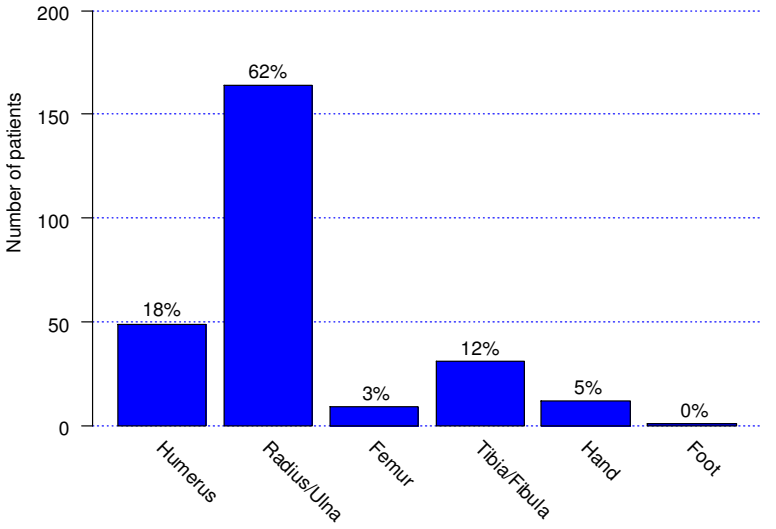

Anatomical distribution for Kolding
Primary surgery
Adults
(1761)
Number of patients
1000
800
600
400
200
0
6%
2%
2%
3%
1%
17%
9%
27%
0%
3%
2%
1%
4%
2%
3%
12%
2%
4%
0%
Proximal humerus
Humeral shaft
Distal humerus
Proximal antebrachium
Antebrachium
Distal radius
Hand
Proximal femur
Acetabulum
Femur
Distal femur
Patella
Proximal tibia
Tibia shaft
Distal tibia
Malleoli
Foot
Clavicle
Scapula


Anatomical distribution for Kolding
Primary surgery
Pediatric
(409)
Number of patients
250
200
150
100
50
0
33%
41%
7%
12%
5%
1%
Humerus
Radius/Ulna
Femur
Tibia/Fibula
Hand
Foot

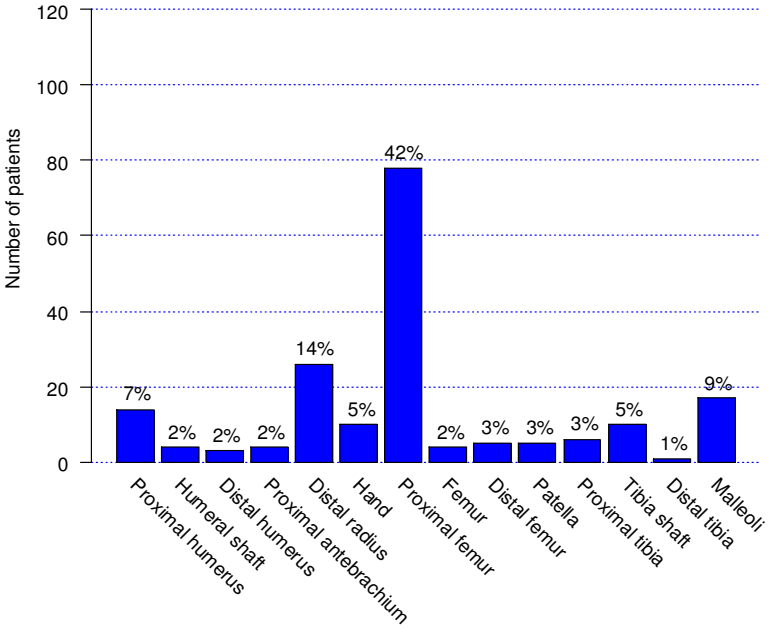
Anatomical distribution for Køge
Primary surgery
Adults
(1479)



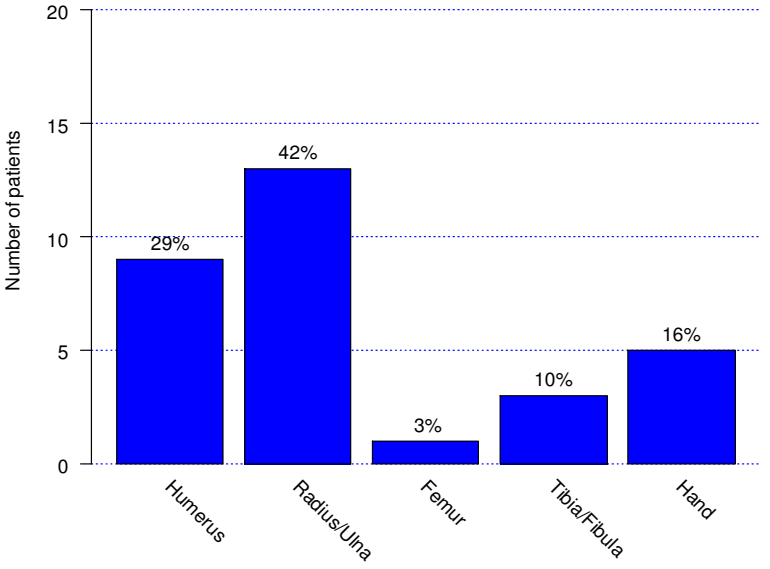
Anatomical distribution for Køge
Primary surgery
Pediatric
(266)



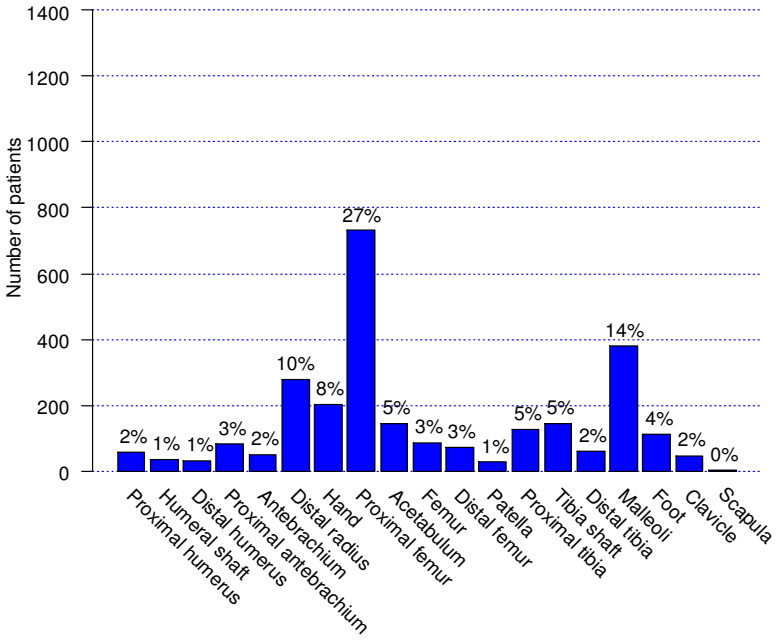
Anatomical distribution for Nykøbing F
Primary surgery
Adults
(187)



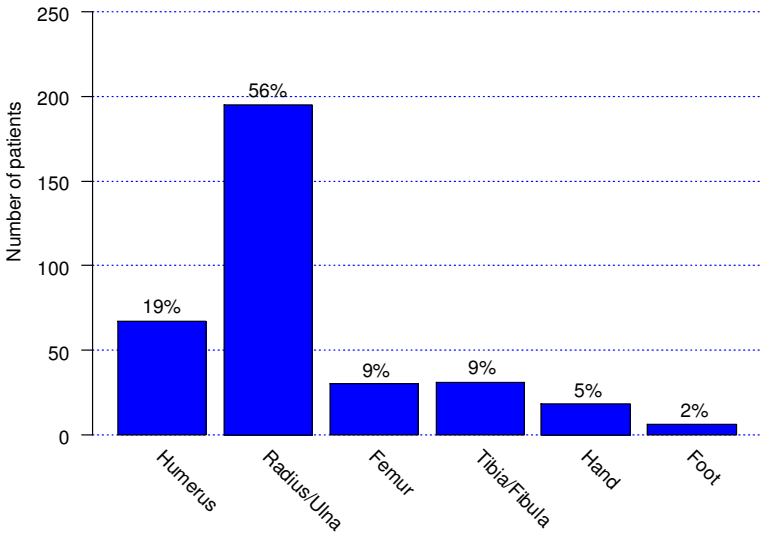
Anatomical distribution for Nykøbing F
Primary surgery
Pediatric
(31)



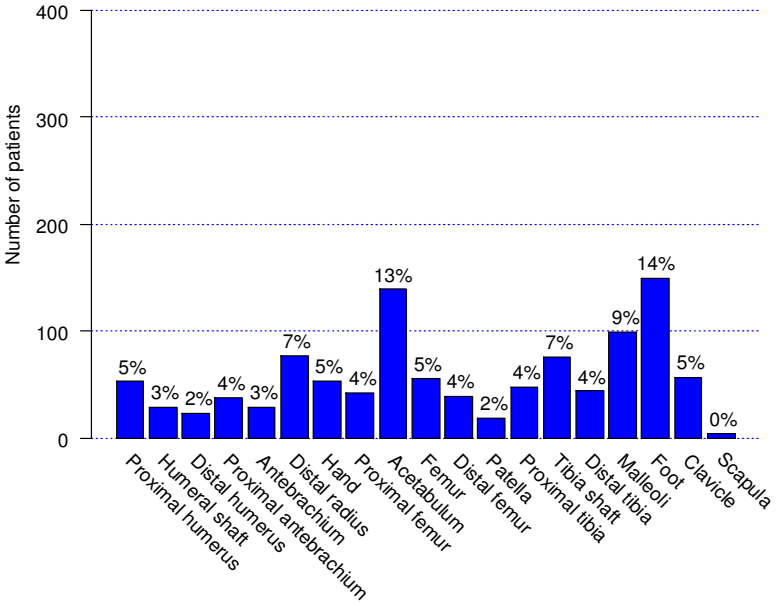
Anatomical distribution for Odense
Primary surgery
Adults
(2685)



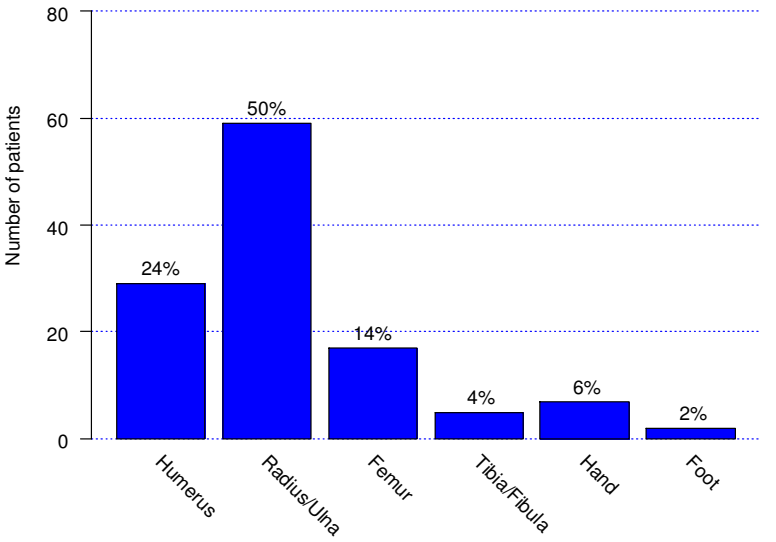
Anatomical distribution for Odense
Primary surgery
Pediatric
(347)



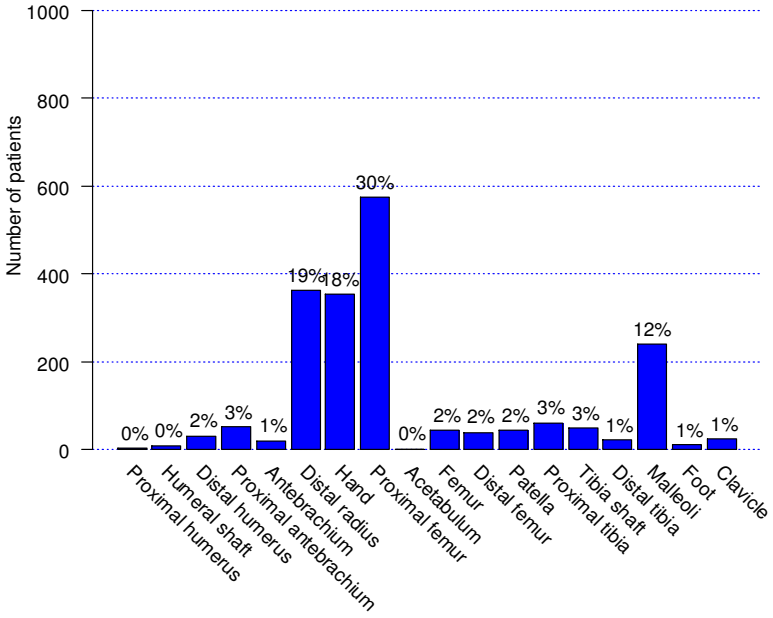
Anatomical distribution for Rigshospitalet
Primary surgery
Adults
(1076)



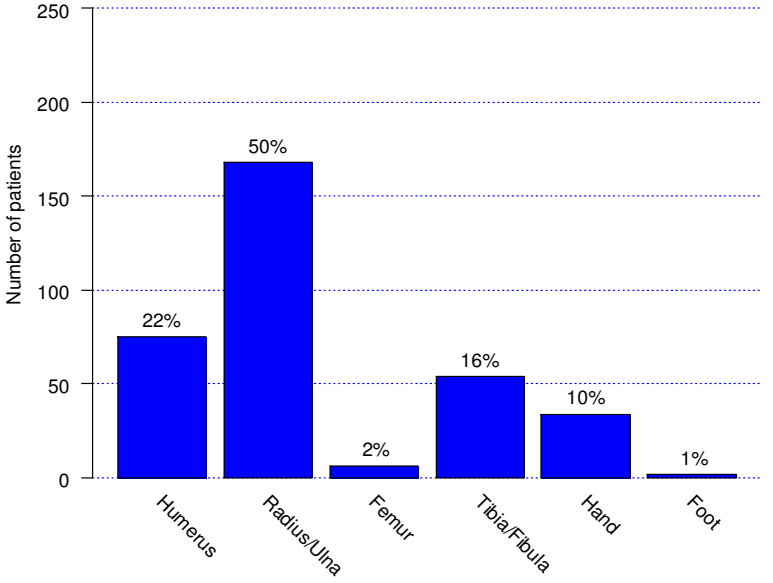
Anatomical distribution for Rigshospitalet
Primary surgery
Pediatric
(119)



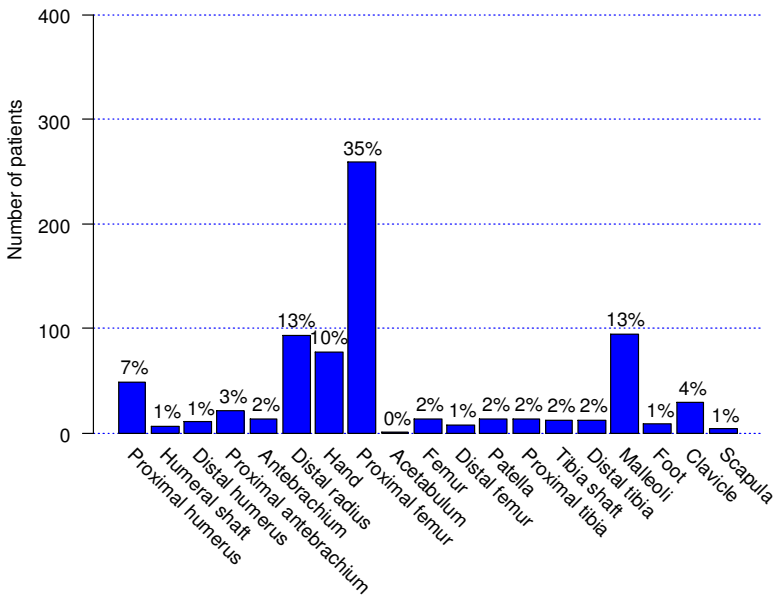
Anatomical distribution for Slagelse
Primary surgery
Adults
(1933)



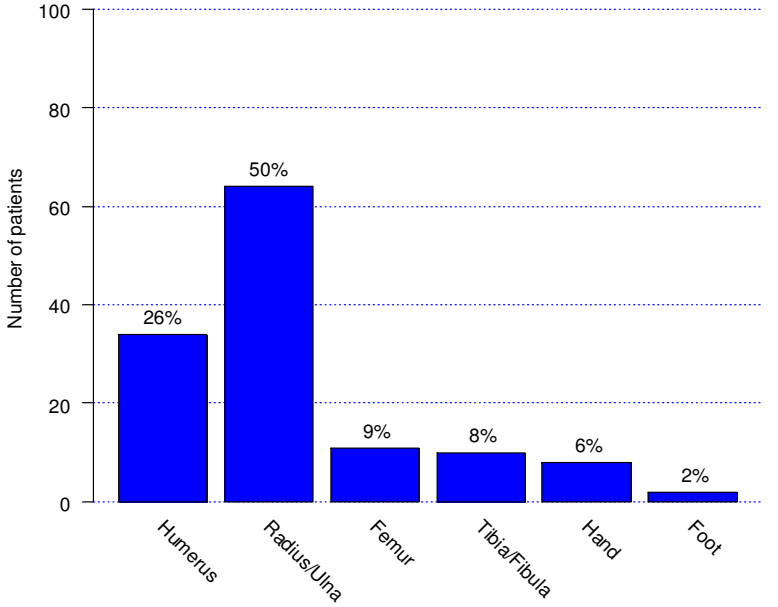
Anatomical distribution for Slagelse
Primary surgery
Pediatric
(339)



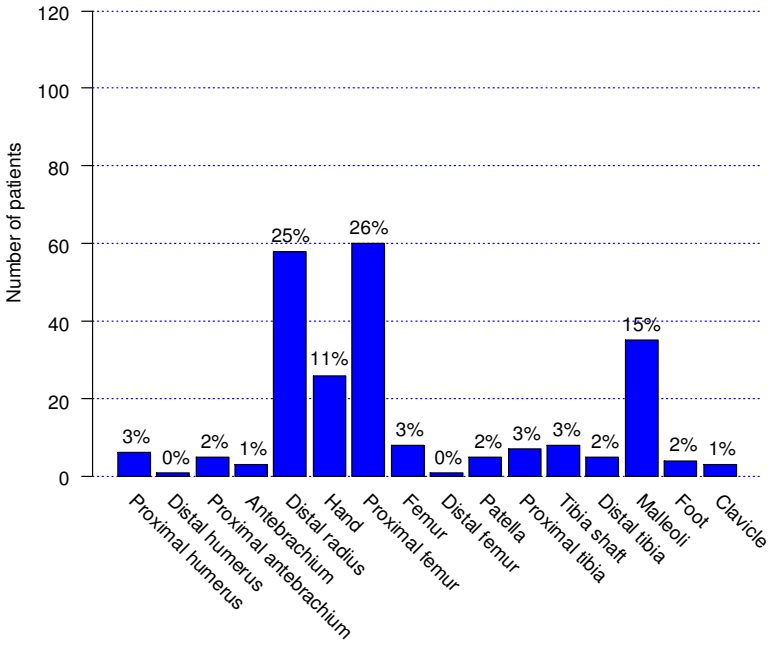
Anatomical distribution for Esbjerg
Primary surgery
Adults
(748)



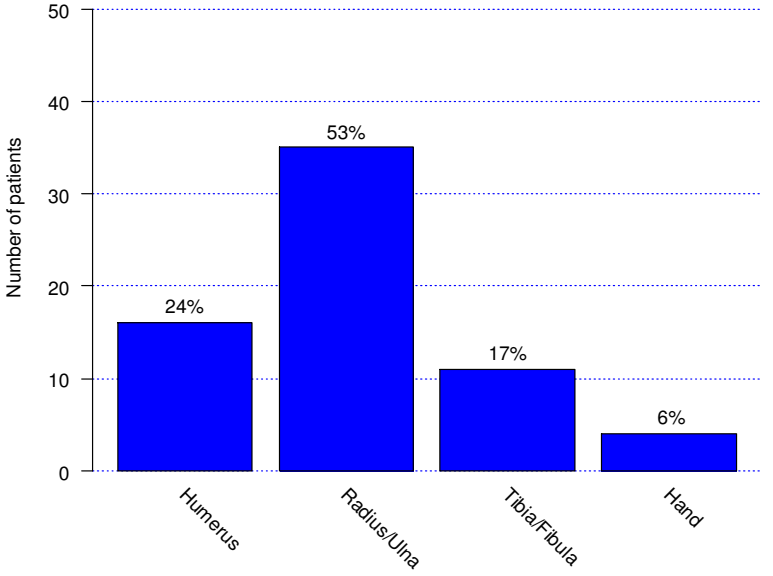
Anatomical distribution for Esbjerg
Primary surgery
Pediatric
(129)



Anatomical distribution for Viborg
Primary surgery
Adults
(235)

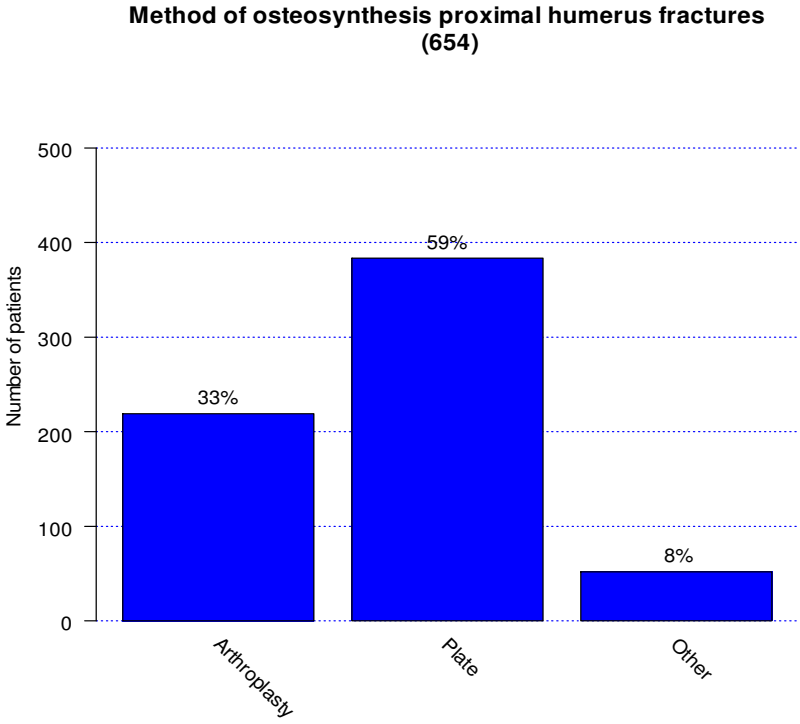


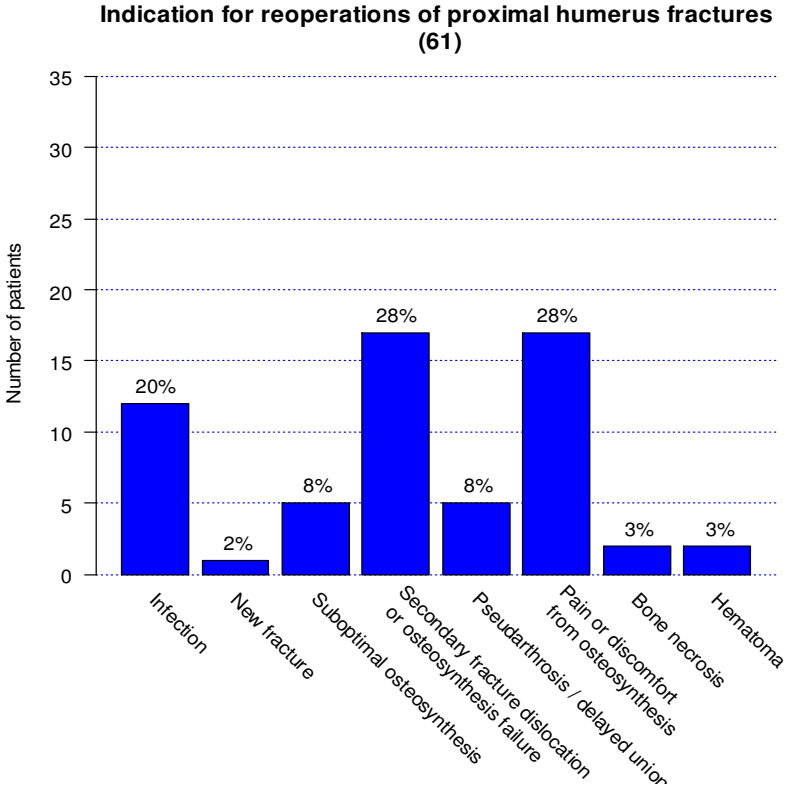
Anatomical distribution for Viborg
Primary surgery
Pediatric
(66)



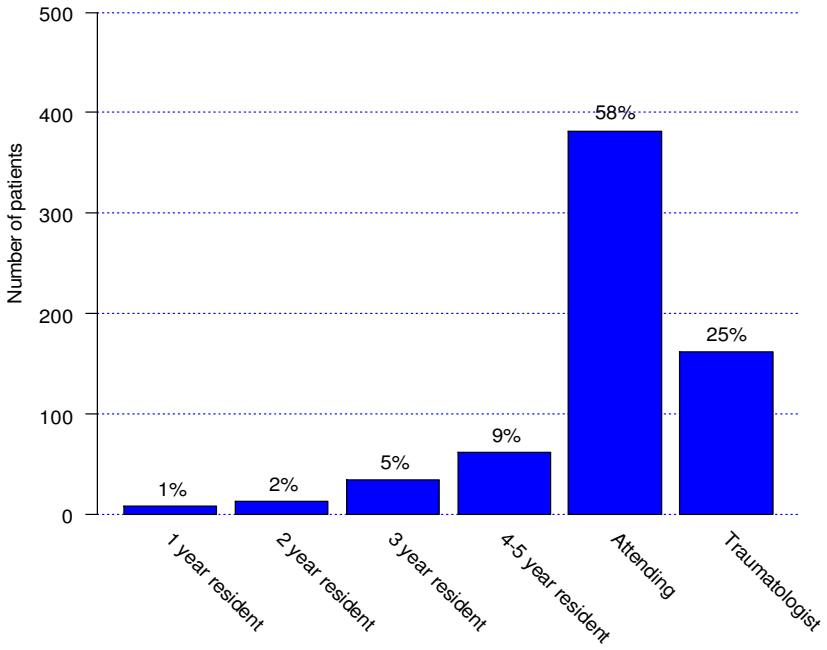
Adult

Proximal Humerus

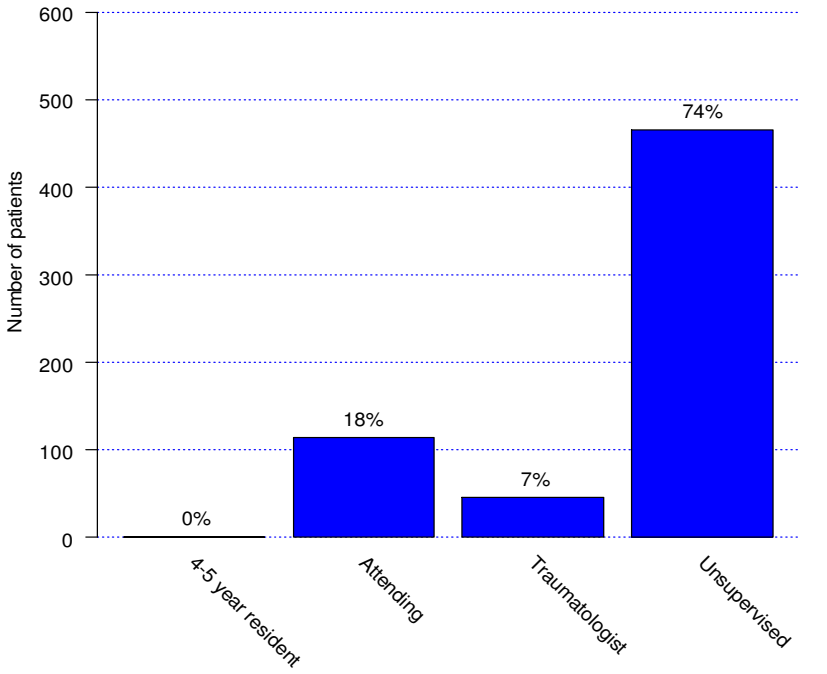


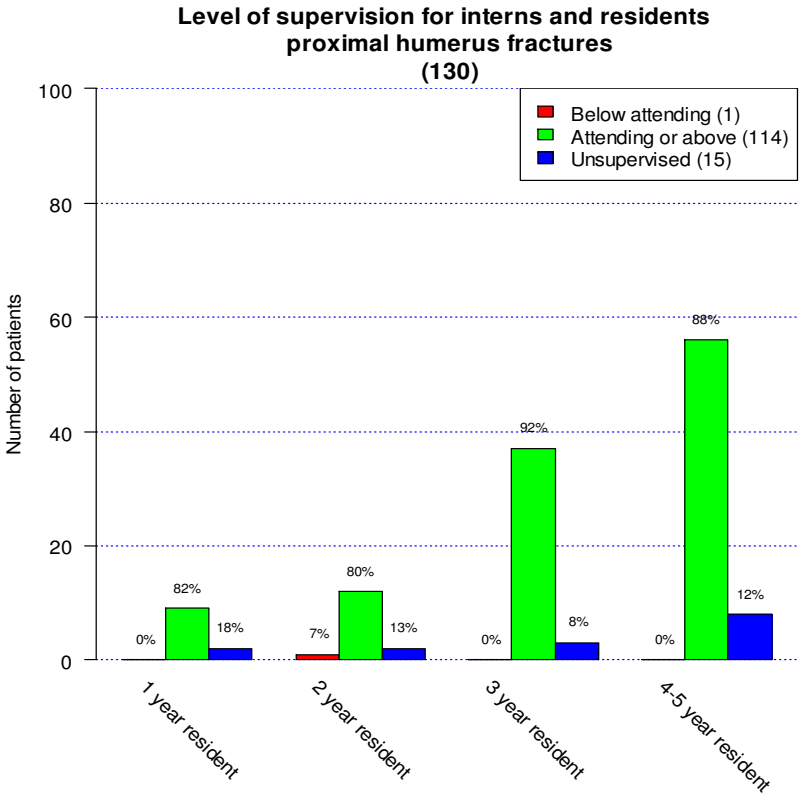


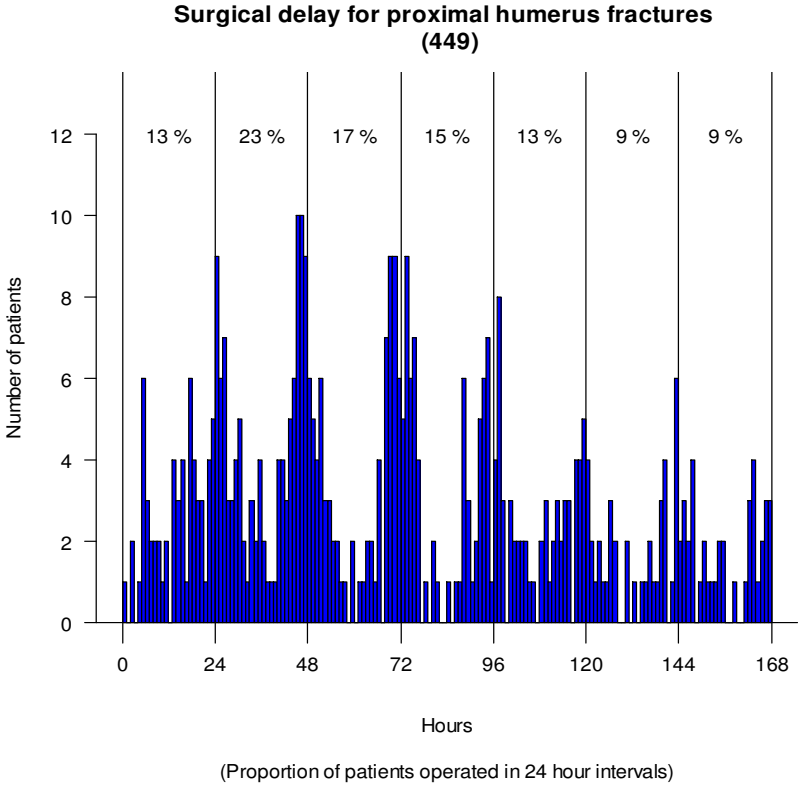
Primary surgeons for proximal humerus fractures (661)



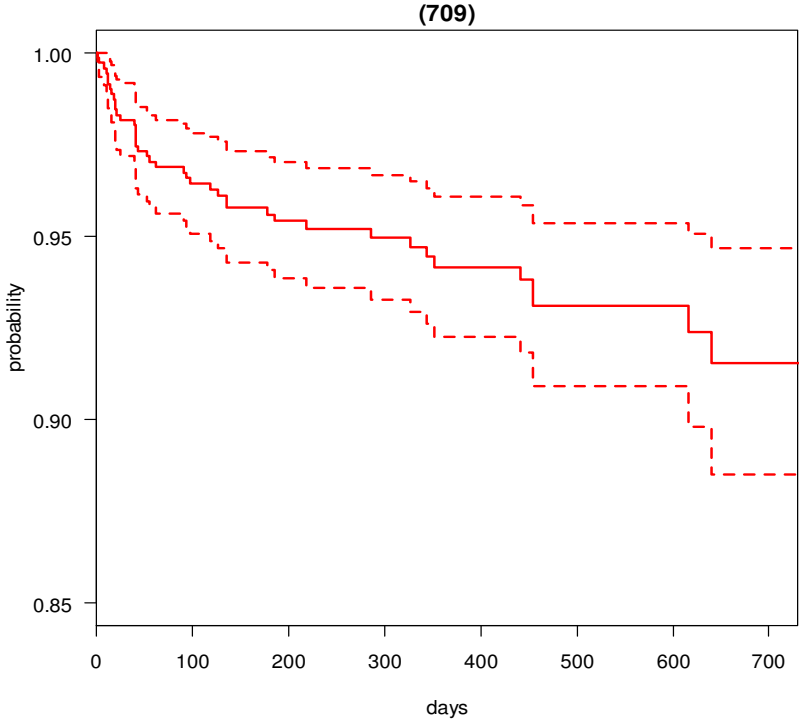
Level of supervision for proximal humerus fractures (626)



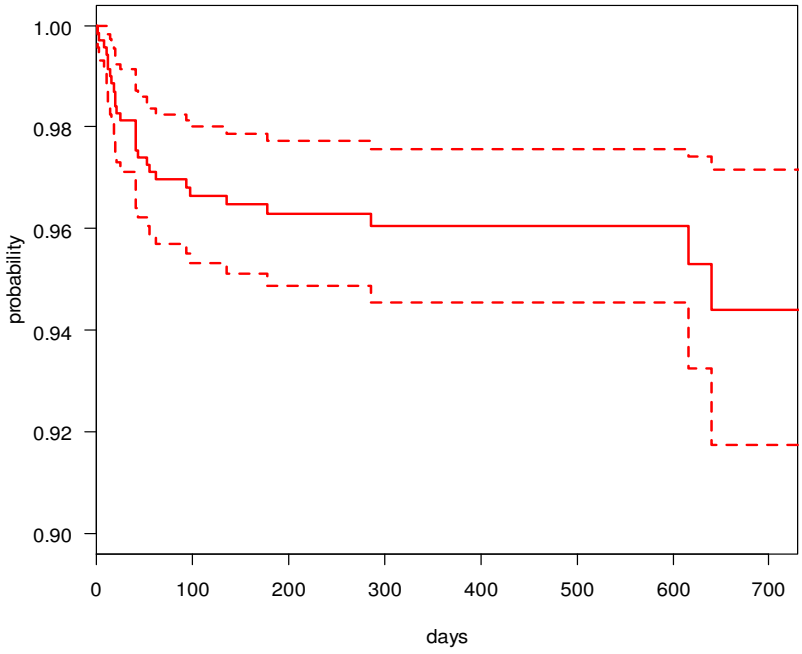

Level of supervision for interns and residents
proximal humerus fractures
(130)
Below attending (1)
Attending or above (114)
Unsupervised (15)
Number of patients
100
80
60
40
20
0
0%
82%
18%
7%
80%
13%
0%
92%
8%
0%
88%
12%
1 year resident
2 year resident
3 year resident
4-5 year resident

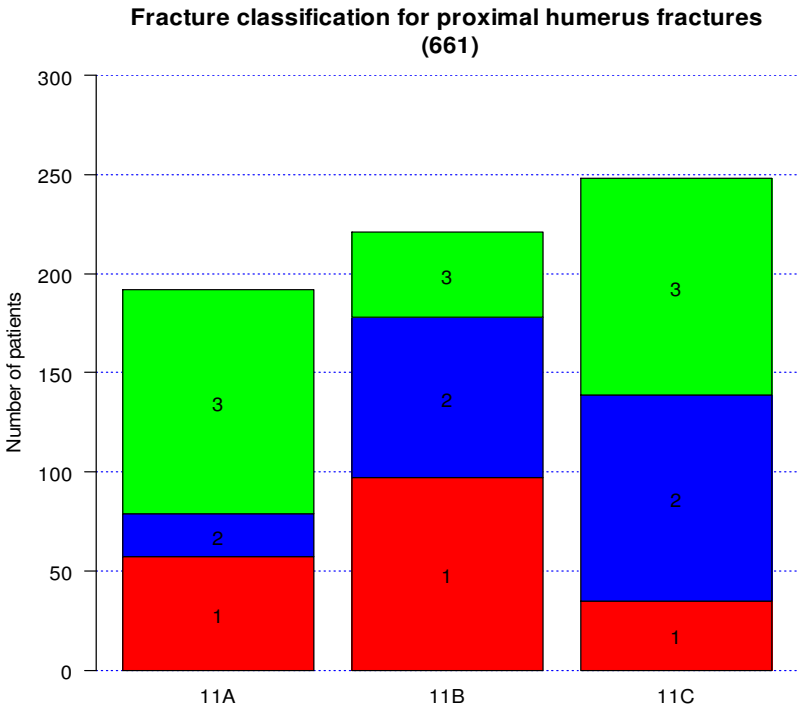

Surgical delay for proximal humerus fractures
(449)
13 %
23 %
17 %
15 %
13 %
9 %
9 %
Number of patients
12
10
8
6
4
2
0
0
24
48
72
96
120
144
168
Hours
(Proportion of patients operated in 24 hour intervals)

Survival for primary surgery with reoperation due to any reason proximal humerus fractures (709)



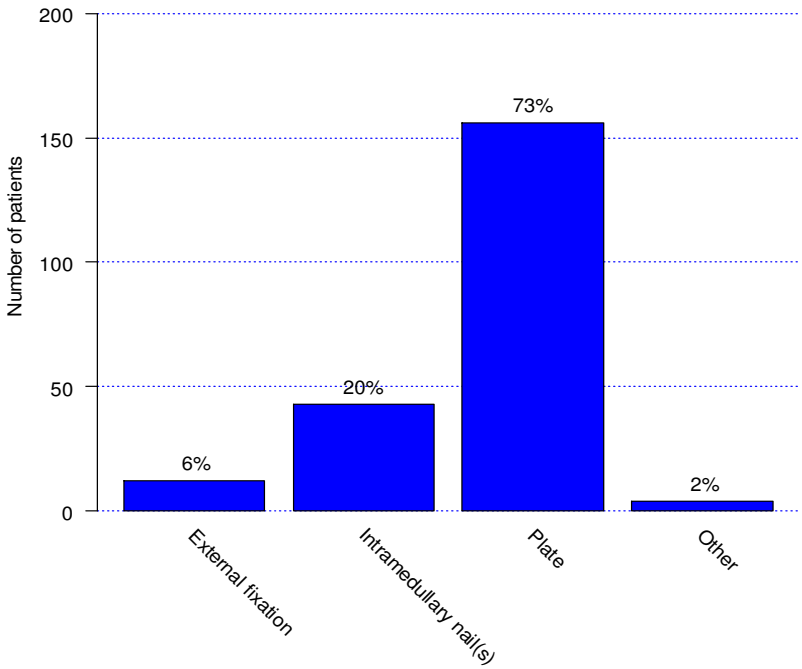
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware proximal humerus fractures (695)



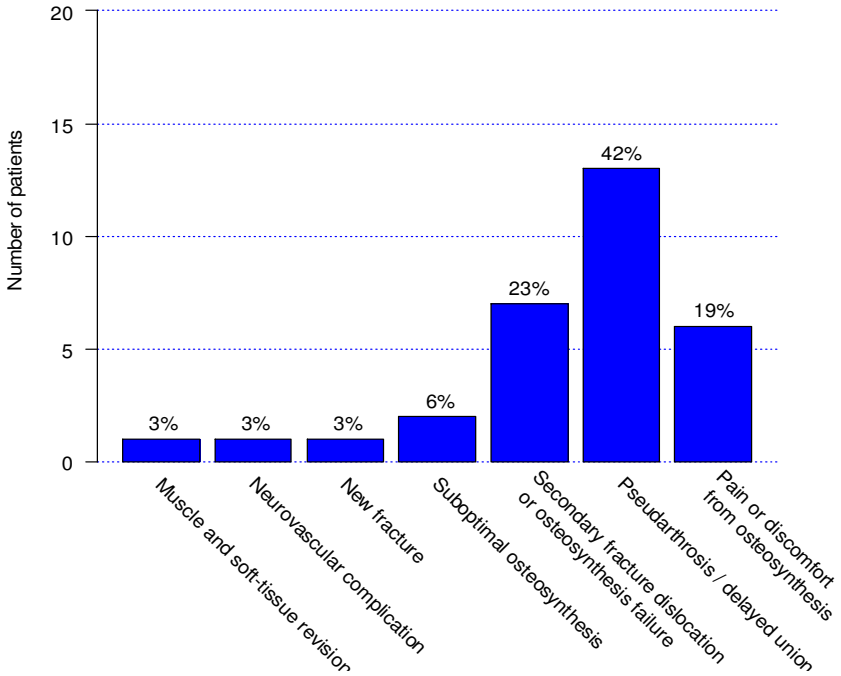

Fracture classification for proximal humerus fractures
(661)
Number of patients
300
250
200
150
100
50
0
3
2
1
3
2
1
3
2
1
11A
11B
11C

Humeral shaft

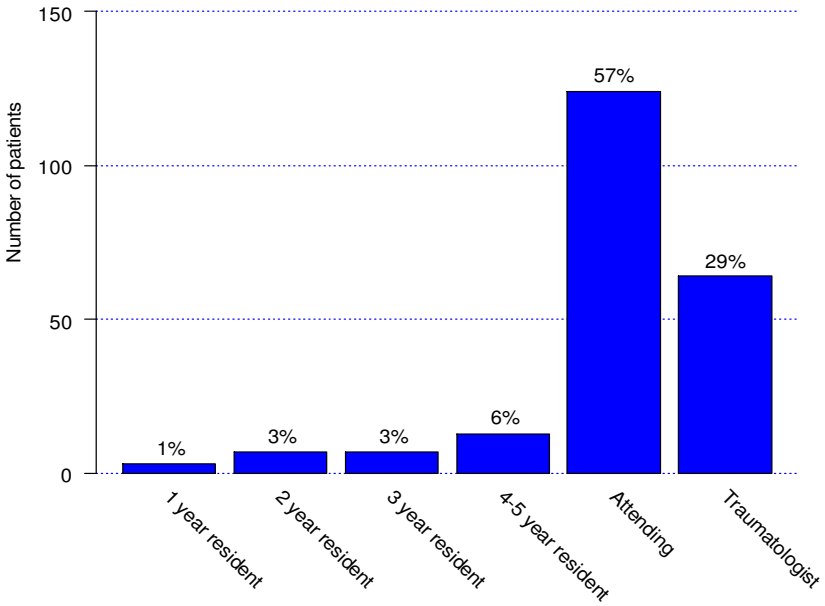
Method of osteosynthesis humeral shaft fractures (215)



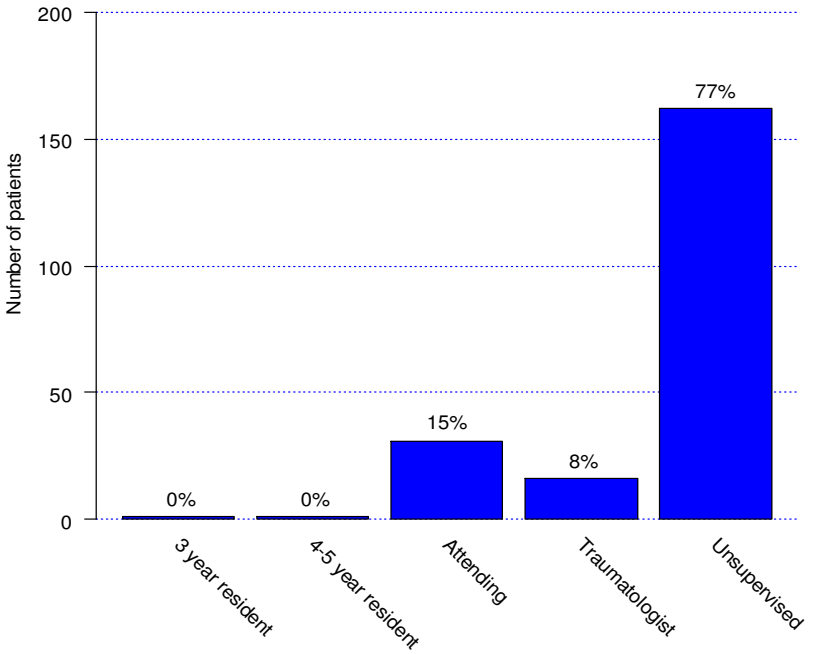
Indication for reoperations of humeral shaft fractures (31)

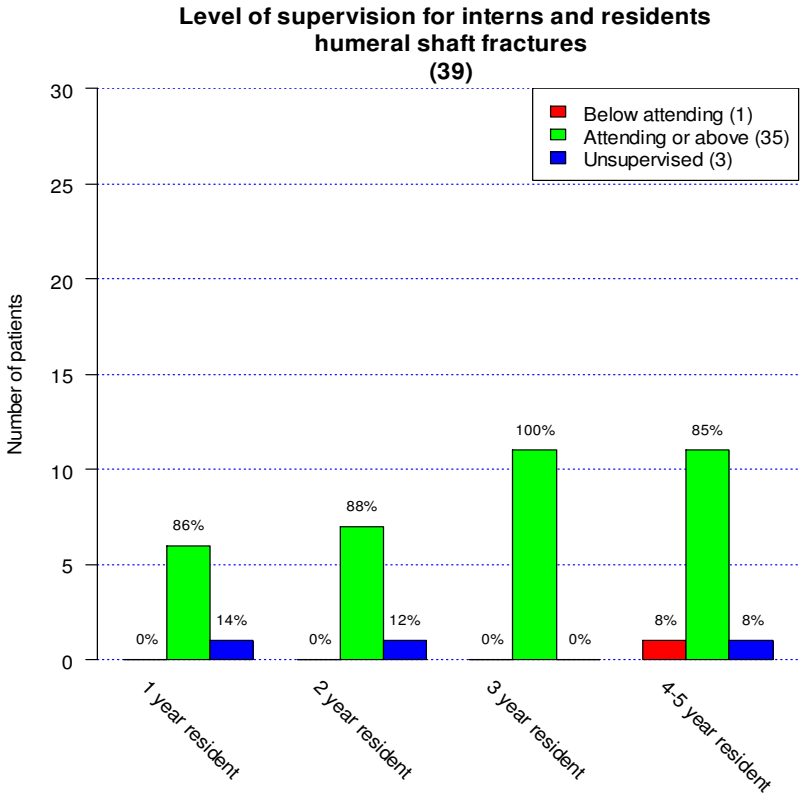


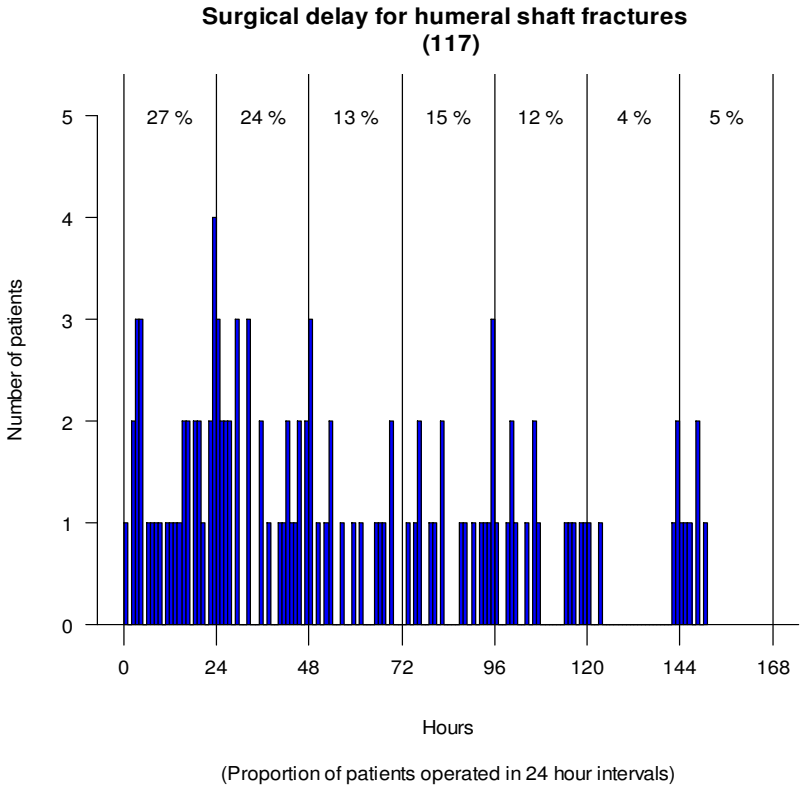
Primary surgeons for humeral shaft fractures (218)



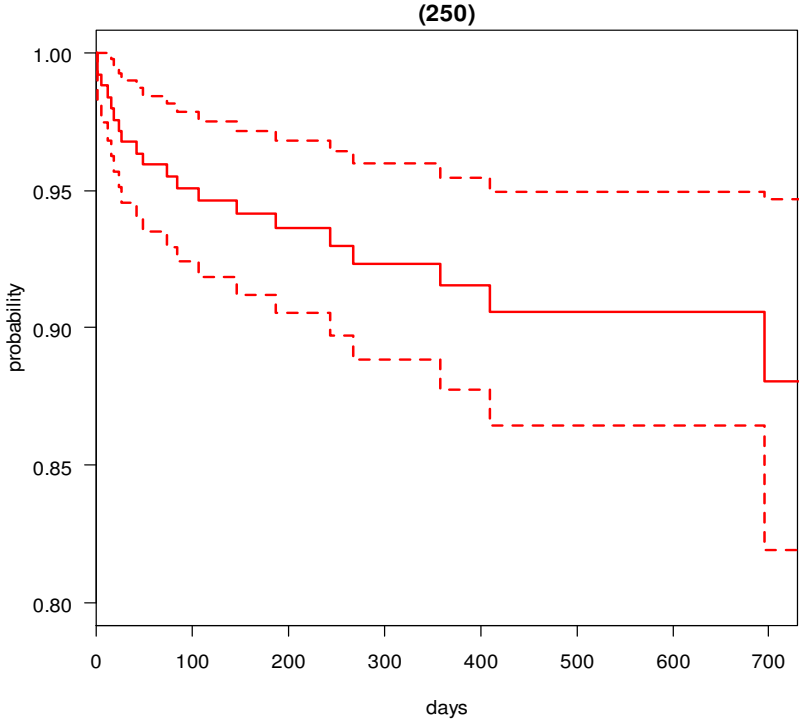
Level of supervision for humeral shaft fractures (211)



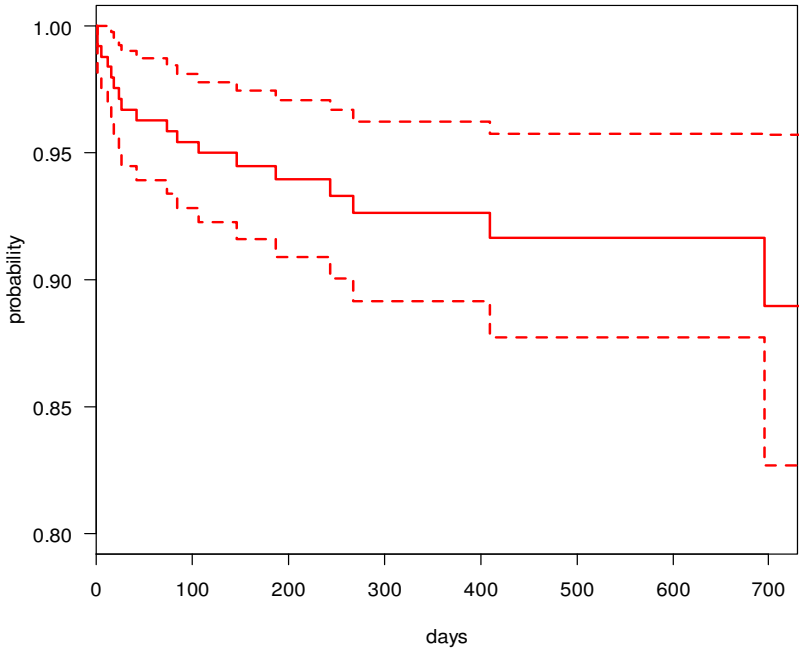

Level of supervision for interns and residents
humeral shaft fractures
(39)
Below attending (1)
Attending or above (35)
Unsupervised (3)
Number of patients
30
25
20
15
10
5
0
0%
86%
14%
0%
88%
12%
0%
100%
0%
8%
85%
8%
1 year resident
2 year resident
3 year resident
4-5 year resident

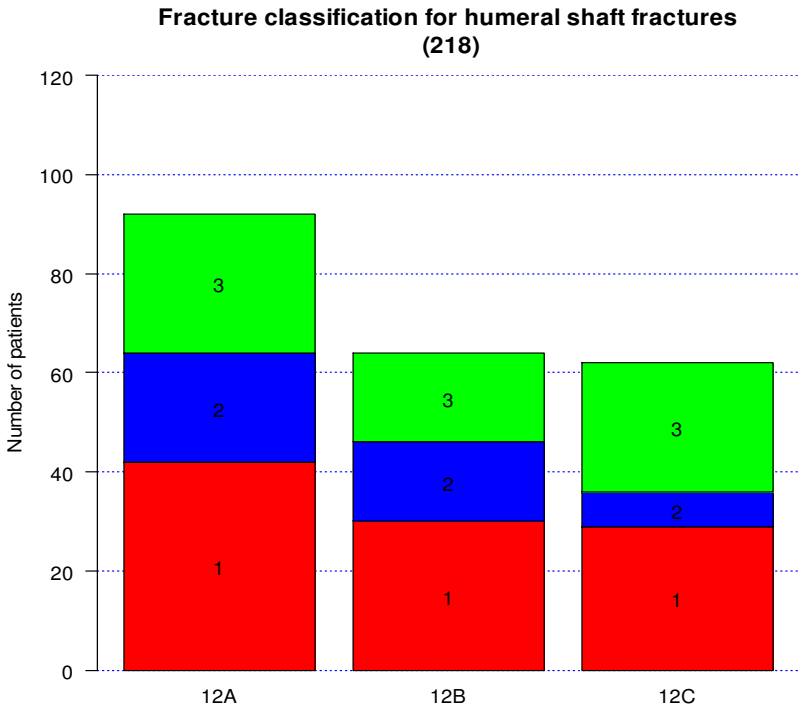

Surgical delay for humeral shaft fractures
(117)
Number of patients
5
4
3
2
1
0
27 %
24 %
13 %
15 %
12 %
4 %
5 %
0
24
48
72
96
120
144
168
Hours
(Proportion of patients operated in 24 hour intervals)

Survival for primary surgery with reoperation due to any reason
humeral shaft fractures
(250)



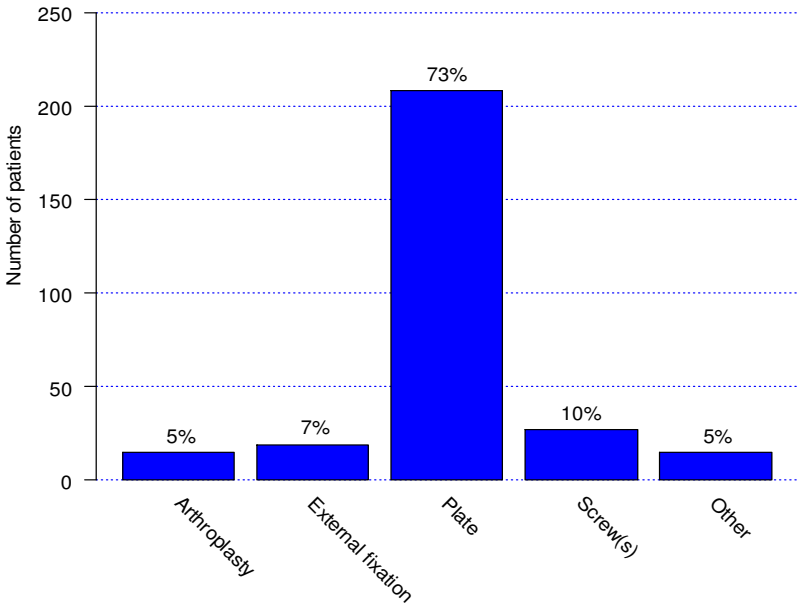
Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
humeral shaft fractures
(246)



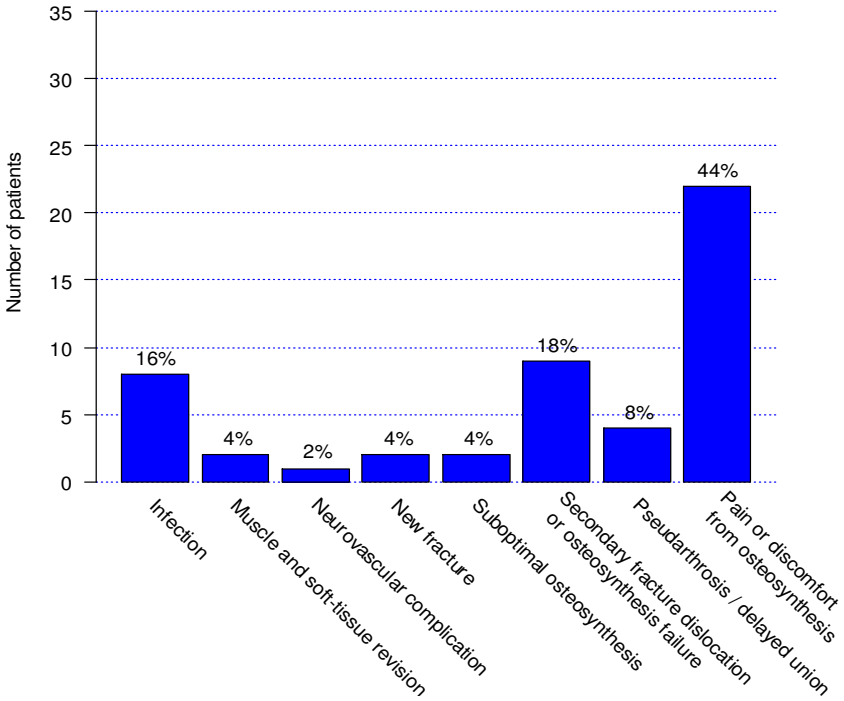

Fracture classification for humeral shaft fractures
(218)
Number of patients
120
100
80
60
40
20
0
3
2
1
3
2
1
3
2
1
12A
12B
12C

Distal Humerus

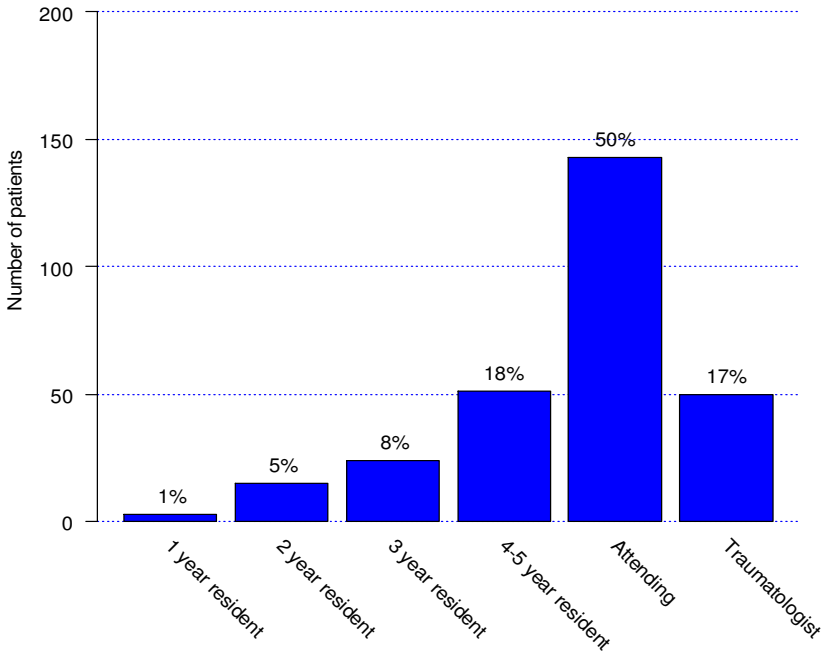
Method of osteosynthesis distal humerus fractures (284)



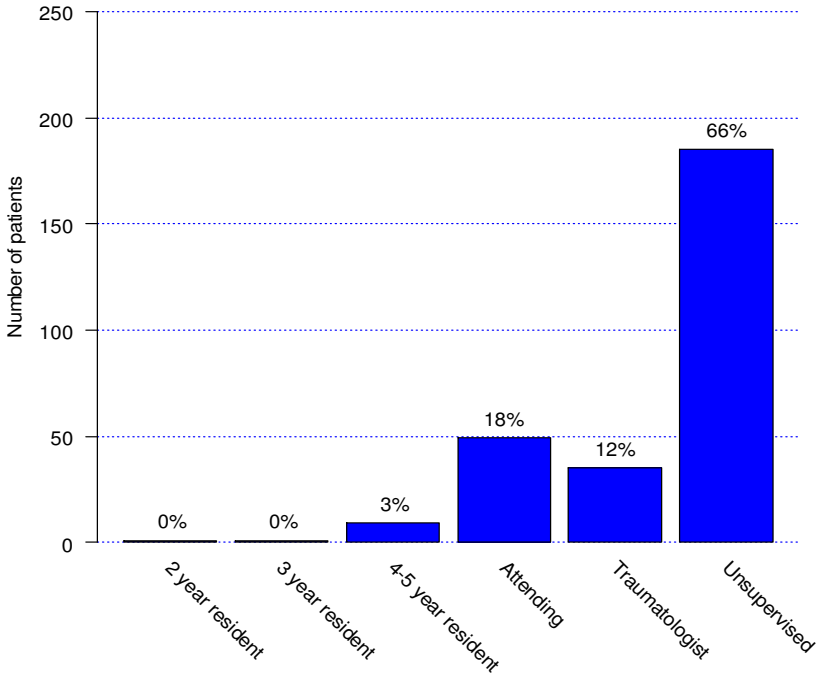
Indication for rereoperations of distal humerus fractures (50)

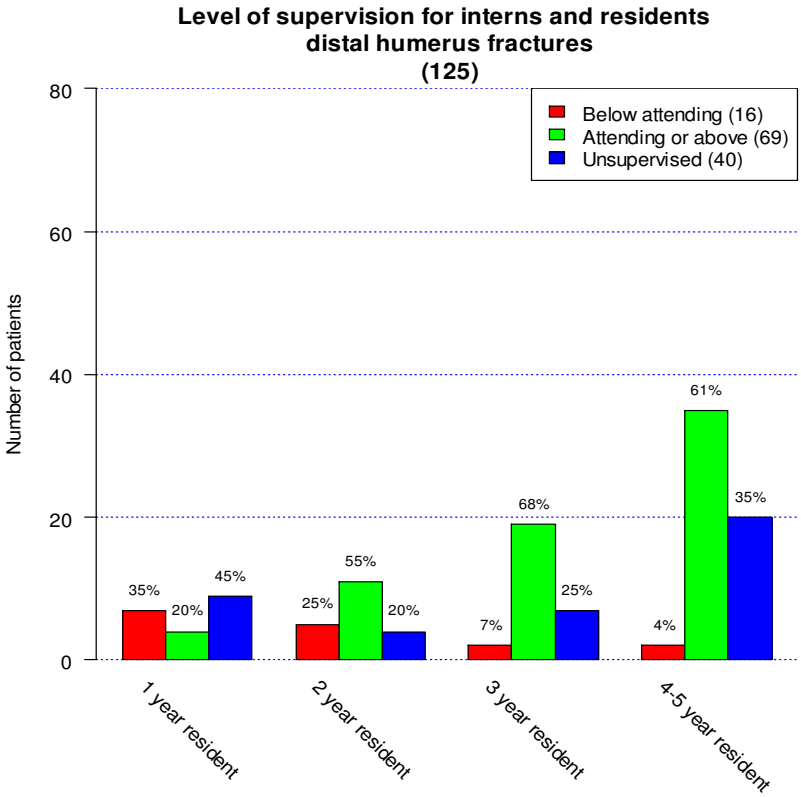


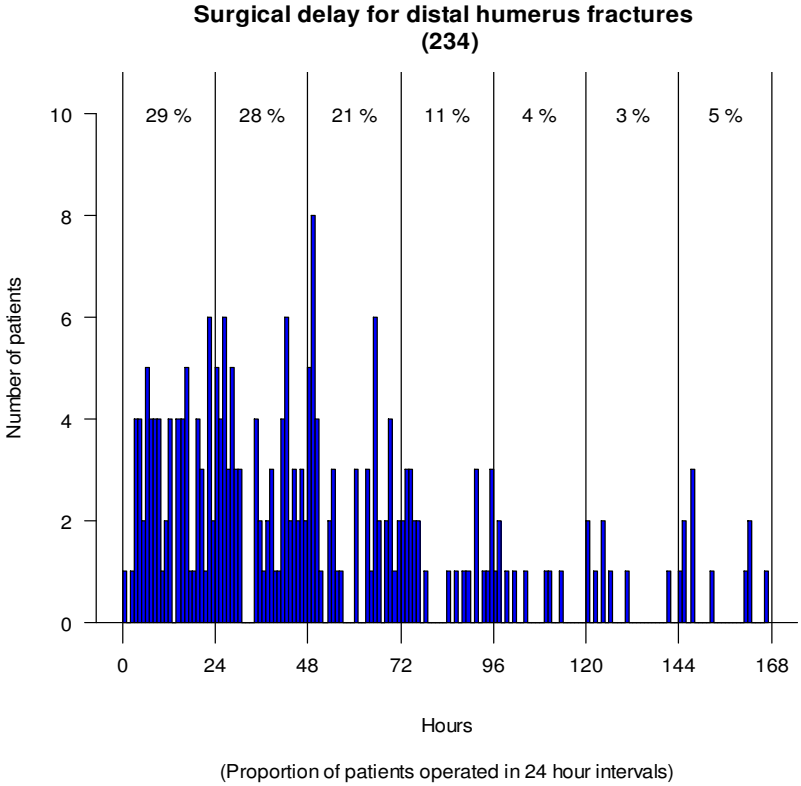
Primary surgeons for distal humerus fractures (286)



Level of supervision for distal humerus fractures (280)

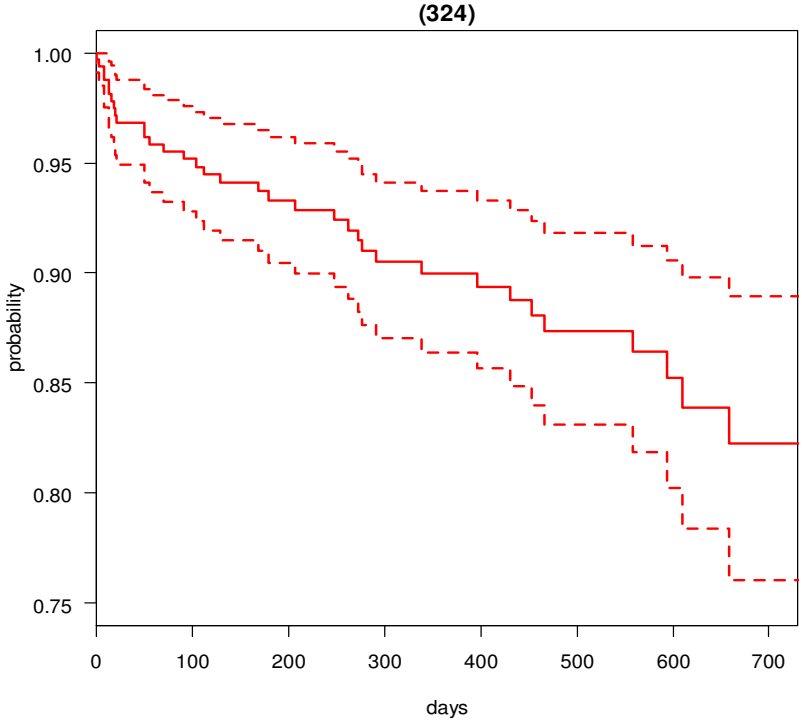




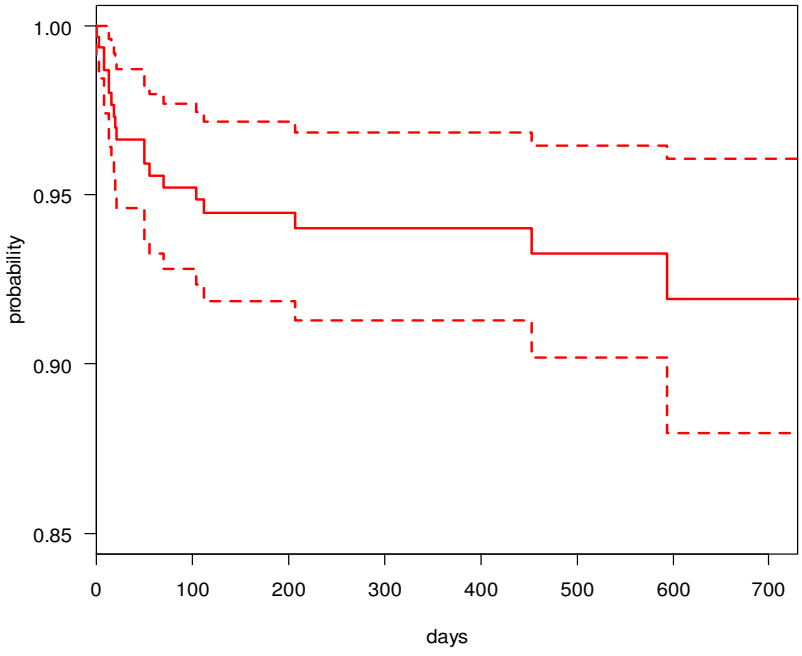


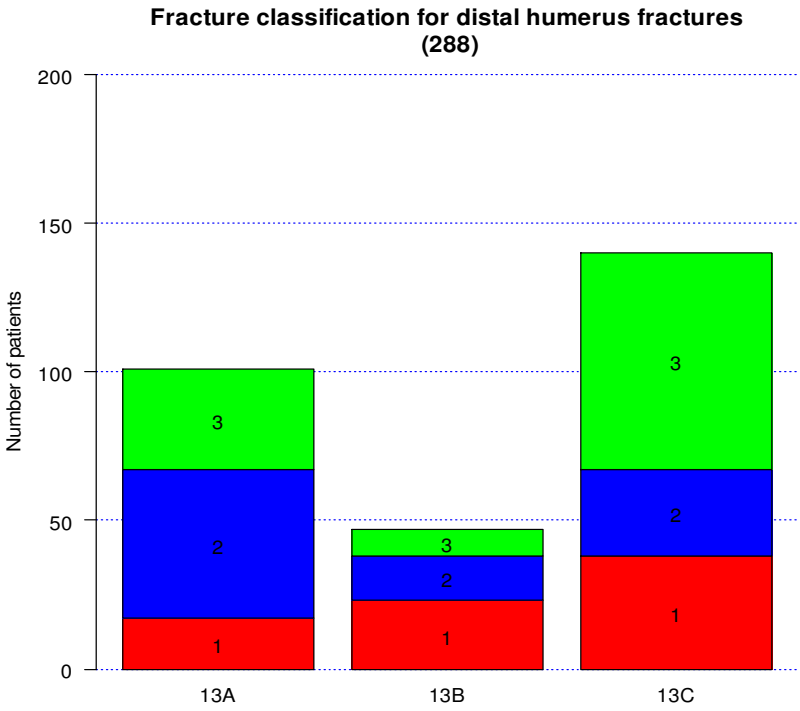
(Proportion of patients operated in 24 hour intervals)

Survival for primary surgery with reoperation due to any reason
distal humerus fractures
(324)



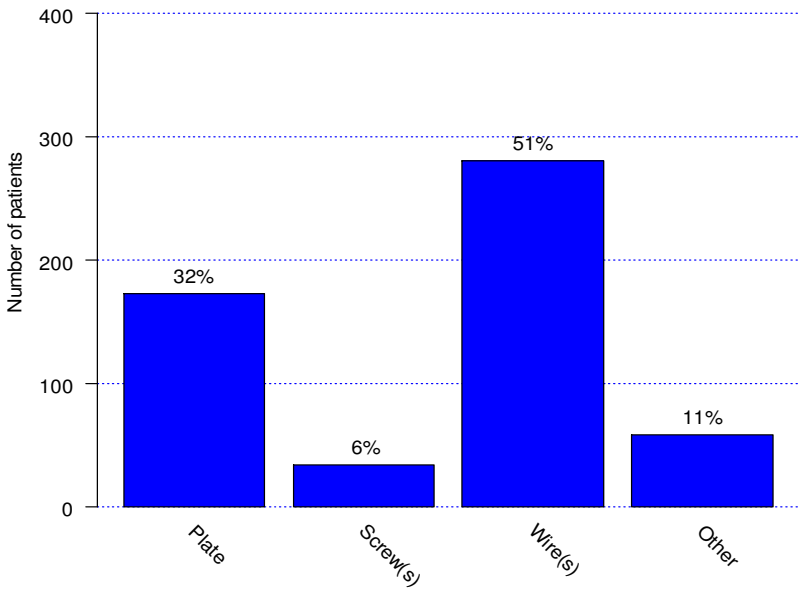
Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
distal humerus fractures
(305)



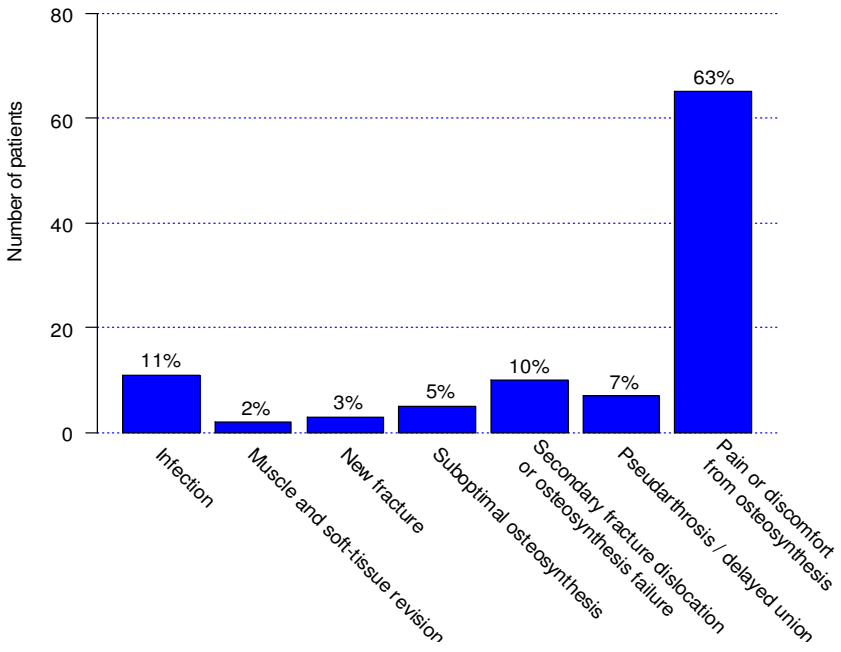

Fracture classification for distal humerus fractures
(288)
Number of patients
200
150
100
50
0
3
2
1
3
2
1
3
2
1
13A
13B
13C

Proximal antebrachium

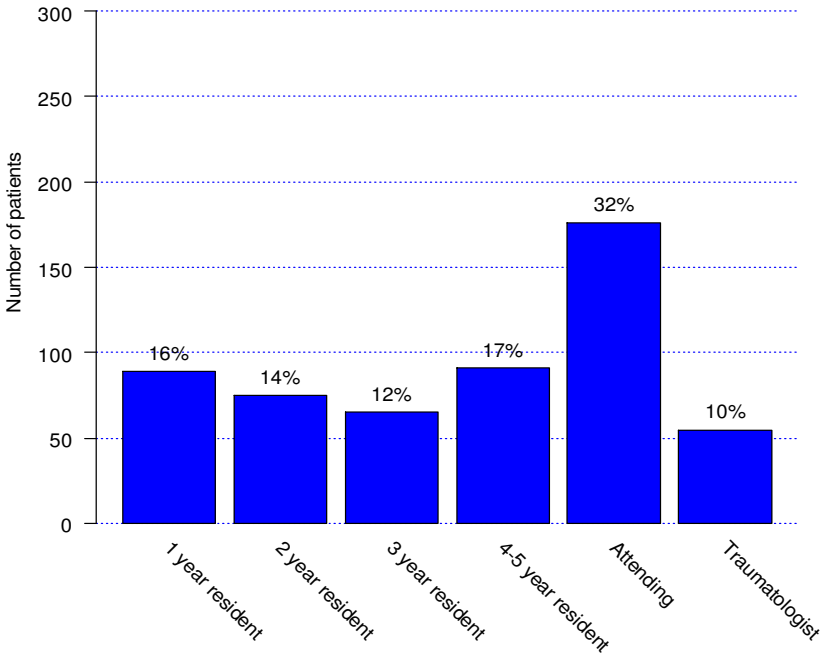
Method of osteosynthesis proximal antebrachium fractures (546)



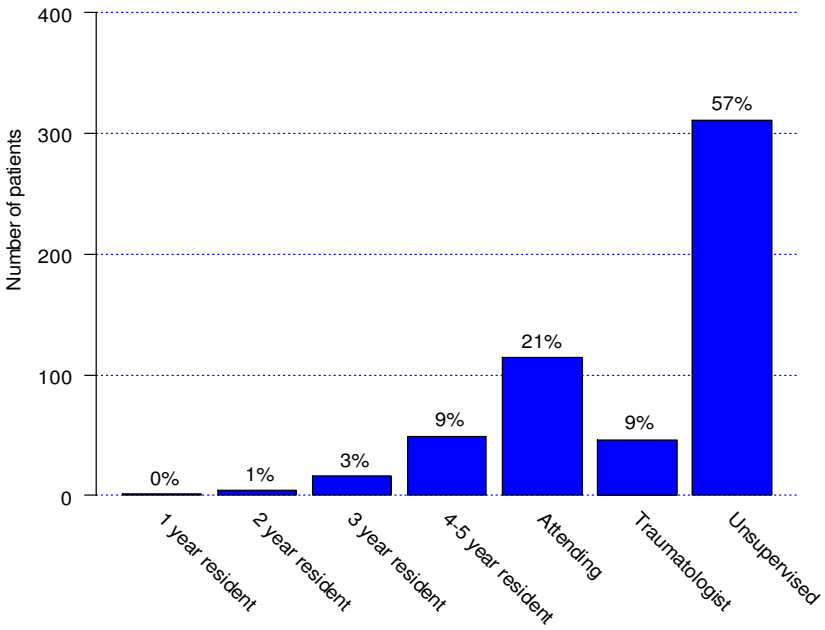
Indication for reoperations of proximal antebrachium fractures (103)

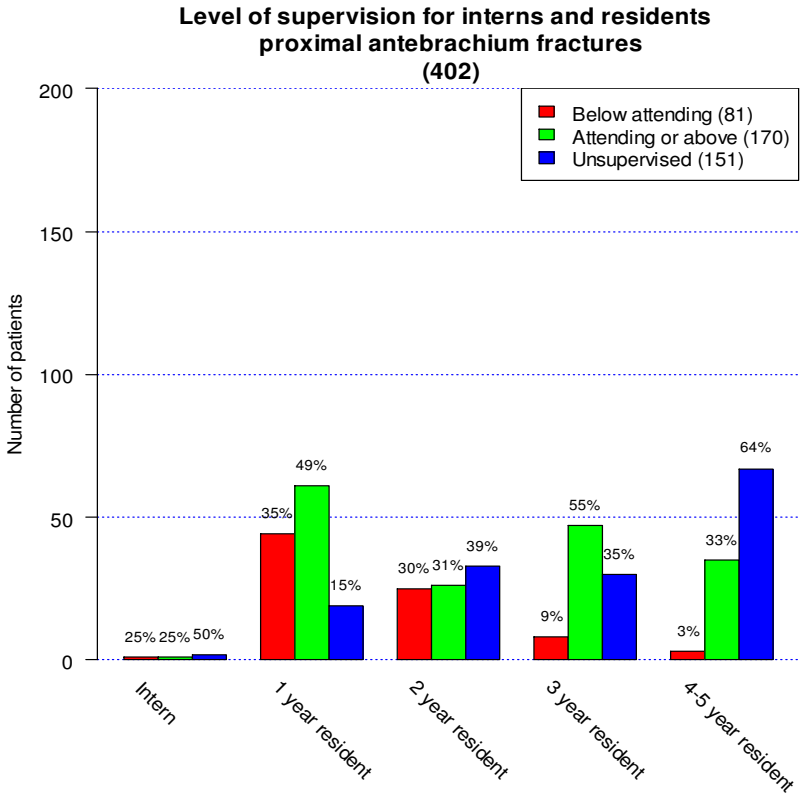


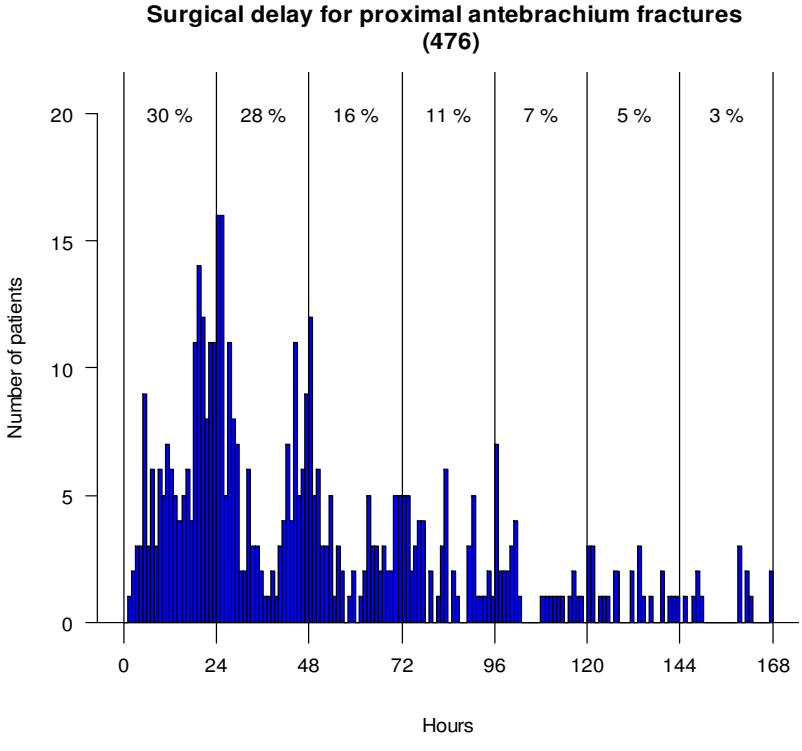
Primary surgeons for proximal antebrachium fractures (551)



Level of supervision for proximal antebrachium fractures (541)

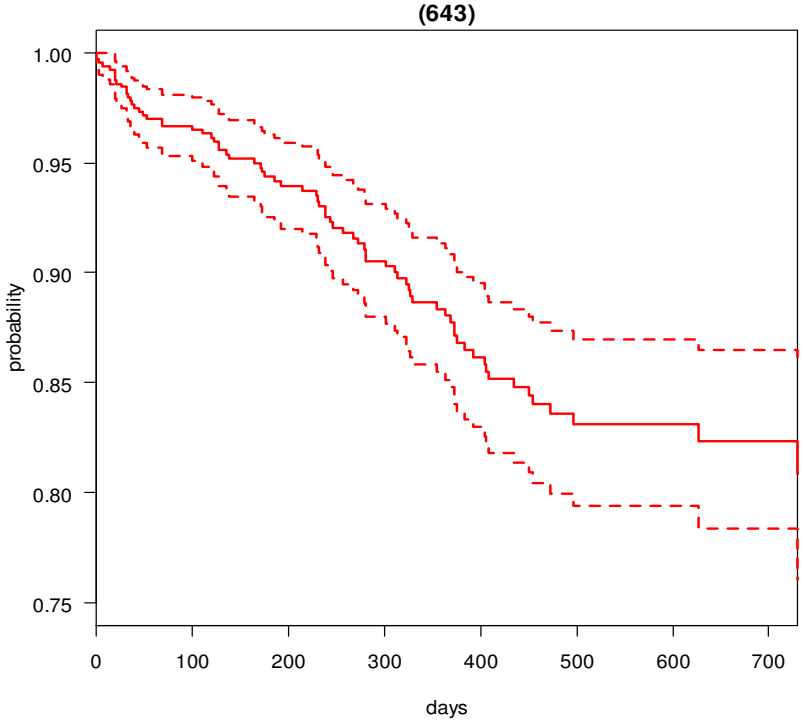




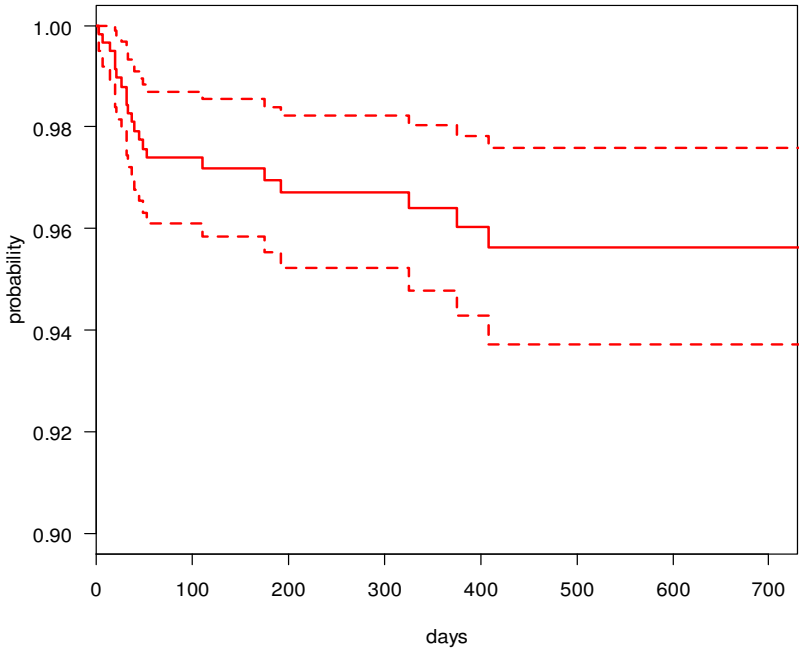


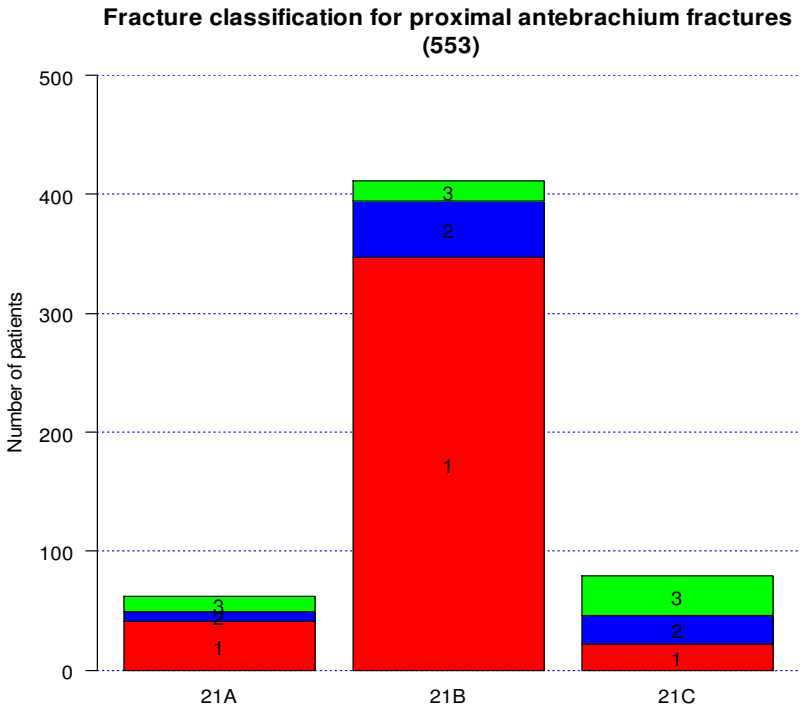
(Proportion of patients operated in 24 hour intervals)

Survival for primary surgery with reoperation due to any reason proximal antebrachium fractures (643)

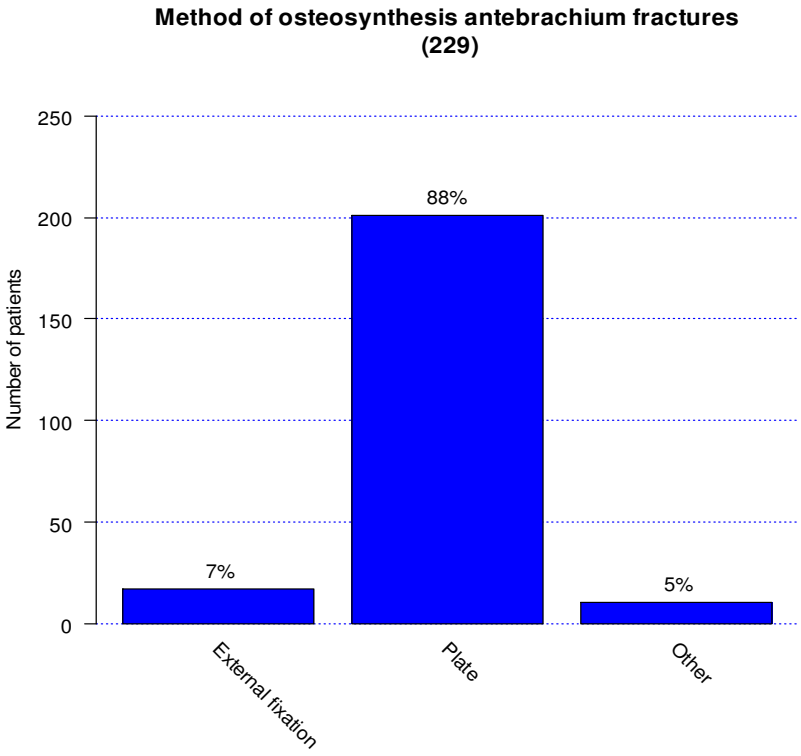


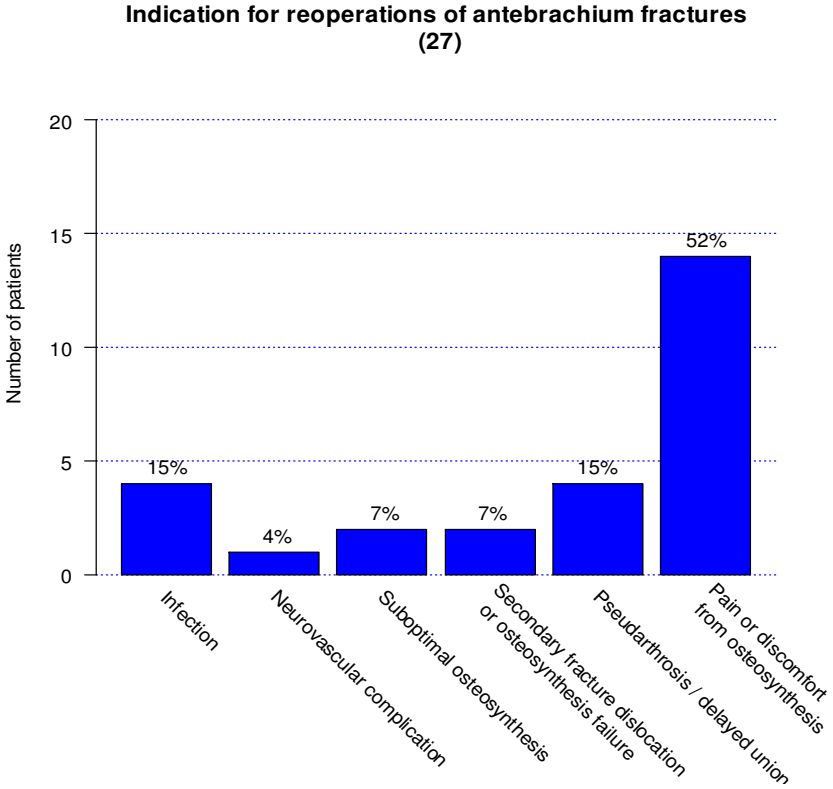
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware proximal antebrachium fractures (585)



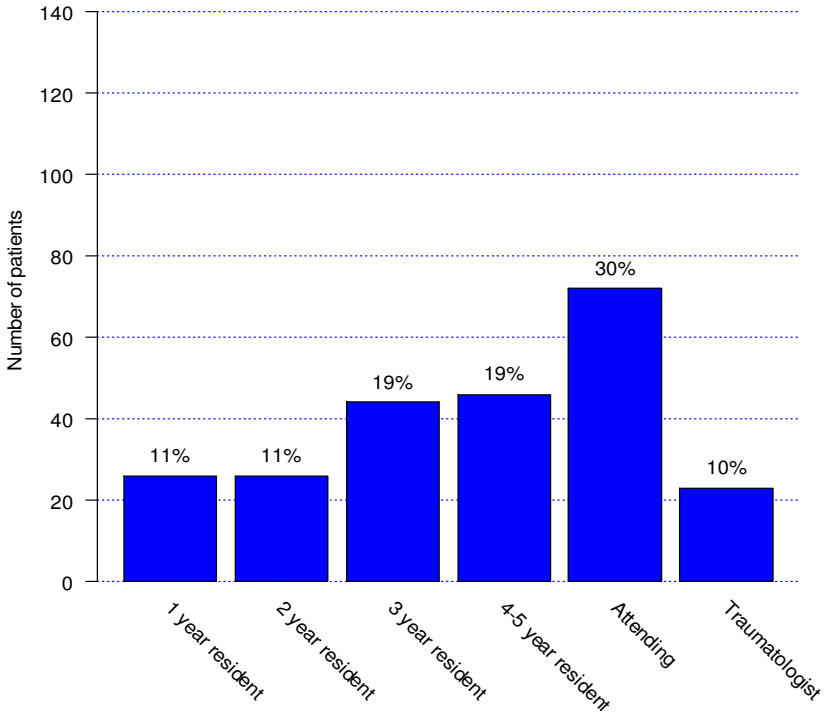

Fracture classification for proximal antebrachium fractures
(553)
Number of patients
500
400
300
200
100
0
3
2
1
21A
21B
21C

Antebrachium

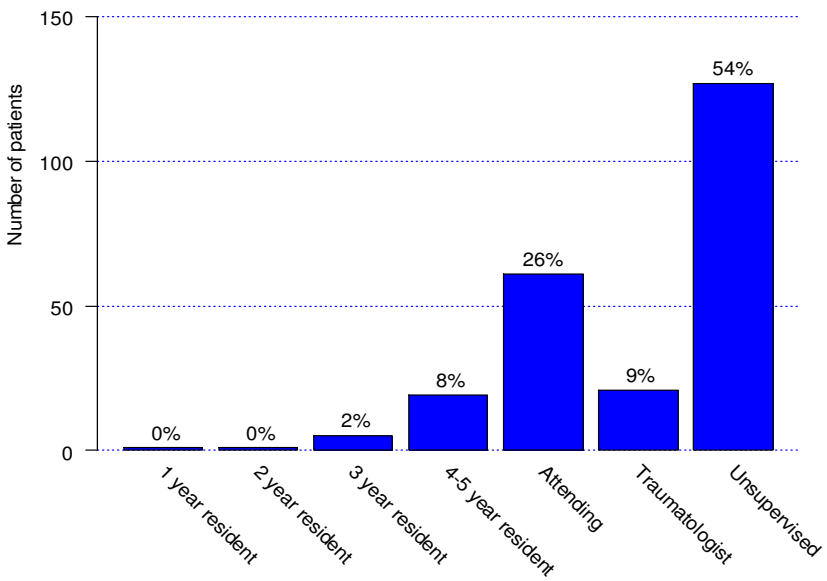


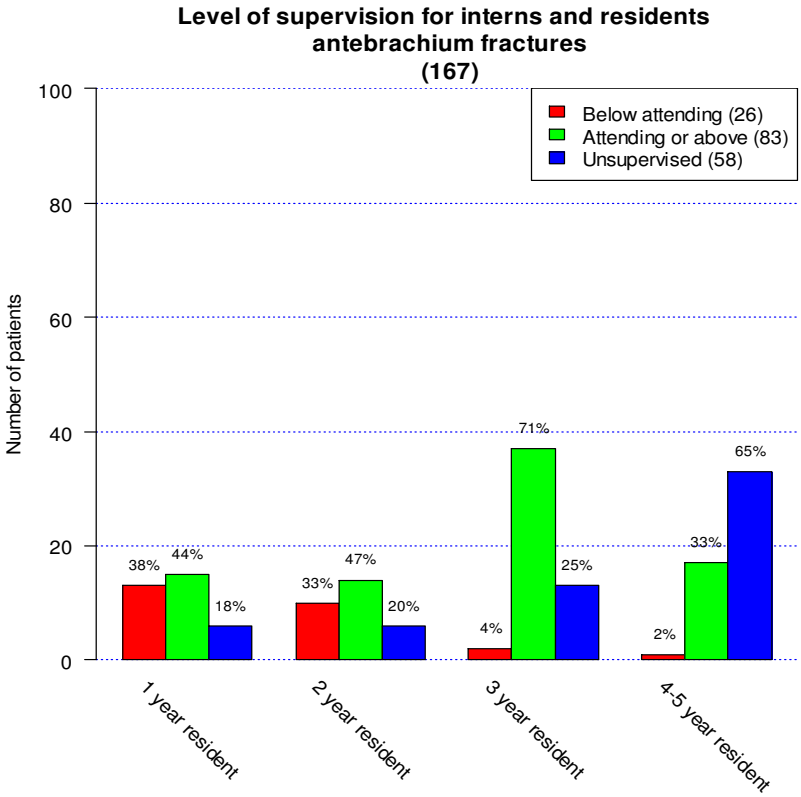


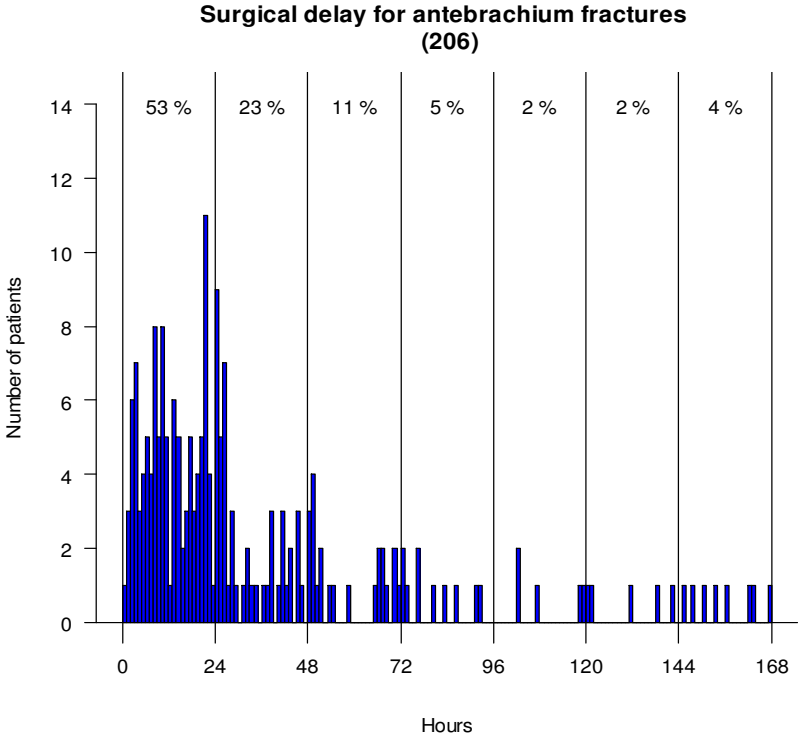
Primary surgeons for antebrachium fractures (237)



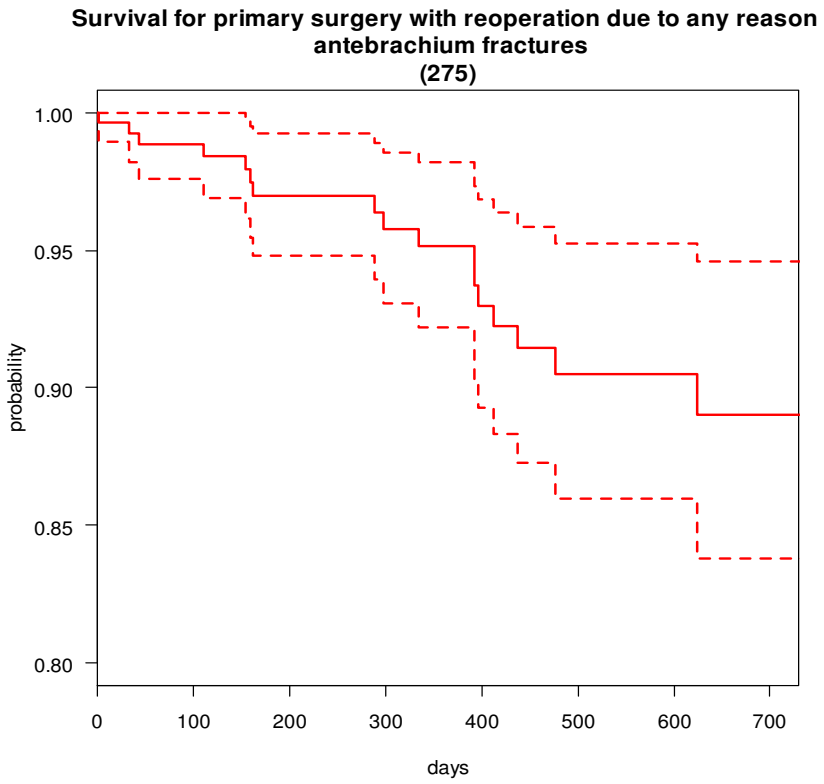
Level of supervision for antebrachium fractures (235)

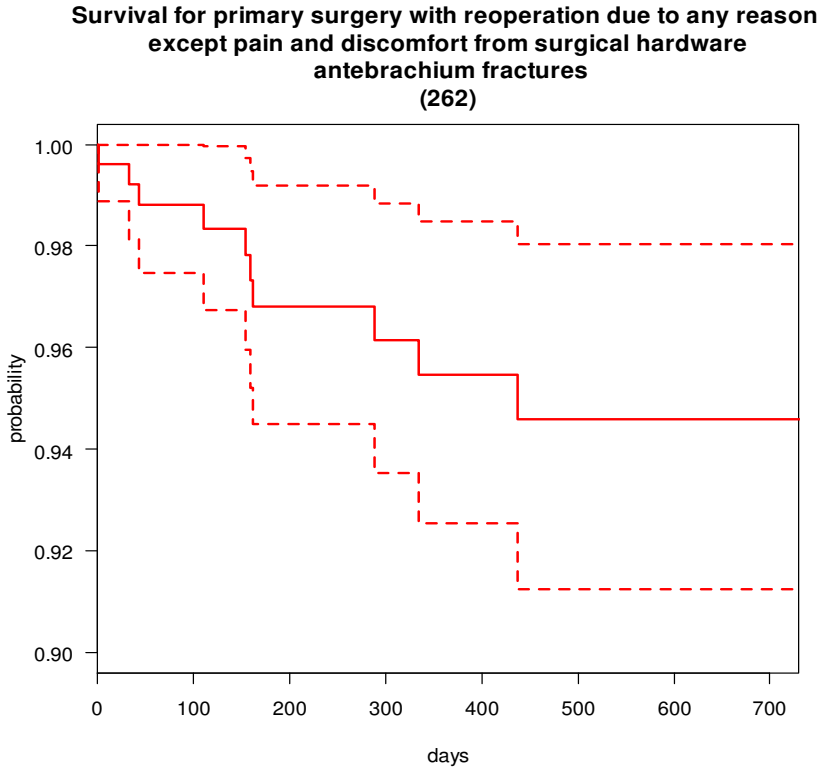


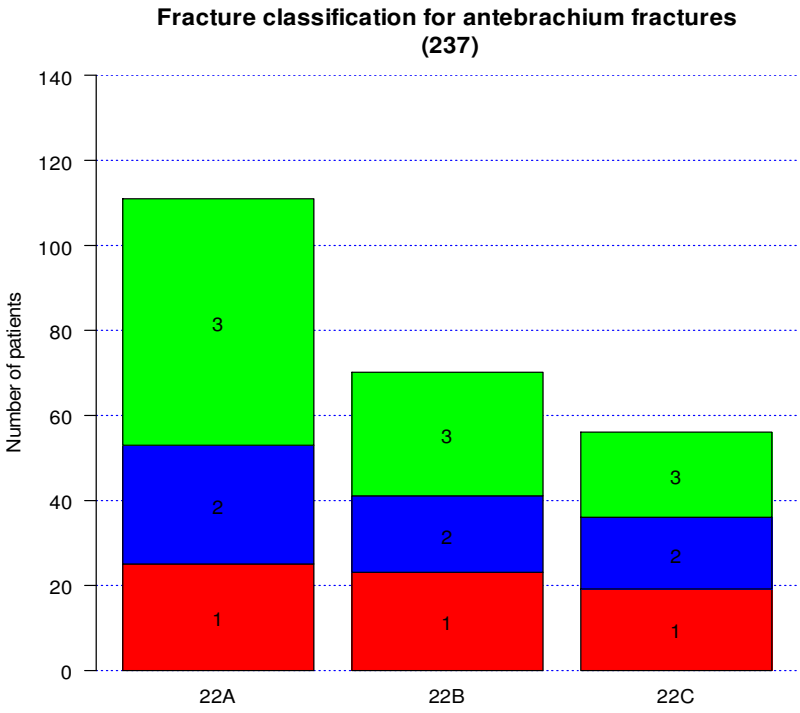




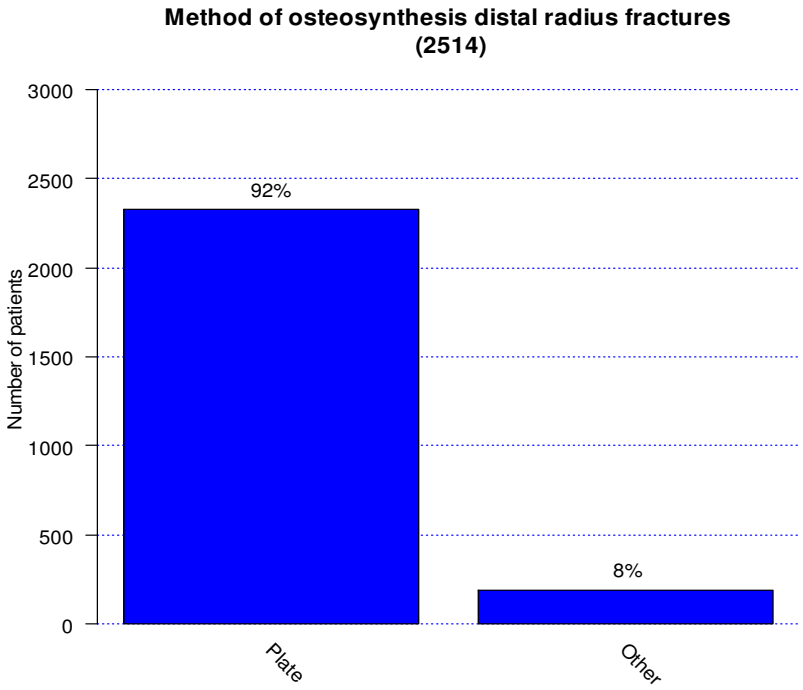
(Proportion of patients operated in 24 hour intervals)

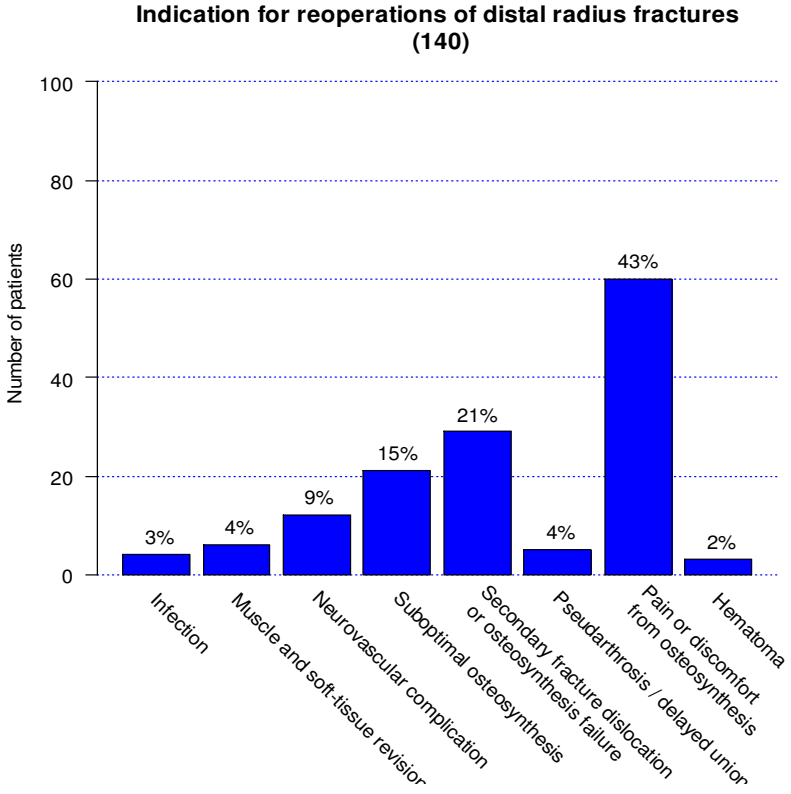

Survival for primary surgery with reoperation due to any reason
antebrachium fractures
(275)
probability
1.00
0.95
0.90
0.85
0.80
0
100
200
300
400
500
600
700
days


Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
antebrachium fractures
(262)
probability
1.00
0.98
0.96
0.94
0.92
0.90
0
100
200
300
400
500
600
700
days

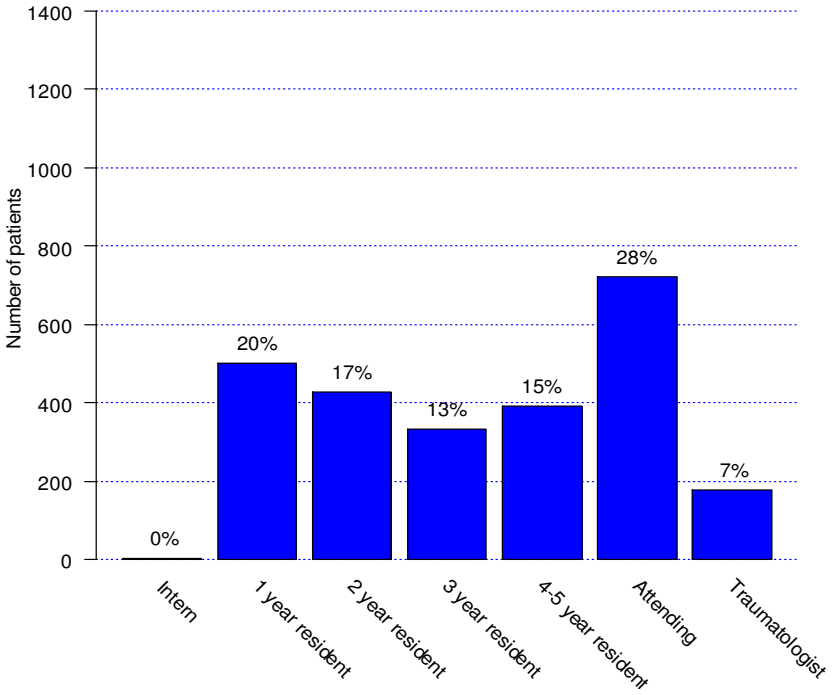

Fracture classification for antebrachium fractures
(237)
Number of patients
140
120
100
80
60
40
20
0
3
2
1
3
2
1
3
2
1
22A
22B
22C

Distal radius

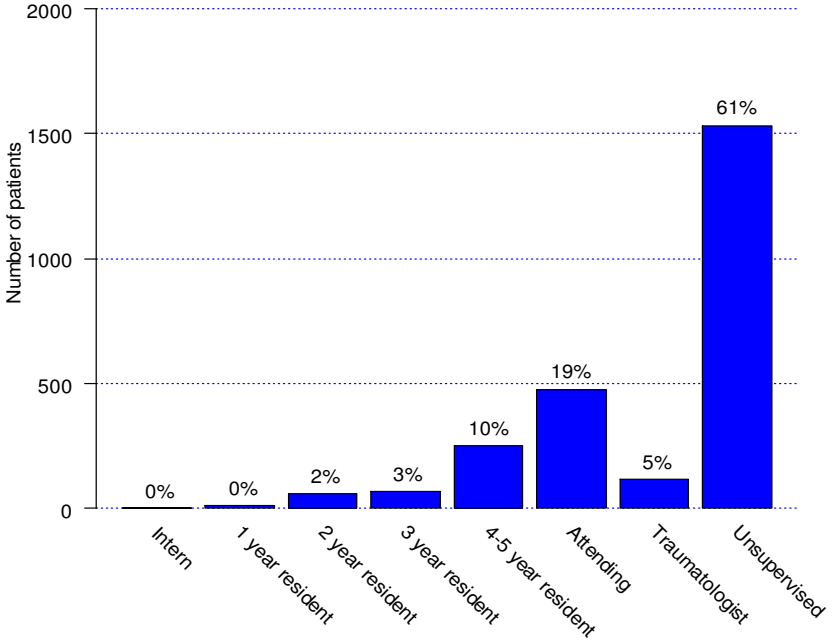


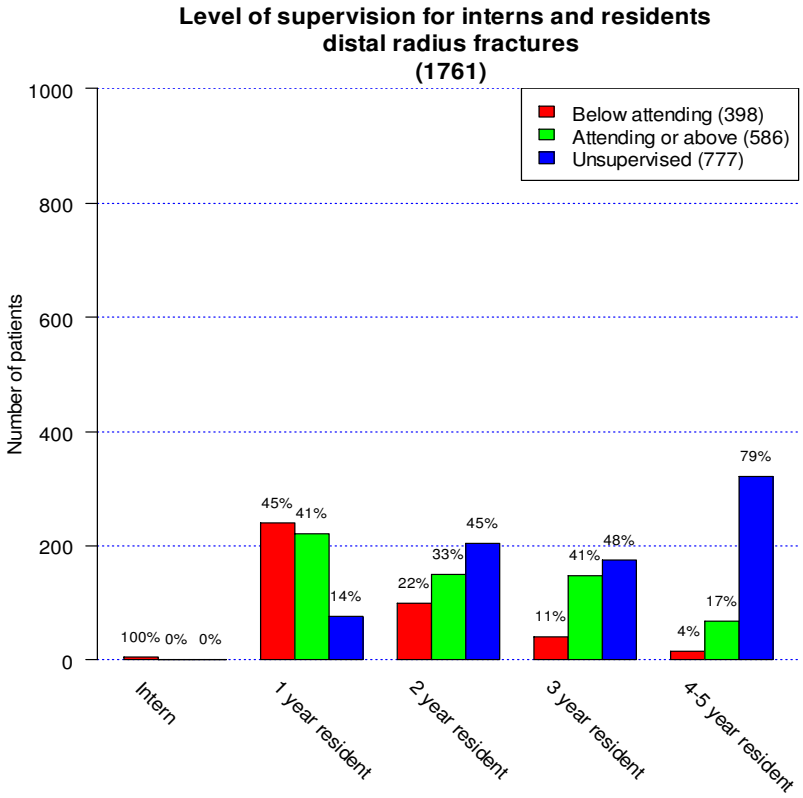


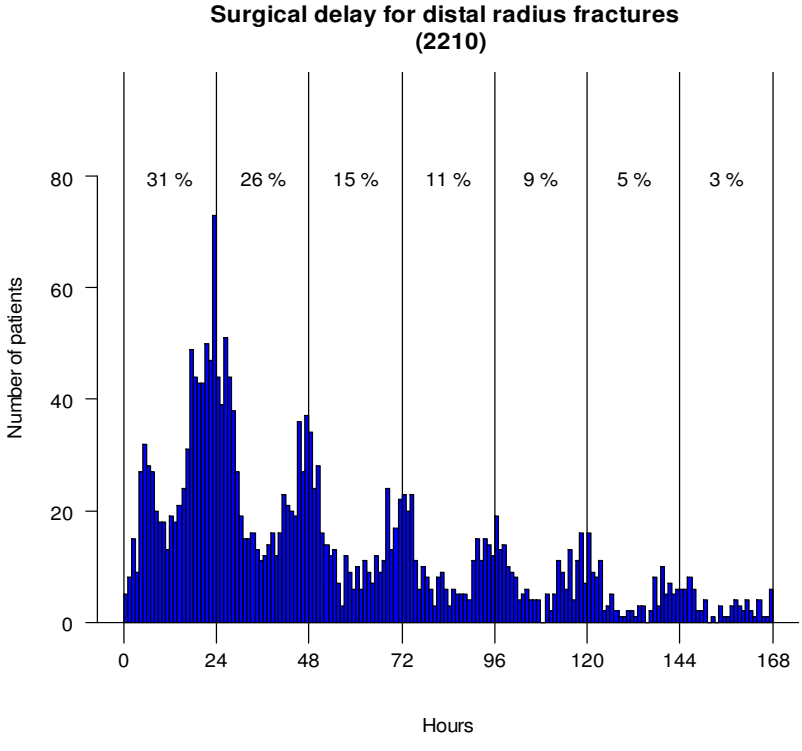
Primary surgeons for distal radius fractures (2553)



Level of supervision for distal radius fractures (2515)

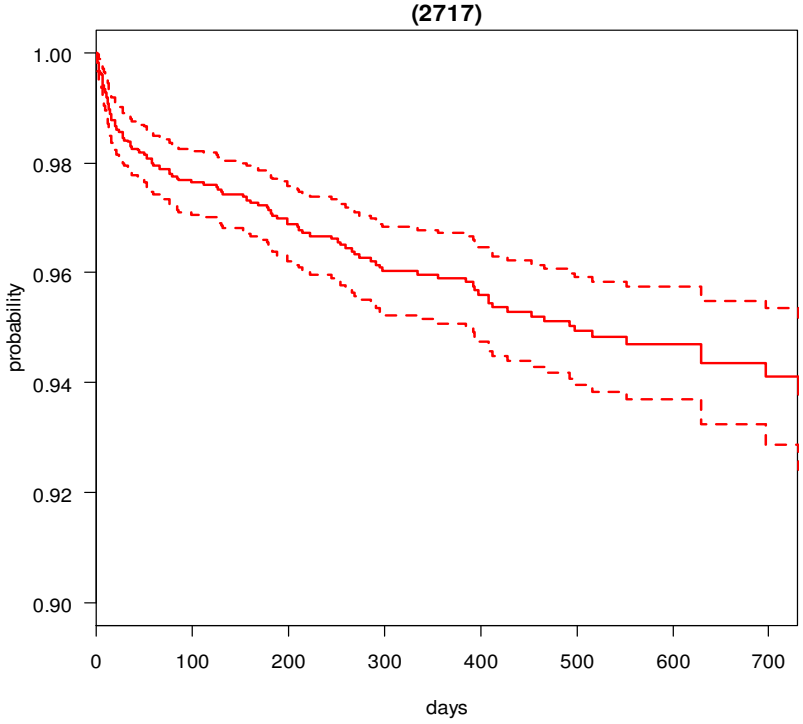




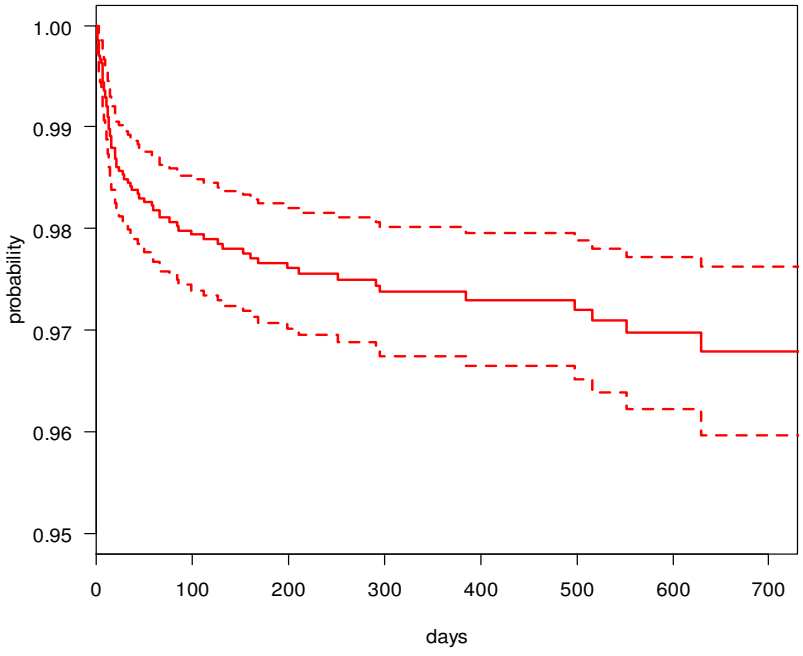


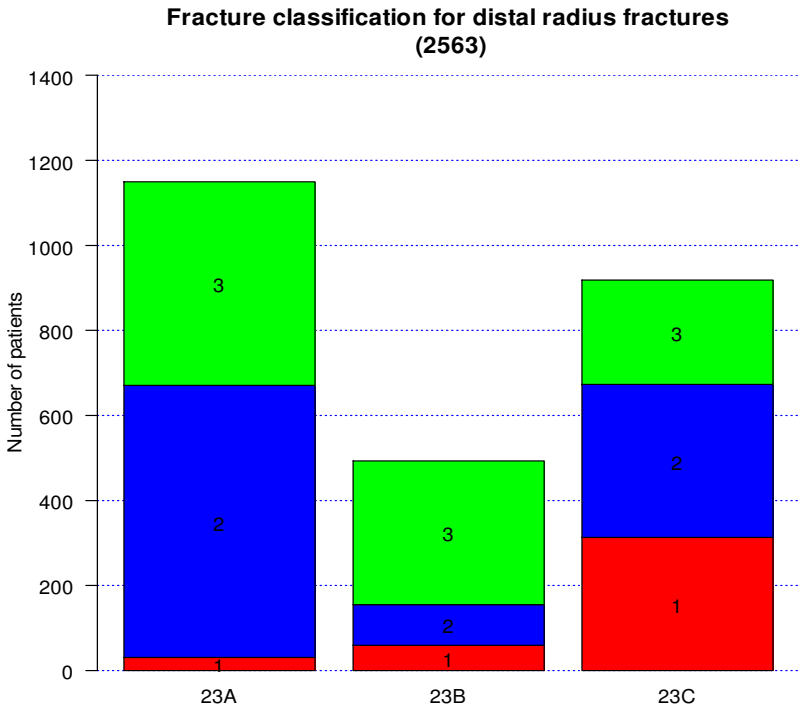
(Proportion of patients operated in 24 hour intervals)

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



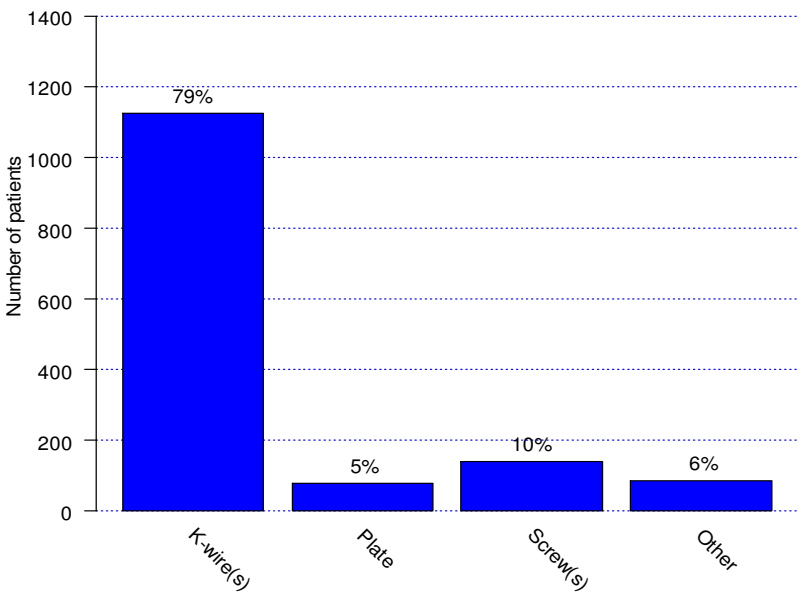
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware distal radius fractures (2665)



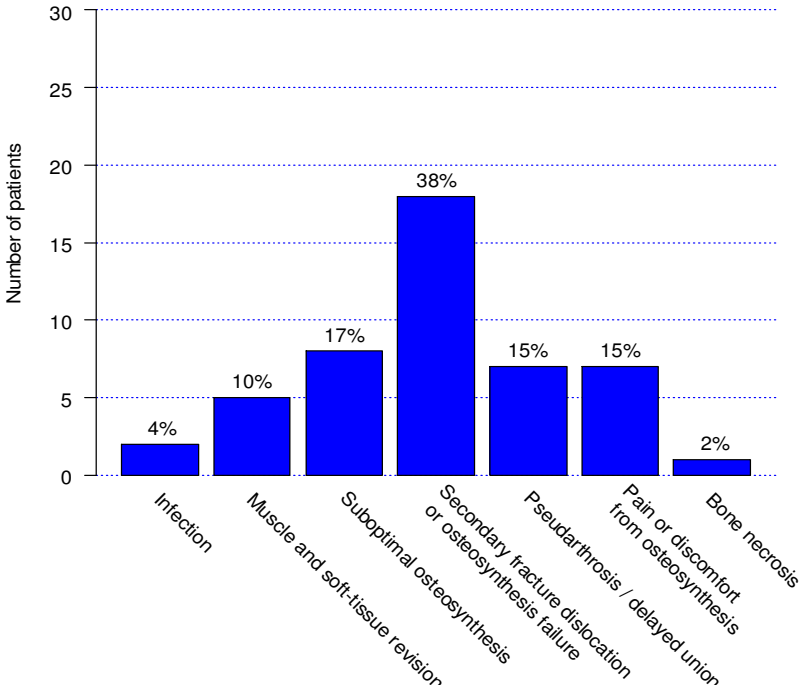

Fracture classification for distal radius fractures
(2563)
Number of patients
1400
1200
1000
800
600
400
200
0
3
2
1
3
2
1
3
2
1
23A
23B
23C

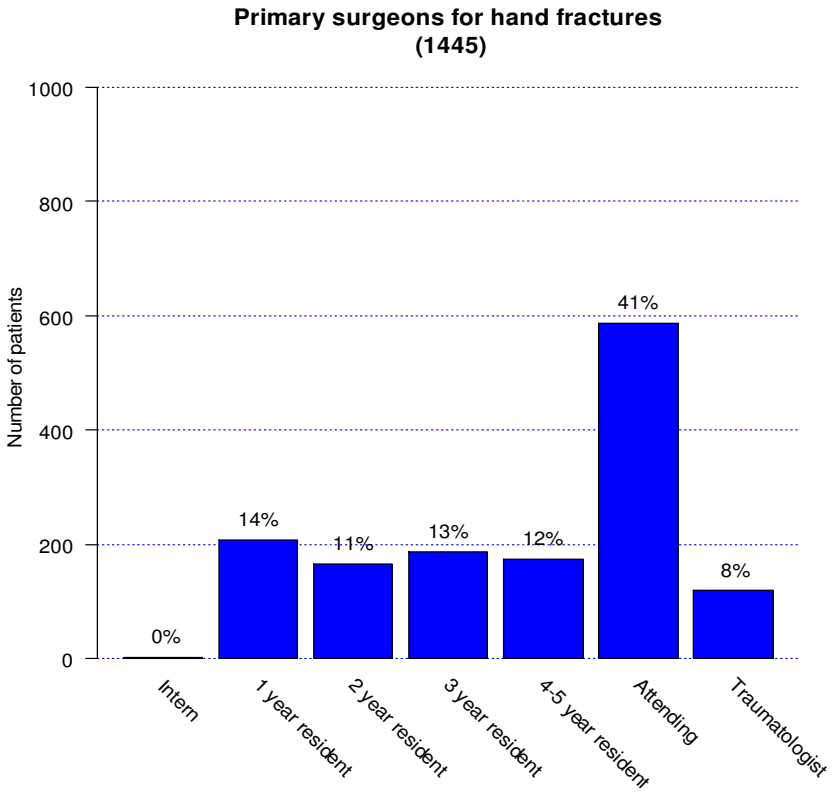
Hand

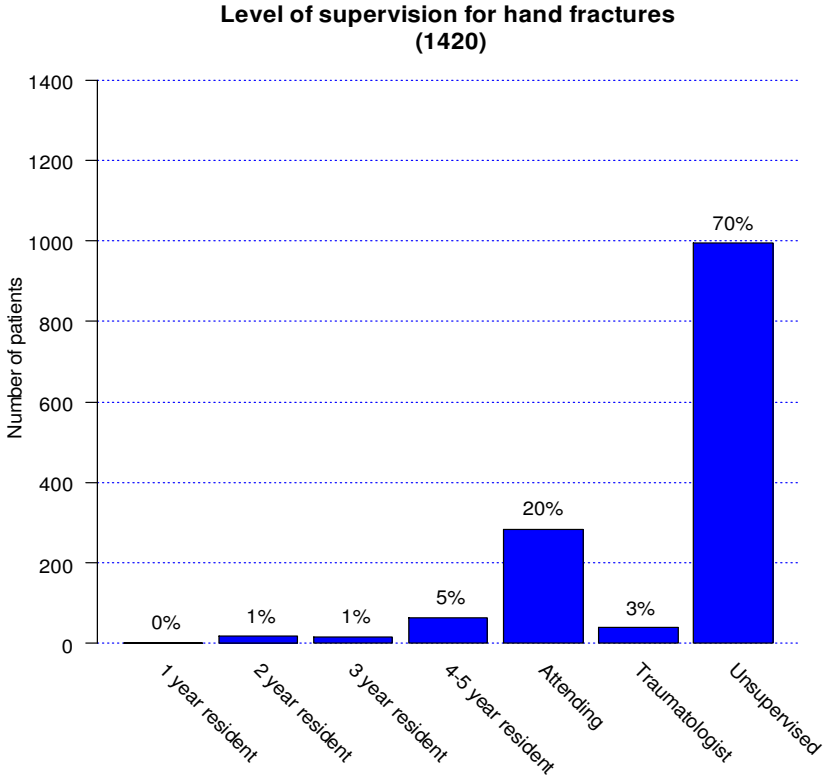
Method of osteosynthesis hand fractures (1425)

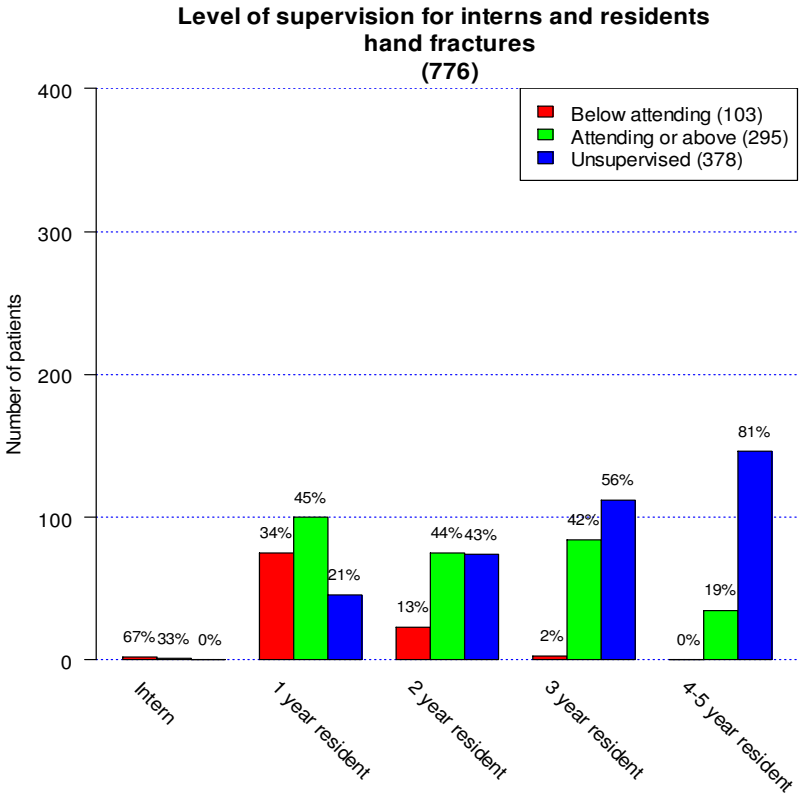


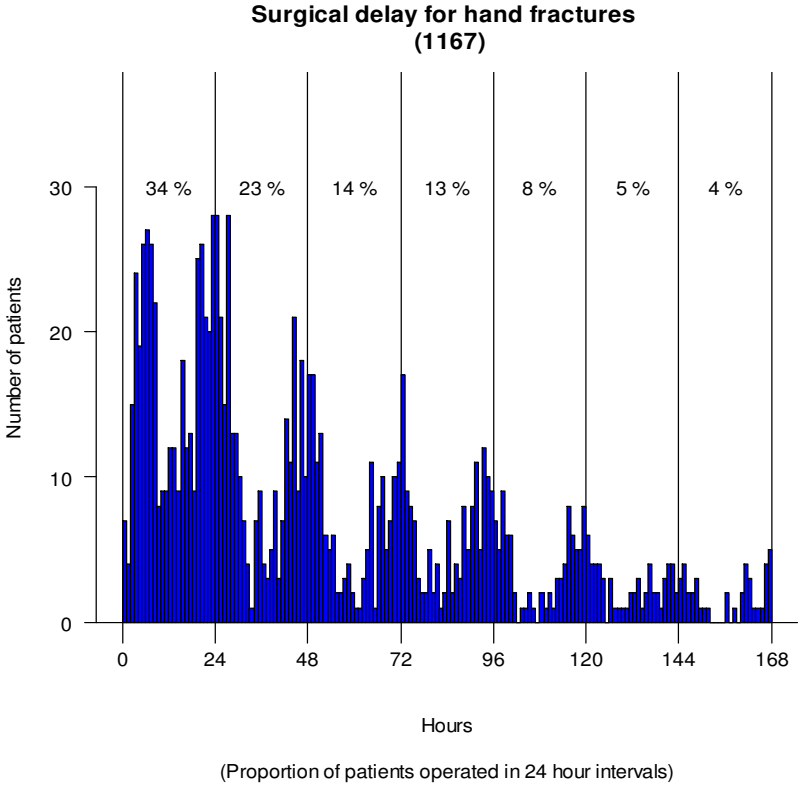
Indication for reoperations of hand fractures (48)



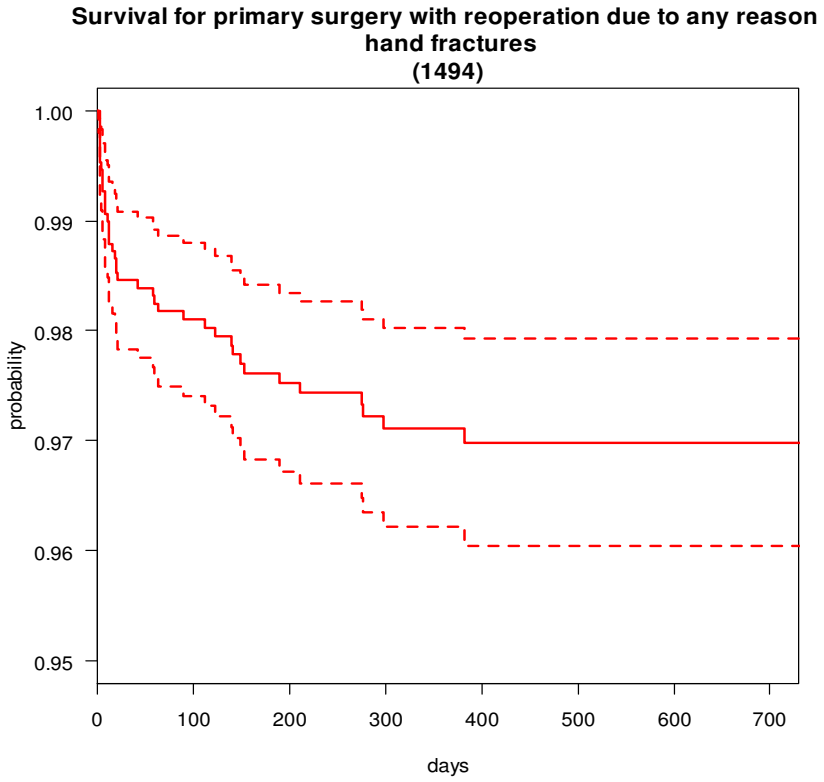

Primary surgeons for hand fractures
(1445)
Number of patients
1000
800
600
400
200
0
0%
14%
11%
13%
12%
41%
8%
Intern
1 year resident
2 year resident
3 year resident
4-5 year resident
Attending
Traumatologist

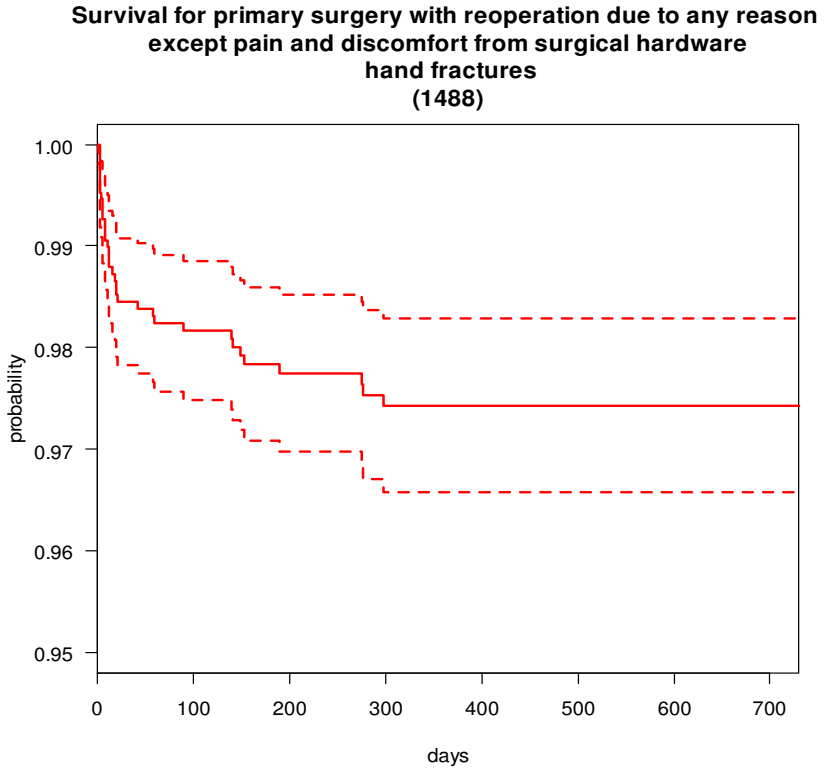

Level of supervision for hand fractures
(1420)
Number of patients
1400
1200
1000
800
600
400
200
0
0%
1%
1%
5%
20%
3%
70%
1 year resident
2 year resident
3 year resident
4-5 year resident
Attending
Traumatologist
Unsupervised

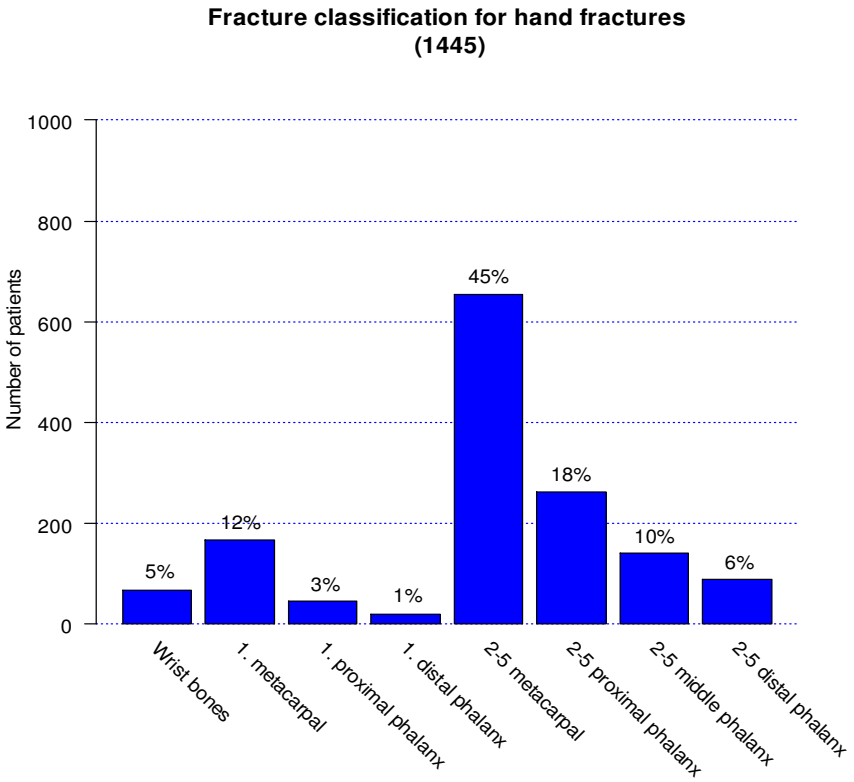




(Proportion of patients operated in 24 hour intervals)

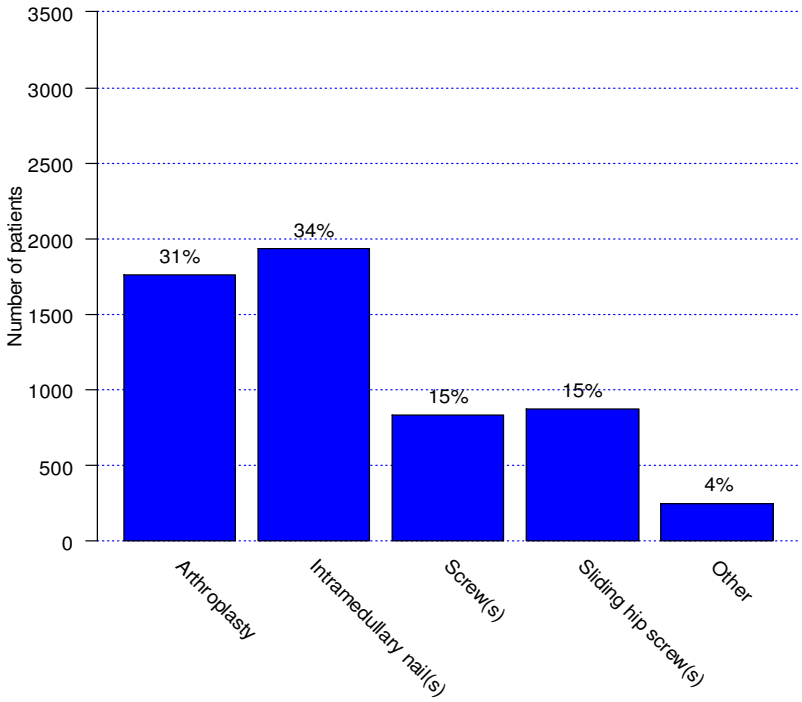

Survival for primary surgery with reoperation due to any reason
hand fractures
(1494)
probability
1.00
0.99
0.98
0.97
0.96
0.95
0
100
200
300
400
500
600
700
days


Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
hand fractures
(1488)
probability
1.00
0.99
0.98
0.97
0.96
0.95
0
100
200
300
400
500
600
700
days

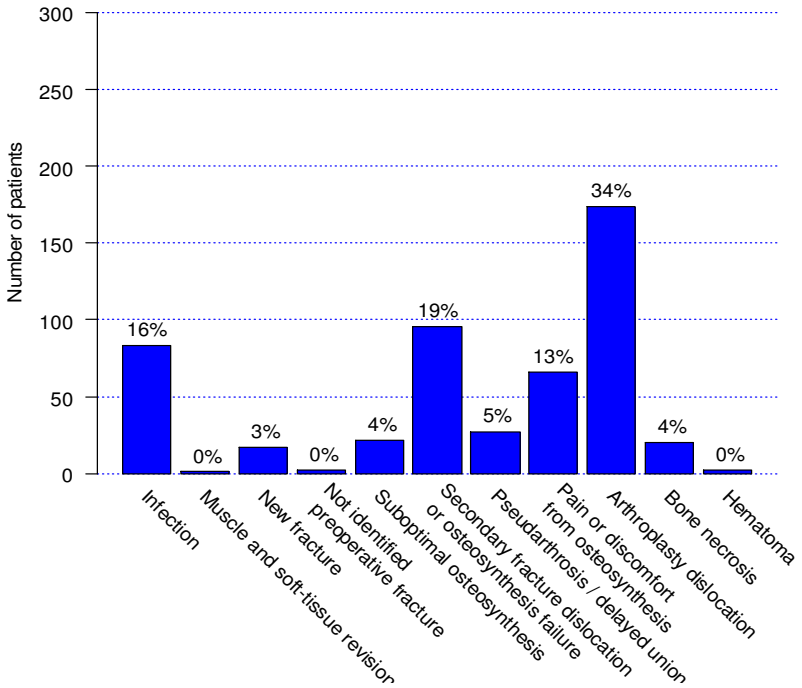

Fracture classification for hand fractures
(1445)
Number of patients
1000
800
600
400
200
0
5%
12%
3%
1%
45%
18%
10%
6%
Wrist bones
1. metacarpal
1. proximal phalanx
1. distal phalanx
2-5 metacarpal
2-5 proximal phalanx
2-5 middle phalanx
2-5 distal phalanx

Proximal femur

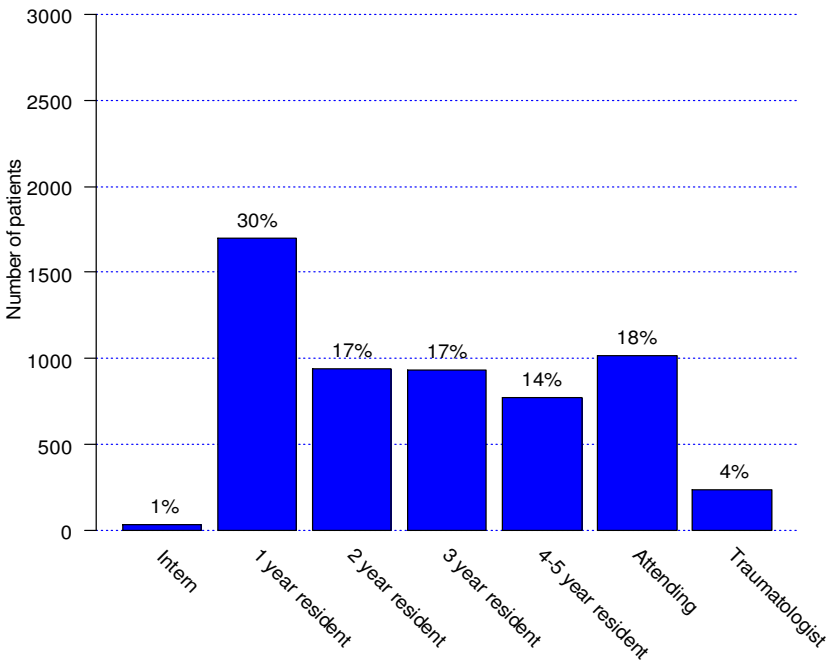
Method of osteosynthesis proximal femur fractures (5653)



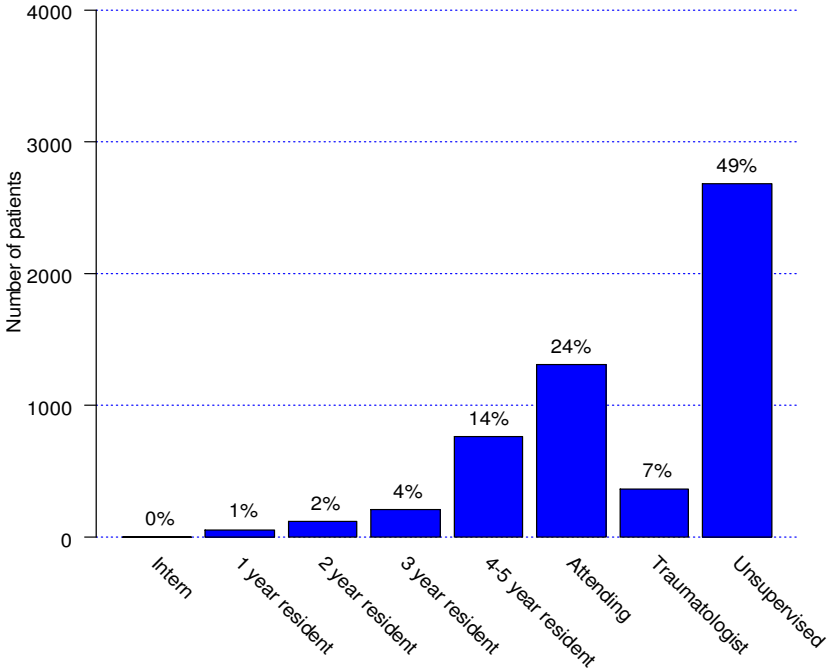
Indication for reoperations of proximal femur fractures (510)

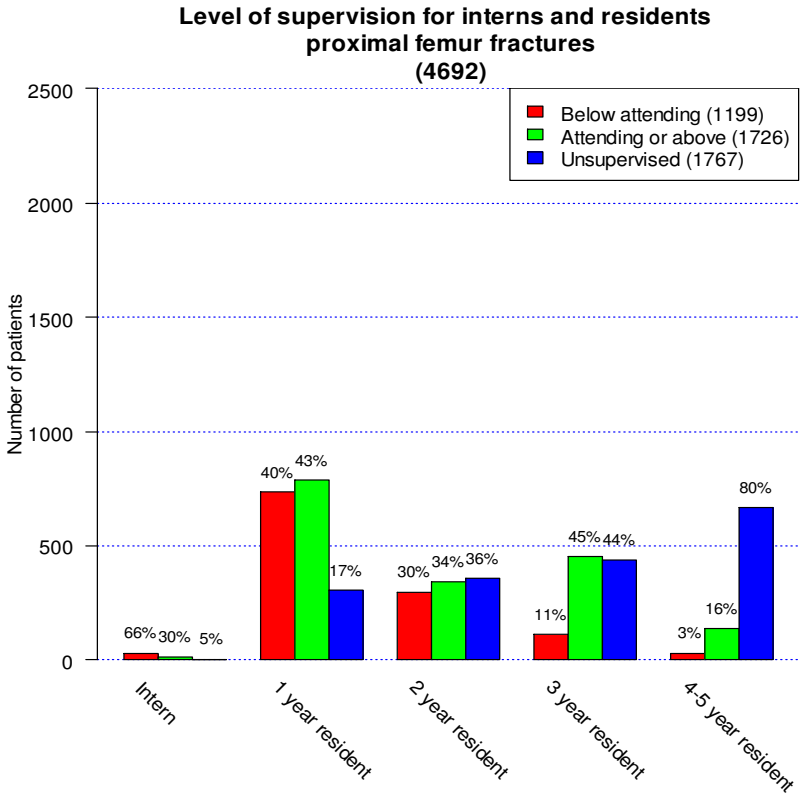


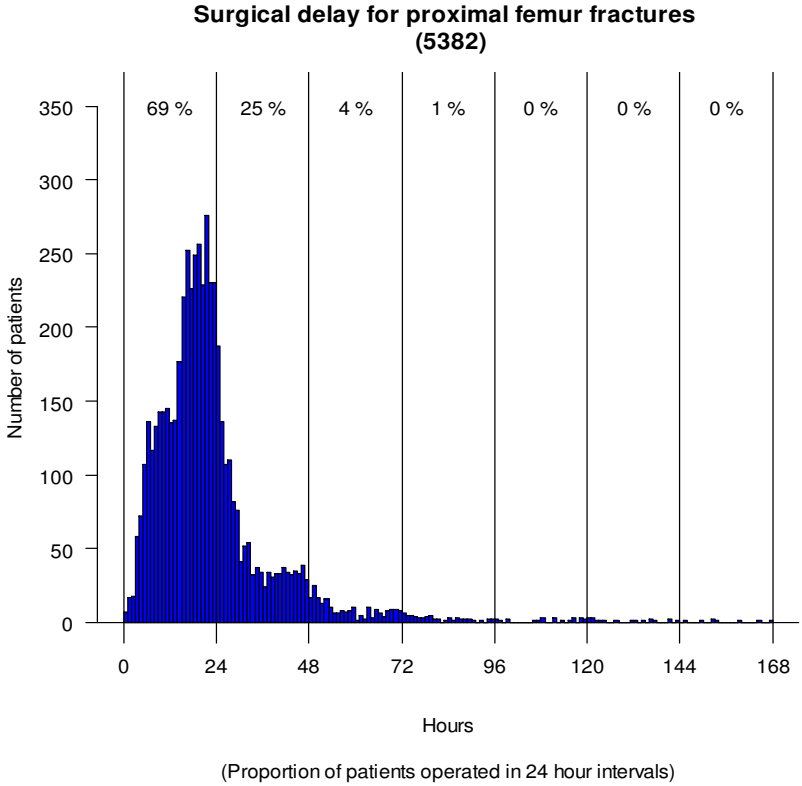
Primary surgeons for proximal femur fractures (5634)



Level of supervision for proximal femur fractures (5517)

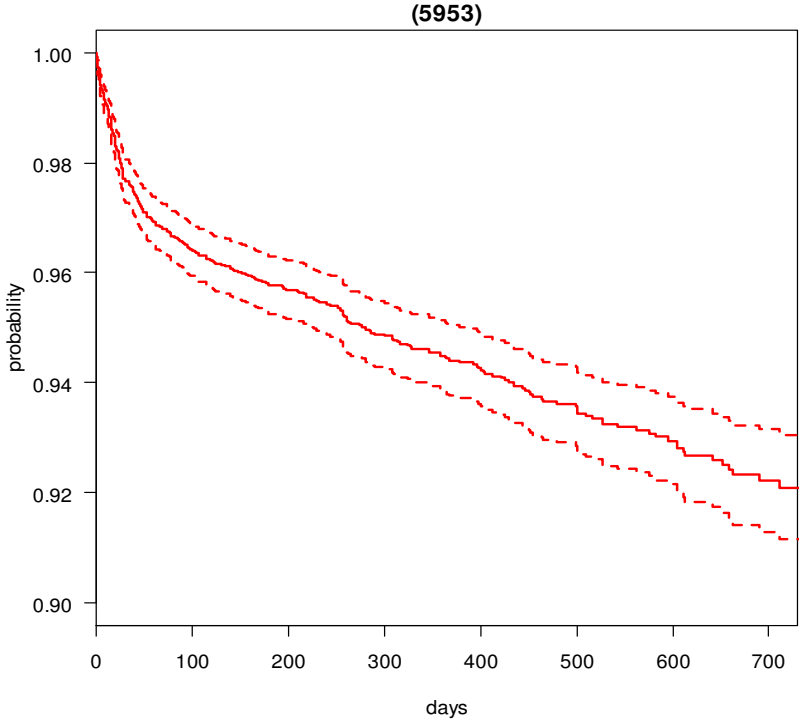




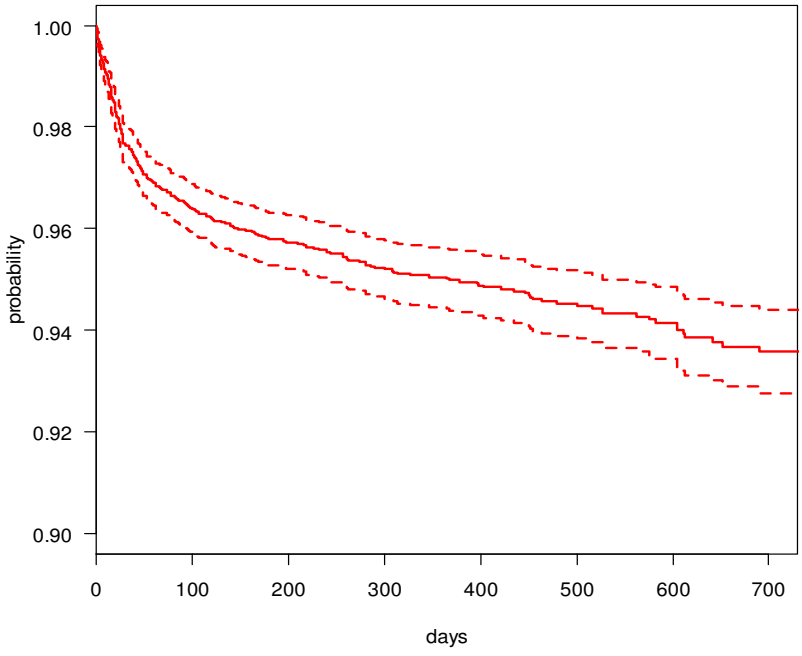


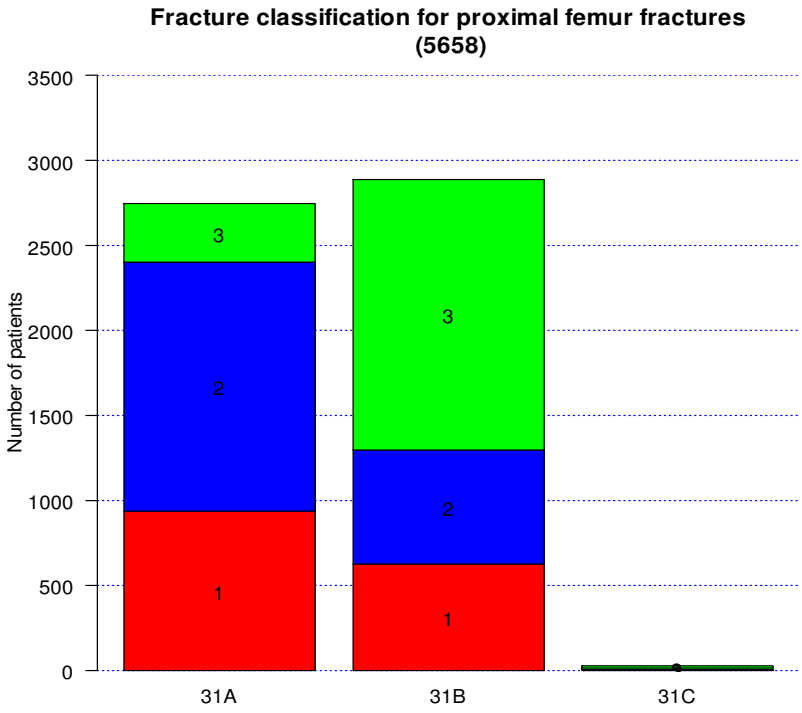
(Proportion of patients operated in 24 hour intervals)

Survival for primary surgery with reoperation due to any reason
proximal femur fractures
(5953)



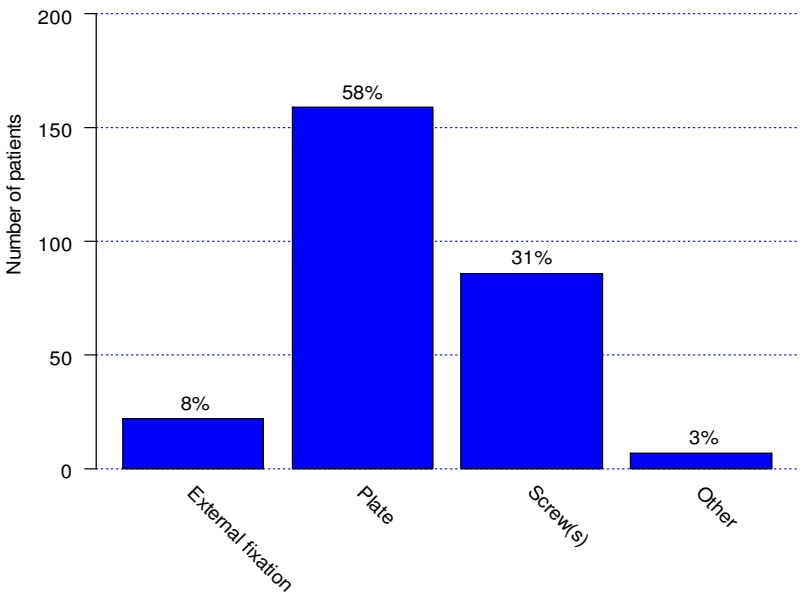
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware
proximal femur fractures
(5891)



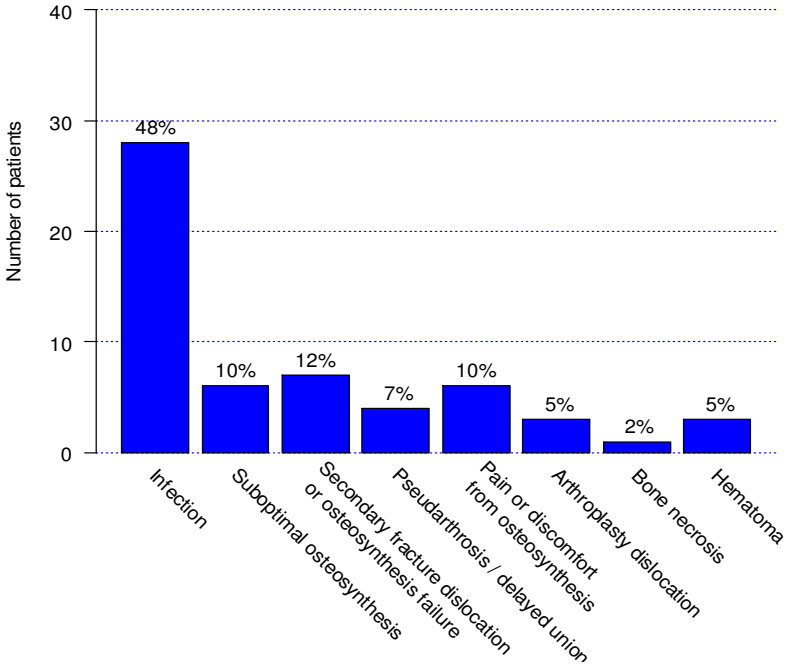

Fracture classification for proximal femur fractures
(5658)
Number of patients
3500
3000
2500
2000
1500
1000
500
0
3
2
1
3
2
1
31A
31B
31C

Acetabulum

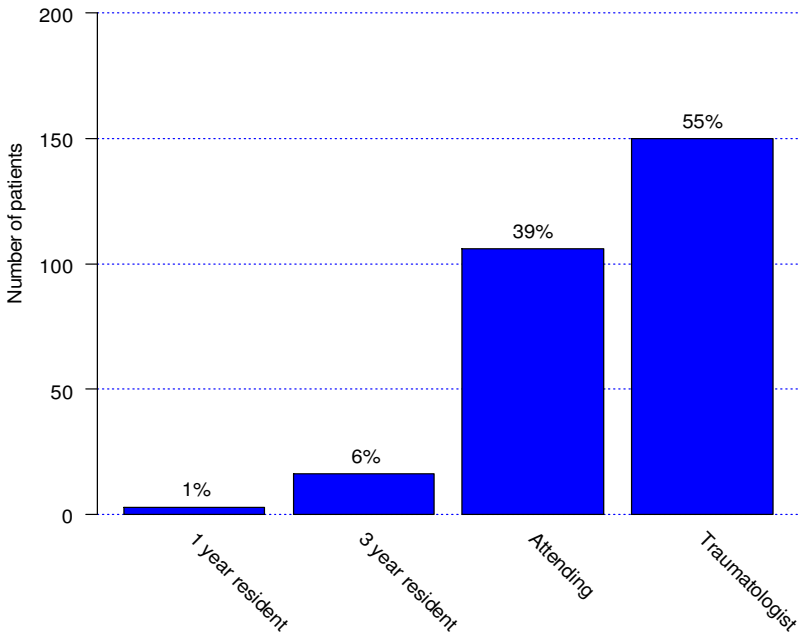
Method of osteosynthesis acetabulum fractures (274)



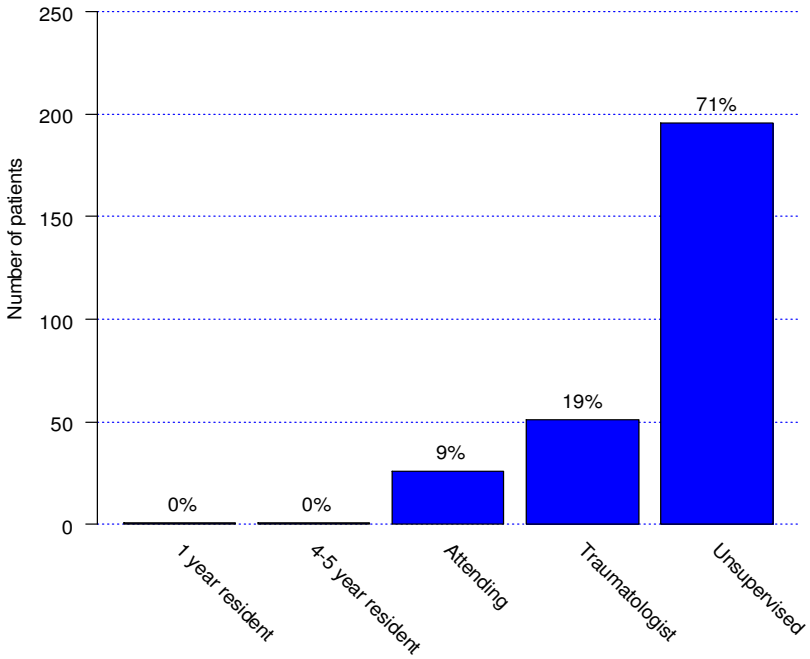
Indication for reoperations of acetabulum fractures (58)

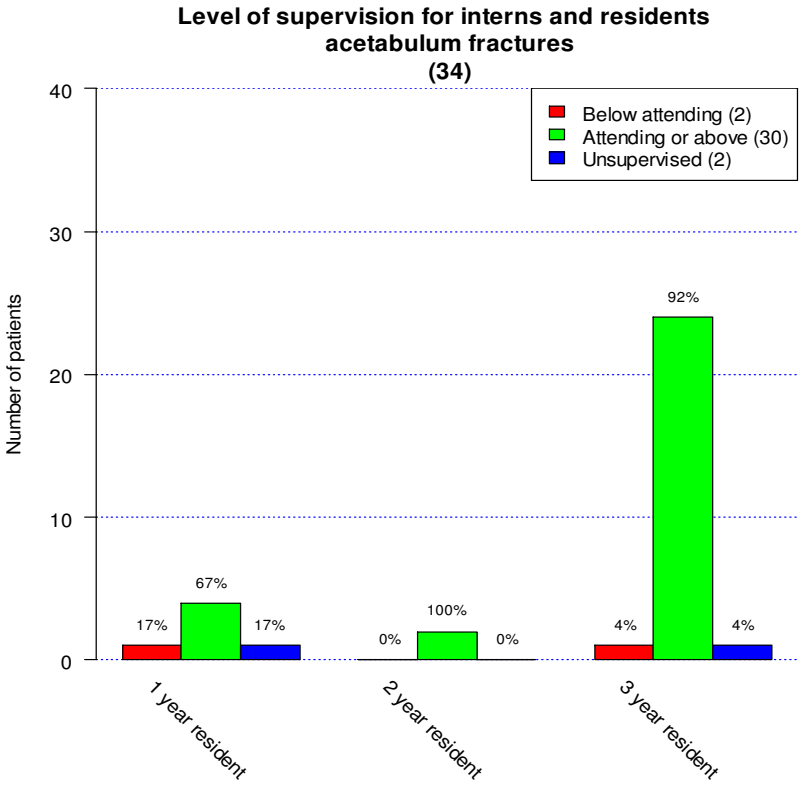


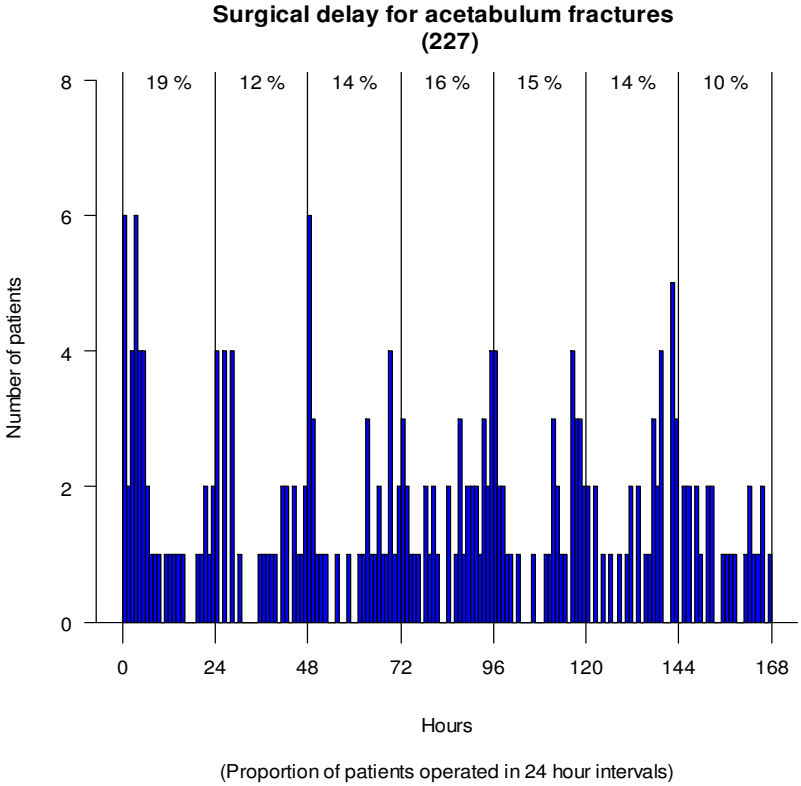
Primary surgeons for acetabulum fractures (275)



Level of supervision for acetabulum fractures (275)

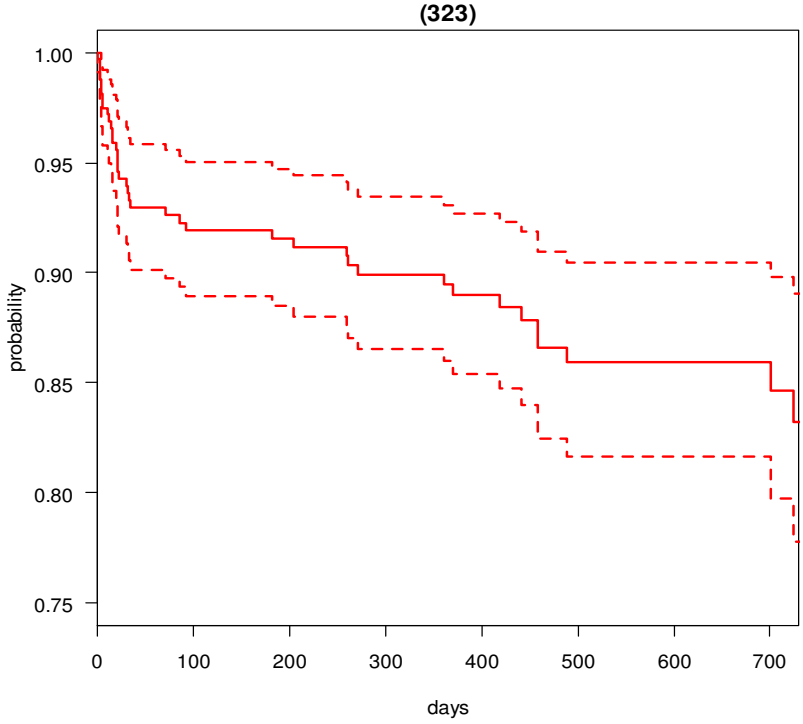




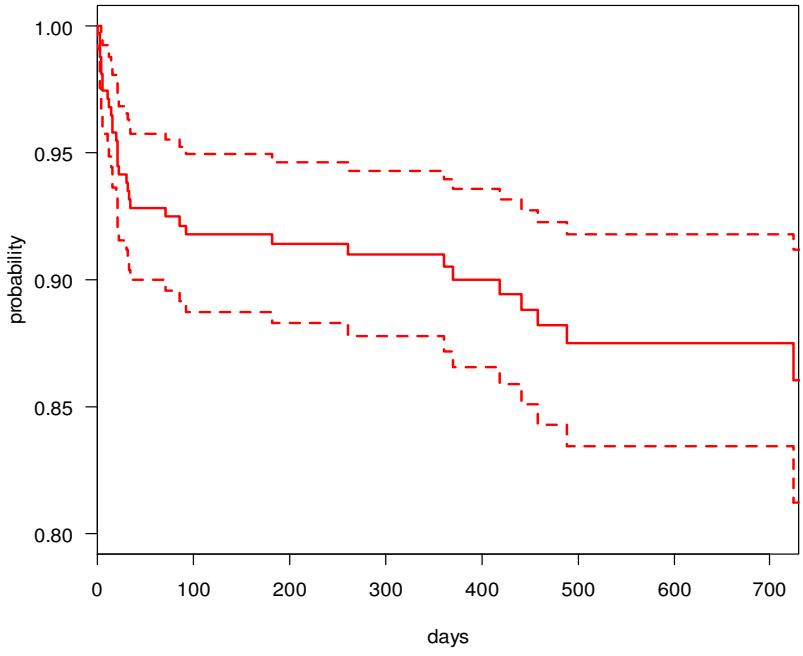


(Proportion of patients operated in 24 hour intervals)

Survival for primary surgery with reoperation due to any reason
acetabulum fractures
(323)

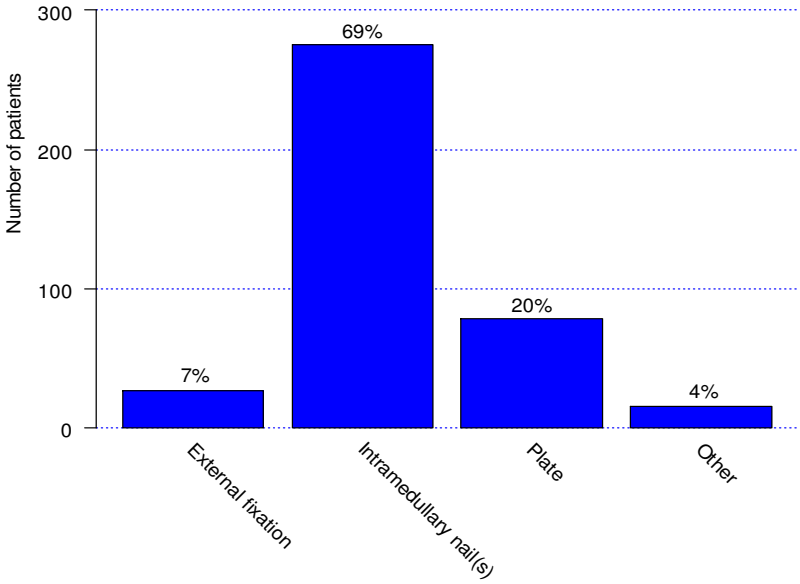


Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
acetabulum fractures
(317)

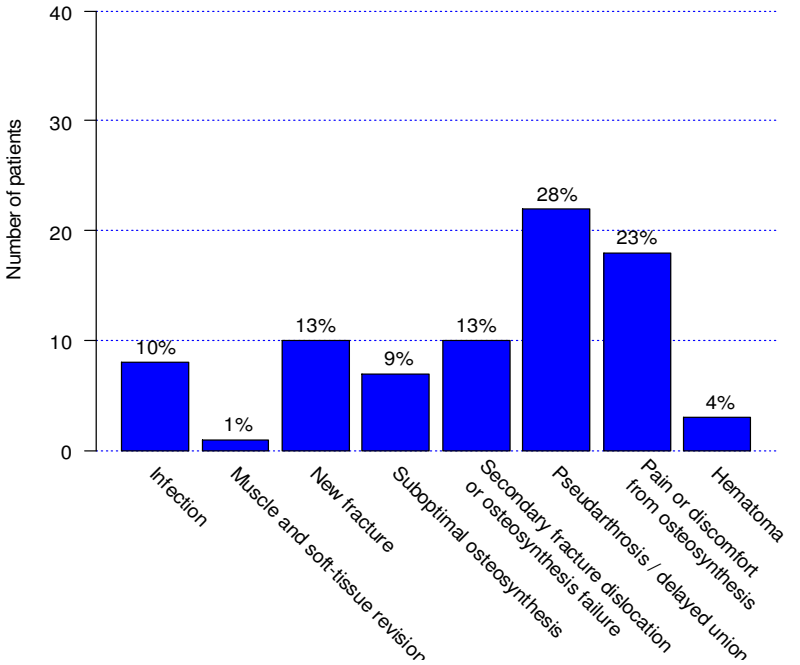


Femur

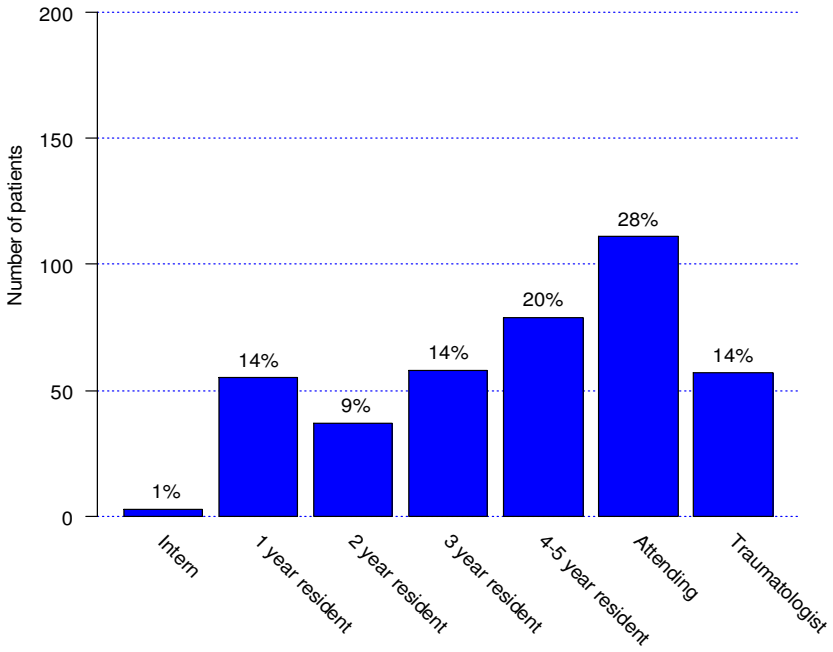
Method of osteosynthesis femur fractures (396)



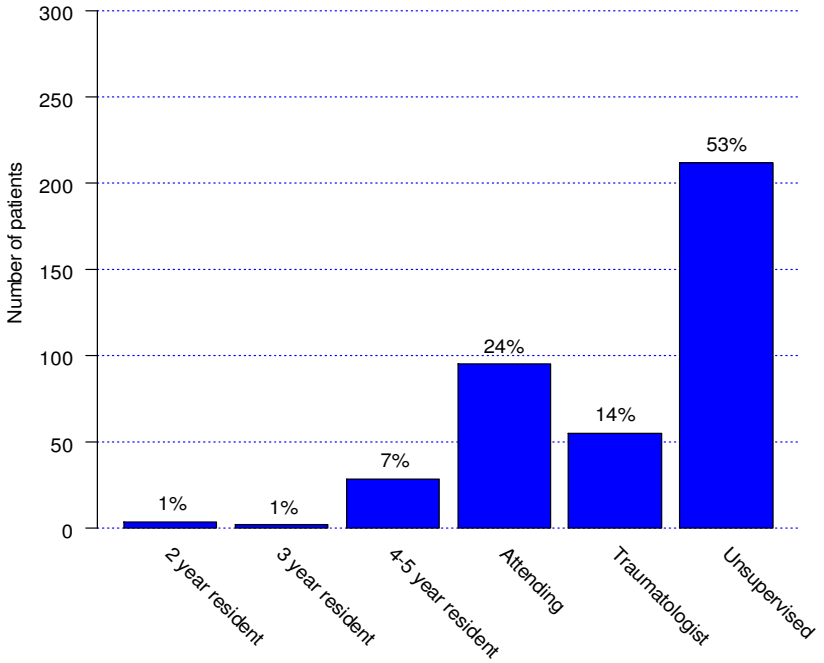
Indication for reoperations of femur fractures (79)

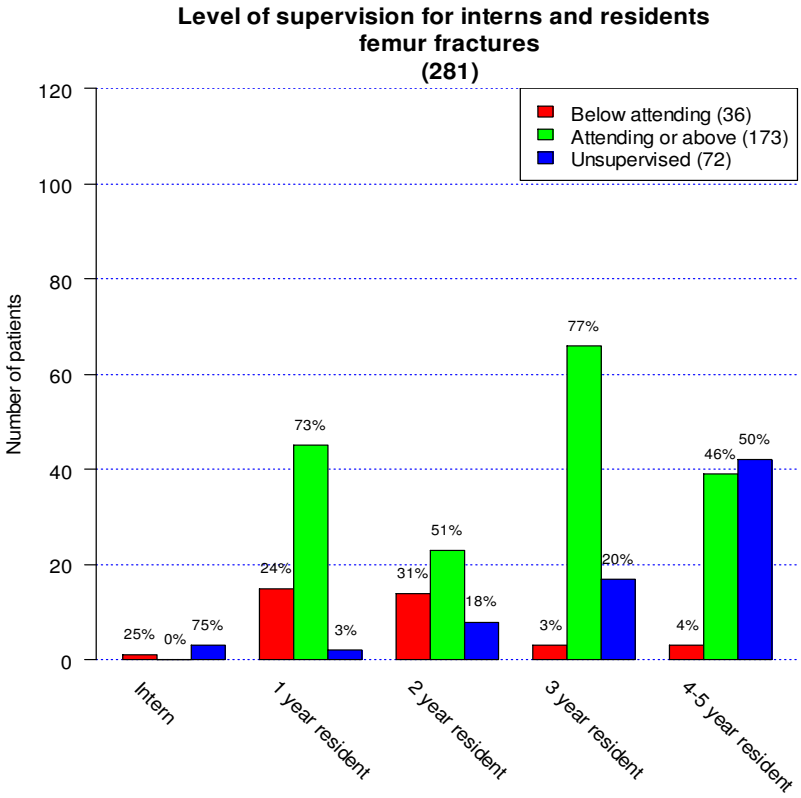


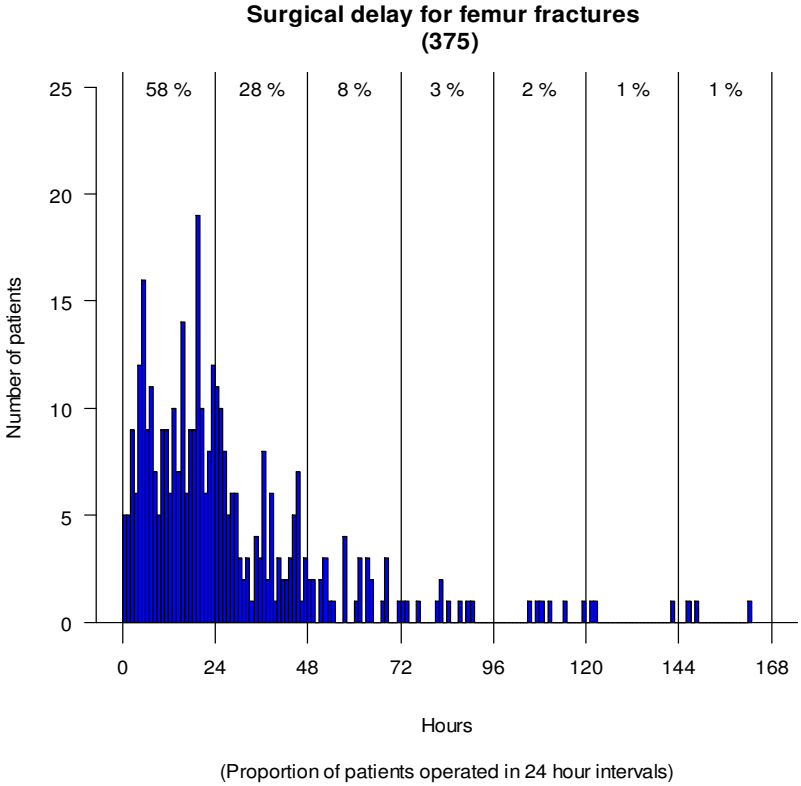
Primary surgeons for femur fractures
(400)



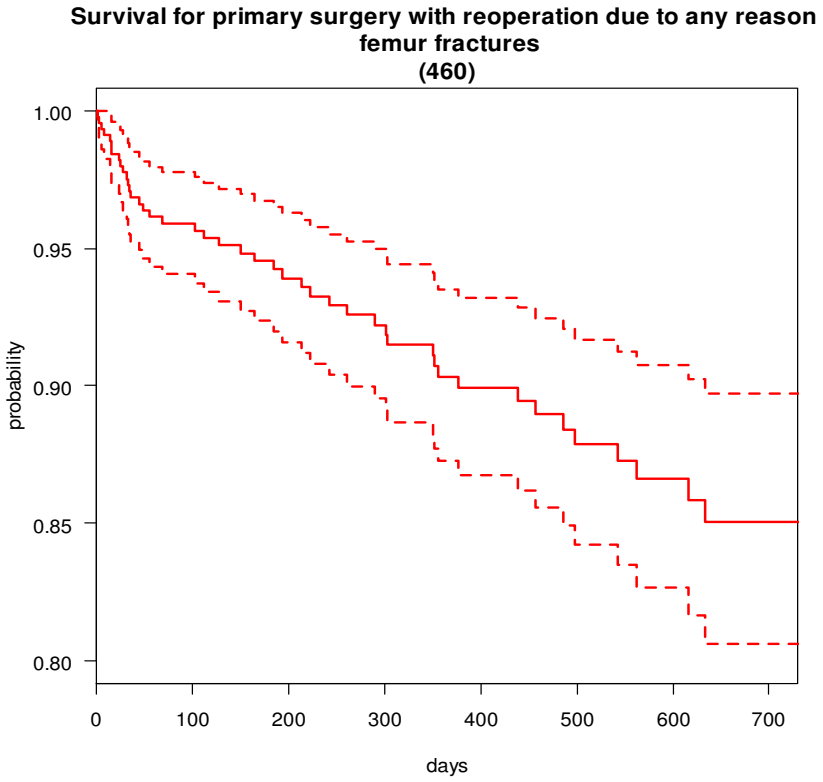
Level of supervision for femur fractures
(397)

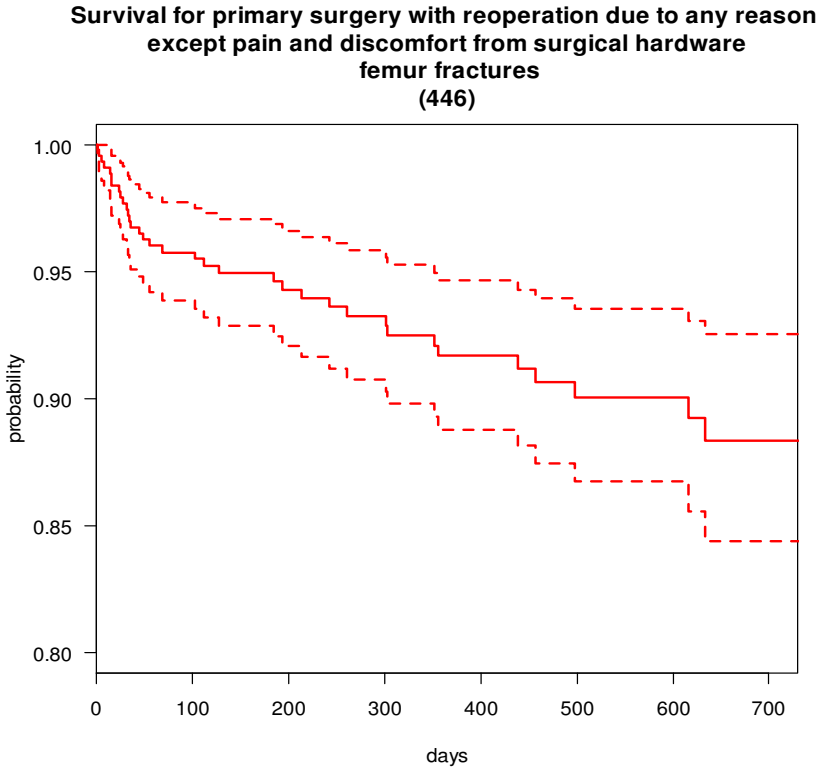


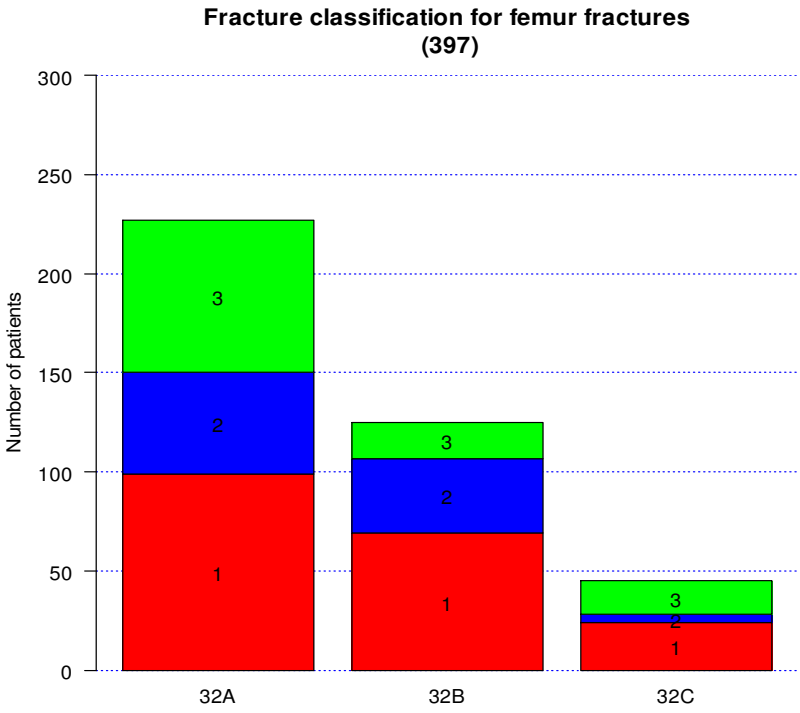




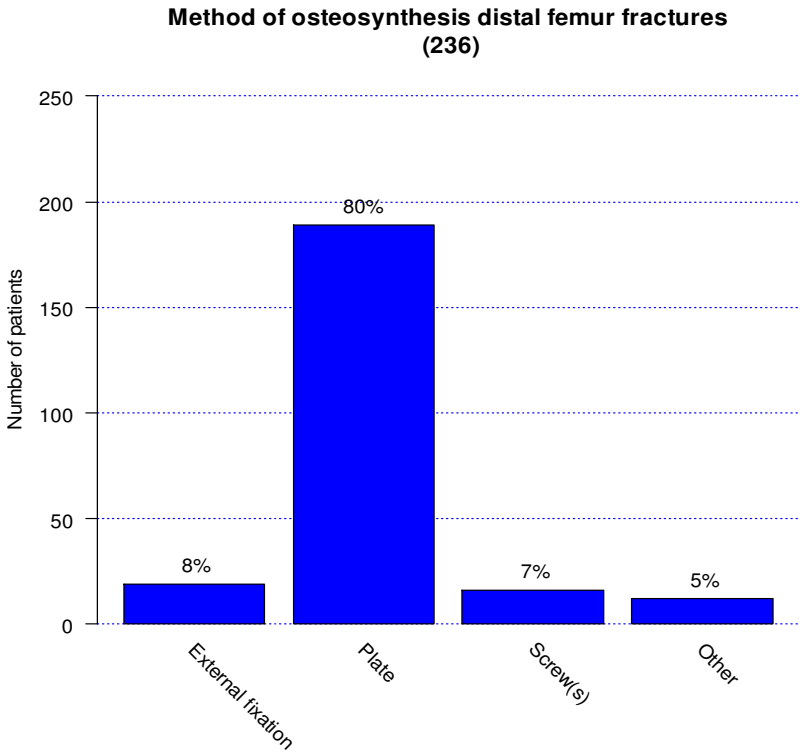
(Proportion of patients operated in 24 hour intervals)

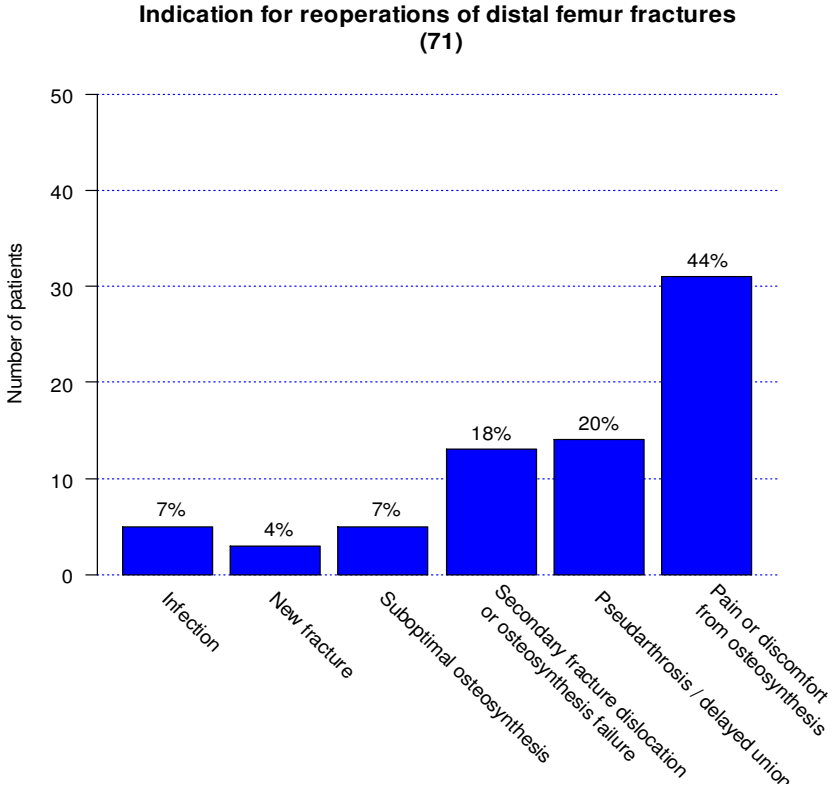

Survival for primary surgery with reoperation due to any reason
femur fractures
(460)
probability
1.00
0.95
0.90
0.85
0.80
0
100
200
300
400
500
600
700
days

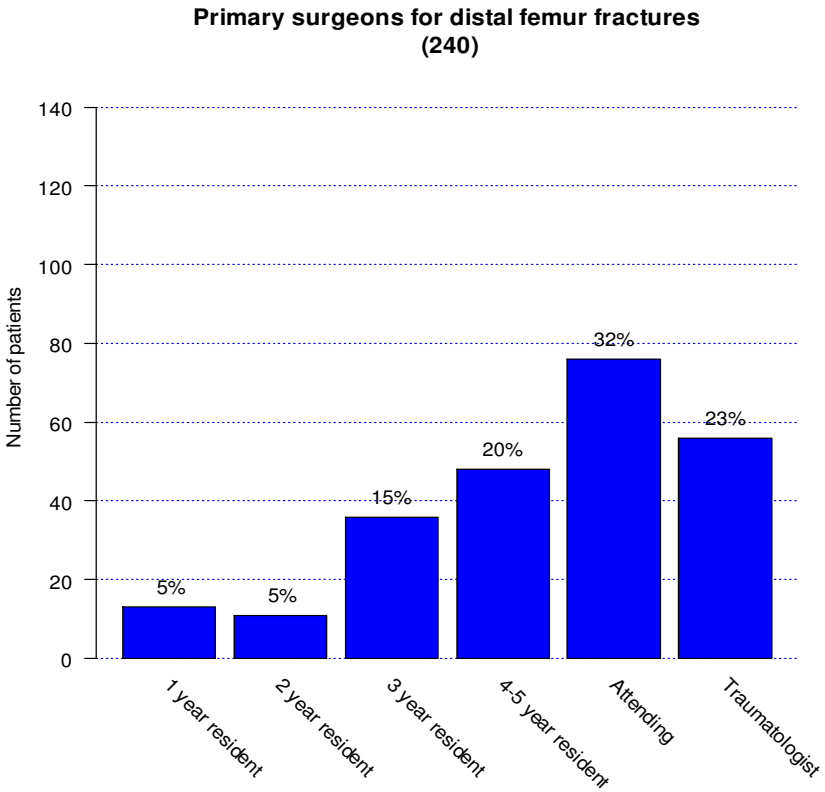

Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
femur fractures
(446)
probability
1.00
0.95
0.90
0.85
0.80
0
100
200
300
400
500
600
700
days

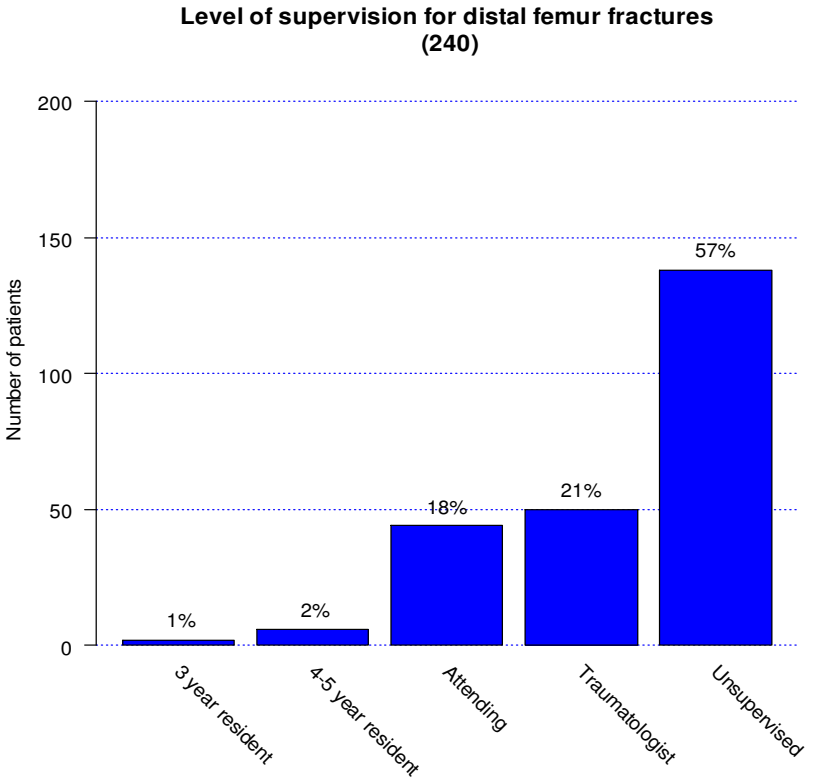

Fracture classification for femur fractures
(397)
Number of patients
300
250
200
150
100
50
0
3
2
1
3
2
1
3
2
1
32A
32B
32C

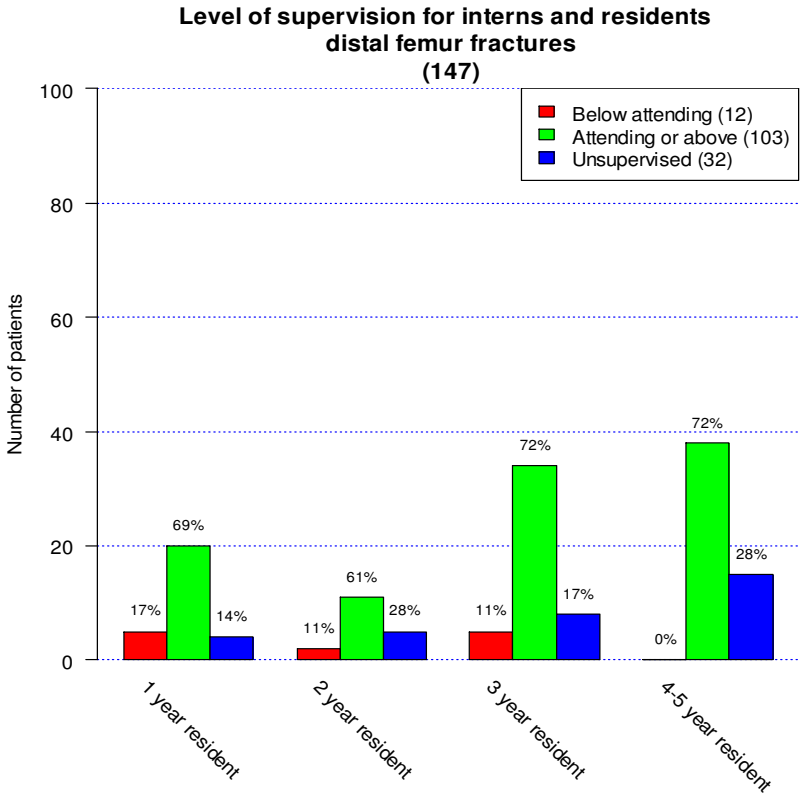
Distal femur

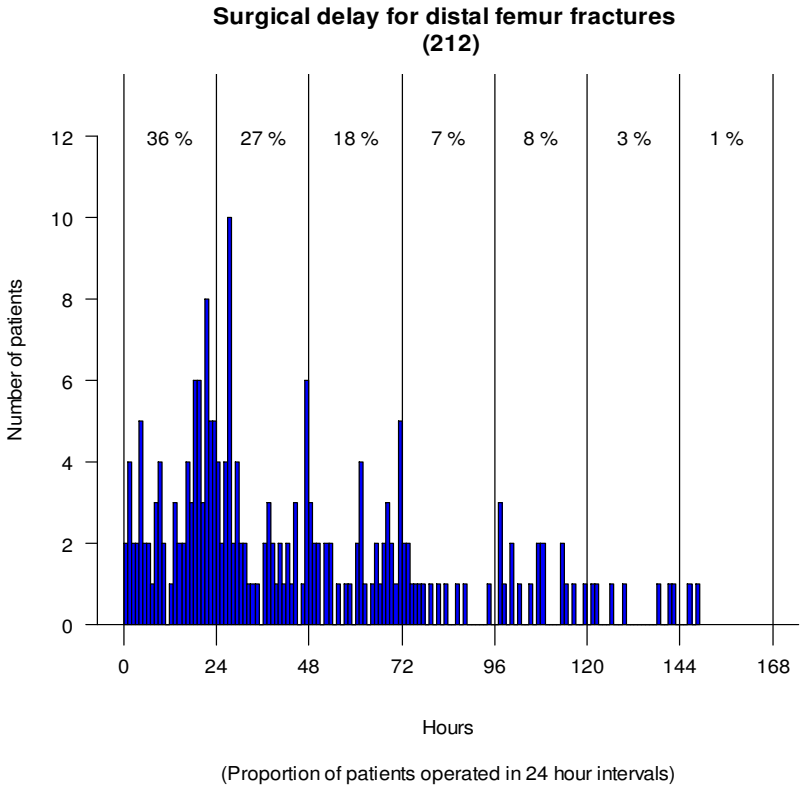





Primary surgeons for distal femur fractures
(240)
Number of patients
0
20
40
60
80
100
120
140
5%
5%
15%
20%
32%
23%
1 year resident
2 year resident
3 year resident
4-5 year resident
Attending
Traumatologist

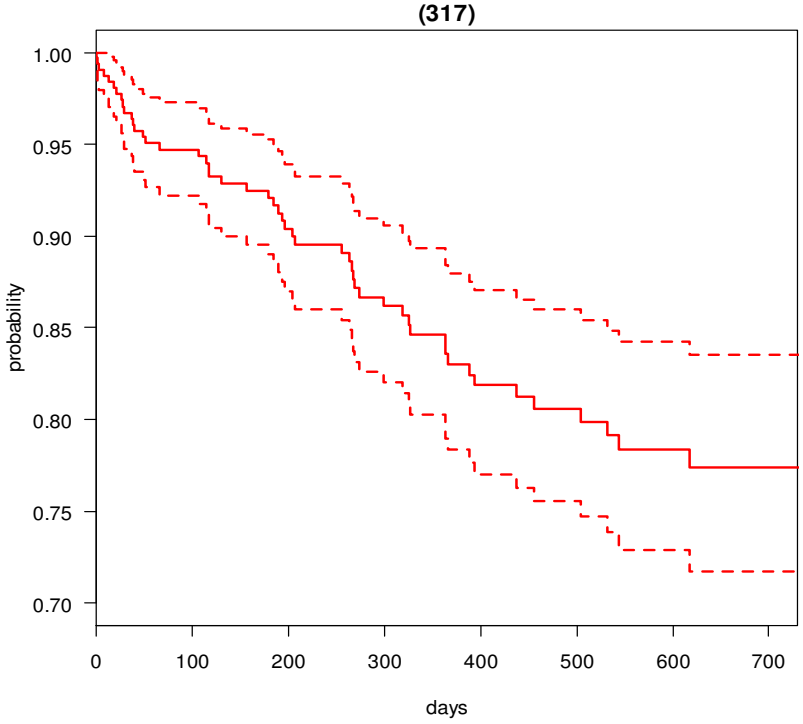

Level of supervision for distal femur fractures
(240)
Number of patients
0
50
100
150
200
1%
2%
18%
21%
57%
3 year resident
4-5 year resident
Attending
Traumatologist
Unsupervised



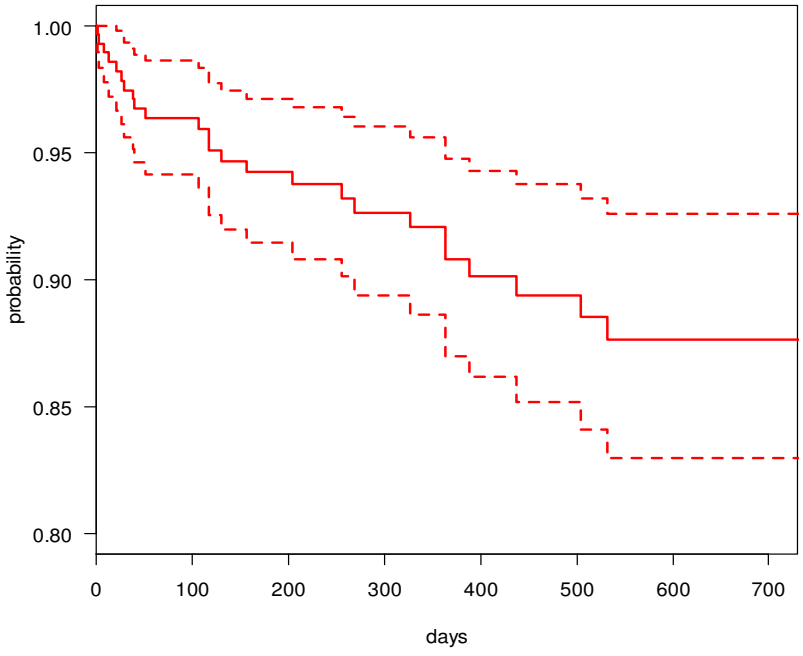


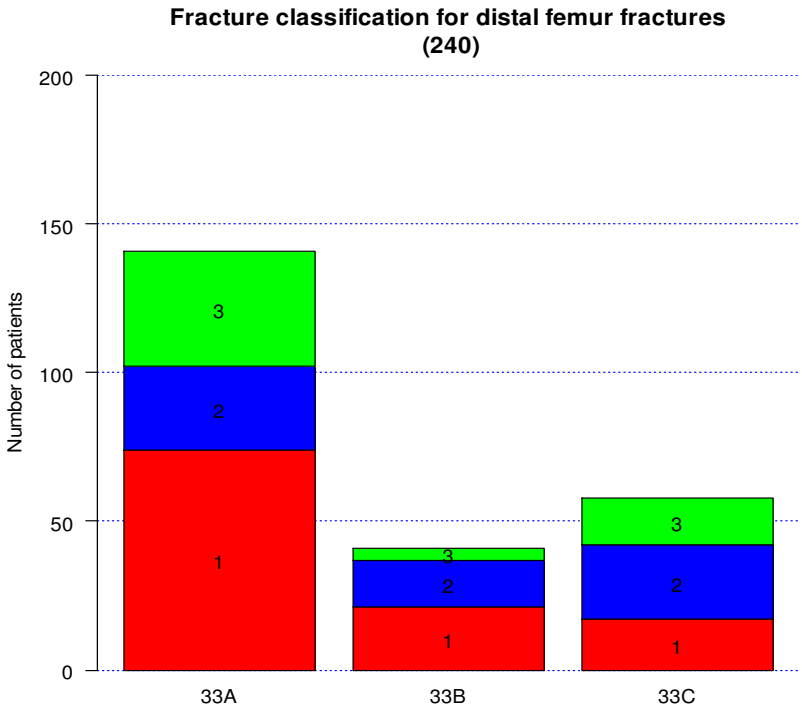
(Proportion of patients operated in 24 hour intervals)

Survival for primary surgery with reoperation due to any reason
distal femur fractures
(317)

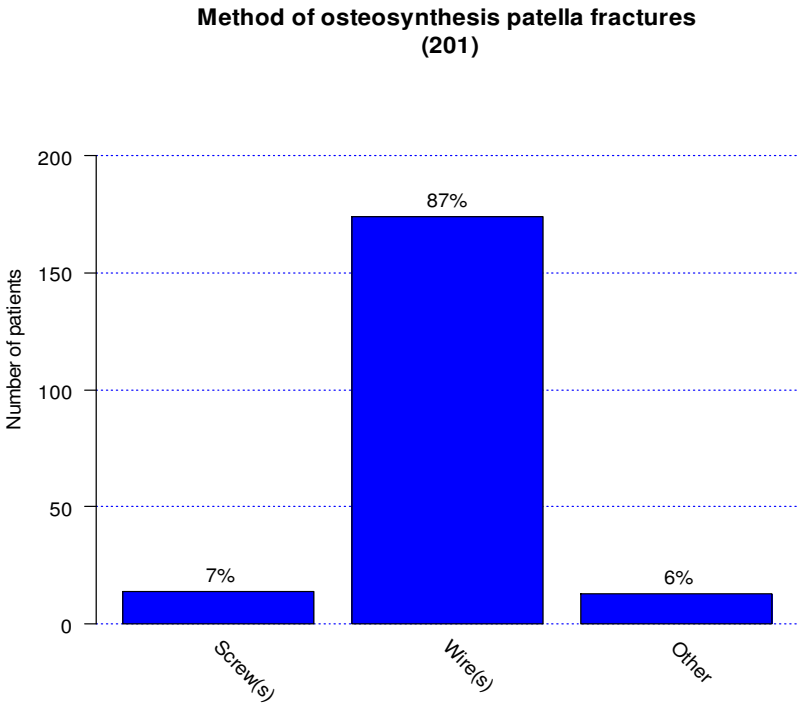


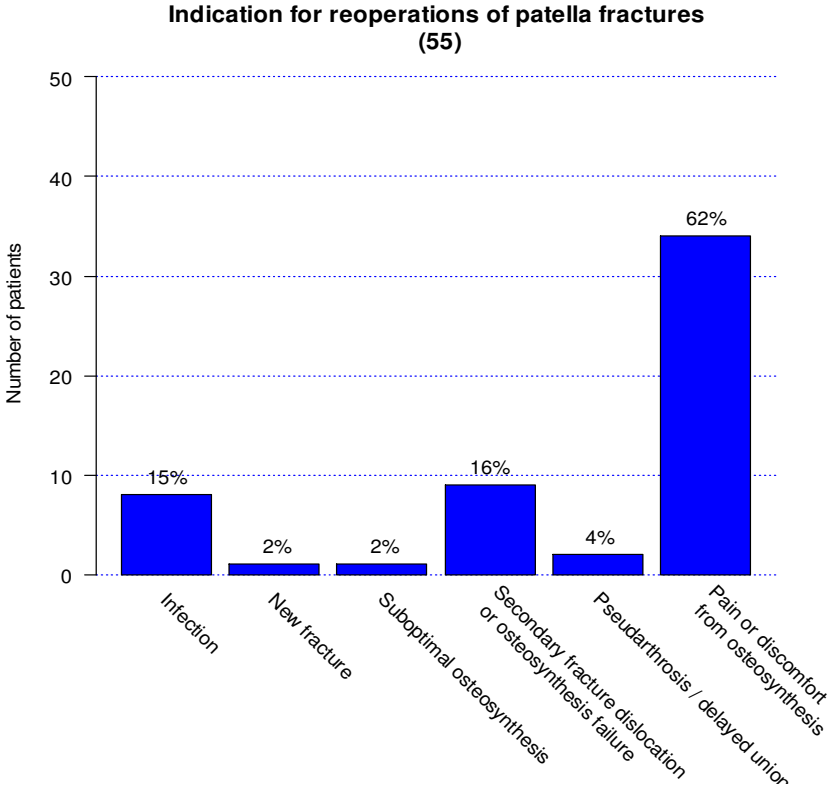
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware
distal femur fractures
(286)



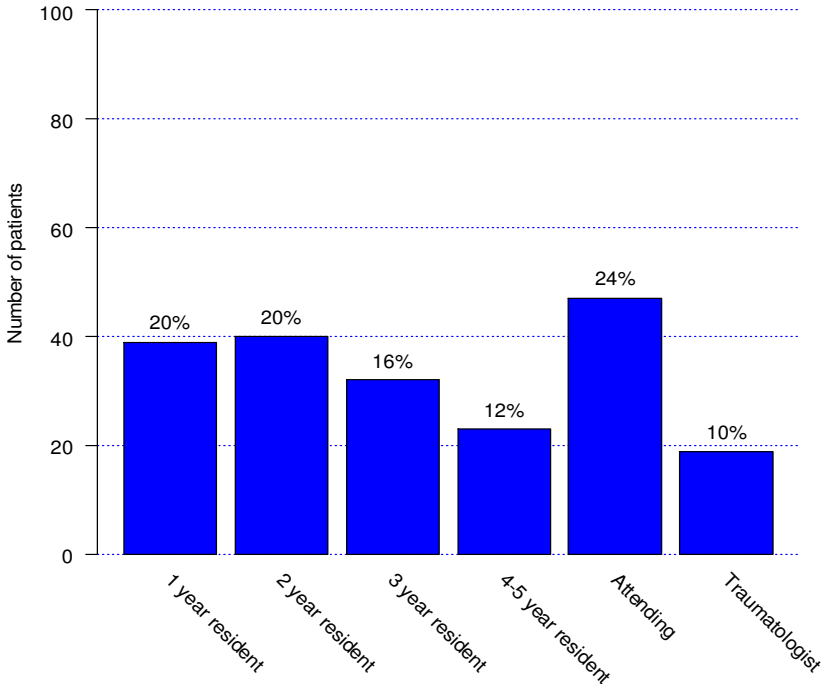

Fracture classification for distal femur fractures
(240)
Number of patients
200
150
100
50
0
3
2
1
3
2
1
3
2
1
33A
33B
33C

Patella

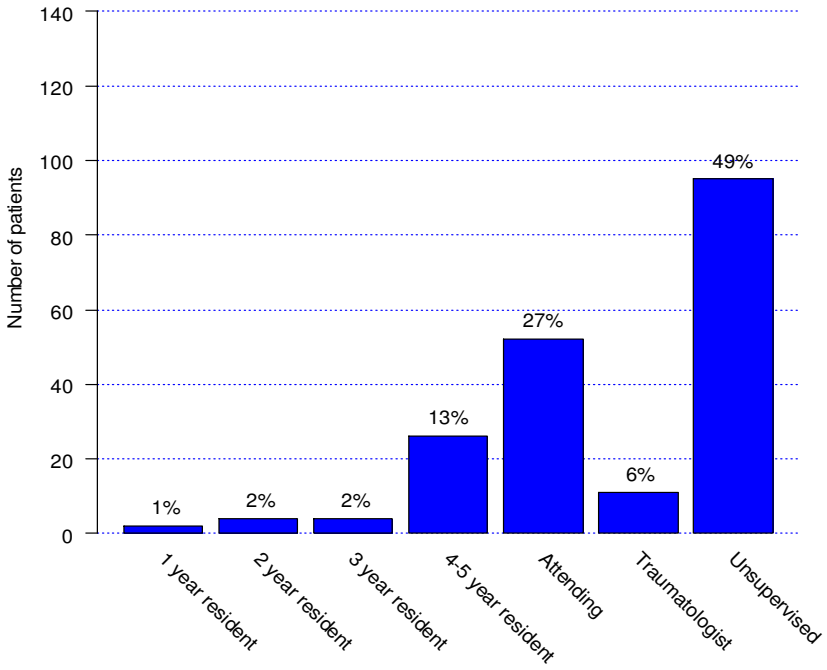

Method of osteosynthesis patella fractures
(201)
Number of patients
200
150
100
50
0
87%
7%
6%
Screw(s)
Wire(s)
Other

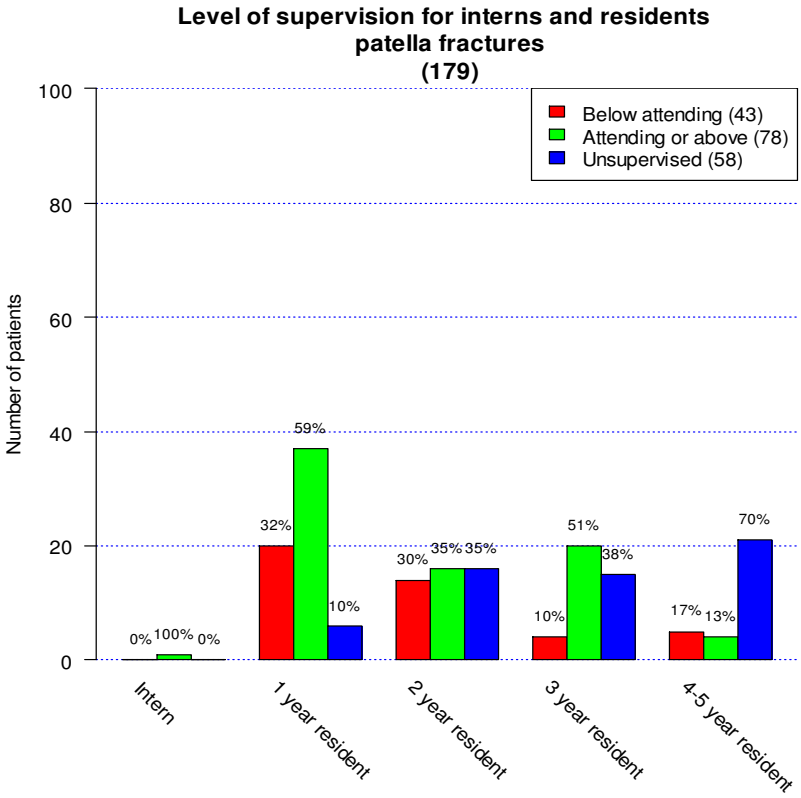

Indication for reoperations of patella fractures
(55)
Number of patients
50
40
30
20
10
0
15%
2%
2%
16%
4%
62%
Infection
New fracture
Suboptimal osteosynthesis
Secondary fracture dislocation
or osteosynthesis failure
Pseudarthrosis / delayed unior
Pain or discomfort
from osteosynthesis

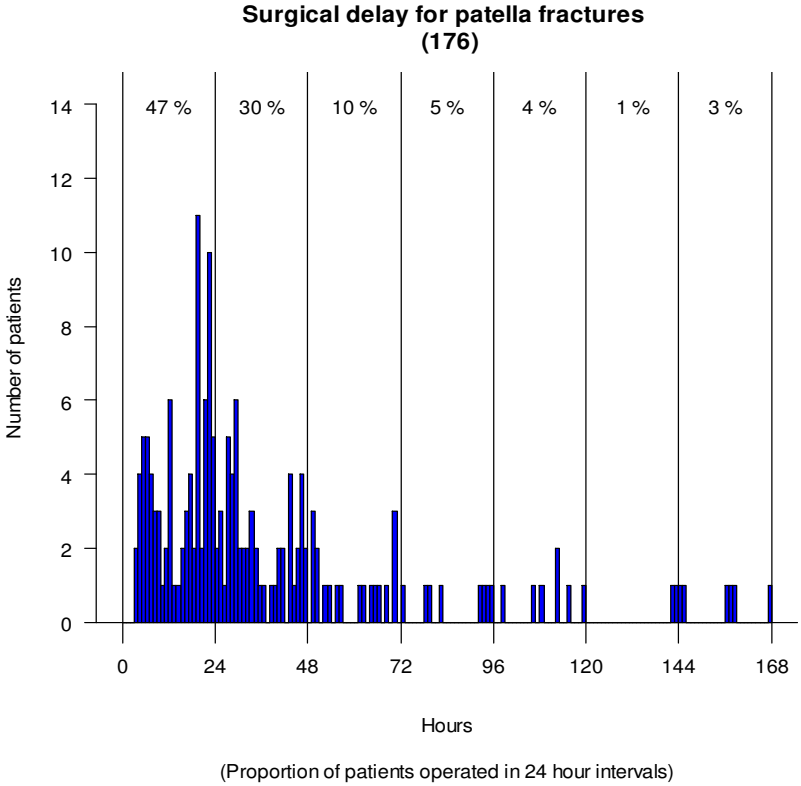
Primary surgeons for patella fractures
(200)



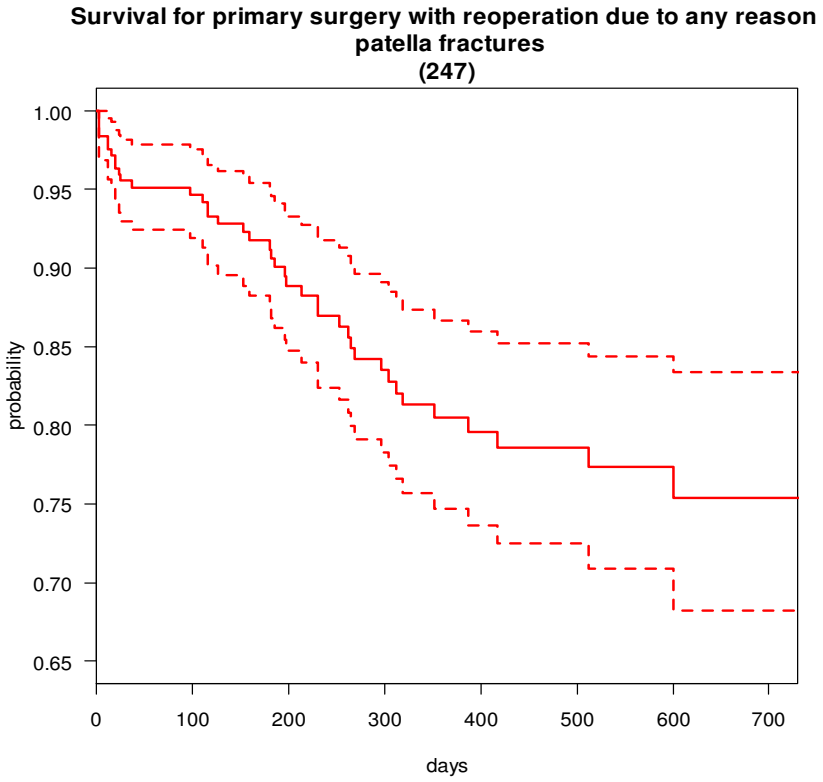
Level of supervision for patella fractures
(194)

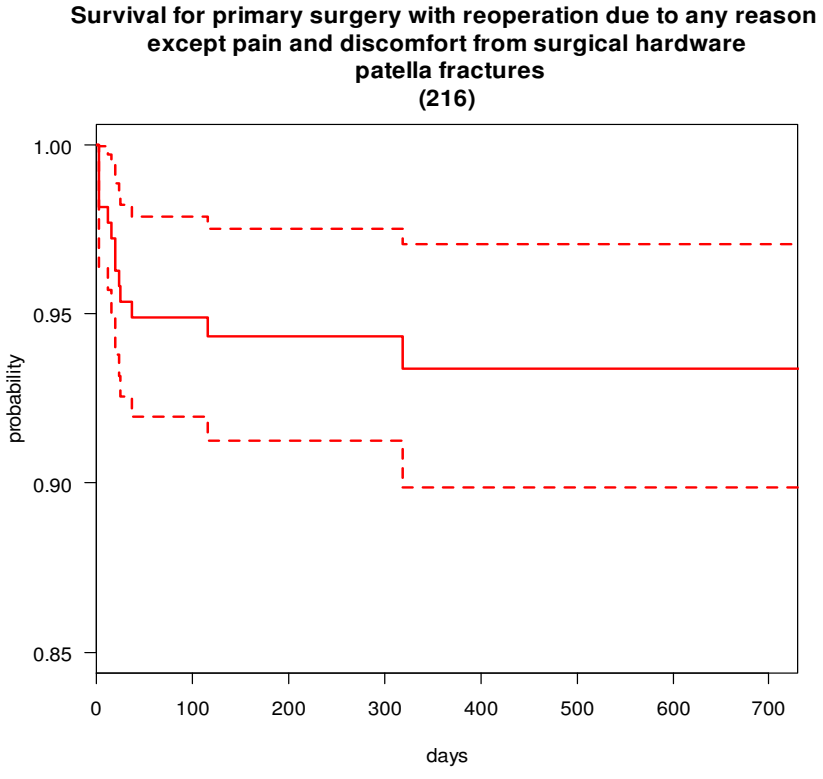


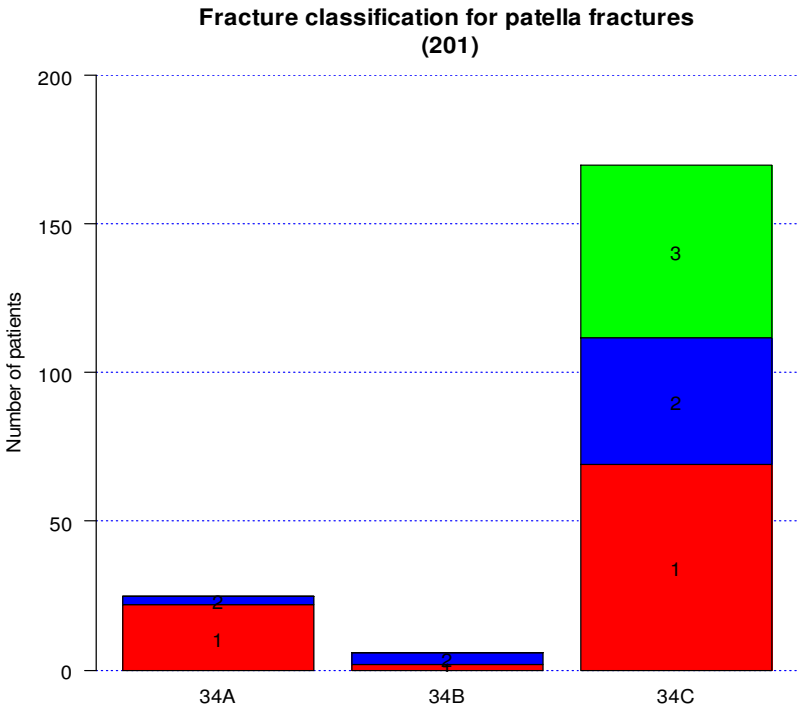




(Proportion of patients operated in 24 hour intervals)

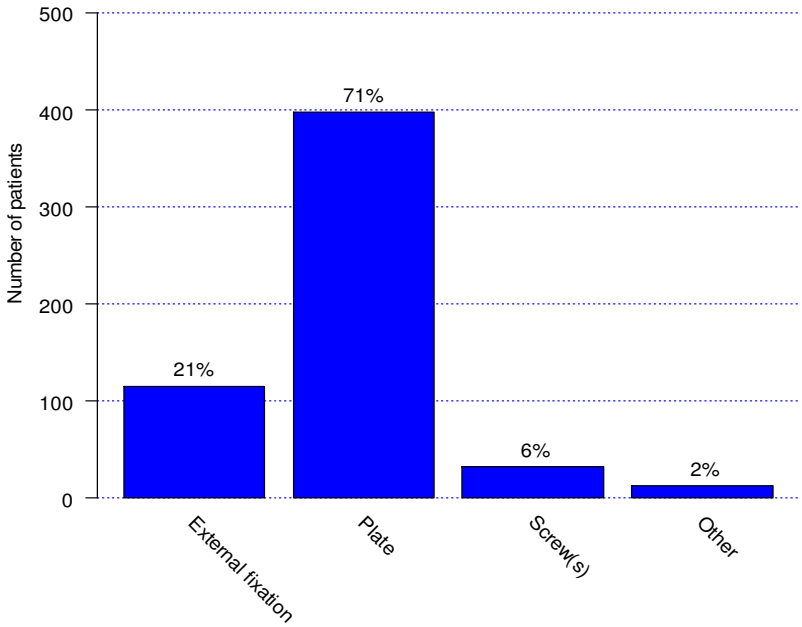

Survival for primary surgery with reoperation due to any reason
patella fractures
(247)
probability
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0.65
0
100
200
300
400
500
600
700
days


Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
patella fractures
(216)
probability
1.00
0.95
0.90
0.85
0
100
200
300
400
500
600
700
days

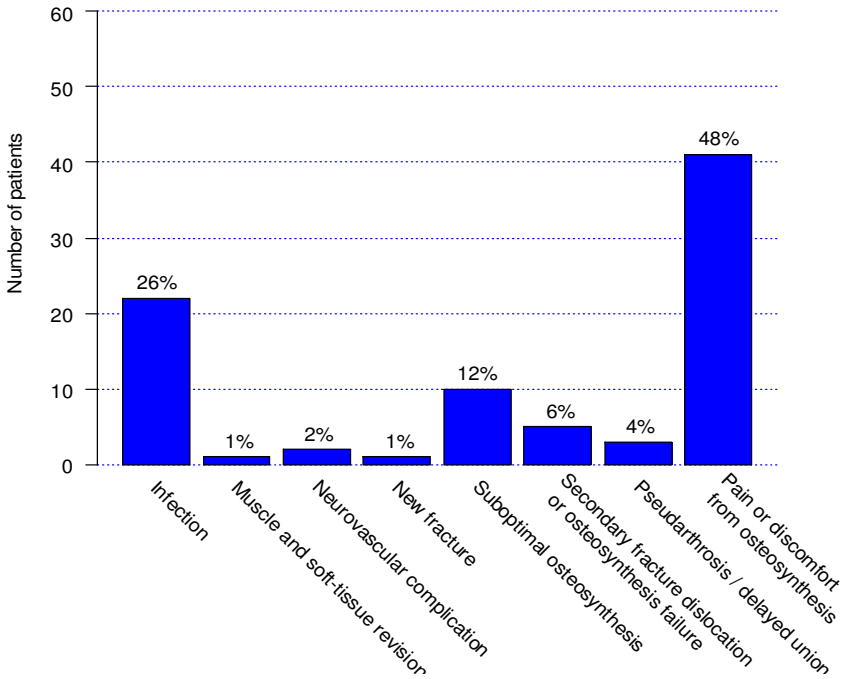

Fracture classification for patella fractures
(201)
Number of patients
200
150
100
50
0
3
2
1
2
1
2
1
34A
34B
34C

Proximal tibia

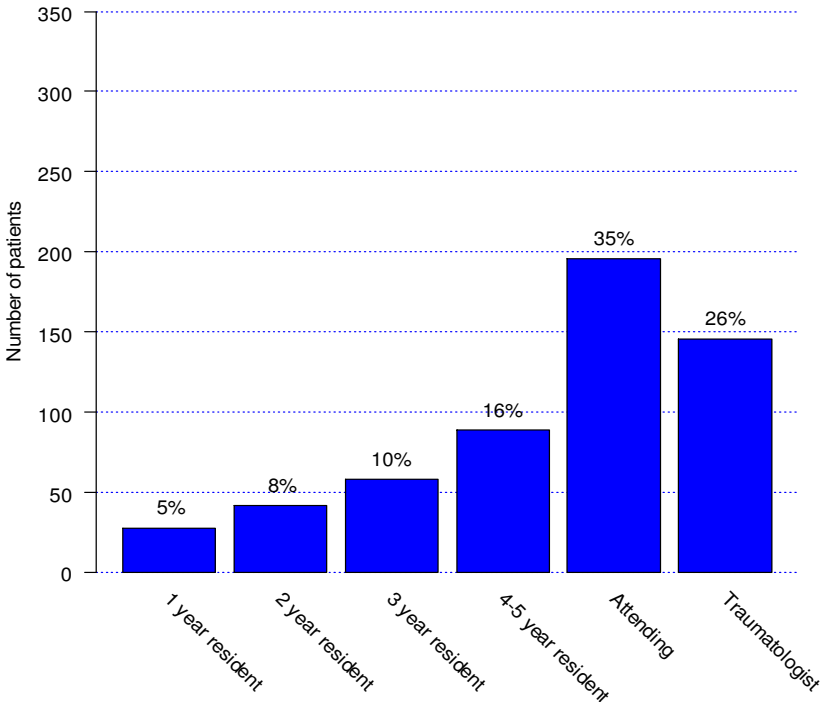
Method of osteosynthesis proximal tibia fractures (557)



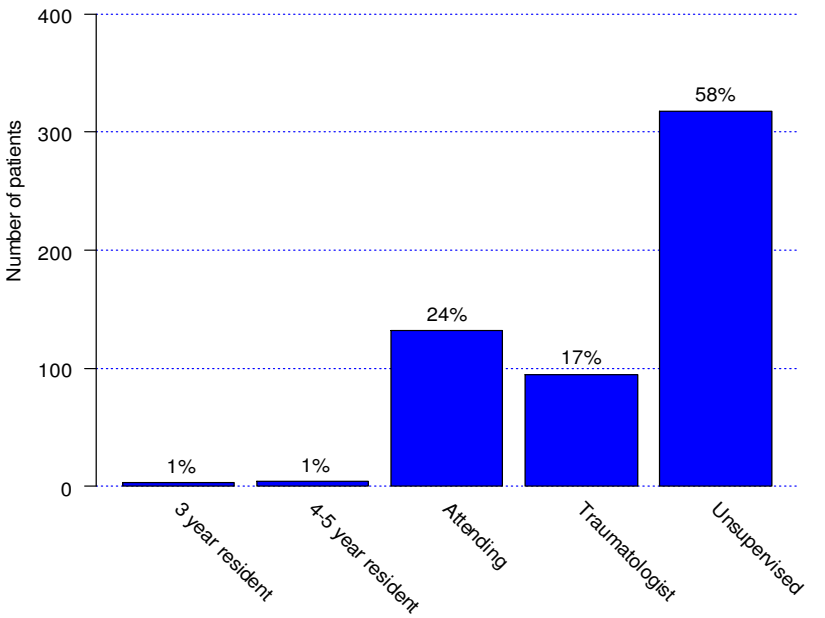
Indication for reoperations of proximal tibia fractures (85)

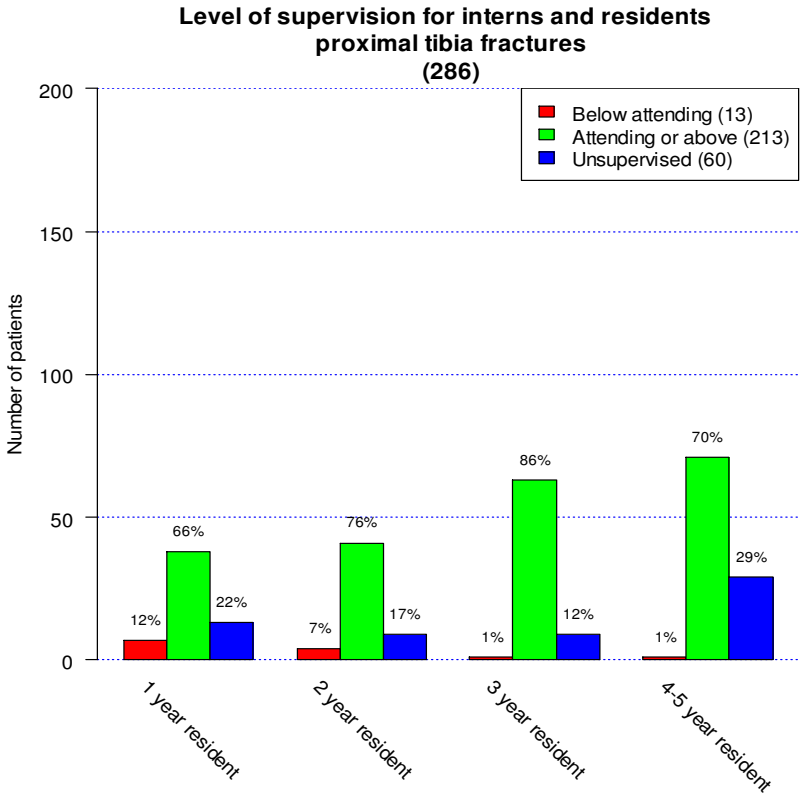


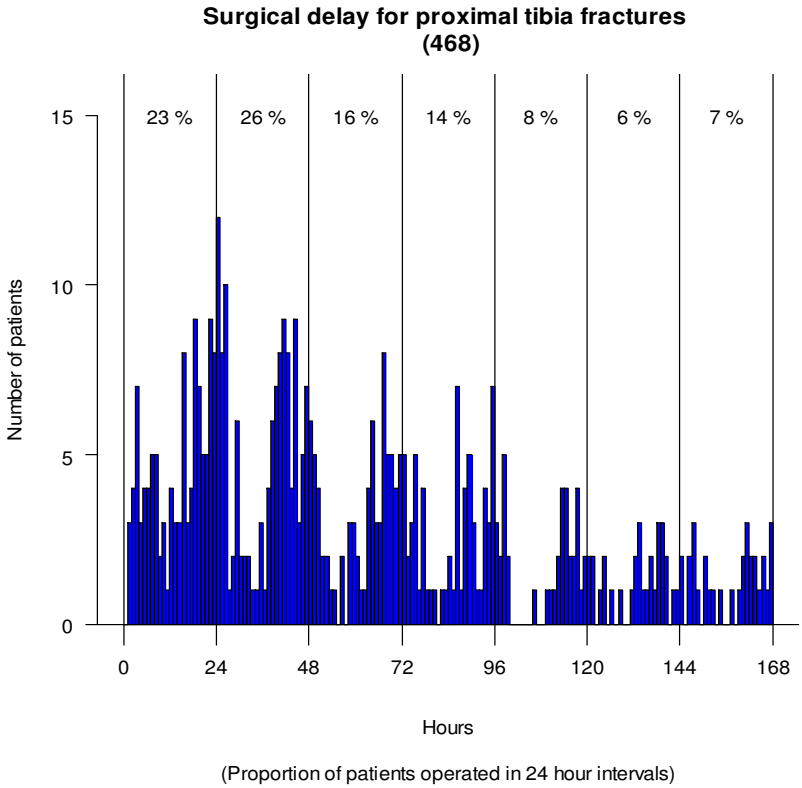
Primary surgeons for proximal tibia fractures (559)



Level of supervision for proximal tibia fractures (552)

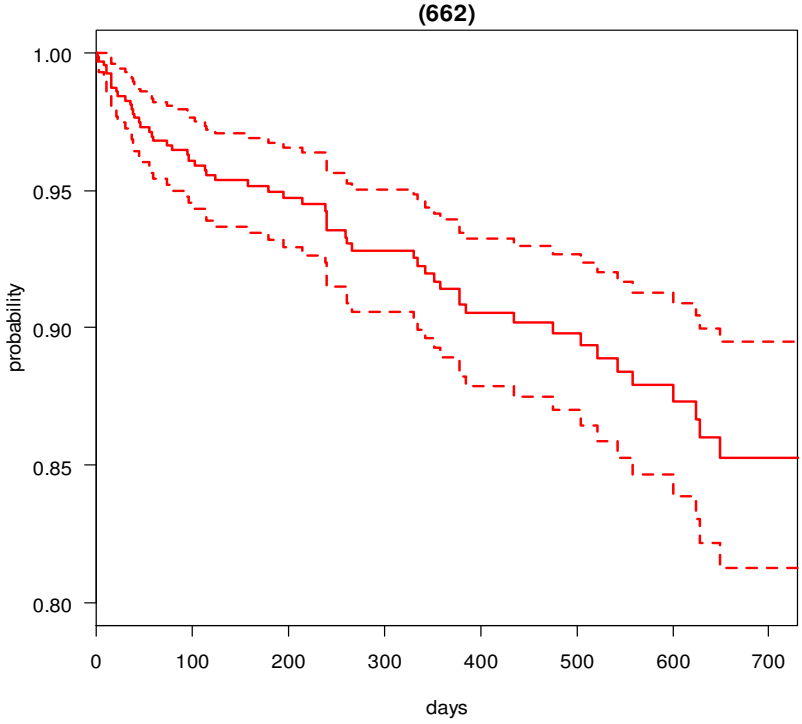




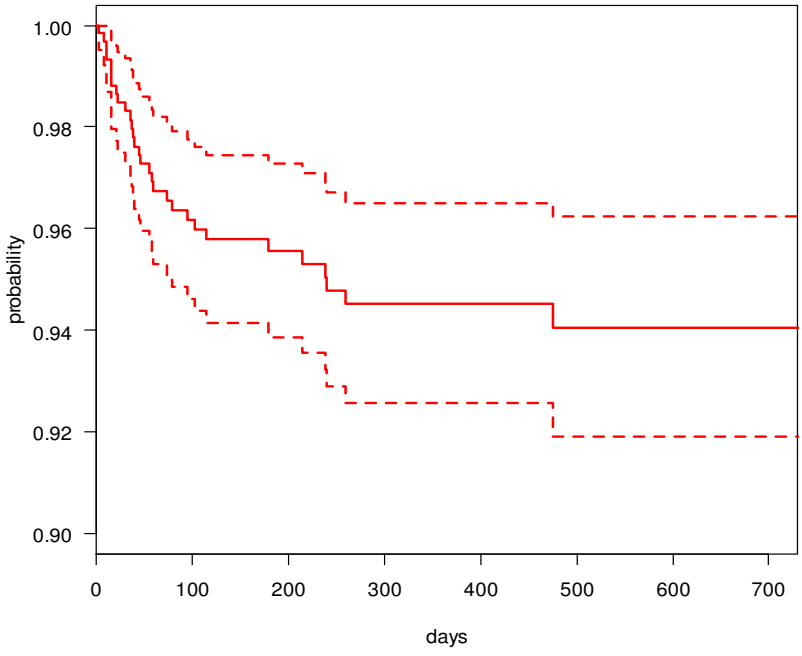


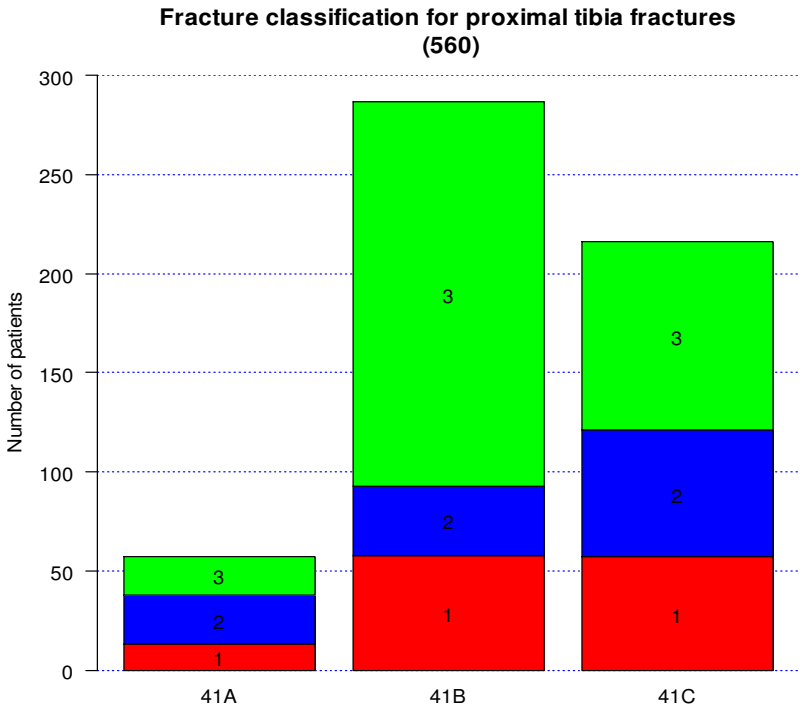
(Proportion of patients operated in 24 hour intervals)

Survival for primary surgery with reoperation due to any reason
proximal tibia fractures
(662)

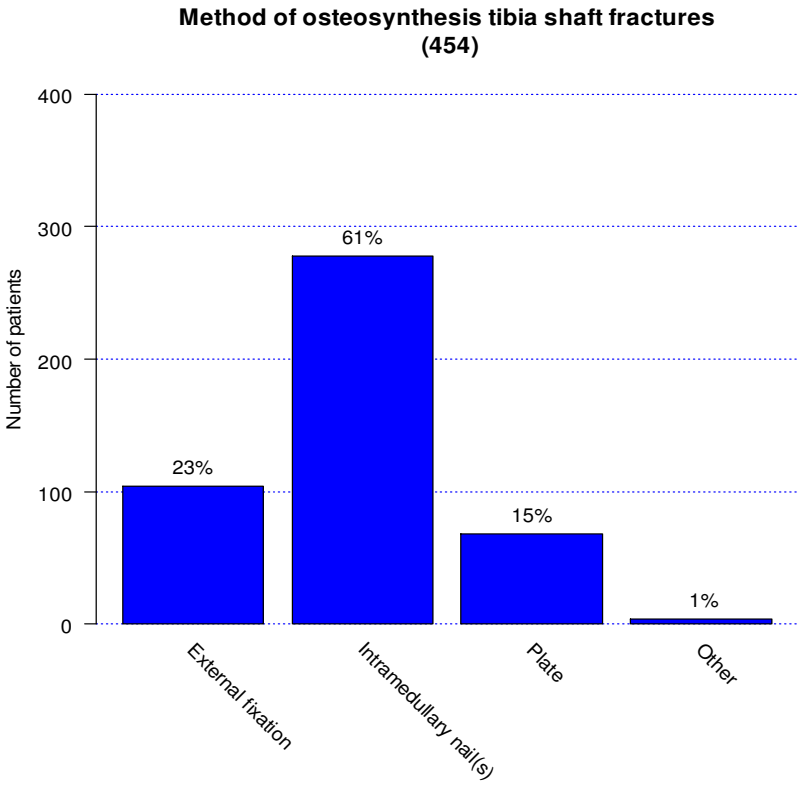


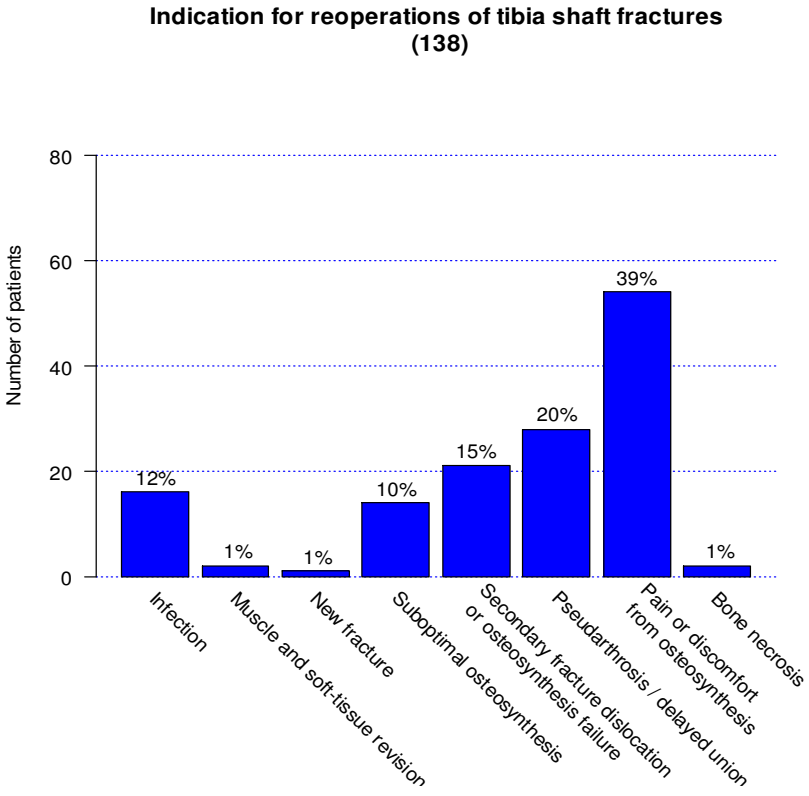
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware
proximal tibia fractures
(623)

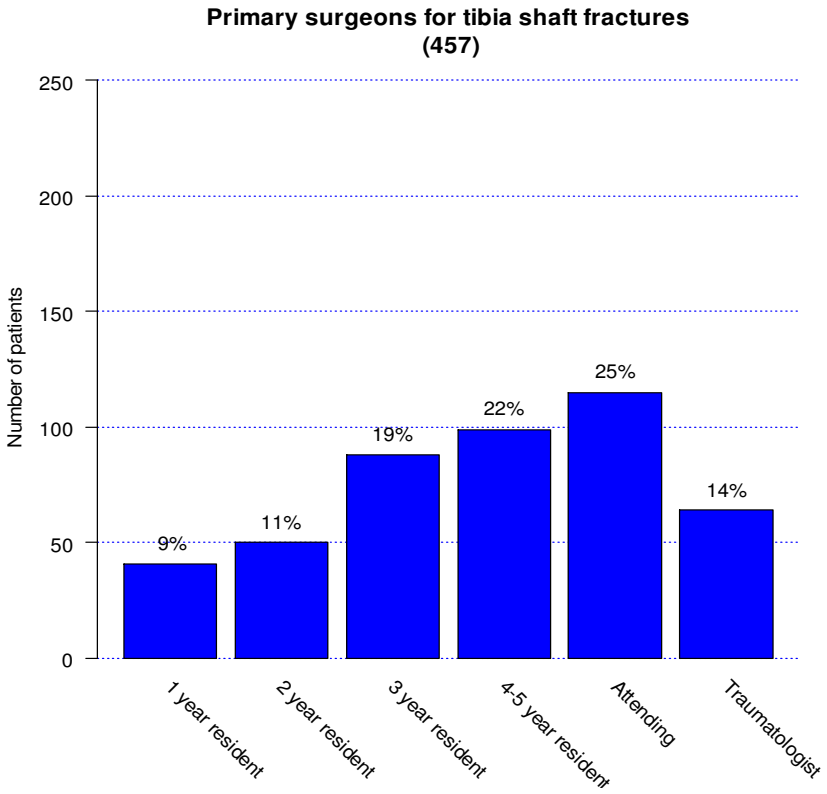


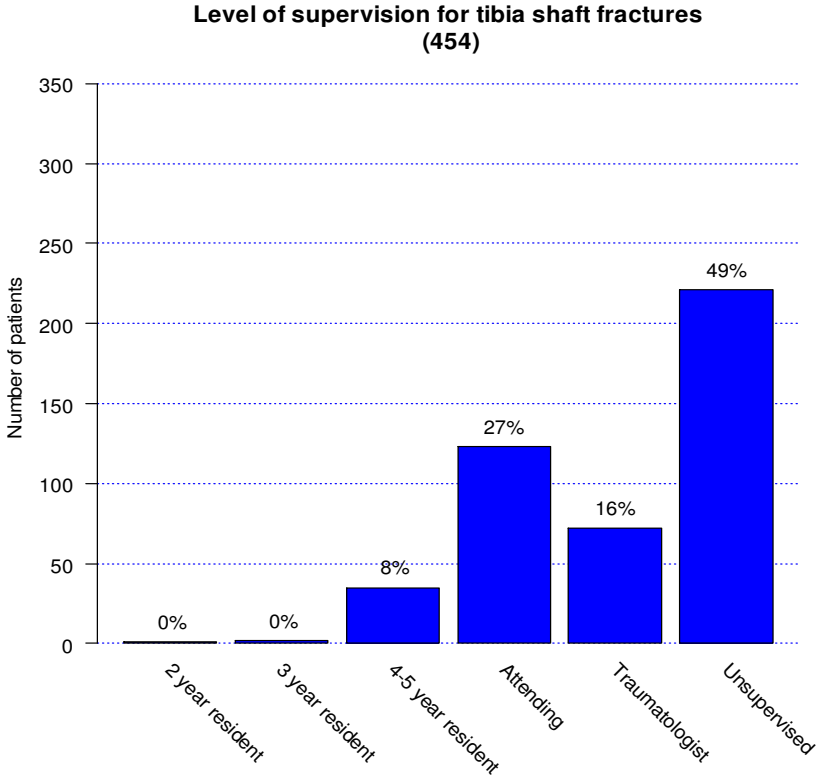

Fracture classification for proximal tibia fractures
(560)
Number of patients
300
250
200
150
100
50
0
3
2
1
3
2
1
3
2
1
41A
41B
41C

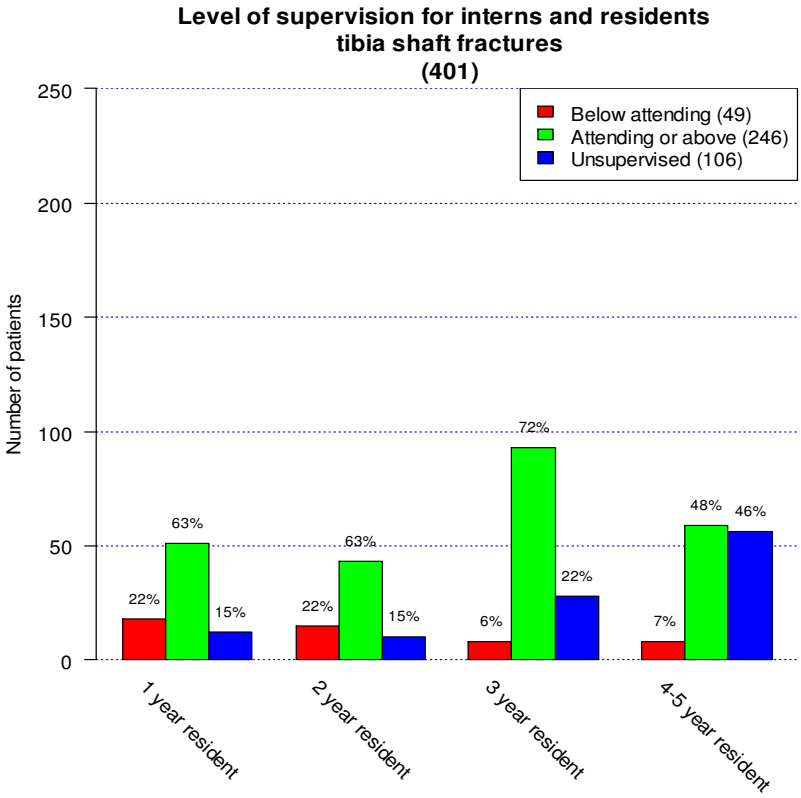
Tibia shaft

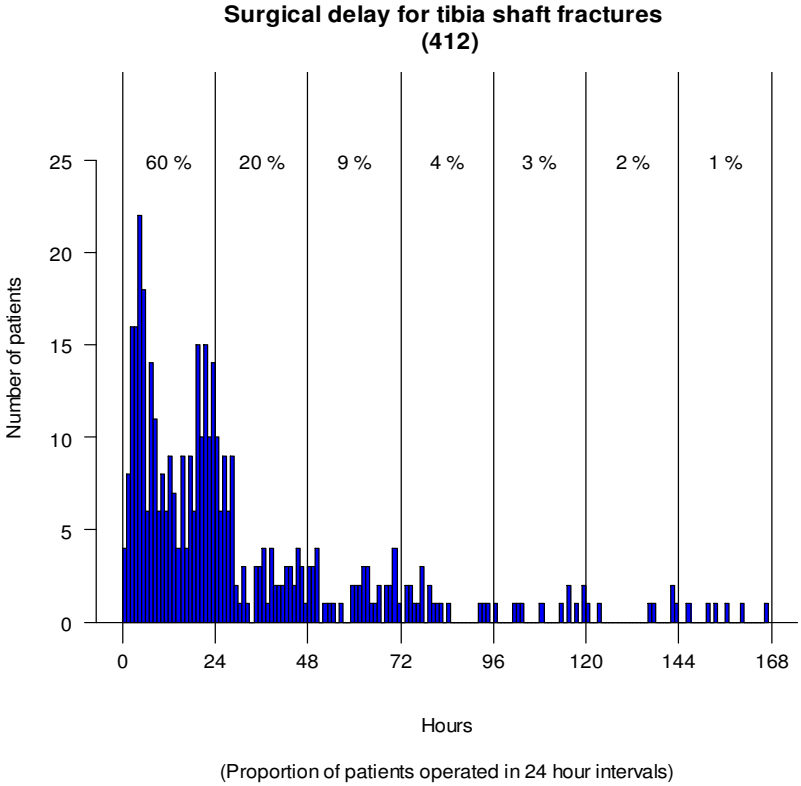

Method of osteosynthesis tibia shaft fractures
(454)
Number of patients
400
300
200
100
0
23%
61%
15%
1%
External fixation
Intramedullary nail(s)
Plate
Other

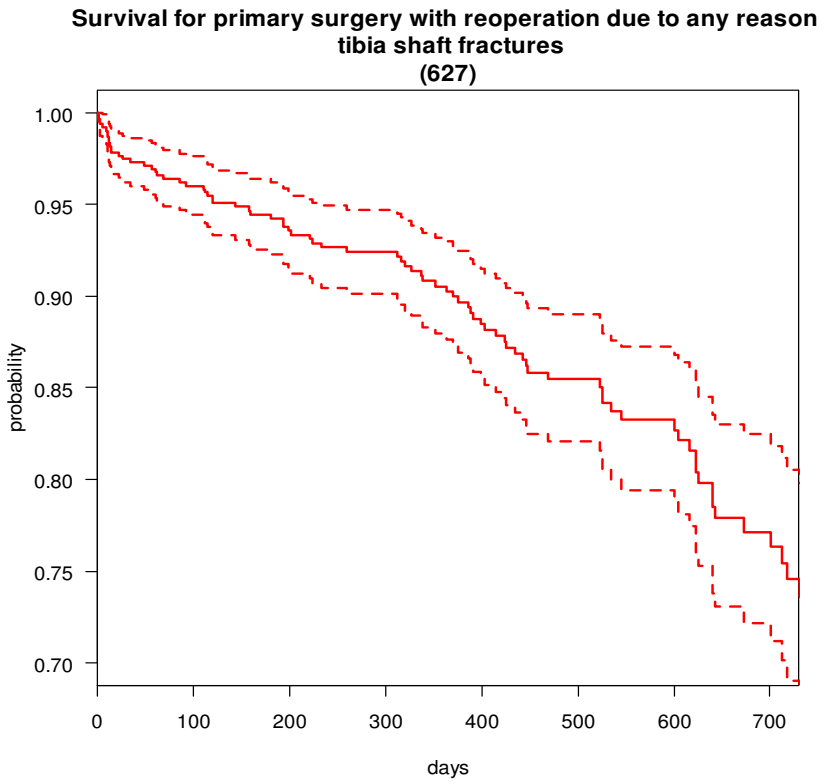

Indication for reoperations of tibia shaft fractures
(138)
Number of patients
80
60
40
20
0
12%
1%
1%
10%
15%
20%
39%
1%
Infection
Muscle and soft-tissue revision
New fracture
Suboptimal osteosynthesis
Secondary fracture dislocation or osteosynthesis failure
Pseudarthrosis / delayed union
Pain or discomfort from osteosynthesis
Bone necrosis

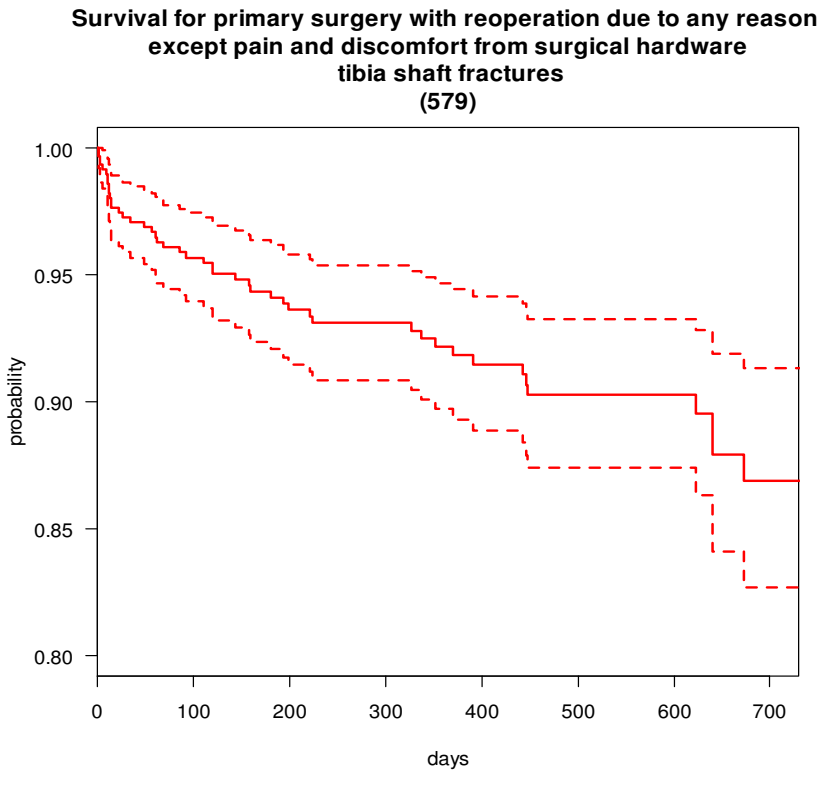

Primary surgeons for tibia shaft fractures
(457)
Number of patients
250
200
150
100
50
0
9%
11%
19%
22%
25%
14%
1 year resident
2 year resident
3 year resident
4-5 year resident
Attending
Traumatologist

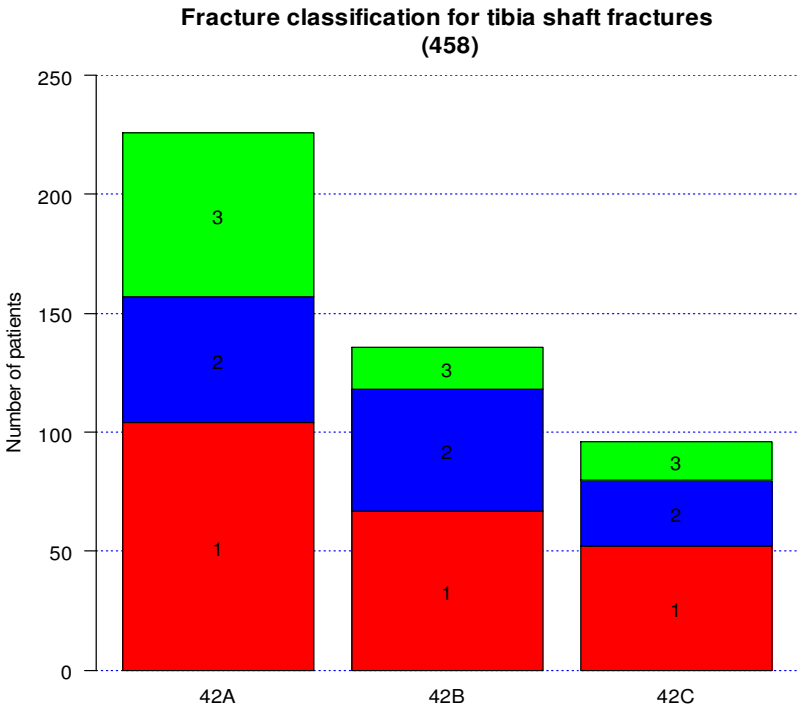

Level of supervision for tibia shaft fractures
(454)
Number of patients
350
300
250
200
150
100
50
0
0%
0%
8%
27%
16%
49%
2 year resident
3 year resident
4-5 year resident
Attending
Traumatologist
Unsupervised


Level of supervision for interns and residents
tibia shaft fractures
(401)
Below attending (49)
Attending or above (246)
Unsupervised (106)
Number of patients
250
200
150
100
50
0
22%
63%
15%
22%
63%
15%
6%
72%
22%
7%
48%
46%
1 year resident
2 year resident
3 year resident
4-5 year resident

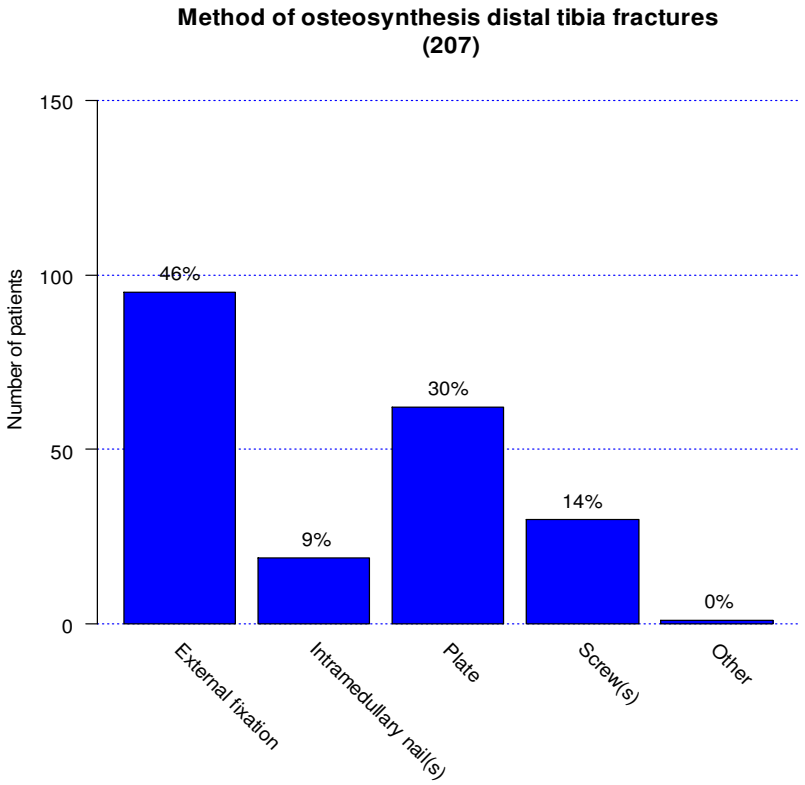

Surgical delay for tibia shaft fractures
(412)
60 %
20 %
9 %
4 %
3 %
2 %
1 %
Number of patients
25
20
15
10
5
0
0
24
48
72
96
120
144
168
Hours
(Proportion of patients operated in 24 hour intervals)

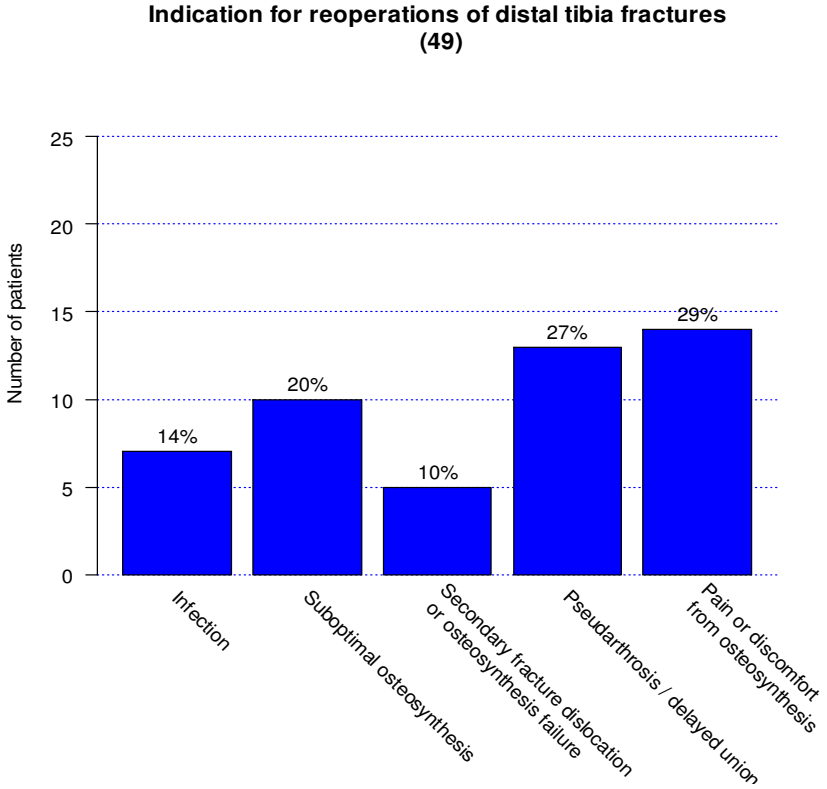

Survival for primary surgery with reoperation due to any reason
tibia shaft fractures
(627)
probability
1.00
0.95
0.90
0.85
0.80
0.75
0.70
0
100
200
300
400
500
600
700
days


Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
tibia shaft fractures
(579)
probability
1.00
0.95
0.90
0.85
0.80
0
100
200
300
400
500
600
700
days

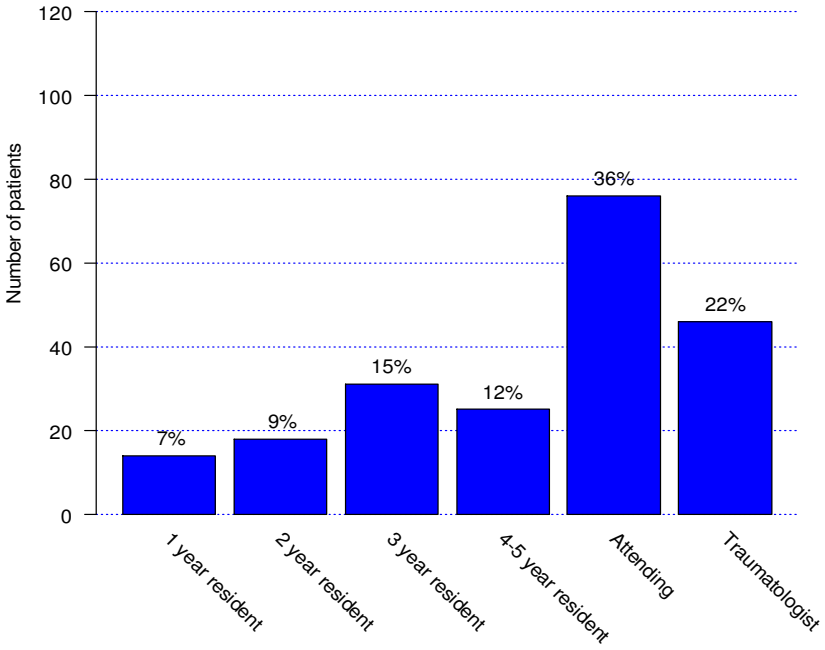

Fracture classification for tibia shaft fractures
(458)
Number of patients
250
200
150
100
50
0
3
2
1
3
2
1
3
2
1
42A
42B
42C

Distal tibia

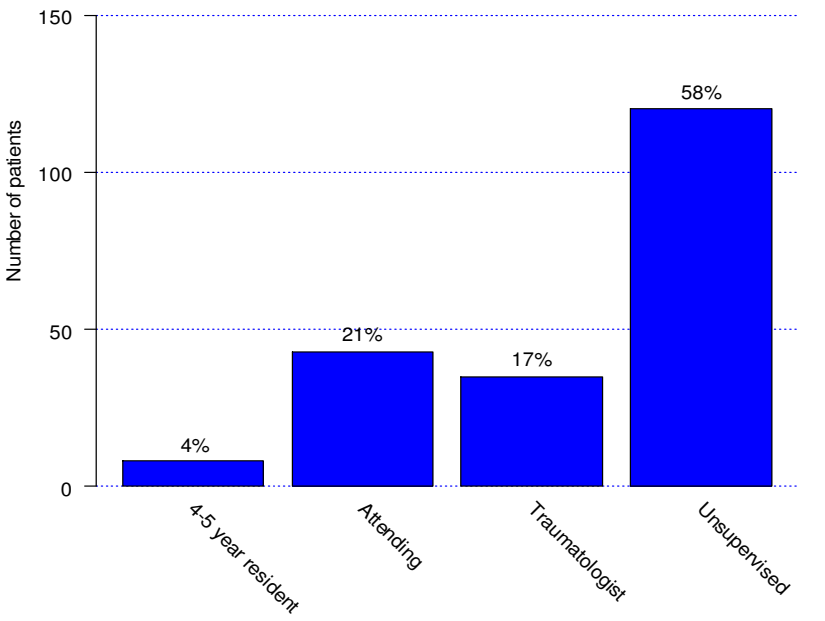


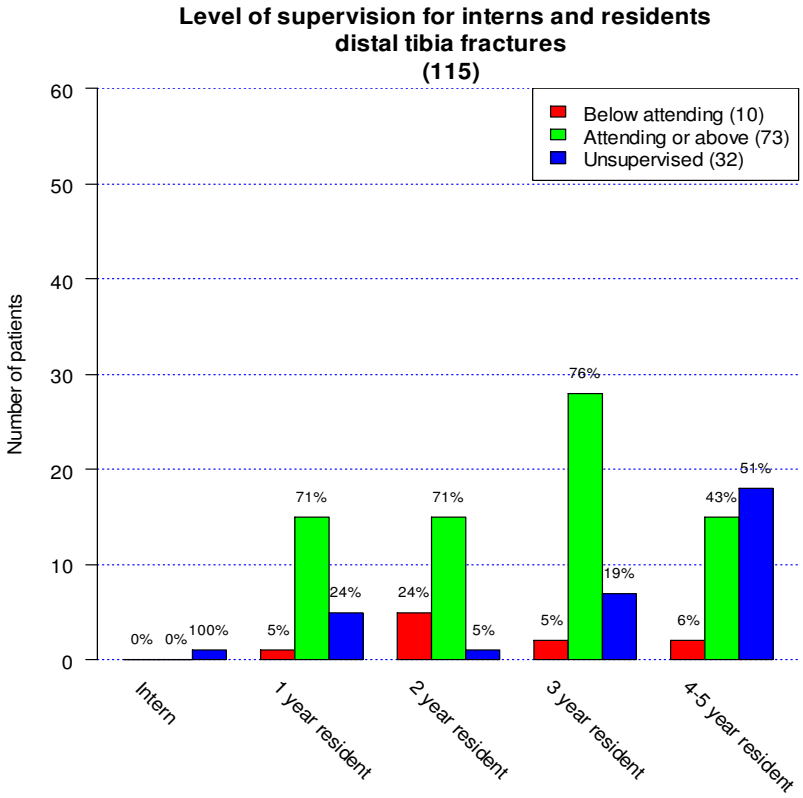


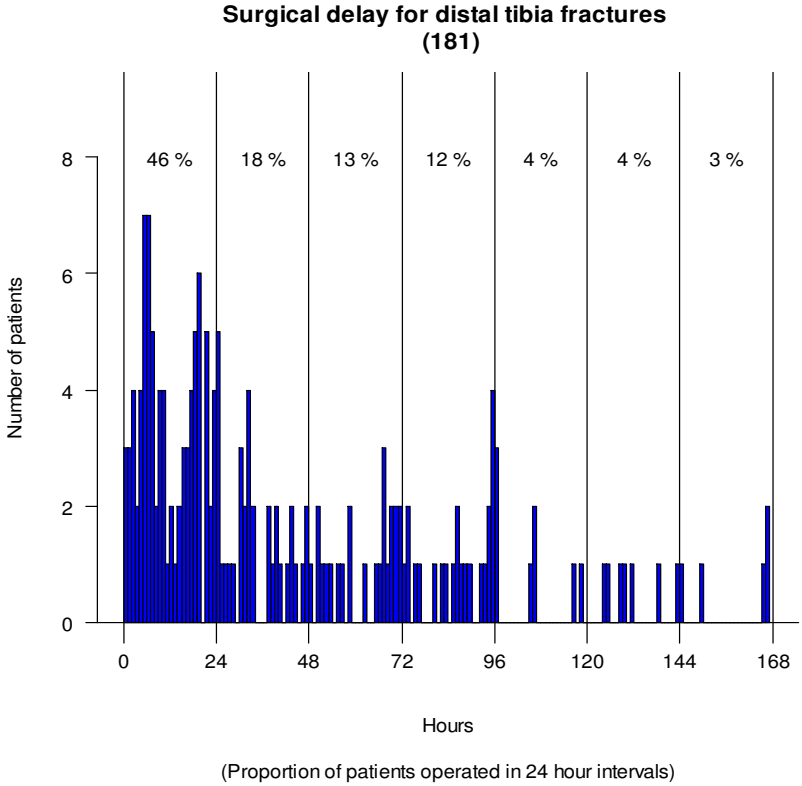
Primary surgeons for distal tibia fractures (210)

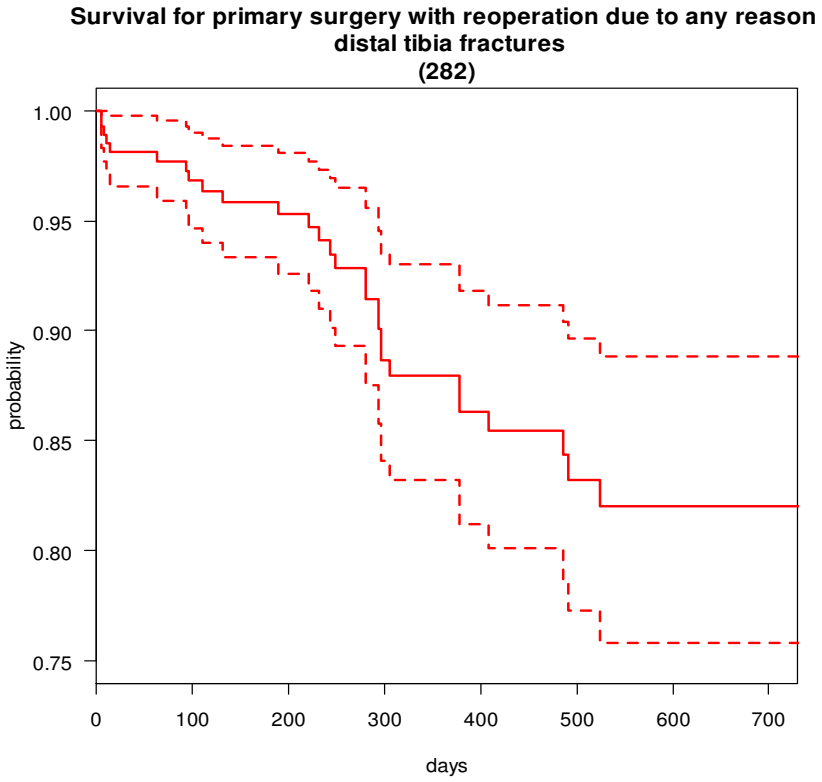


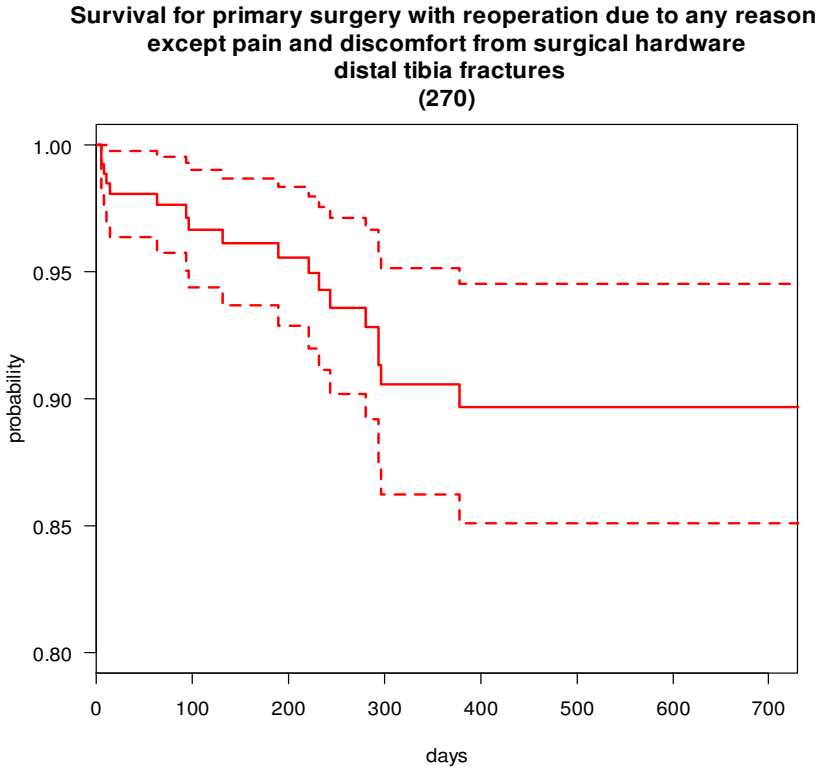
Level of supervision for distal tibia fractures (206)

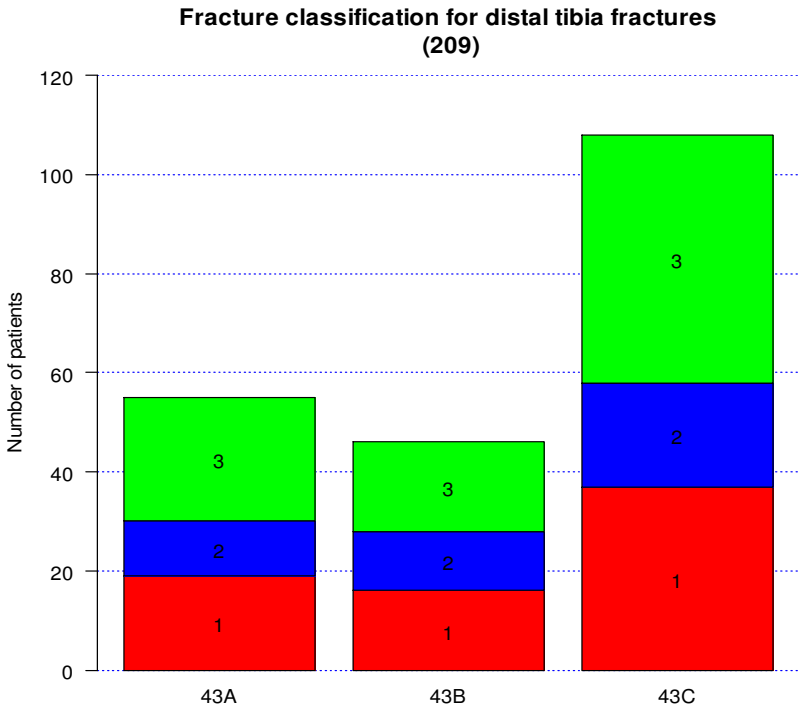



Level of supervision for interns and residents
distal tibia fractures
(115)
Below attending (10)
Attending or above (73)
Unsupervised (32)
Number of patients
0
10
20
30
40
50
60
0%
0%
100%
5%
71%
24%
24%
71%
5%
5%
76%
19%
6%
43%
51%
Intern
1 year resident
2 year resident
3 year resident
4-5 year resident


Surgical delay for distal tibia fractures
(181)
46 %
18 %
13 %
12 %
4 %
4 %
3 %
Number of patients
0
2
4
6
8
0
24
48
72
96
120
144
168
Hours
(Proportion of patients operated in 24 hour intervals)

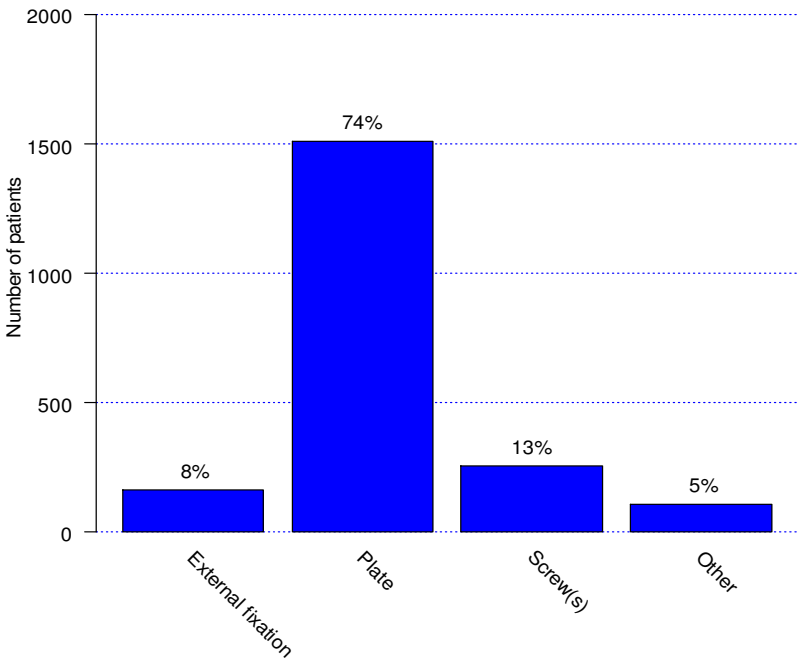

Survival for primary surgery with reoperation due to any reason
distal tibia fractures
(282)
probability
1.00
0.95
0.90
0.85
0.80
0.75
0
100
200
300
400
500
600
700
days


Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
distal tibia fractures
(270)
probability
1.00
0.95
0.90
0.85
0.80
0
100
200
300
400
500
600
700
days

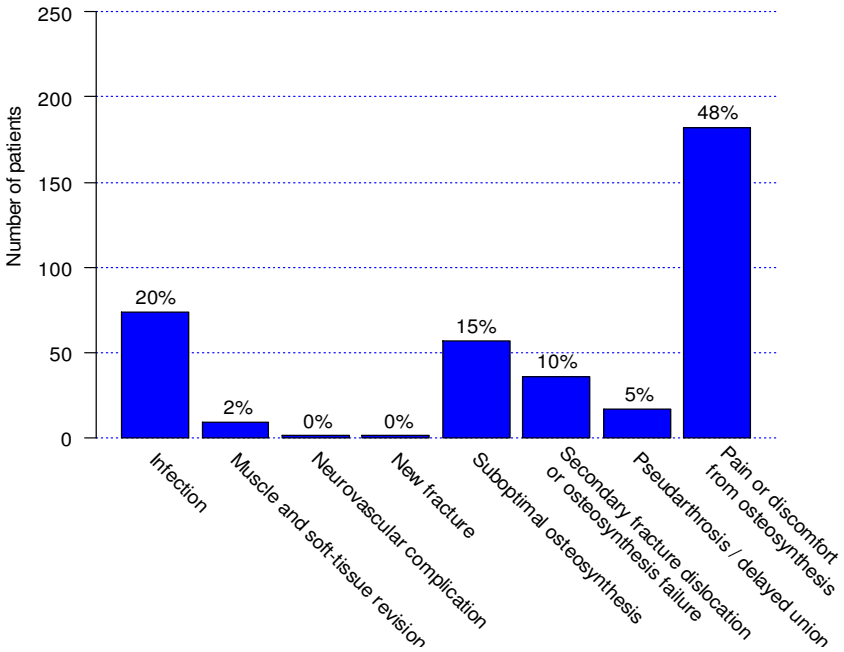

Fracture classification for distal tibia fractures
(209)
Number of patients
120
100
80
60
40
20
0
3
2
1
3
2
1
3
2
1
43A
43B
43C

Malleoli

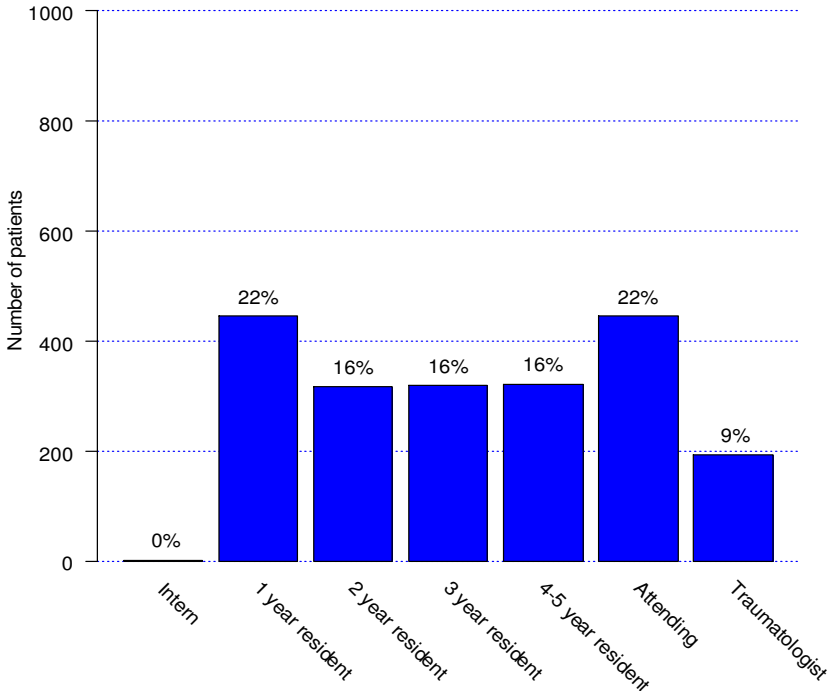
Method of osteosynthesis malleoli fractures (2037)



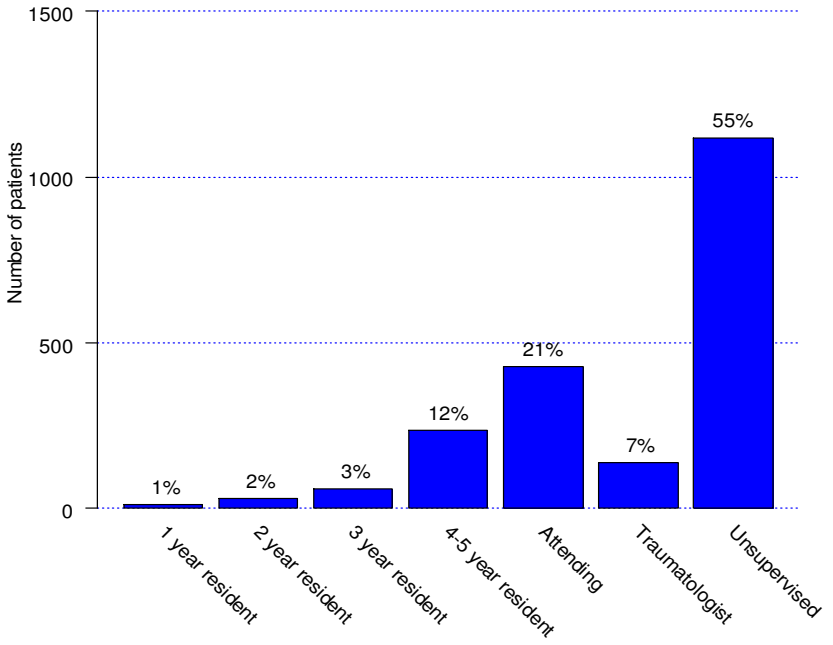
Indication for reoperations of malleoli fractures (377)

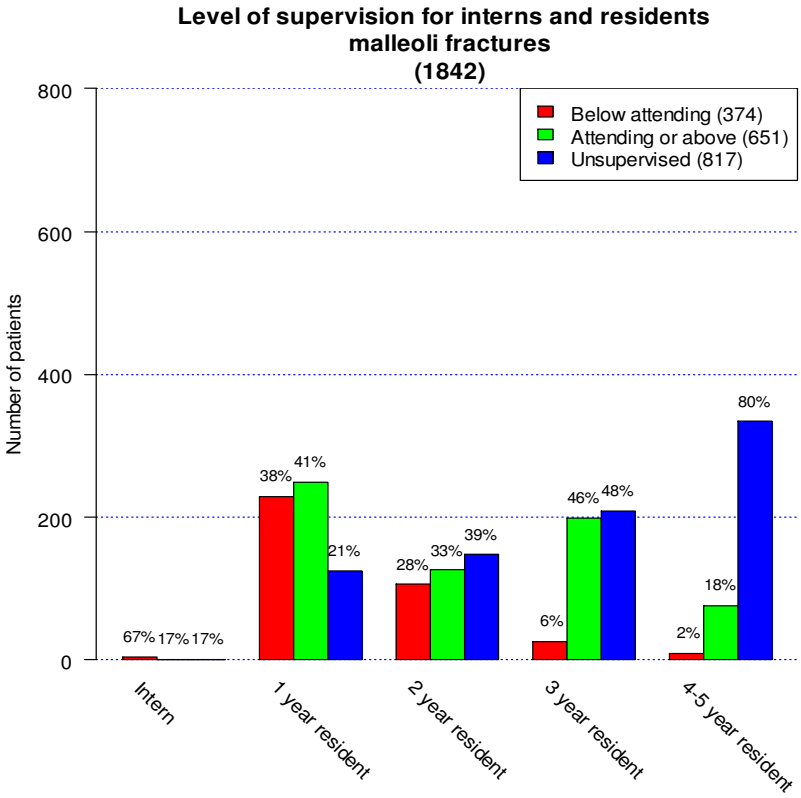


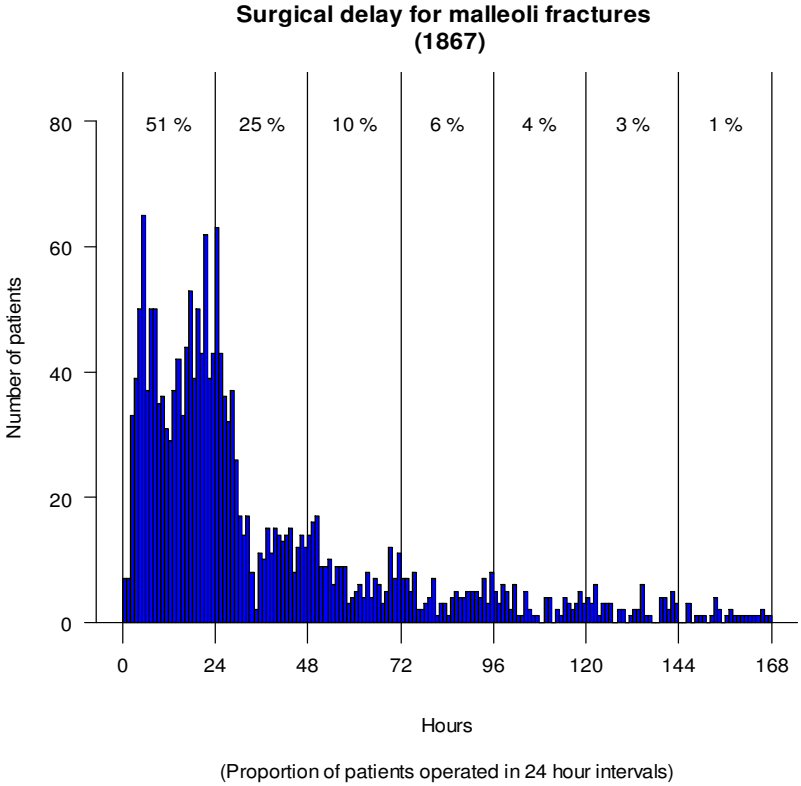
Primary surgeons for malleoli fractures (2047)



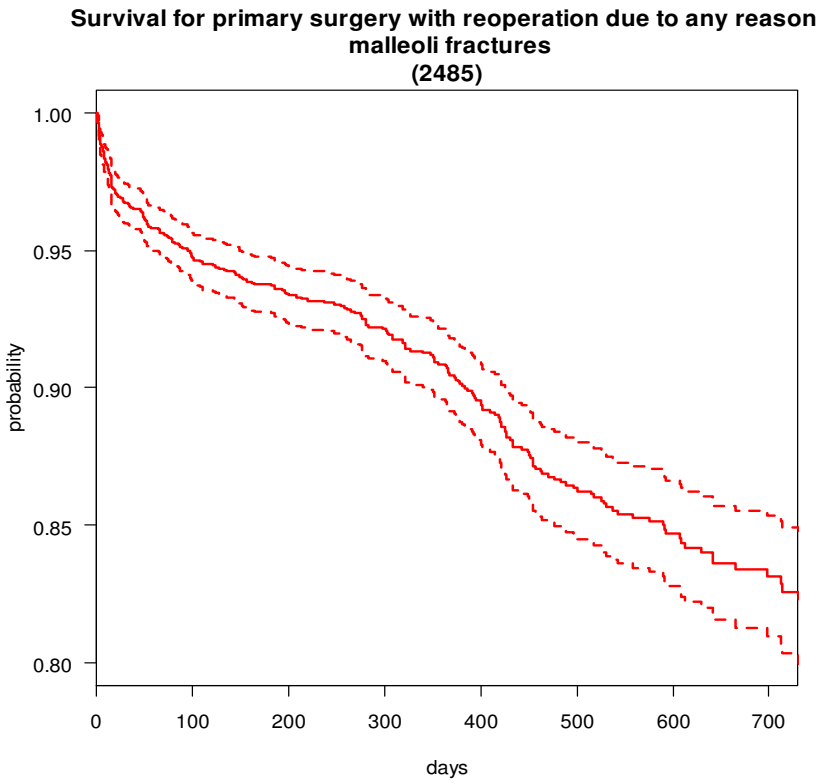
Level of supervision for malleoli fractures (2022)

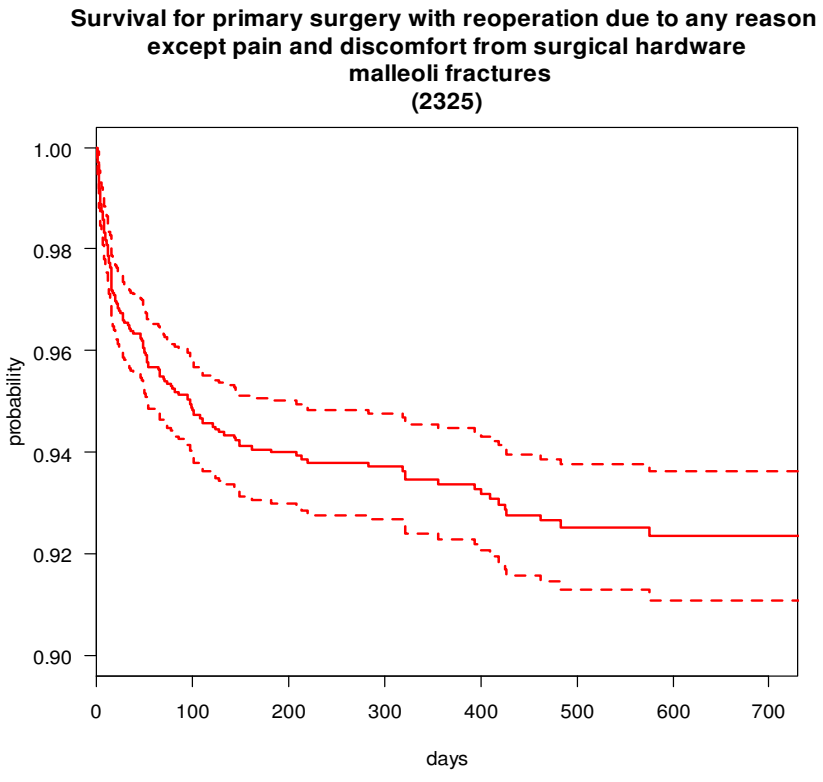


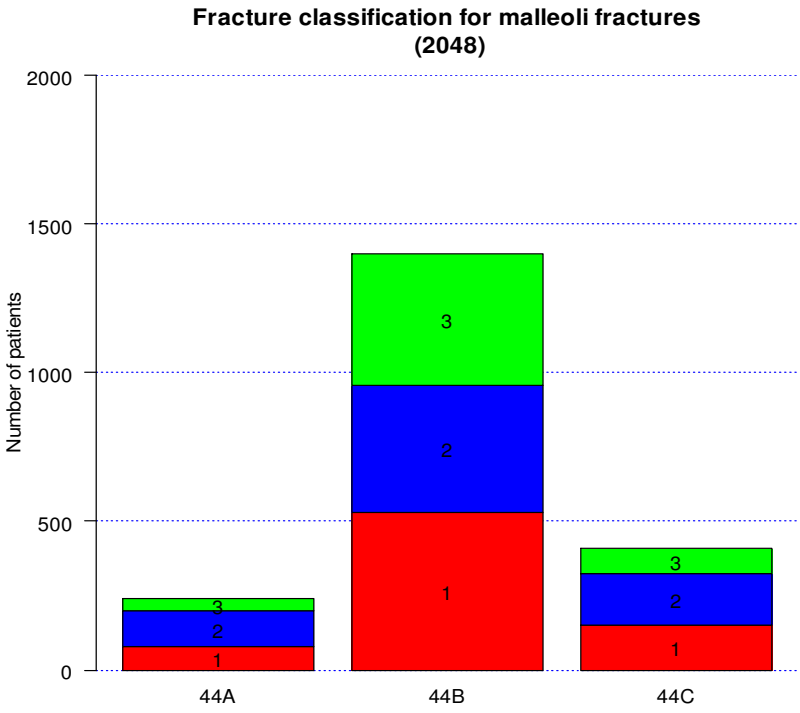




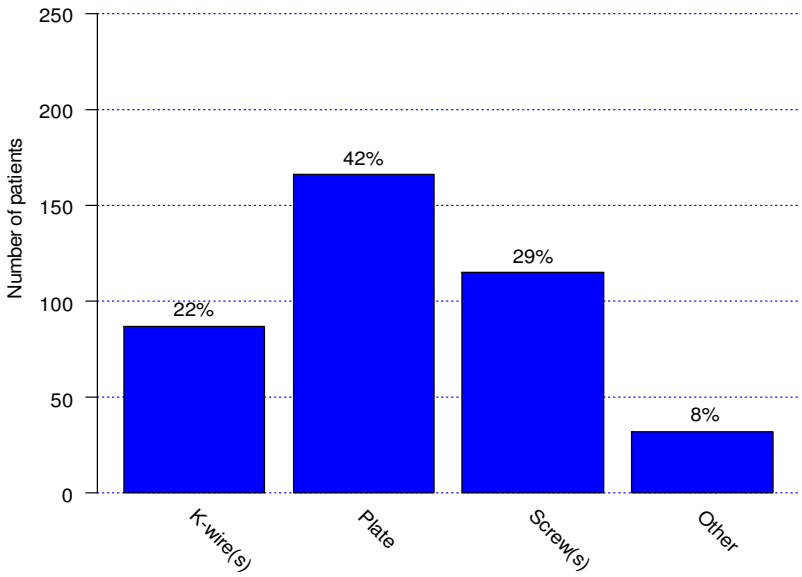
(Proportion of patients operated in 24 hour intervals)


Survival for primary surgery with reoperation due to any reason
malleoli fractures
(2485)
probability
1.00
0.95
0.90
0.85
0.80
0
100
200
300
400
500
600
700
days

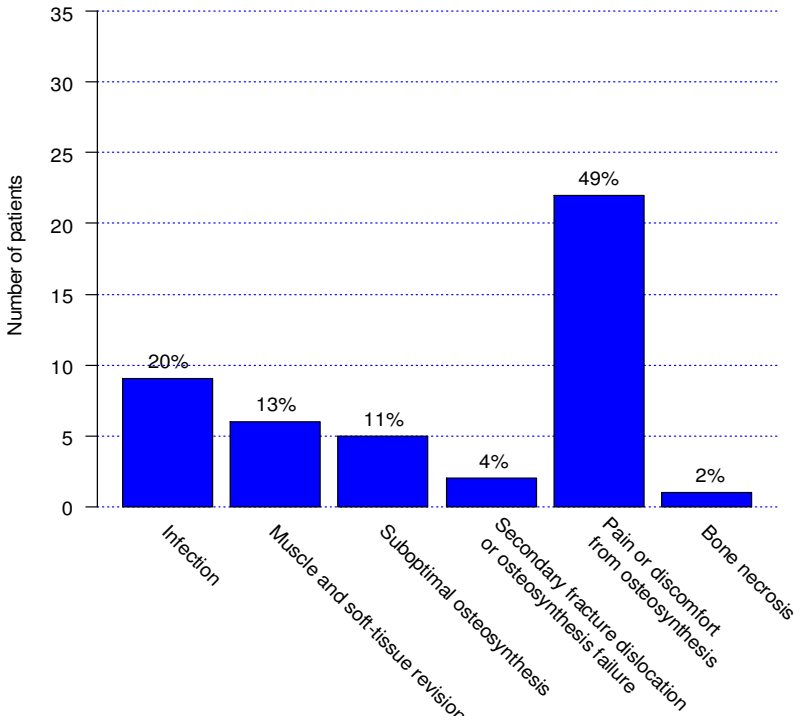

Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
malleoli fractures
(2325)
probability
1.00
0.98
0.96
0.94
0.92
0.90
0
100
200
300
400
500
600
700
days

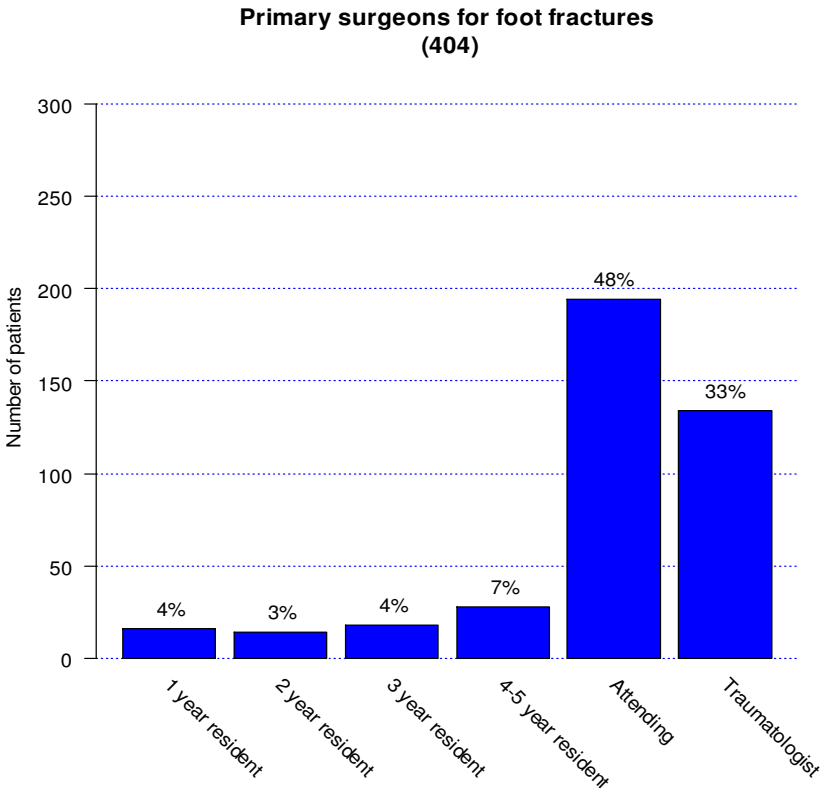

Fracture classification for malleoli fractures
(2048)
Number of patients
2000
1500
1000
500
0
3
2
1
3
2
1
3
2
1
44A
44B
44C

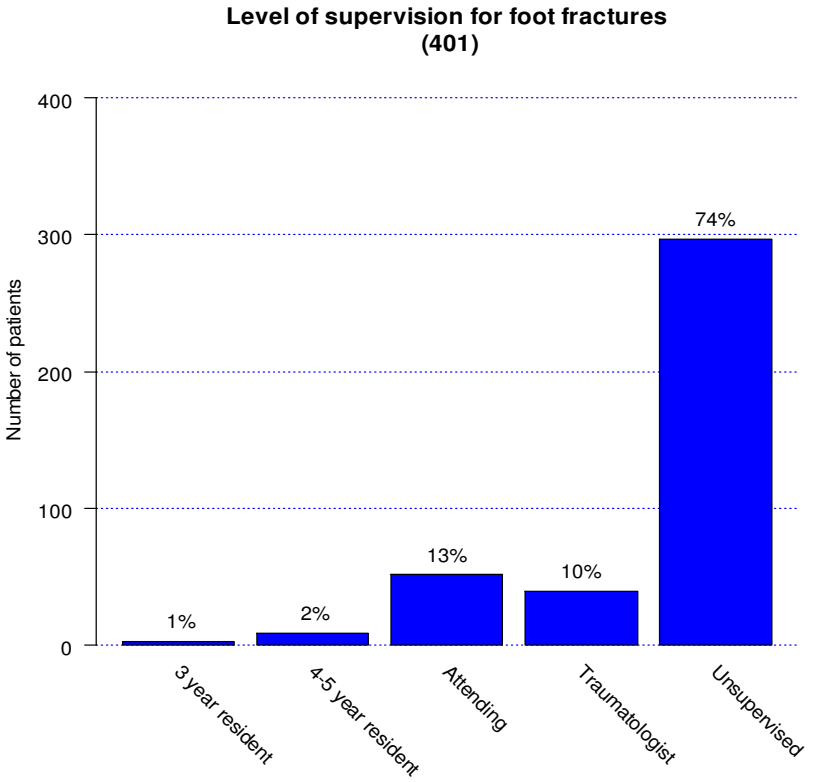
Method of osteosynthesis foot fractures (400)

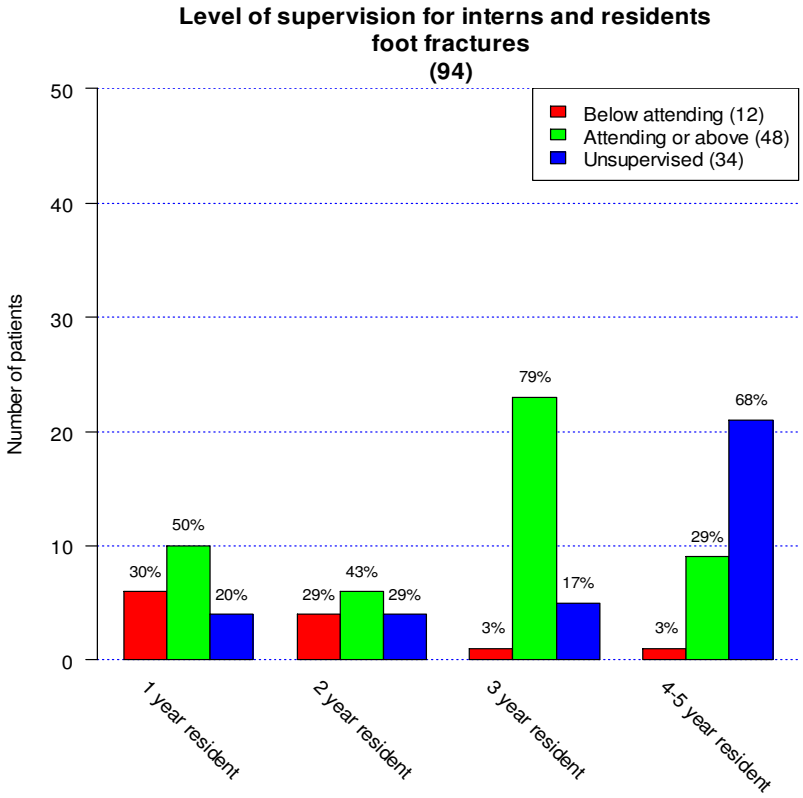


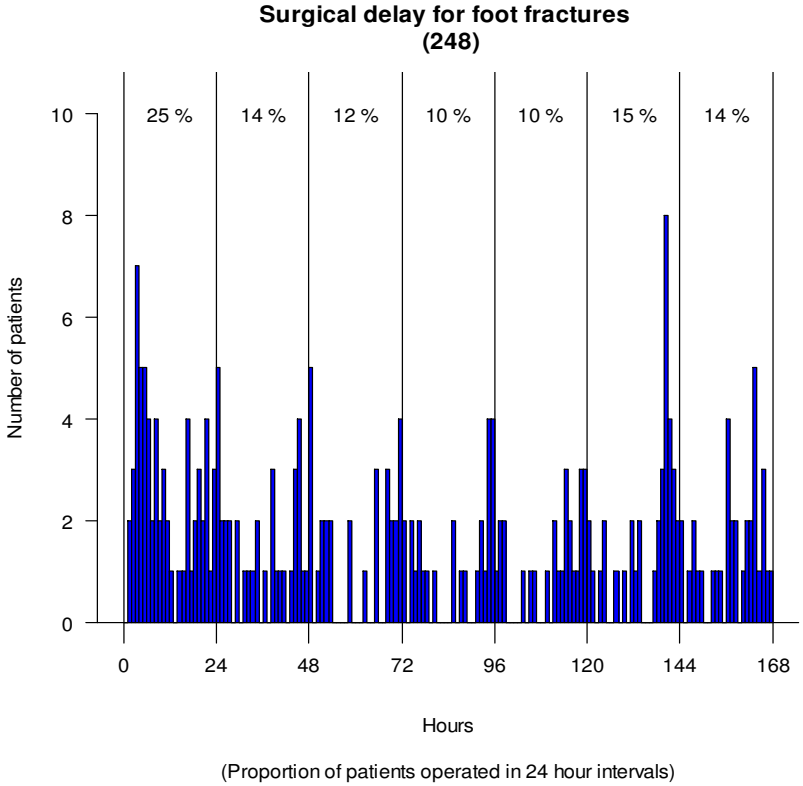
Indication for reoperations of foot fractures (45)



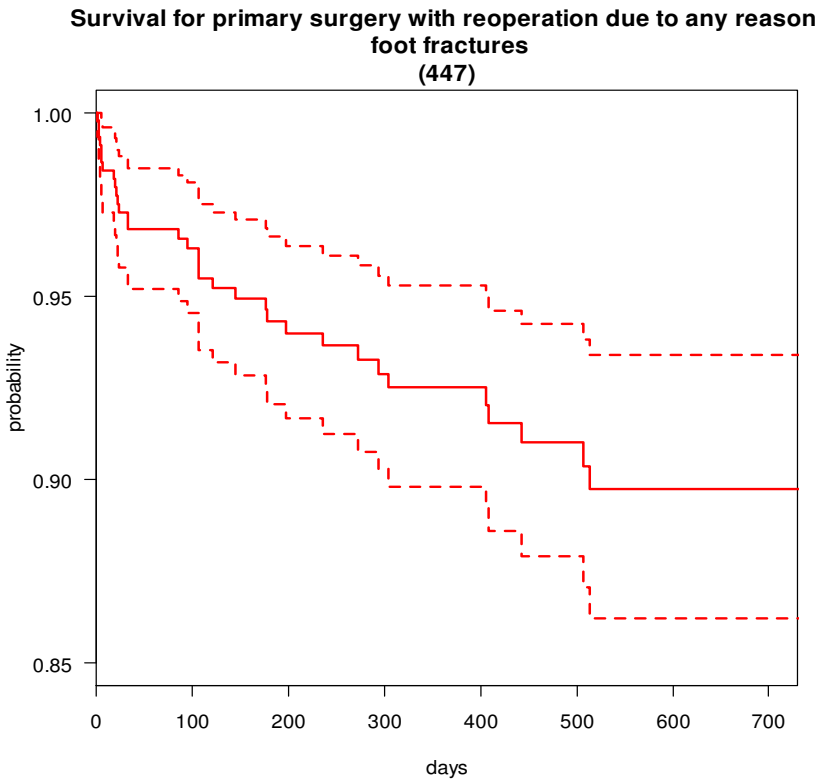

Primary surgeons for foot fractures
(404)
Number of patients
300
250
200
150
100
50
0
4%
3%
4%
7%
48%
33%
1 year resident
2 year resident
3 year resident
4-5 year resident
Attending
Traumatologist

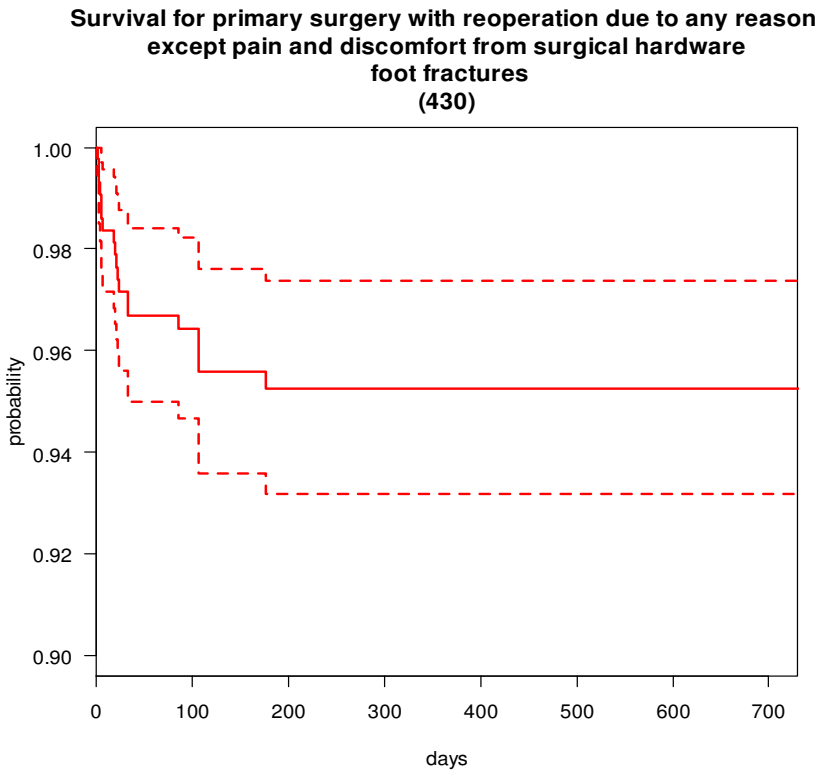

Level of supervision for foot fractures
(401)
Number of patients
400
300
200
100
0
1%
2%
13%
10%
74%
3 year resident
4-5 year resident
Attending
Traumatologist
Unsupervised

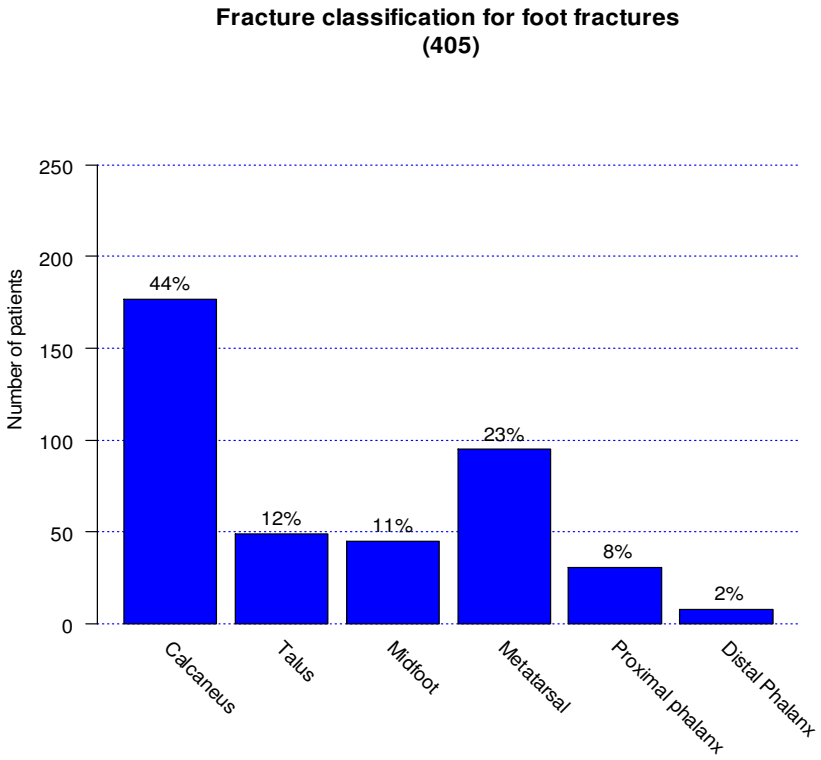




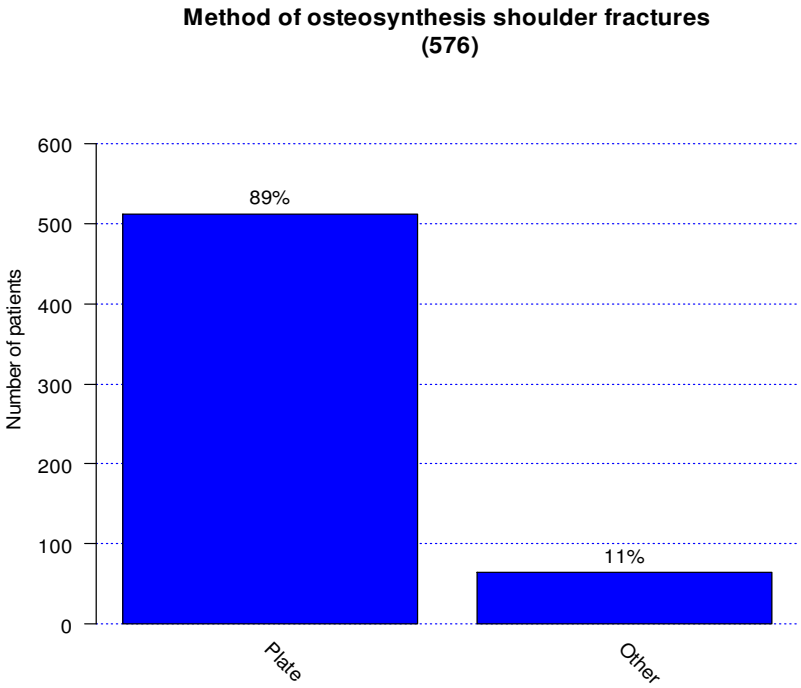
(Proportion of patients operated in 24 hour intervals)

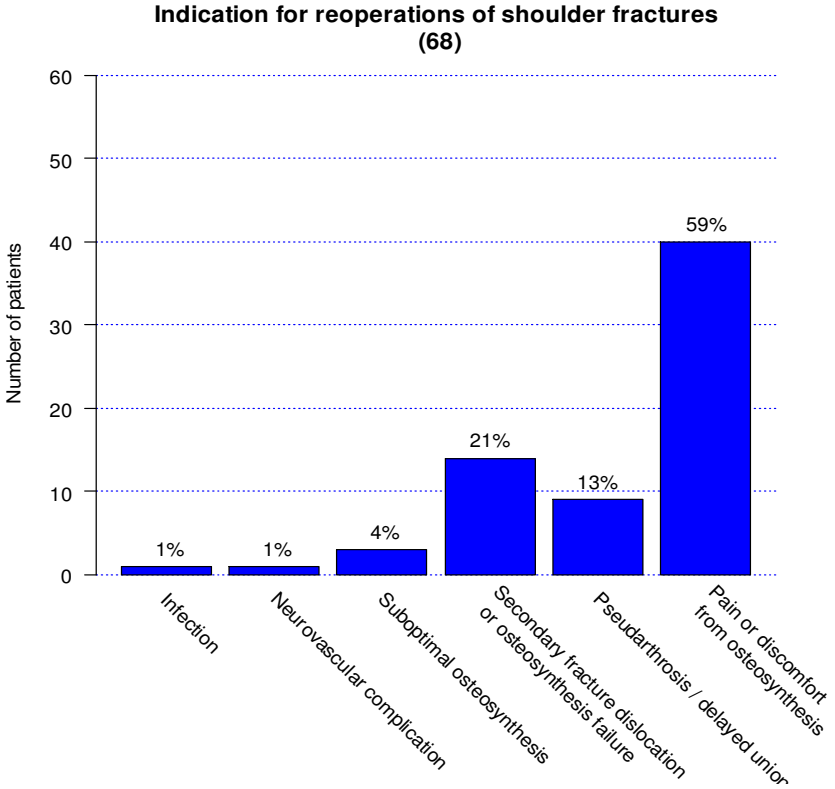

Survival for primary surgery with reoperation due to any reason
foot fractures
(447)
1.00
0.95
0.90
0.85
probability
0
100
200
300
400
500
600
700
days


Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
foot fractures
(430)
1.00
0.98
0.96
0.94
0.92
0.90
probability
0
100
200
300
400
500
600
700
days

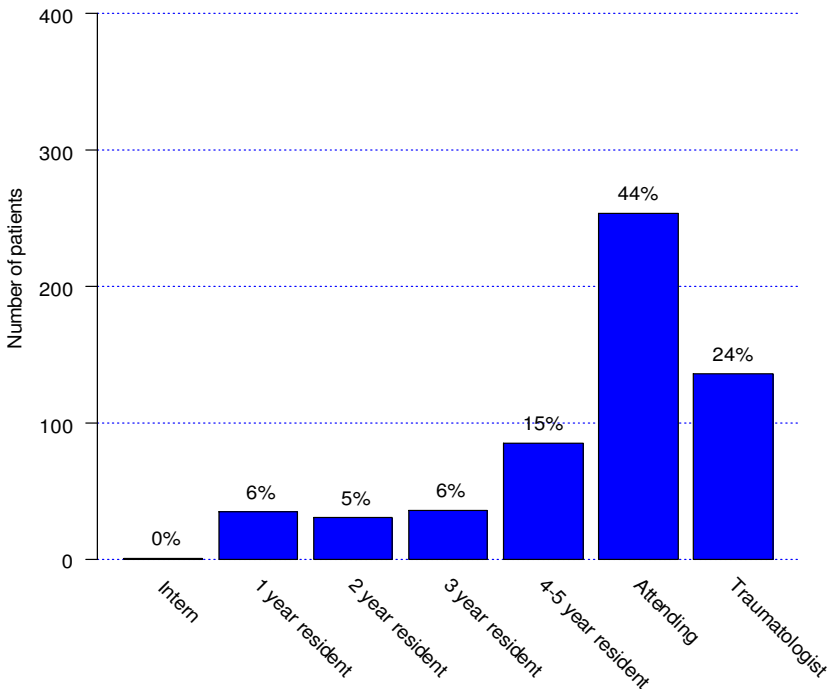

Fracture classification for foot fractures
(405)
Number of patients
250
200
150
100
50
0
44%
12%
11%
23%
8%
2%
Calcaneus
Talus
Midfoot
Metatarsal
Proximal phalanx
Distal Phalanx

Shoulder

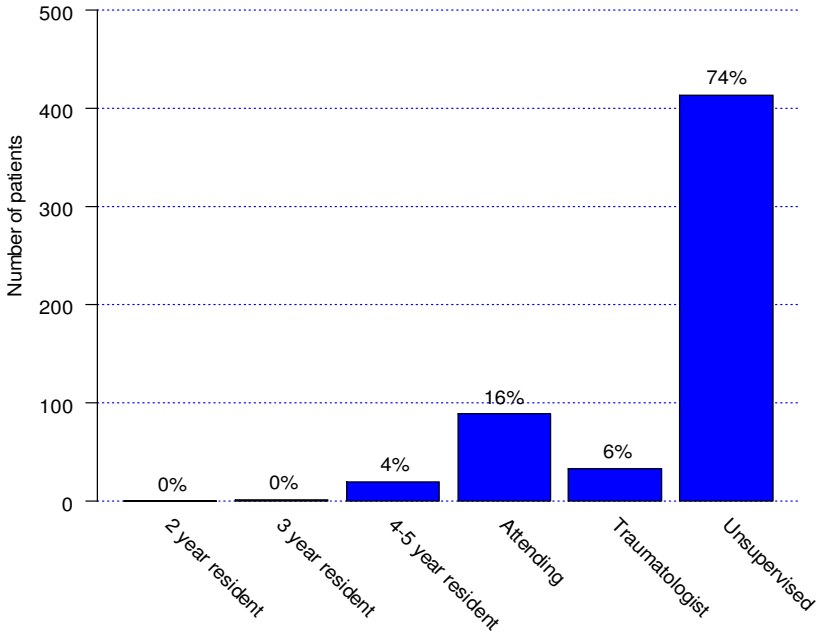

Method of osteosynthesis shoulder fractures
(576)
Number of patients
600
500
400
300
200
100
0
89%
11%
Plate
Other

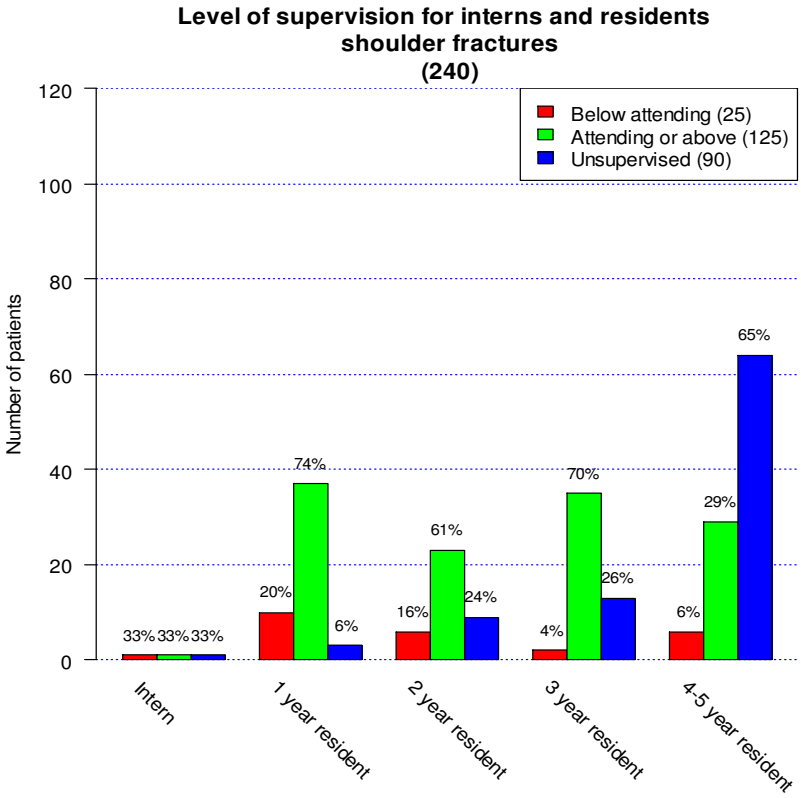

Indication for reoperations of shoulder fractures
(68)
Number of patients
60
50
40
30
20
10
0
1%
1%
4%
21%
13%
59%
Infection
Neurovascular complication
Suboptimal osteosynthesis
Secondary fracture dislocation
or osteosynthesis failure
Pseudarthrosis / delayed unior
Pain or discomfort
from osteosynthesis

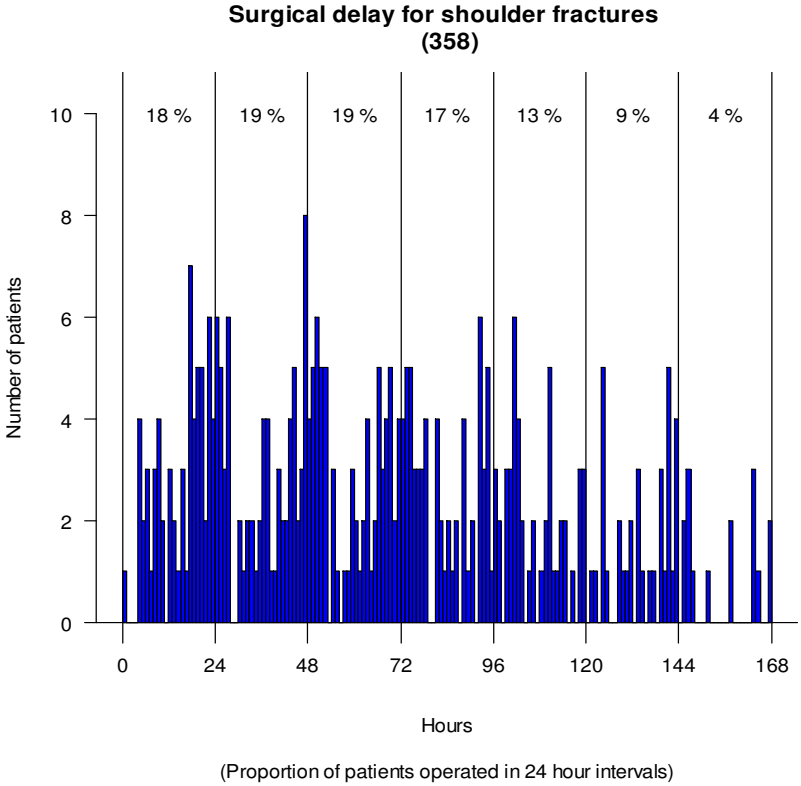
Primary surgeons for shoulder fractures
(578)



Level of supervision for shoulder fractures
(560)

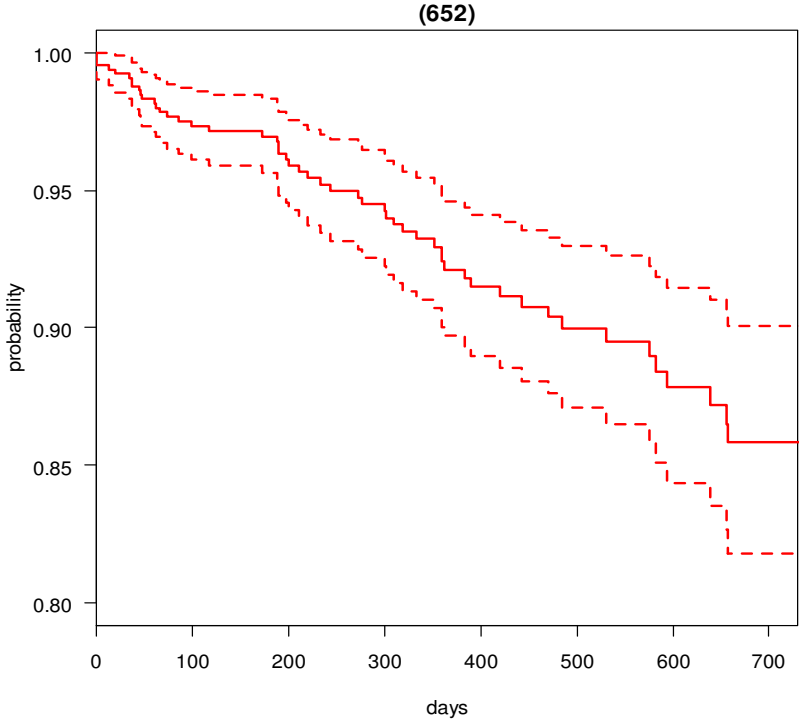




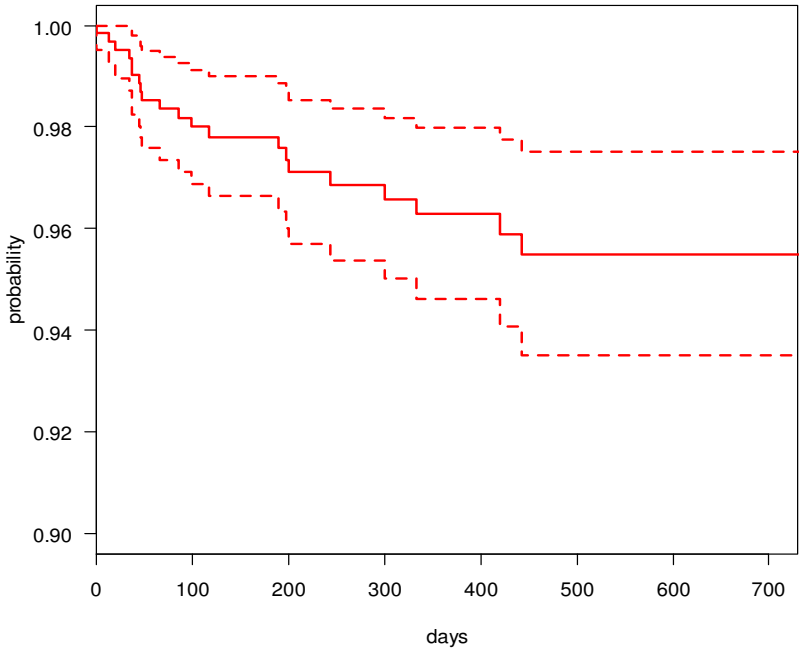


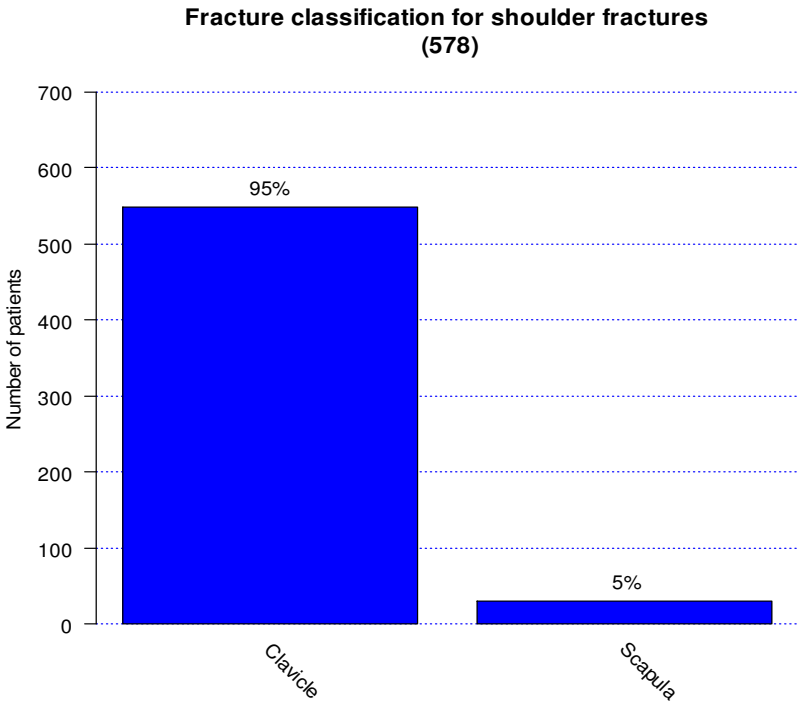
(Proportion of patients operated in 24 hour intervals)

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



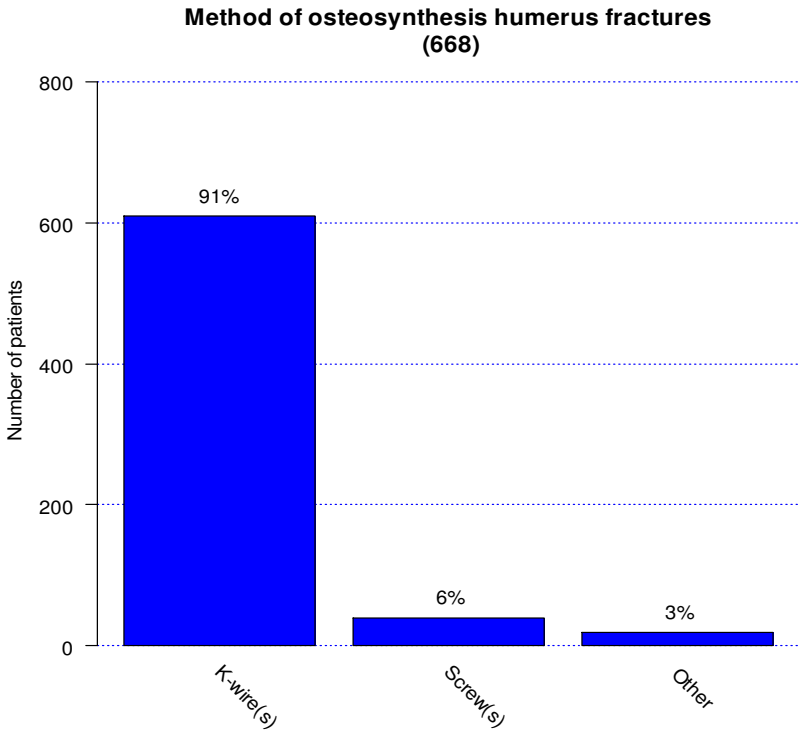
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware shoulder fractures (613)

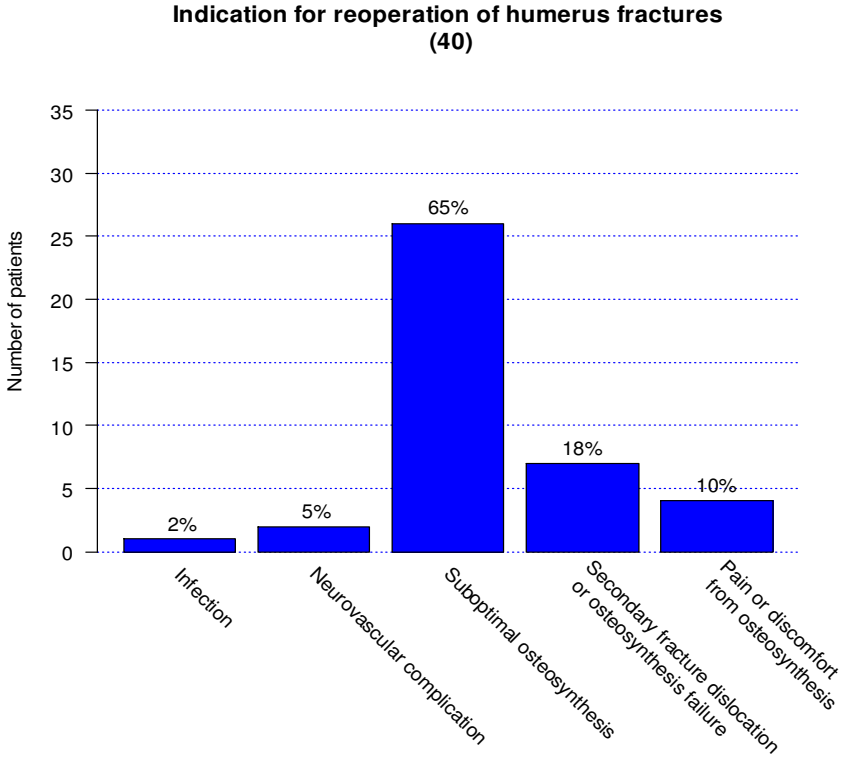



Fracture classification for shoulder fractures
(578)
Number of patients
700
600
500
400
300
200
100
0
95%
5%
Clavicle
Scapula

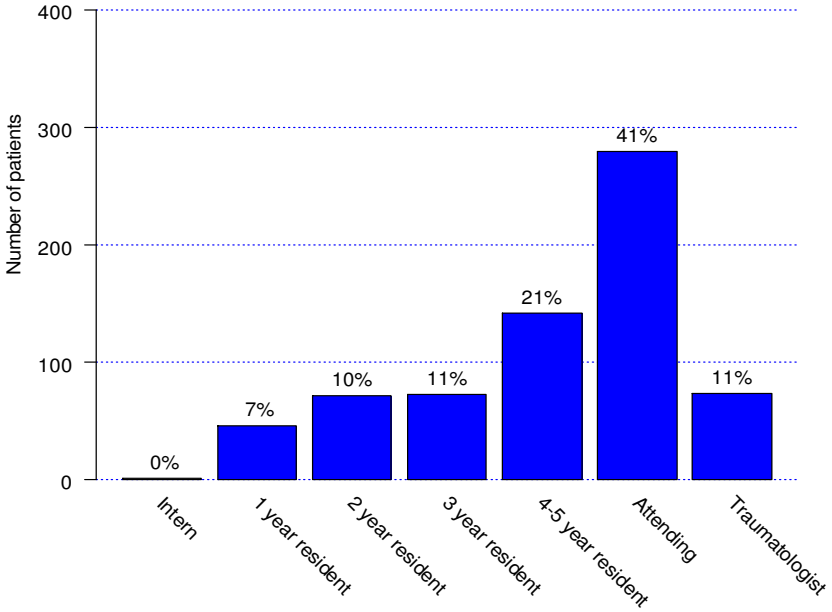
Pediatric

Humerus

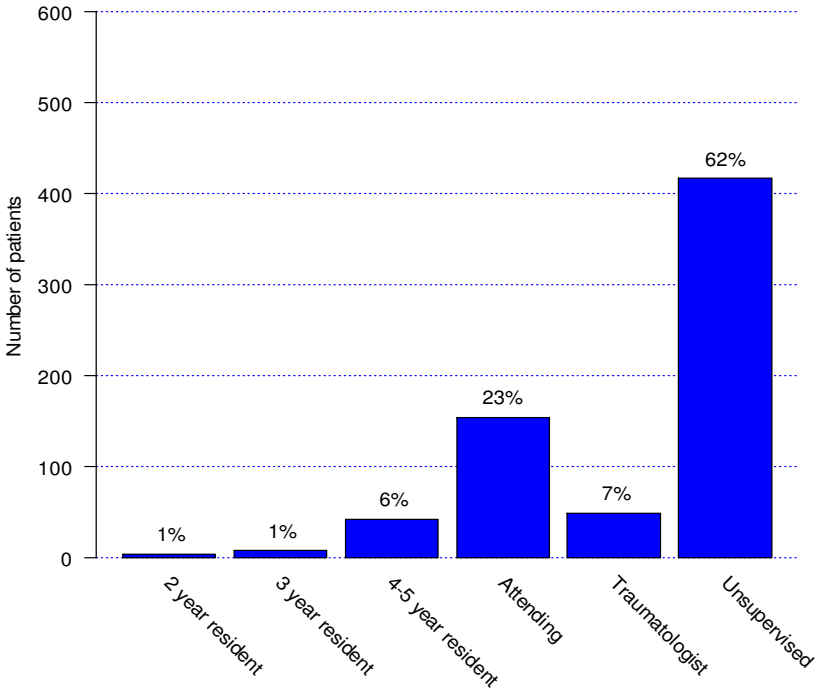


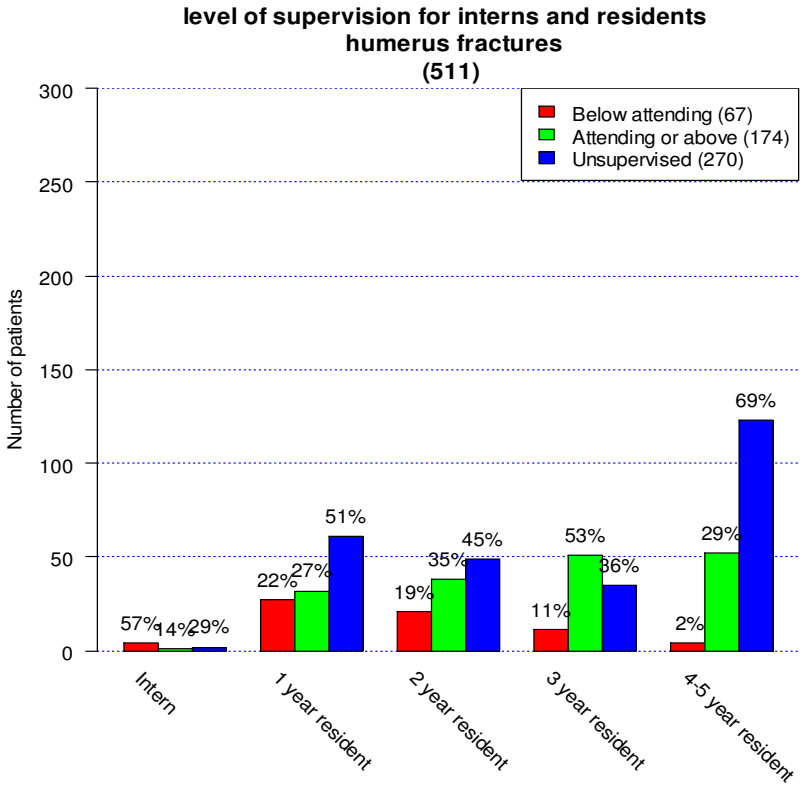


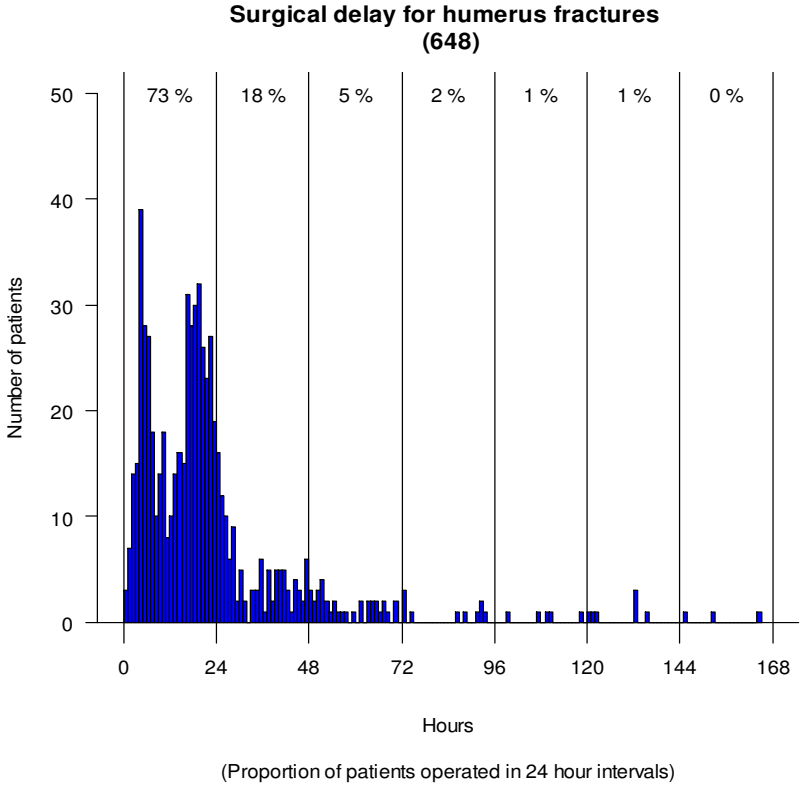
Primary surgeons for humerus fractures (688)



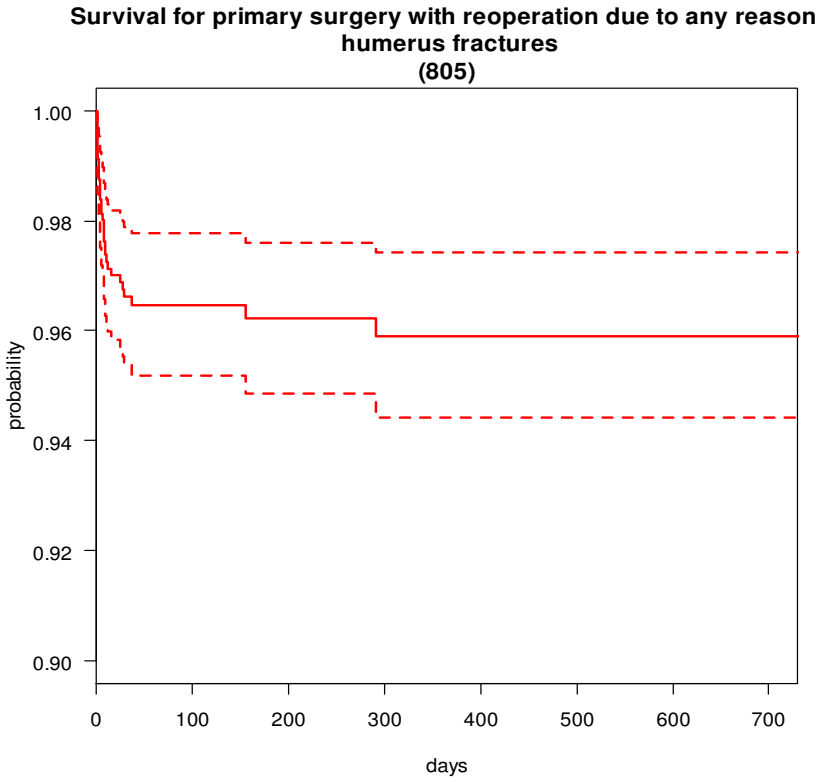
Level of supervision for humerus fractures (672)

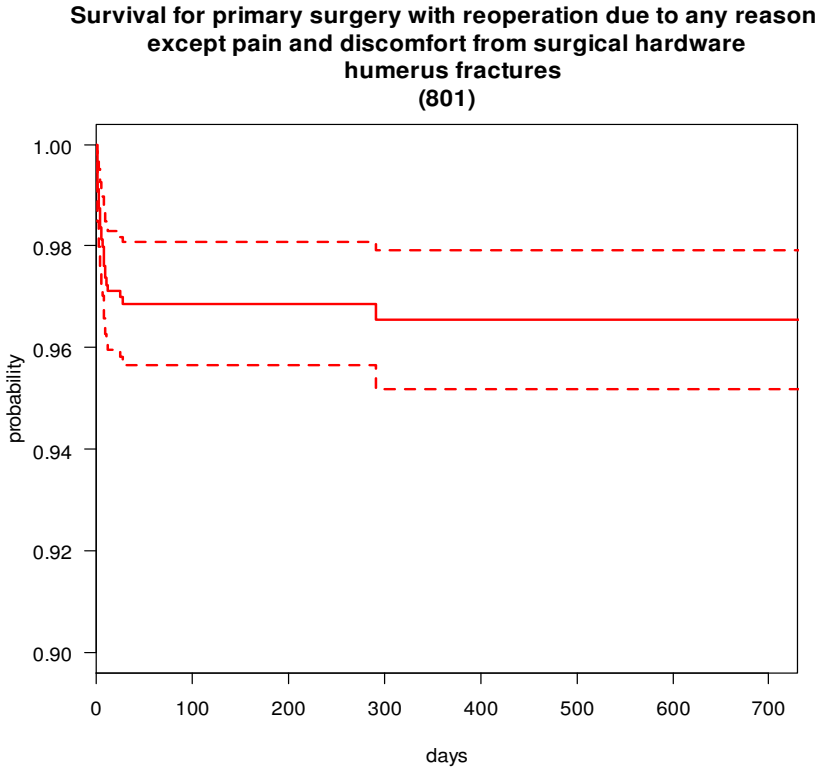


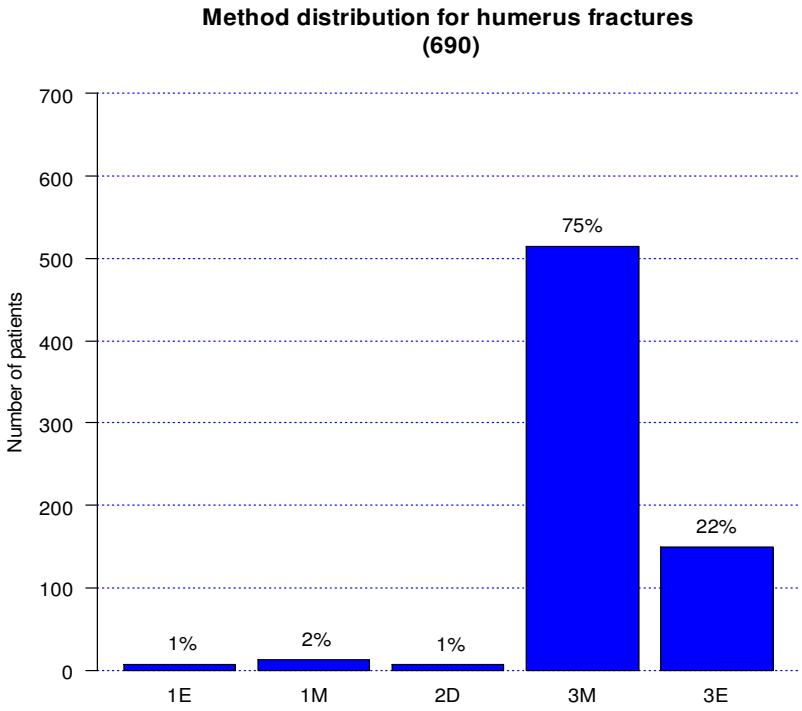




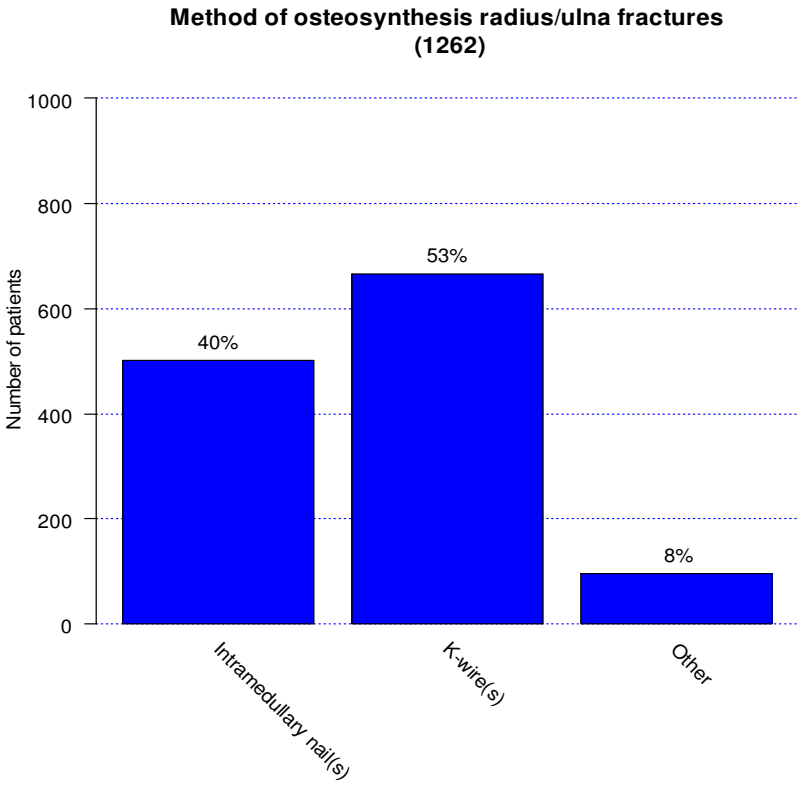
(Proportion of patients operated in 24 hour intervals)

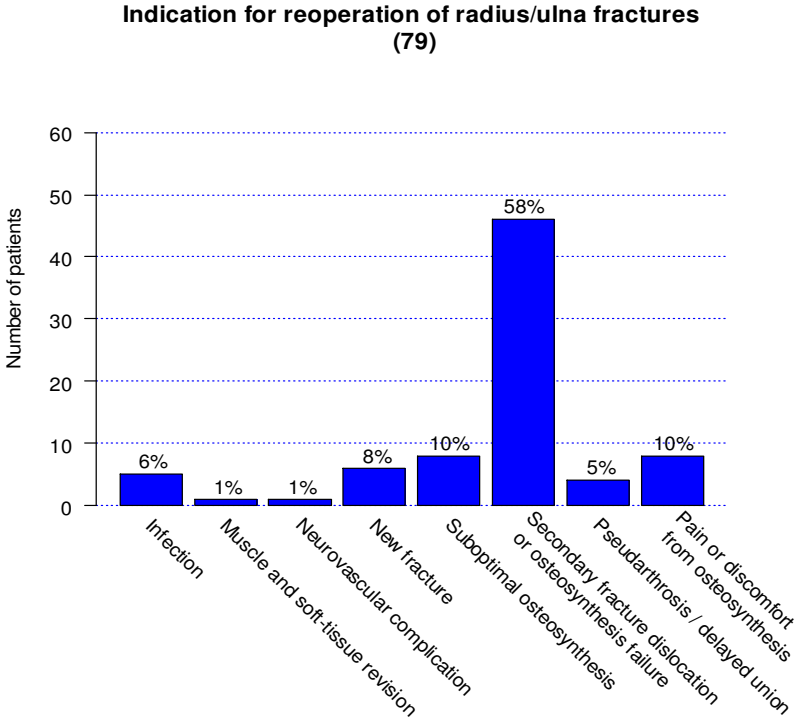

Survival for primary surgery with reoperation due to any reason
humerus fractures
(805)
probability
1.00
0.98
0.96
0.94
0.92
0.90
0
100
200
300
400
500
600
700
days


Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
humerus fractures
(801)
probability
1.00
0.98
0.96
0.94
0.92
0.90
0
100
200
300
400
500
600
700
days

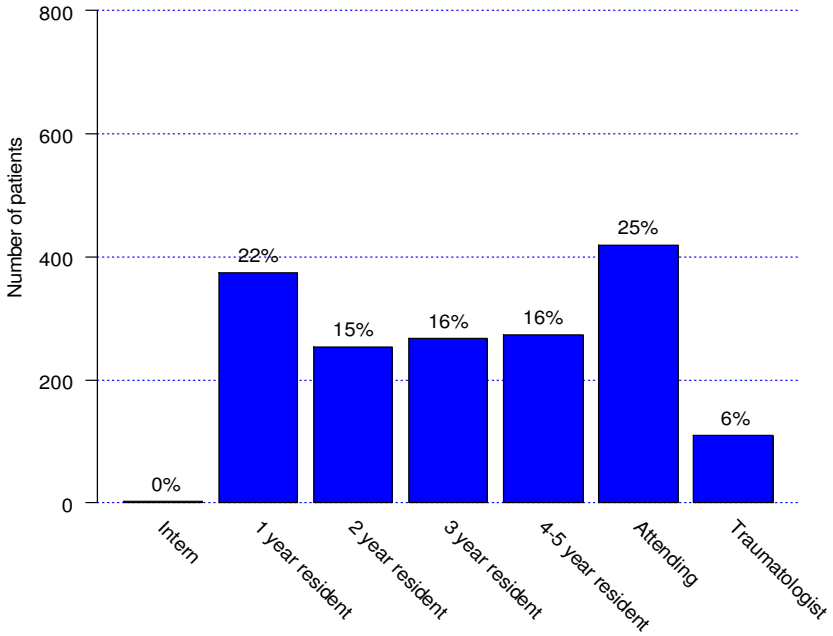

Method distribution for humerus fractures
(690)
Number of patients
700
600
500
400
300
200
100
0
1%
2%
1%
75%
22%
1E
1M
2D
3M
3E

Radius/Ulna

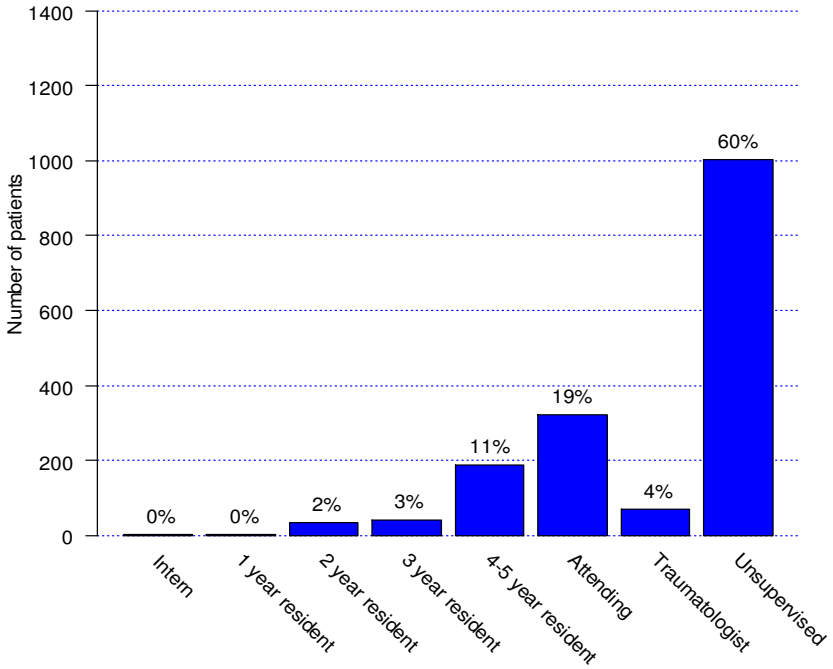

Method of osteosynthesis radius/ulna fractures
(1262)
Number of patients
1000
800
600
400
200
0
40%
53%
8%
Intramedullary nail(s)
K-wire(s)
Other

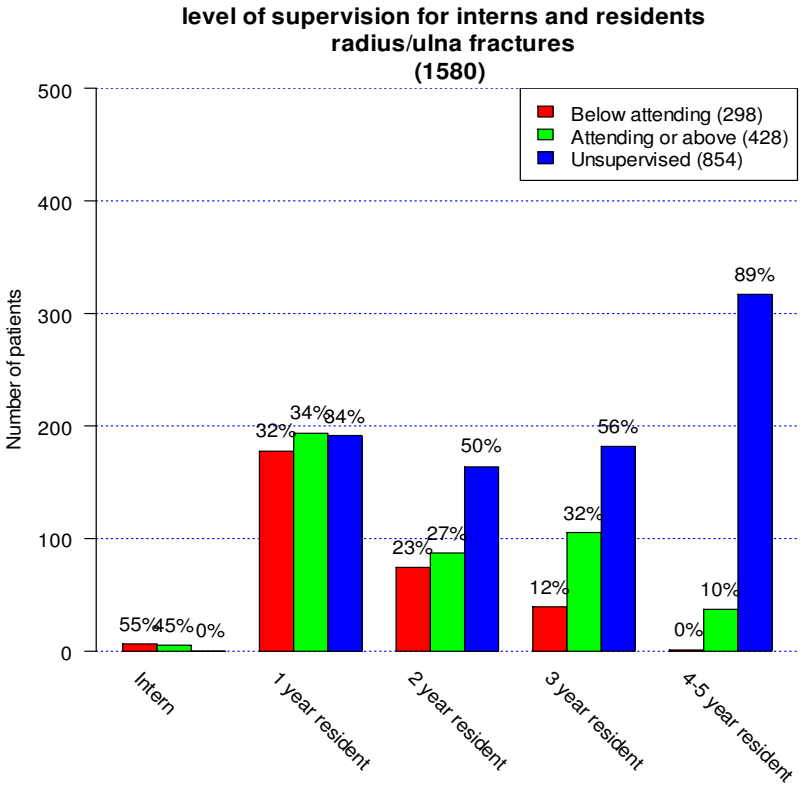

Indication for reoperation of radius/ulna fractures
(79)
Number of patients
60
50
40
30
20
10
0
6%
1%
1%
8%
10%
58%
5%
10%
Infection
Muscle and soft-tissue revision
Neurovascular complication
New fracture
Suboptimal osteosynthesis
Secondary fracture dislocation or osteosynthesis failure
Pseudarthrosis / delayed union
Pain or discomfort from osteosynthesis

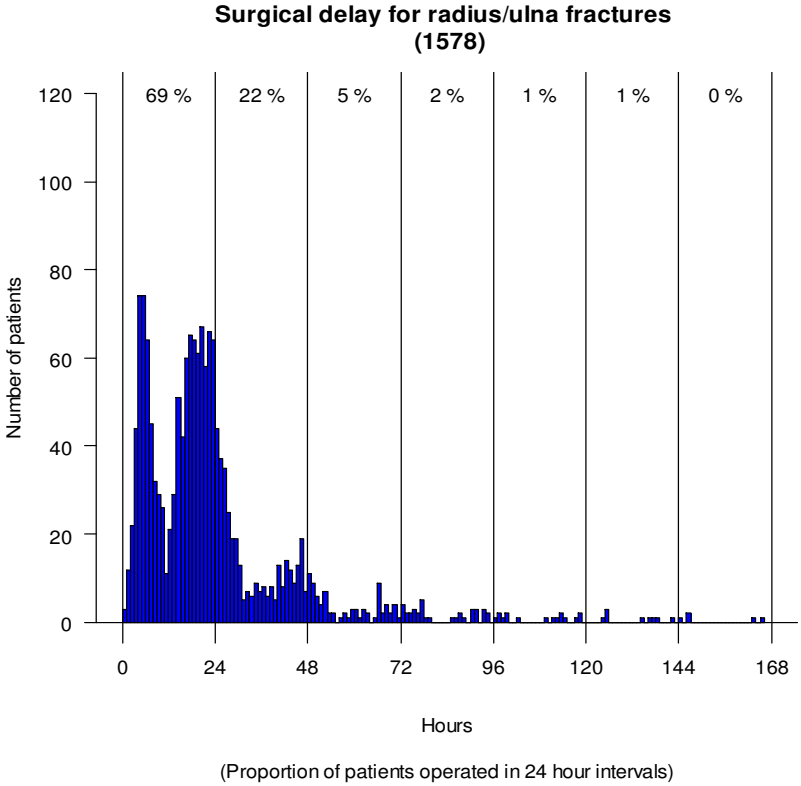
Primary surgeons for radius/ulna fractures (1700)



Level of supervision for radius/ulna fractures (1661)

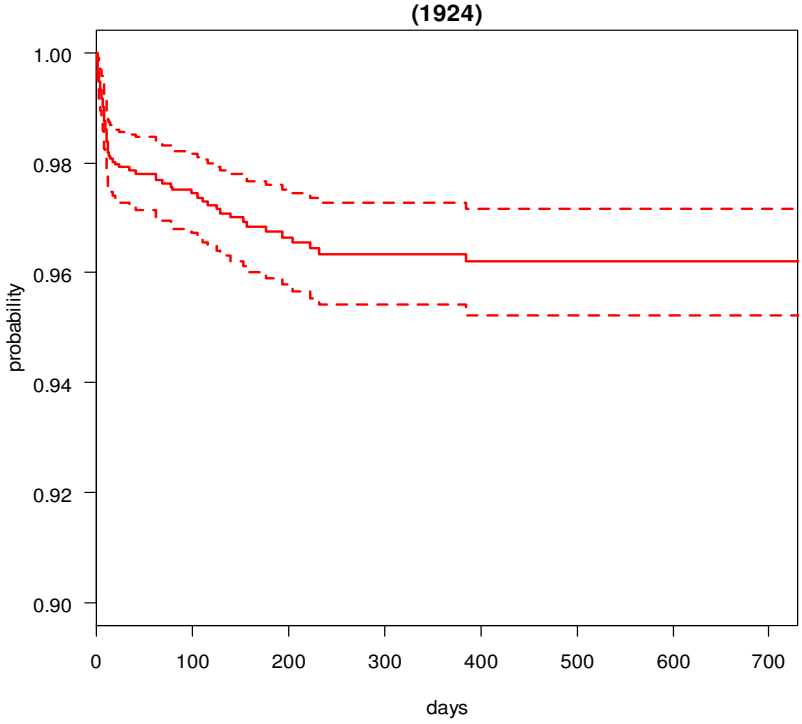




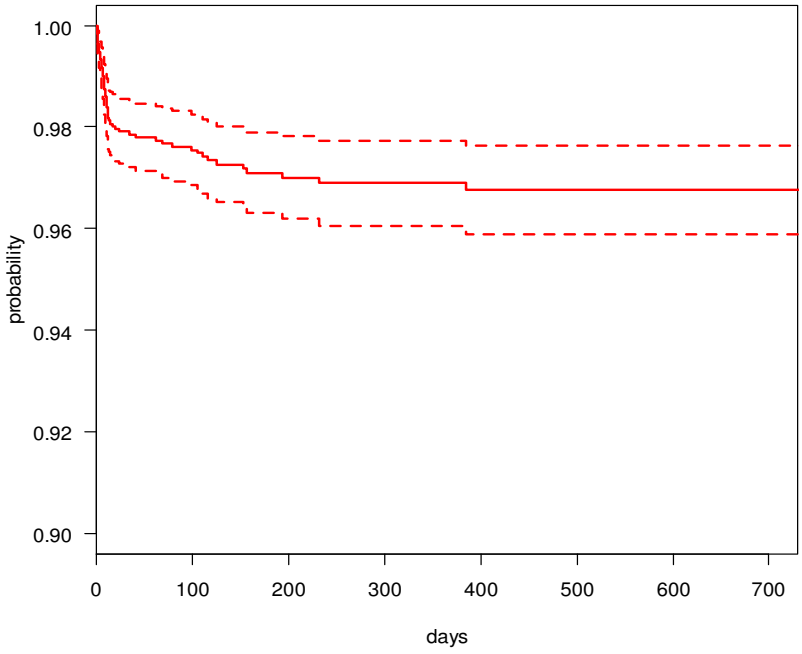


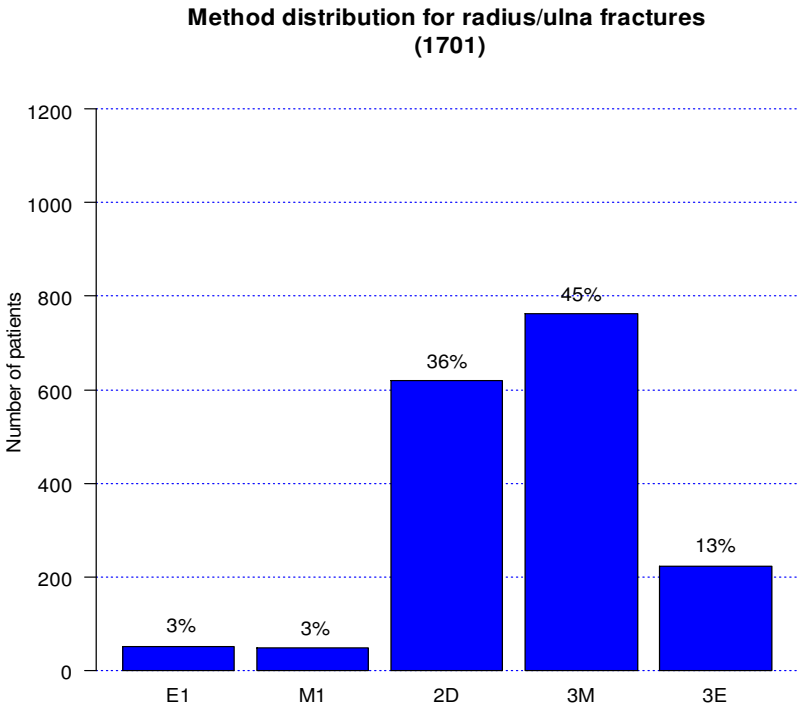
(Proportion of patients operated in 24 hour intervals)

Survival for primary surgery with reoperation due to any reason radius/ulna fractures (1924)



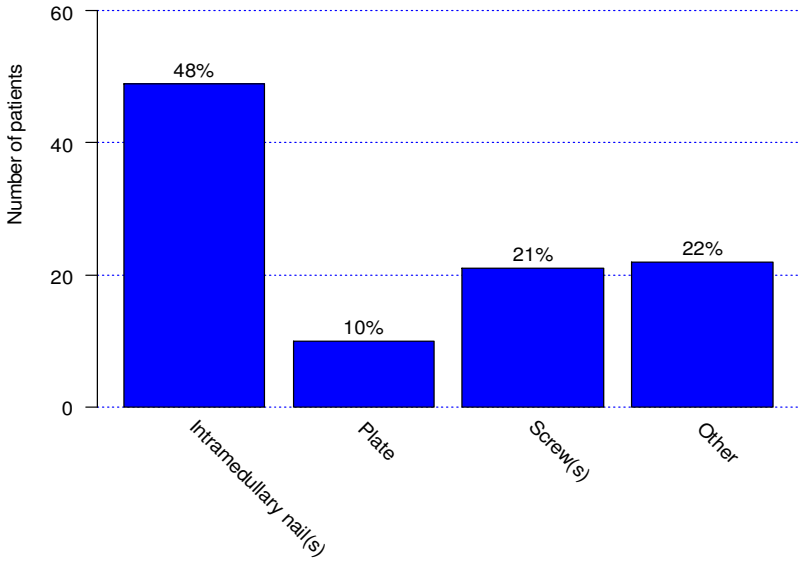
Survival for primary surgery with reoperation due to any reason except pain and discomfort from surgical hardware radius/ulna fractures (1917)



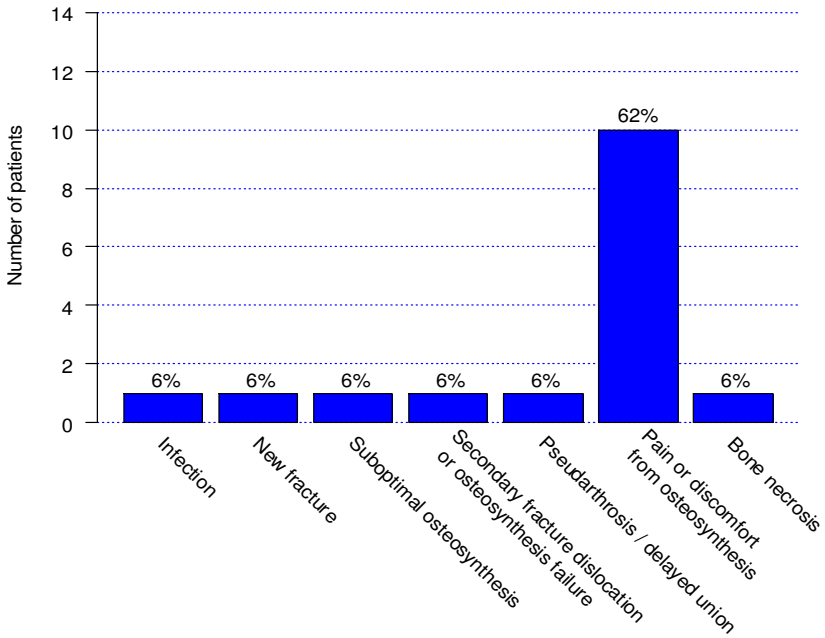

Method distribution for radius/ulna fractures
(1701)
Number of patients
1200
1000
800
600
400
200
0
3%
3%
36%
45%
13%
E1
M1
2D
3M
3E

Femur

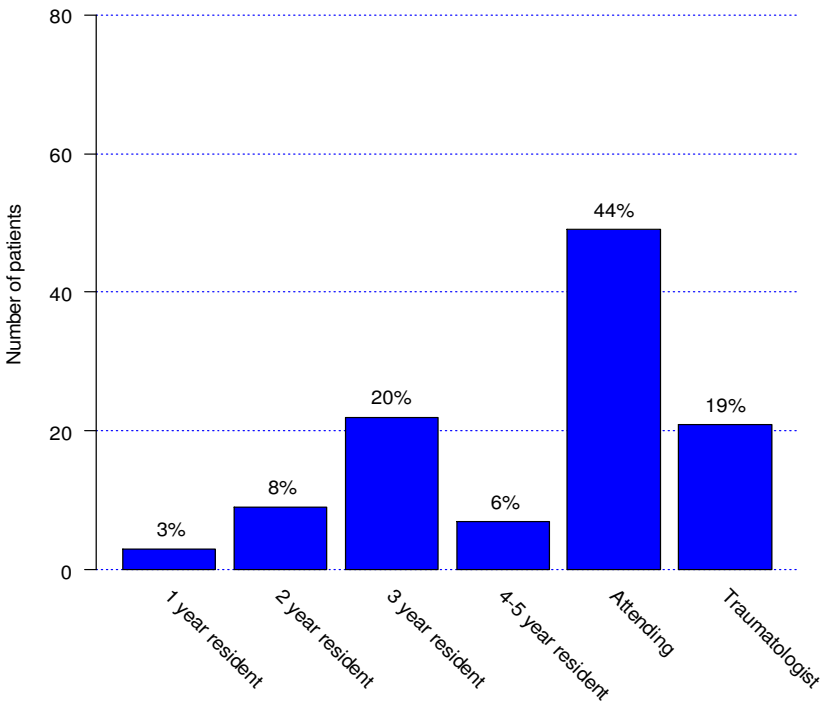
Method of osteosynthesis femur fractures (102)



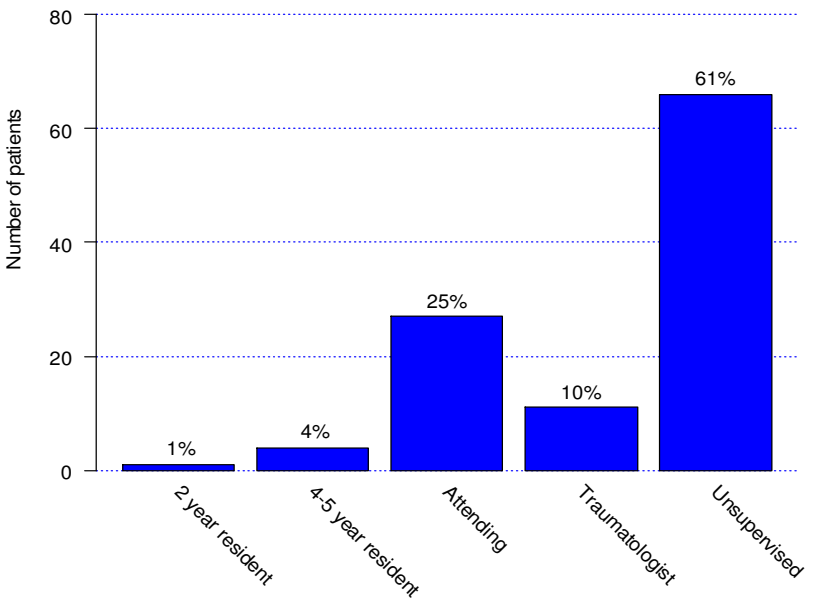
Indication for reoperation of femur fractures (16)

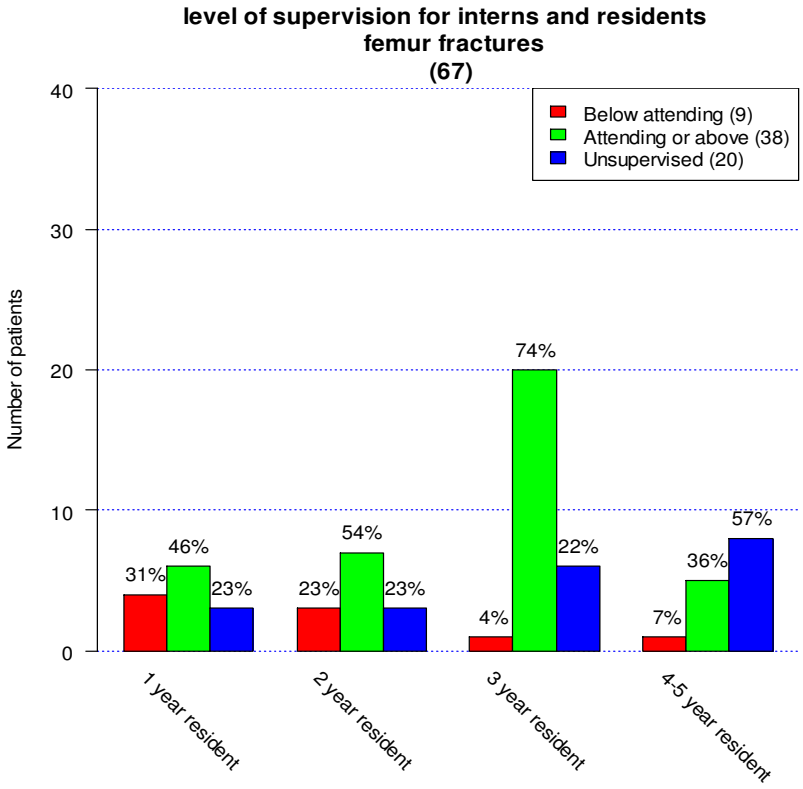


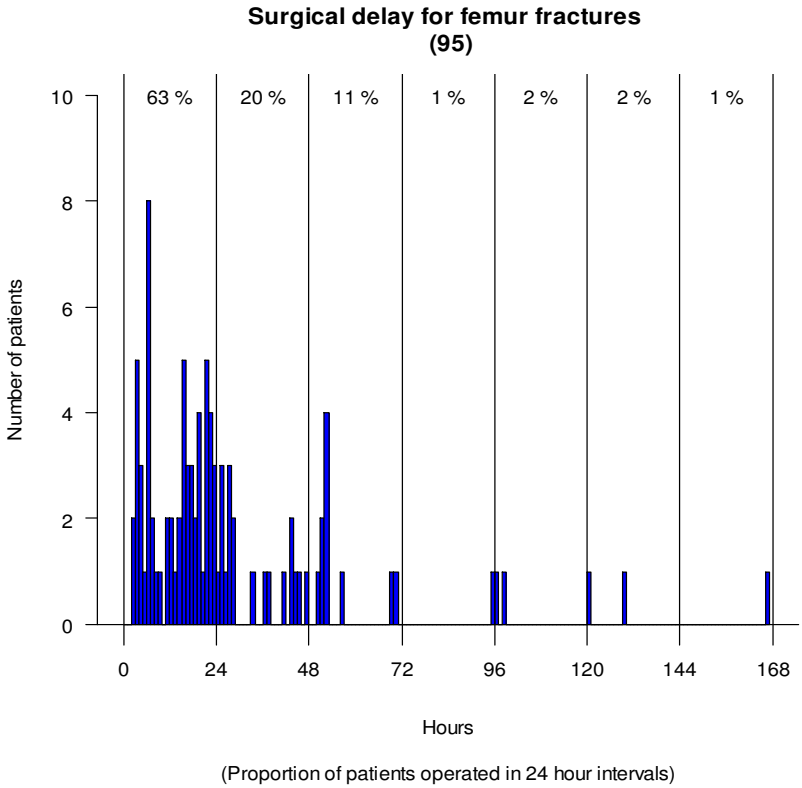
Primary surgeons for femur fractures (111)

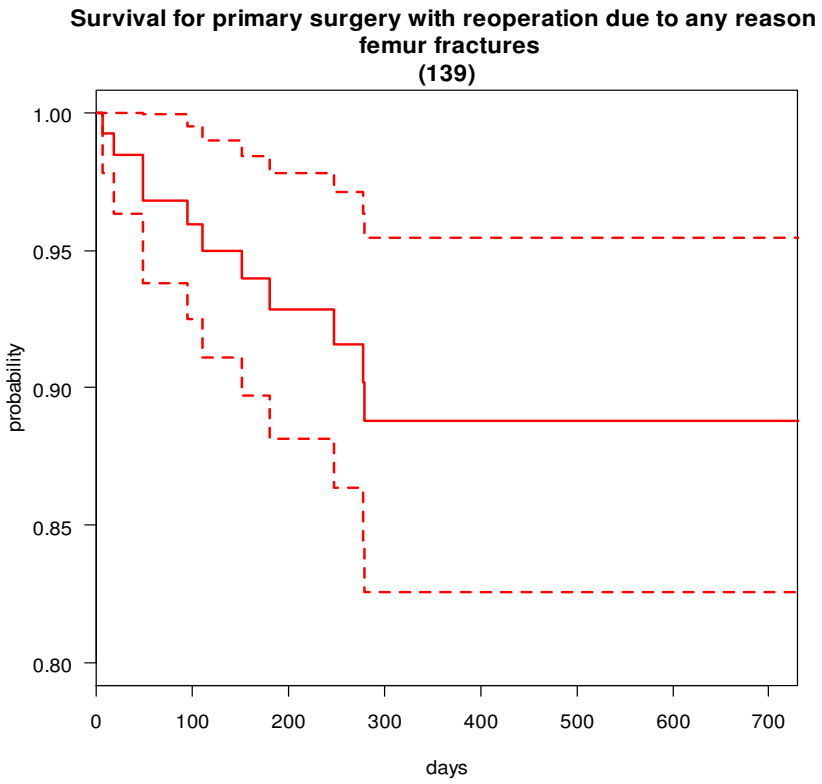


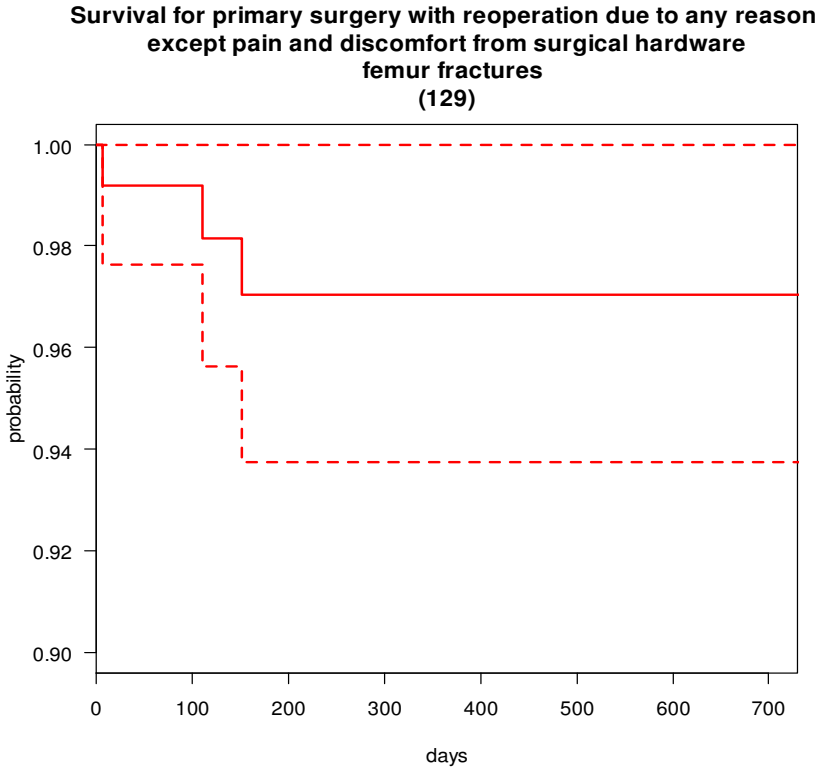
Level of supervision for femur fractures (109)

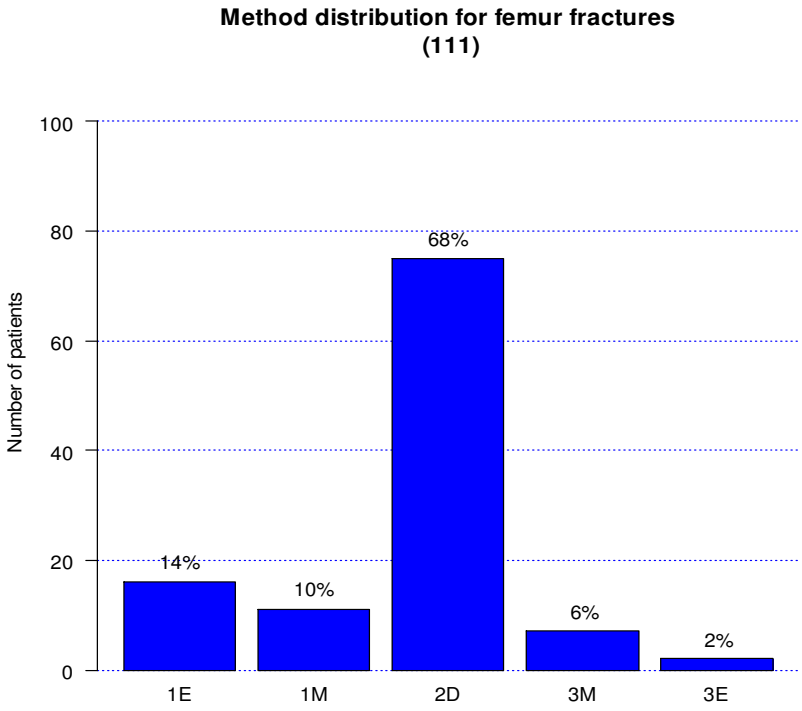



level of supervision for interns and residents
femur fractures
(67)
Below attending (9)
Attending or above (38)
Unsupervised (20)
Number of patients
0
10
20
30
40
31%
46%
23%
23%
54%
23%
4%
74%
22%
7%
36%
57%
1 year resident
2 year resident
3 year resident
4-5 year resident


Surgical delay for femur fractures
(95)
Number of patients
0
2
4
6
8
10
63 %
20 %
11 %
1 %
2 %
2 %
1 %
0
24
48
72
96
120
144
168
Hours
(Proportion of patients operated in 24 hour intervals)

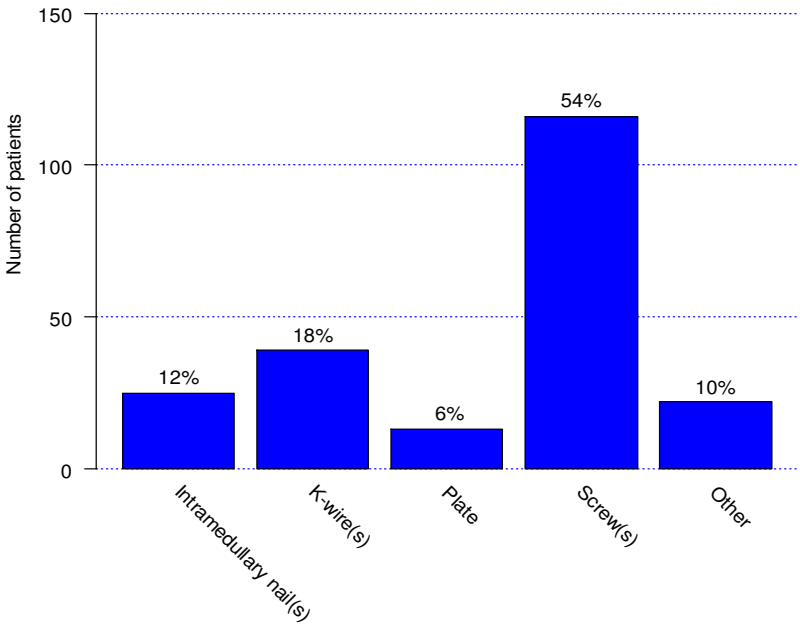

Survival for primary surgery with reoperation due to any reason
femur fractures
(139)
1.00
0.95
0.90
0.85
0.80
probability
0
100
200
300
400
500
600
700
days


Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
femur fractures
(129)
1.00
0.98
0.96
0.94
0.92
0.90
probability
0
100
200
300
400
500
600
700
days

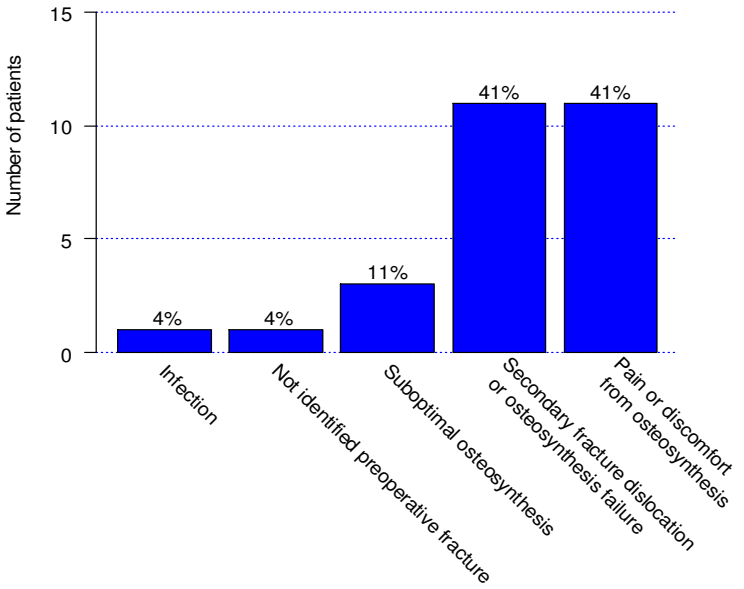

Method distribution for femur fractures
(111)
Number of patients
100
80
60
40
20
0
14%
10%
68%
6%
2%
1E
1M
2D
3M
3E

Tibia/fibula

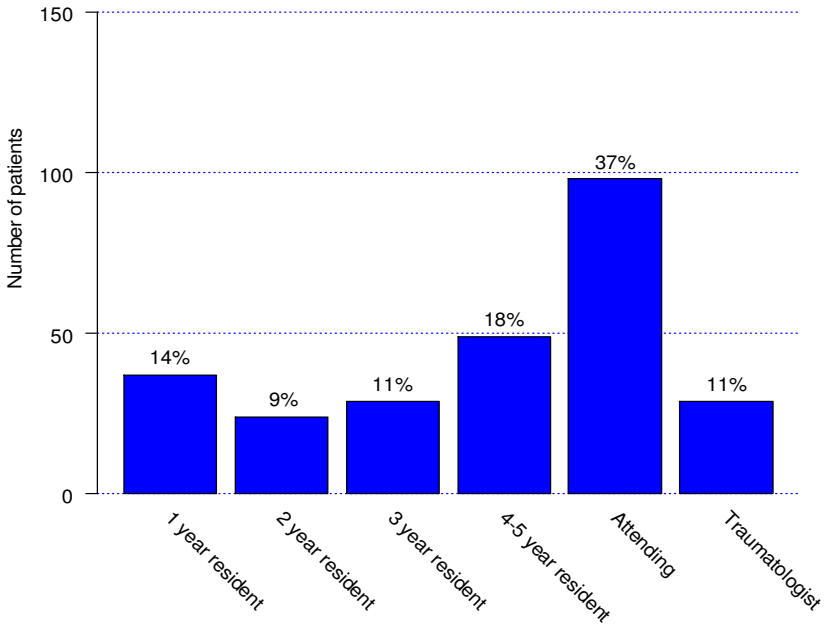
Method of osteosynthesis tibia/fibula fractures (215)



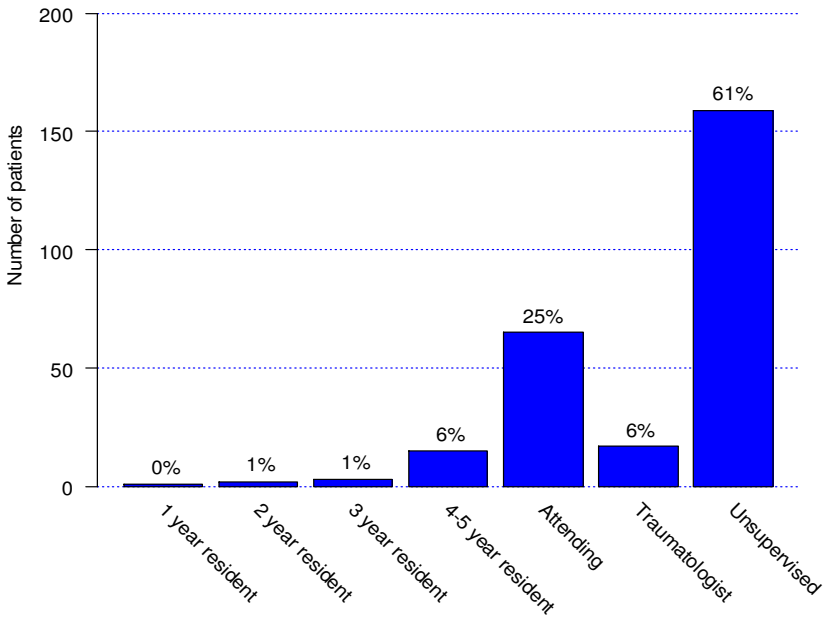
Indication for reoperation of tibia/fibula fractures (27)

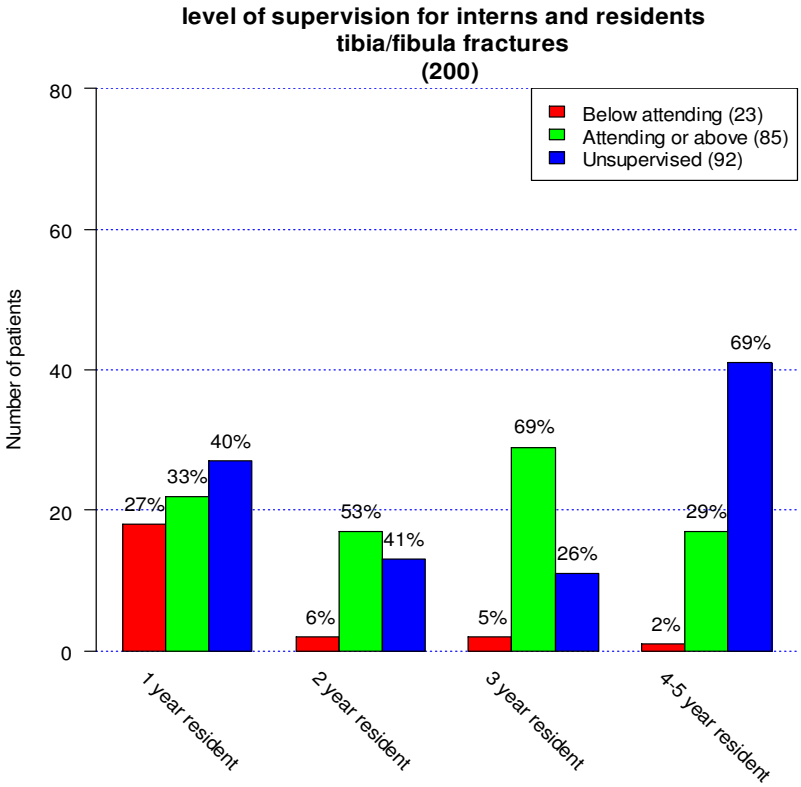


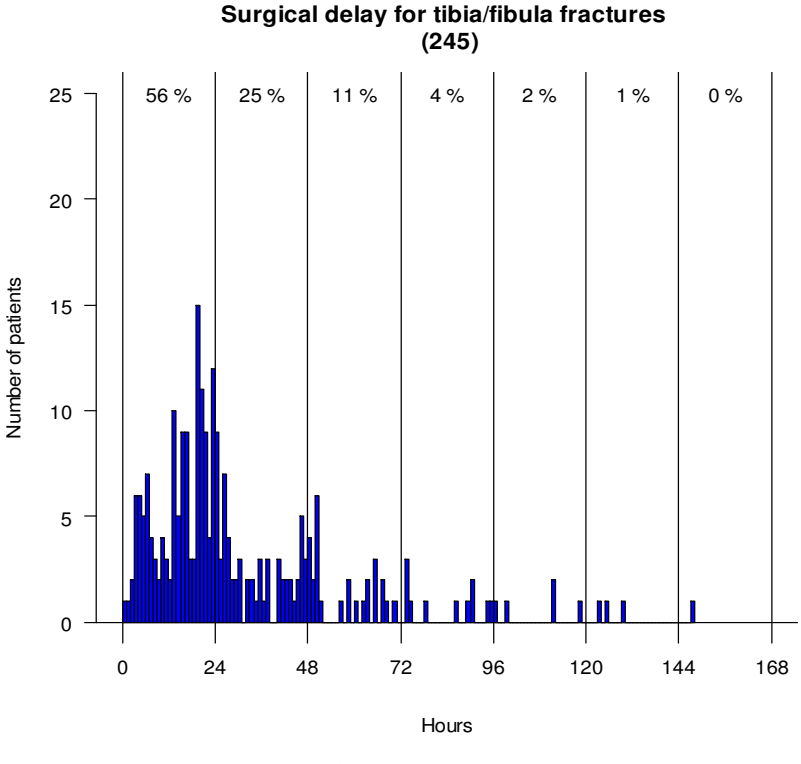
Primary surgeons for tibia/fibula fractures
(266)



Level of supervision for tibia/fibula fractures
(262)

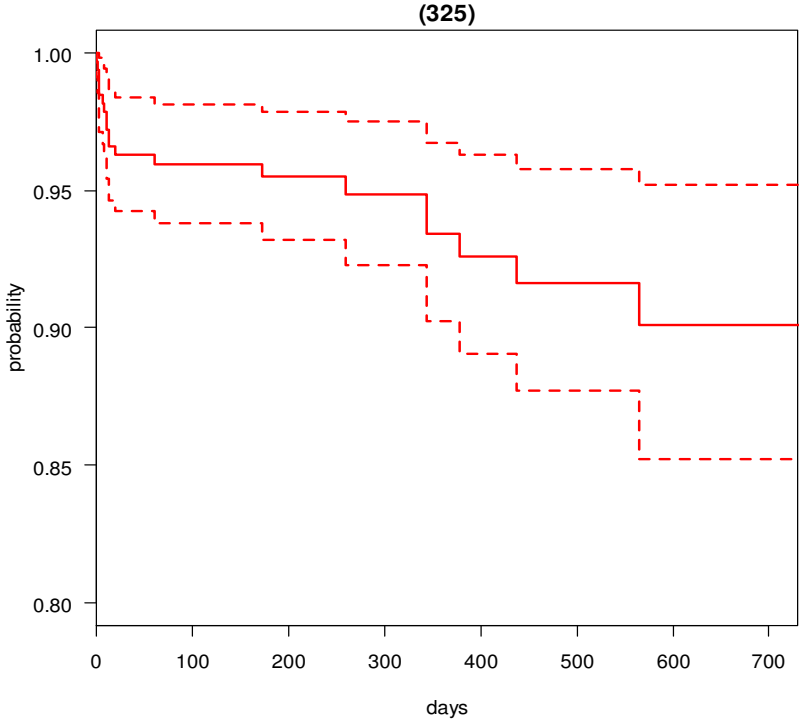




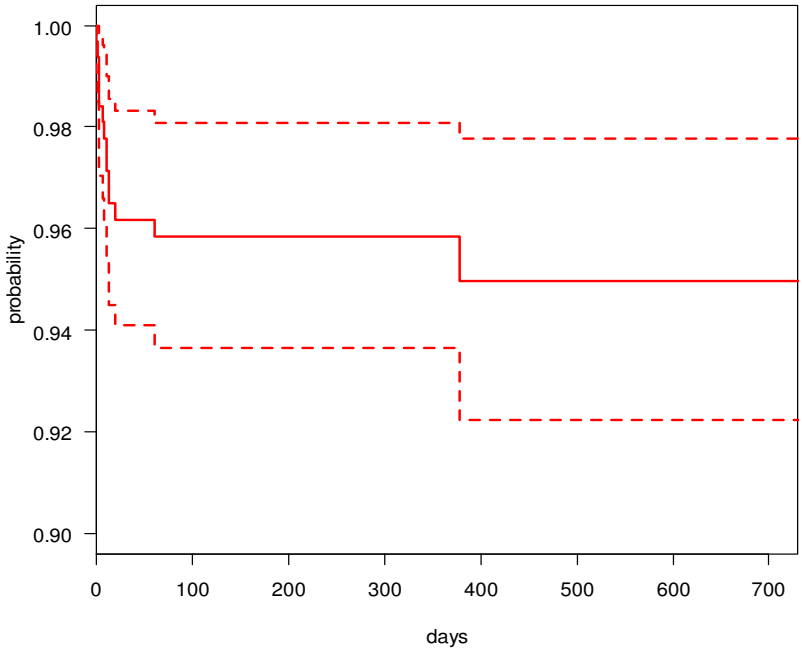


(Proportion of patients operated in 24 hour intervals)

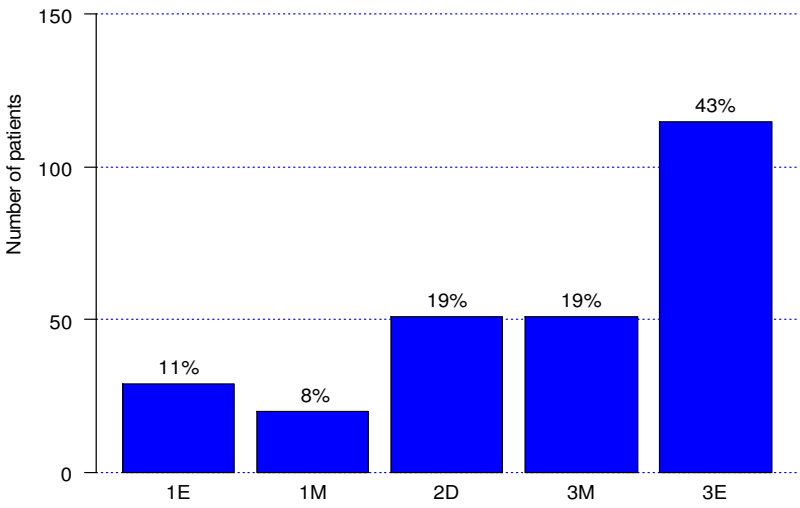
Survival for primary surgery with reoperation due to any reason
tibia/fibula fractures
(325)



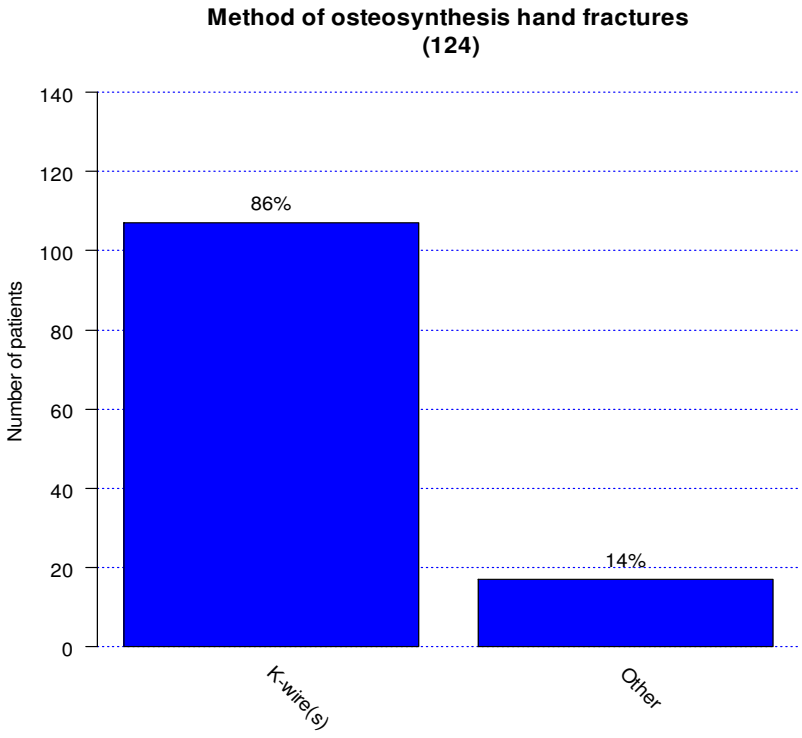
Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
tibia/fibula fractures
(317)

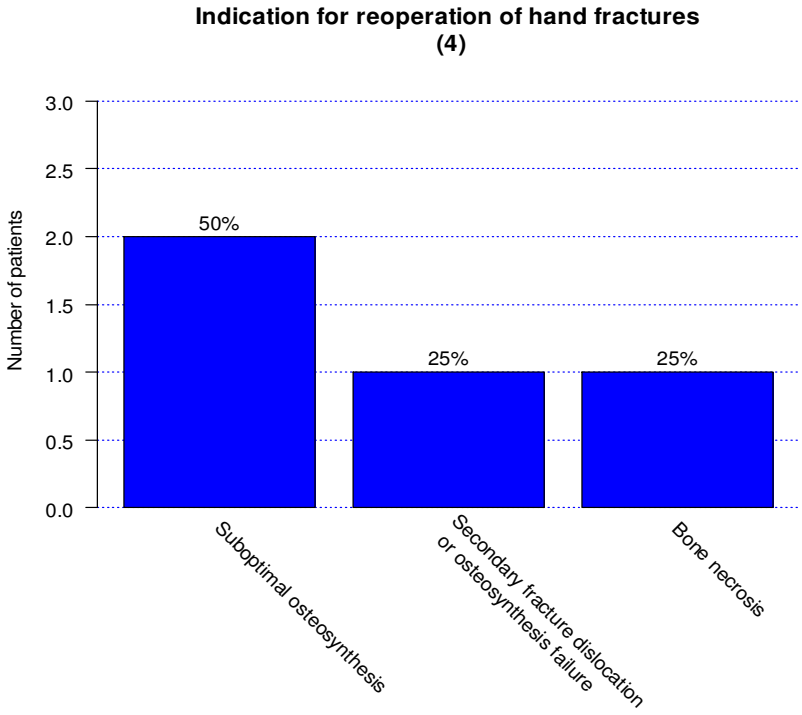


Method distribution for tibia/fibula fractures (266)

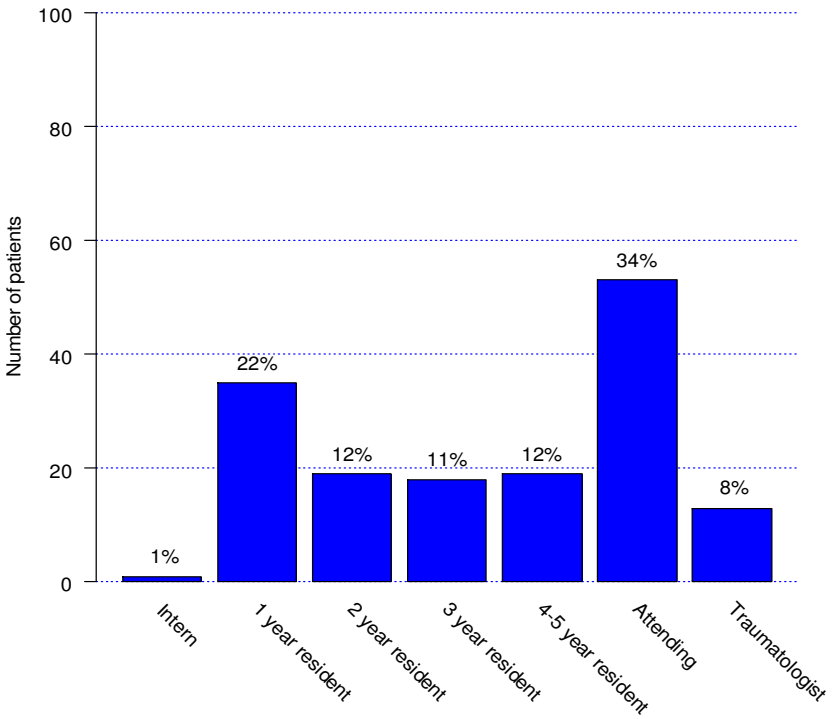


Hand

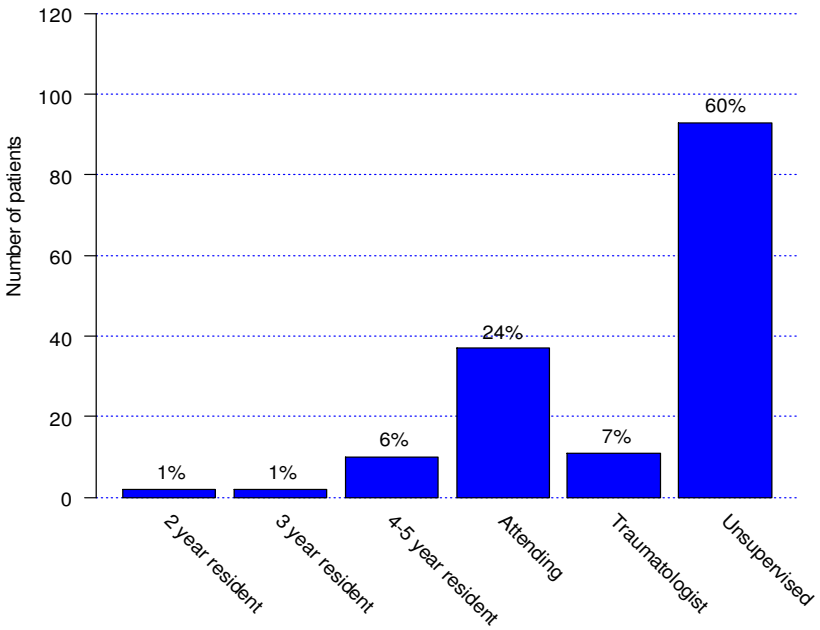

Method of osteosynthesis hand fractures
(124)
Number of patients
140
120
100
80
60
40
20
0
86%
14%
K-wire(s)
Other

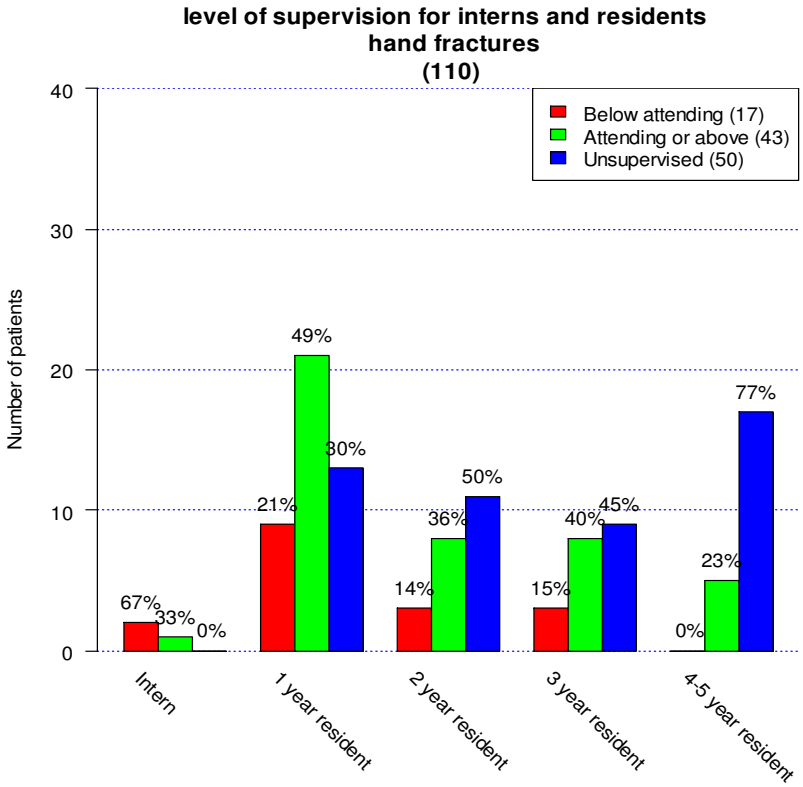

Indication for reoperation of hand fractures
(4)
Number of patients
3.0
2.5
2.0
1.5
1.0
0.5
0.0
50%
25%
25%
Suboptimal osteosynthesis
Secondary fracture dislocation or osteosynthesis failure
Bone necrosis

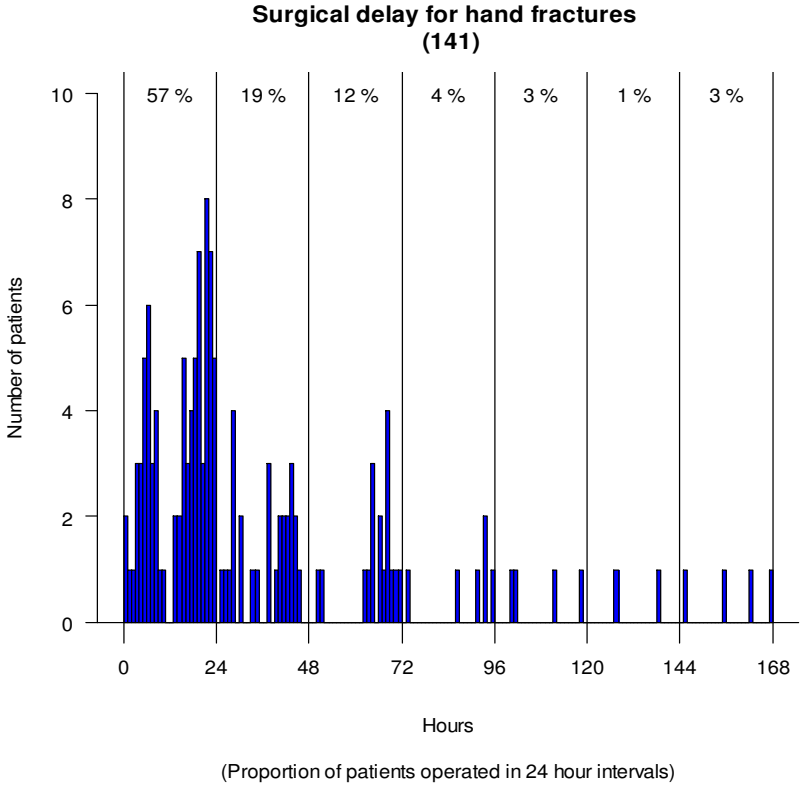
Primary surgeons for hand fractures (158)



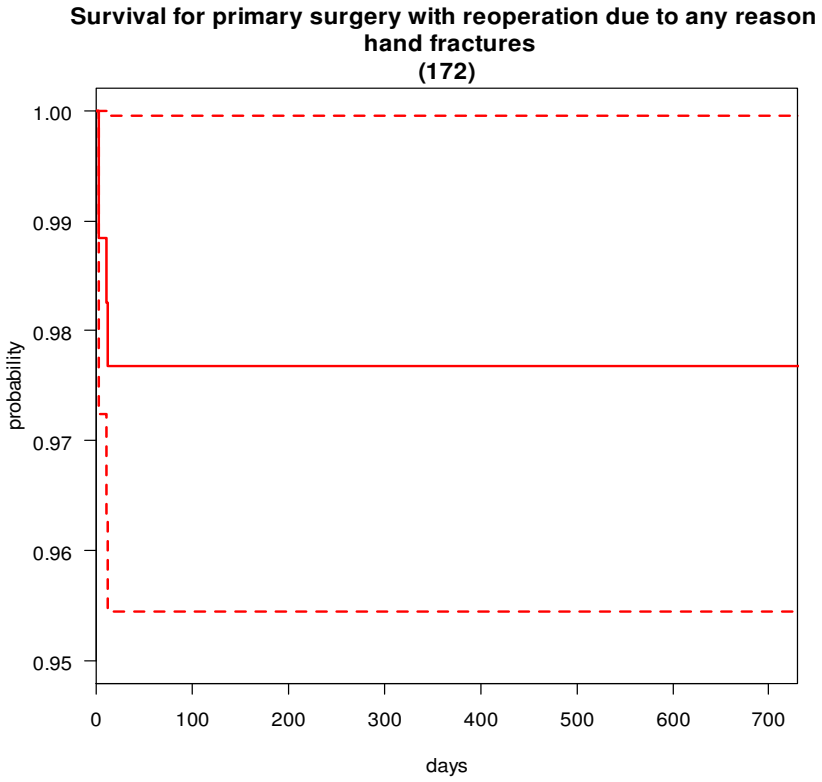
Level of supervision for hand fractures (155)

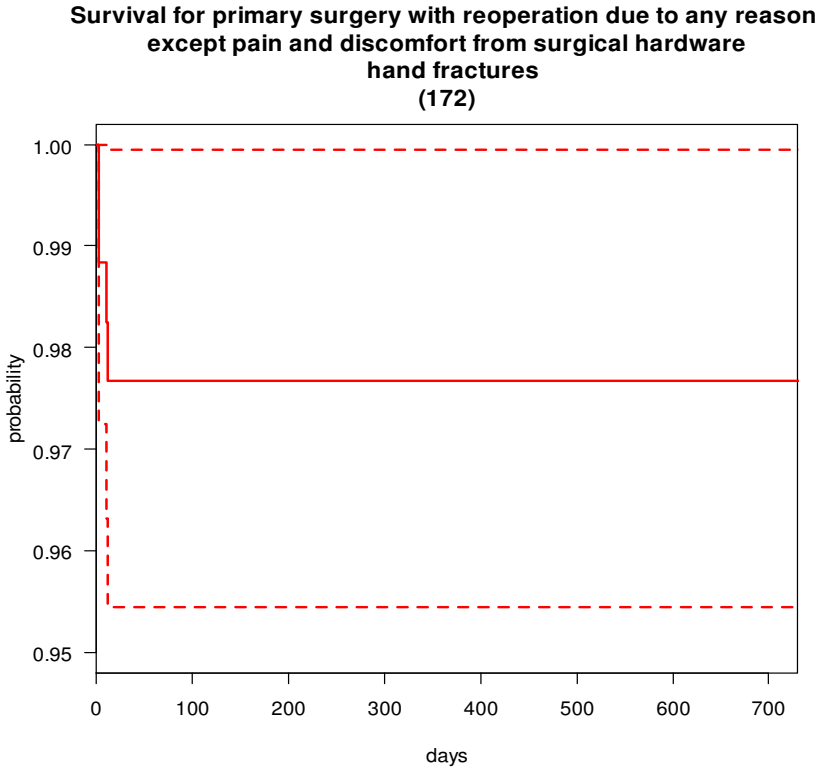






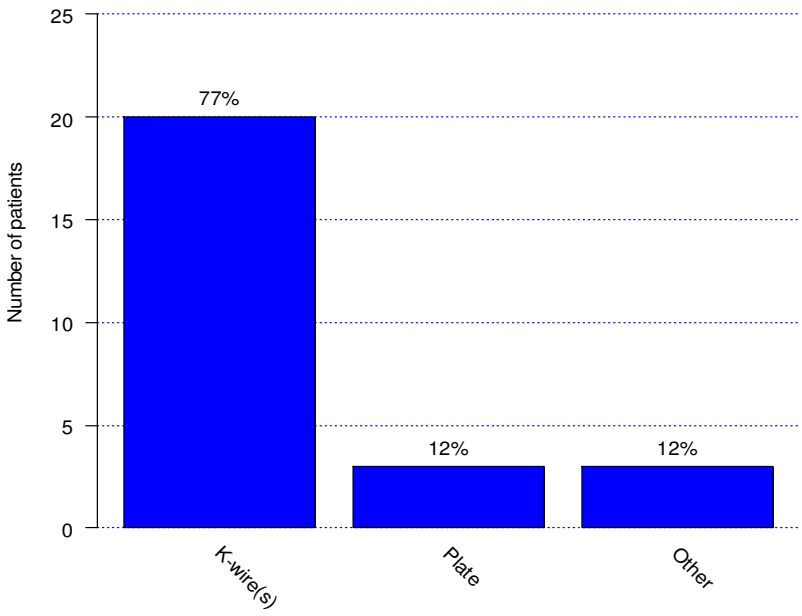
(Proportion of patients operated in 24 hour intervals)


Survival for primary surgery with reoperation due to any reason
hand fractures
(172)
1.00
0.99
0.98
0.97
0.96
0.95
probability
0
100
200
300
400
500
600
700
days

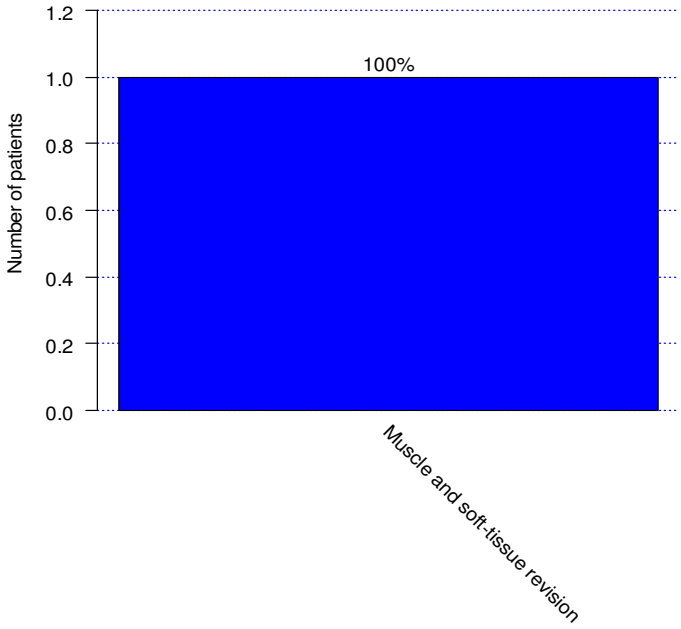

Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
hand fractures
(172)
1.00
0.99
0.98
0.97
0.96
0.95
probability
0
100
200
300
400
500
600
700
days

Foot

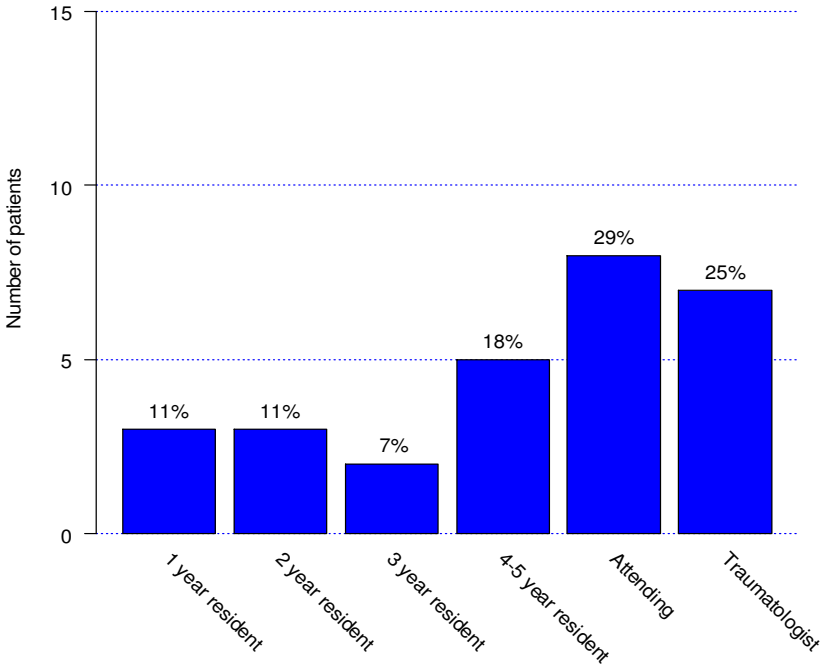
Method of osteosynthesis foot fractures (26)



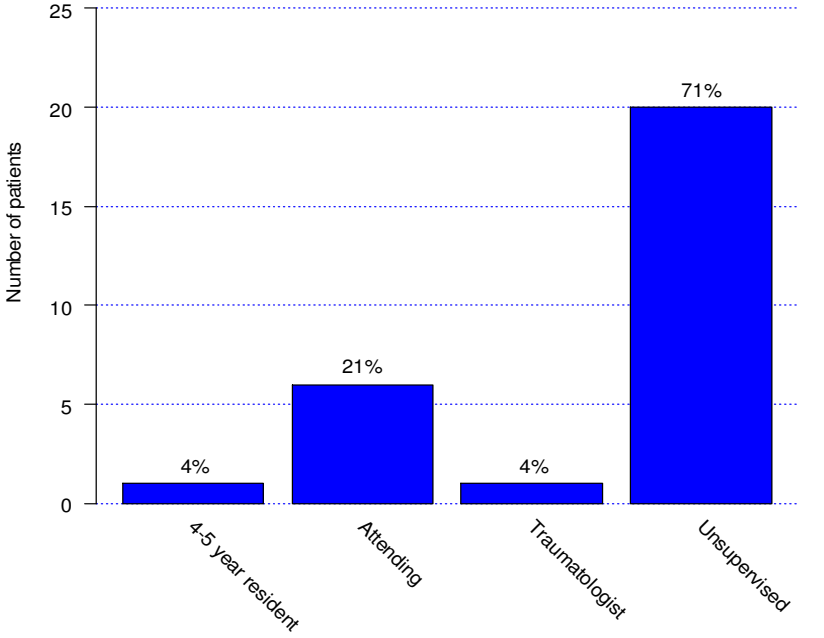
Indication for reoperation of foot fractures (1)

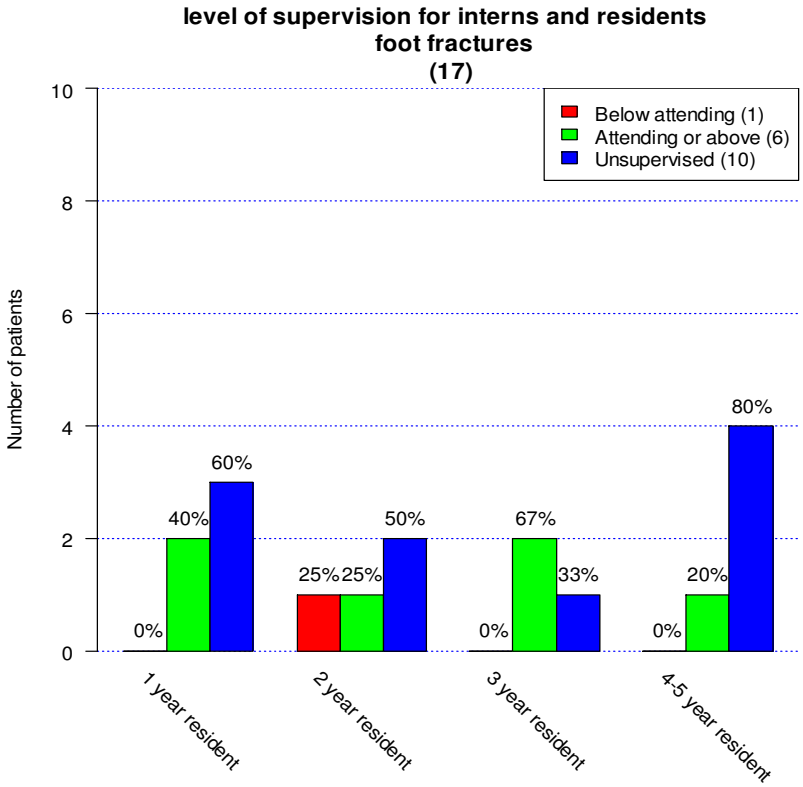


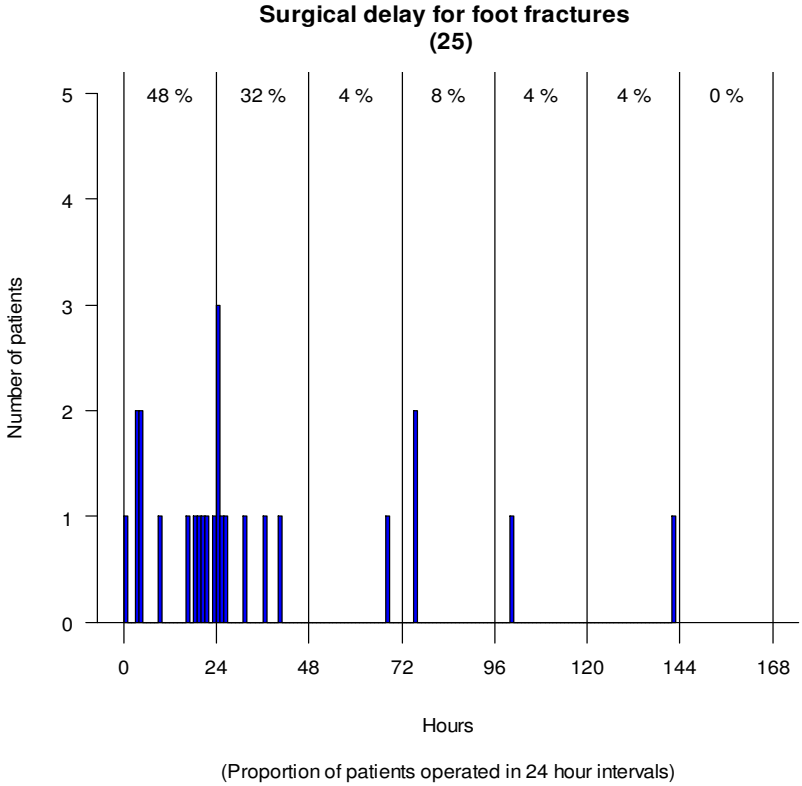
Primary surgeons for foot fractures
(28)

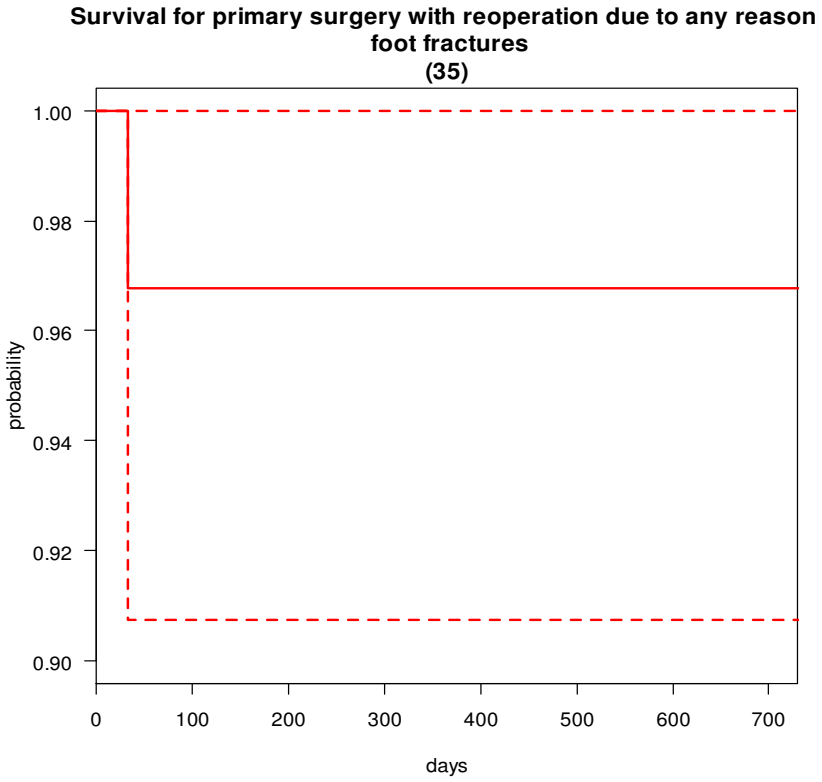


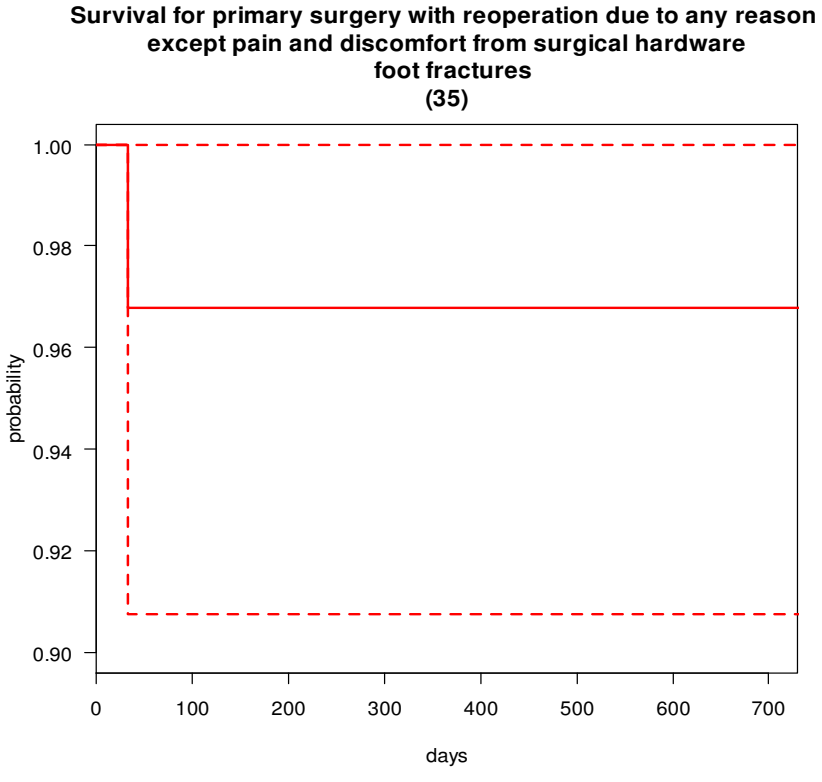
Level of supervision for foot fractures
(28)




level of supervision for interns and residents
foot fractures
(17)
Below attending (1)
Attending or above (6)
Unsupervised (10)
Number of patients
0%
40%
60%
25%
25%
50%
0%
67%
33%
0%
20%
80%
1 year resident
2 year resident
3 year resident
4-5 year resident


Surgical delay for foot fractures
(25)
48 %
32 %
4 %
8 %
4 %
4 %
0 %
Number of patients
Hours
(Proportion of patients operated in 24 hour intervals)


Survival for primary surgery with reoperation due to any reason
foot fractures
(35)
1.00
0.98
0.96
0.94
0.92
0.90
probability
0
100
200
300
400
500
600
700
days


Survival for primary surgery with reoperation due to any reason
except pain and discomfort from surgical hardware
foot fractures
(35)
1.00
0.98
0.96
0.94
0.92
0.90
probability
0
100
200
300
400
500
600
700
days

Appendix 1

Registered parameter		Values
Patient related parameters	CPR	Unique ID
	Gender	Male / Female
	Age	Years
	ASA score*	1/2/3/4
Trauma related parameters	Operated side	Left / Right
	Date and Time of the radiological exam**	Time of the day and date
	Major Trauma ***	Yes / No
	Gustillo Type	Closed / 1 / 2 / 3a / 3b / 3c
	Neurovascular status	Unimpaired/ dysthesia /parasthesia / lack of pulse
	Pathologic fracture****	Yes / No
Surgery related parameters	Date and Time of surgery	Time of the day and date
	Procedure Type	Primary / secondary / planned*****
	Fracture Type	Adult / pediatric / periprostetic
	Fracture Diagnosis	AO Müller / Rorabeck / Vancouver classification
	Method of osteosynthesis	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.
	Supplemental surgical procedures	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.
	Antibiotic prophylaxis	Yes / No
	Use of tourniquet	Yes / No
	Educational level of the surgeon	Intern, 1st year resident, 2nd year resident, 3rd year resident, 4-5th year resident, attending, traumatologist******
	Educational level of the supervisor if present	Intern, 1st year resident, 2nd year resident, 3rd year resident, 4-5th year resident, attending, traumatologist******

* 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.

Indications for reoperation:
Infection
Muscle- and soft-tissue revision
Neurovascular complication
New fracture
Not identified intraoperative fracture
Suboptimal osteosynthesis
Secondary fracture dislocation or osteosynthesis failure
Pseudoarthrosis
Bone necrosis
Pain or discomfort from osteosynthesis

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