

# Preface

In this year's report we have chosen a different layout which we hope will give a better reader experience. We have also left out some of the data available in previous reports in order to make the report a little easier to digest. Some data was left out because it was considered of little interest to most readers. Survival data on implants, regarding re-operation was left out as the data is considered inadequate, as we are missing data on mortality of the patients. We hope to rectify this with the validation of the database using LPR-data.

We have also chosen only to present department specific data for the data generated in 2017, and not the cumulated data from each specific department.

We welcome any feedback on the report and hope you will enjoy it.

The annual report from the Danish Fracture Database (DFDB) 2017 is the fifth of its kind. It contains data based on over 75.000 fracture related surgeries, of which over 62.000 are primary surgeries registered at [www.dfdb.dk](http://www.dfdb.dk). The purpose of DFDB is web based quality monitoring of fracture related surgery. Today these efforts are joined by 21 orthopedic departments in Denmark, covering close to 90% of the Danish population. The effort to monitor quality of fracture related surgery in Denmark is unique and important 1) Unique because DFDB is the fracture register with the highest national coverage in the world and 2) important given the high number of surgeries performed each year probably making fracture surgery/traumatology one of the busiest specialties within orthopedic 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 orthopedic traumatology in Denmark. Also the continued support from The Danish Orthopedic Society (DOS) and Danish Orthopedic Trauma Society (DOT), and the possibility to present the annual report at the DOS Congress is much appreciated.

**The area of focus this year is periprosthetic fractures. A rarer and more challenging type of fracture that often warrants cooperation between trauma and arthroplasty surgeons.**

The challenges ahead for DFDB includes a validation of the database by use of LPR-data and the inclusion of implant tracking in the database. We look forward to receiving your input in shaping the future of DFDB.

Hvidovre 28/9 2017

Peter Toft Tengberg and the DFDB team

# Table on contents

|   |     |
|---|-----|
| About the Danish Fracture Database..... | 1   |
| Summary and comments.....               | 2   |
| Data limitations.....                   | 3   |
| General overview of data.....           | 5   |
| Department specific data.....           | 14  |
| Focus area - Clavicle.....              | 36  |
| Adult                                   |     |
| <i>Proximal Humerus</i> .....           | 40  |
| <i>Humeral shaft</i> .....              | 43  |
| <i>Distal humerus</i> .....             | 46  |
| <i>Proximal antebrachium</i> .....      | 49  |
| <i>Antebrachium</i> .....               | 52  |
| <i>Distal radius</i> .....              | 55  |
| <i>Hand</i> .....                       | 58  |
| <i>Proximal femur</i> .....             | 61  |
| <i>Acetabulum</i> .....                 | 64  |
| <i>Femur</i> .....                      | 67  |
| <i>Distal femur</i> .....               | 70  |
| <i>Patella</i> .....                    | 73  |
| <i>Proximal tibia</i> .....             | 76  |
| <i>Tibia shaft</i> .....                | 79  |
| <i>Distal tibia</i> .....               | 82  |
| <i>Malleoli</i> .....                   | 85  |
| <i>Foot</i> .....                       | 88  |
| <i>Shoulder</i> .....                   | 90  |
| Pediatric                               |     |
| <i>Humerus</i> .....                    | 92  |
| <i>Radius/Ulna</i> .....                | 94  |
| <i>Femur</i> .....                      | 96  |
| <i>Tibia/Fibula</i> .....               | 98  |
| <i>Hand</i> .....                       | 100 |
| <i>Foot</i> .....                       | 102 |
| Appendix 1 - Registered parameters..... | 104 |

# 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 registered surgeries has increased from approximately 28.000 in 2014 to more than 75.000 in 2017.

## 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 at the Department of Orthopaedic Surgery, Hvidovre Hospital. The secretariat consists of an administrator and a statistician. Together the developers of DFDB and the secretariat have the responsibility and right for development and changes of the registry in cooperation with the provider Procordo Aps.

## Steering Committee

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

# 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. Anatomical distribution for primary surgeries for all separate departments participating in the DFDB collaboration is described in the first part of the report.

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 60-90. 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 ASA score 1-2 while 78% of patients with reoperations had ASA score 1-2. 56% of all registered patients were female.

## Anatomical distribution

Proximal femur (35%), distal radius (15%), and malleoli (12%) were the 3 most frequent operated regions for primary adult surgical procedures. Radius/ulna (58%), humerus (22%), and tibia (9%) were the 3 most frequently operated regions for primary paediatric surgical procedures.

## Reoperations

Proximal femur (27%), malleoli (20%), and distal radius (7%) were the 3 most frequently reoperated anatomical regions in adults. Radius/ulna (47%), humerus (21%) and tibia (18%) were the 3 most frequently reoperated anatomical regions in children. Pain and discomfort due to osteosynthesis material (38%), secondary fracture dislocation (15%), and infection (13%) were the 3 most frequent indications for adult reoperations. Secondary fracture dislocation (39%), suboptimal osteosynthesis (21%), and pain and discomfort due to osteosynthesis material (22%) were the 3 most frequent indications for paediatric reoperations.

## Level of education

60% of all primary surgeries were performed by surgeons in training (intern- 5th year resident). Interns, 1<sup>st</sup> year resident, 2<sup>nd</sup> year resident, and 3<sup>rd</sup> year residents performed more procedures under supervision than without supervision, while 4-5<sup>th</sup> 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) the registry had only been implemented for few months, and 2) 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, at an early stage after initiation of DFDB, there was a satisfactory degree of data validity and data completeness under the prevailing circumstances. Similar evaluations of data completeness should be performed continuously.

Another limitation is lacking reoperation data performed at non-participating departments where the primary operation was performed and registered at a participating department. The extent of this phenomenon can be investigated by using data from the National Patient Registry (Landspatientregistret, LPR). For this year's report, data was not extracted from LPR with regards to knowing the "true" proportion of reoperations. Therefore the proportion of reoperations are underestimated. However, as the number of departments participating in DFDB collaboration has risen to 21, covering close to 90% of the Danish population, such underestimation is significantly reduced.

Currently, work is ongoing to validate the primary fracture codes that are registered in the LPR, to know the validity of these codes if they are to be used as a data source for the DFDB. Furthermore, definition and validation of the reoperation codes in LPR to investigate the applicability of the LPR as a data source for the DFDB is ongoing.

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 4<sup>th</sup> 2017.

## 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.

# Participating departments

Aabenraa

Aalborg

Aarhus

Bispebjerg

Esbjerg

Farsø

Gentofte

Herlev

Hillerød

Holbæk

Horsens

Hvidovre

Kolding

Køge

Nykøbing Falster

Odense

Randers

Rigshospitalet

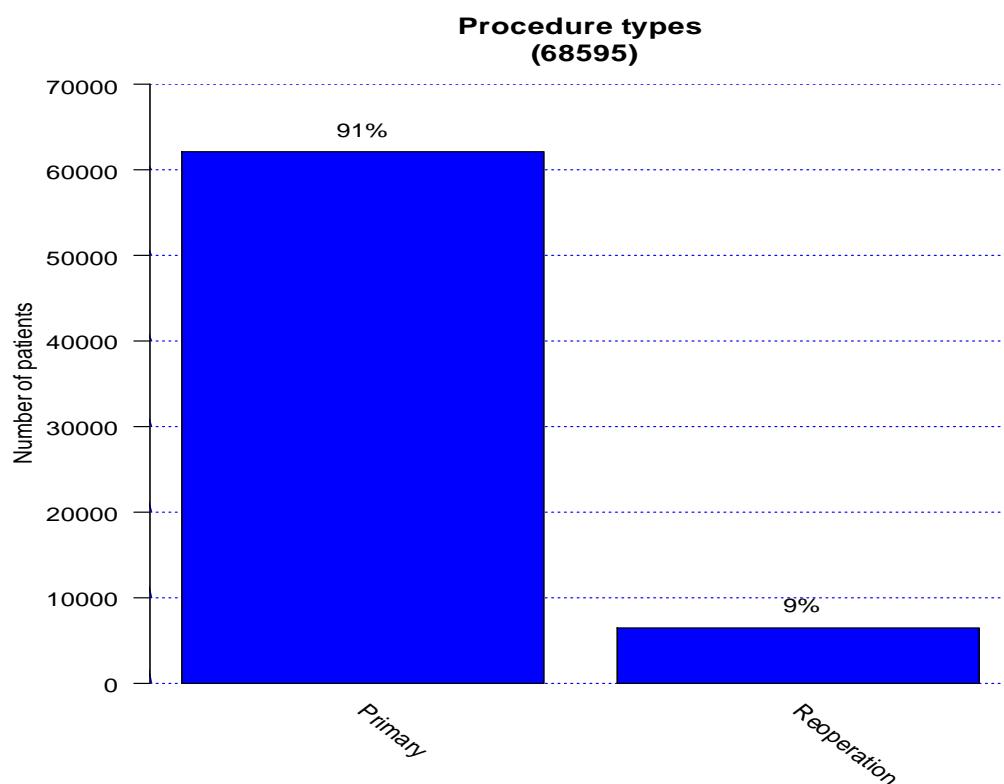
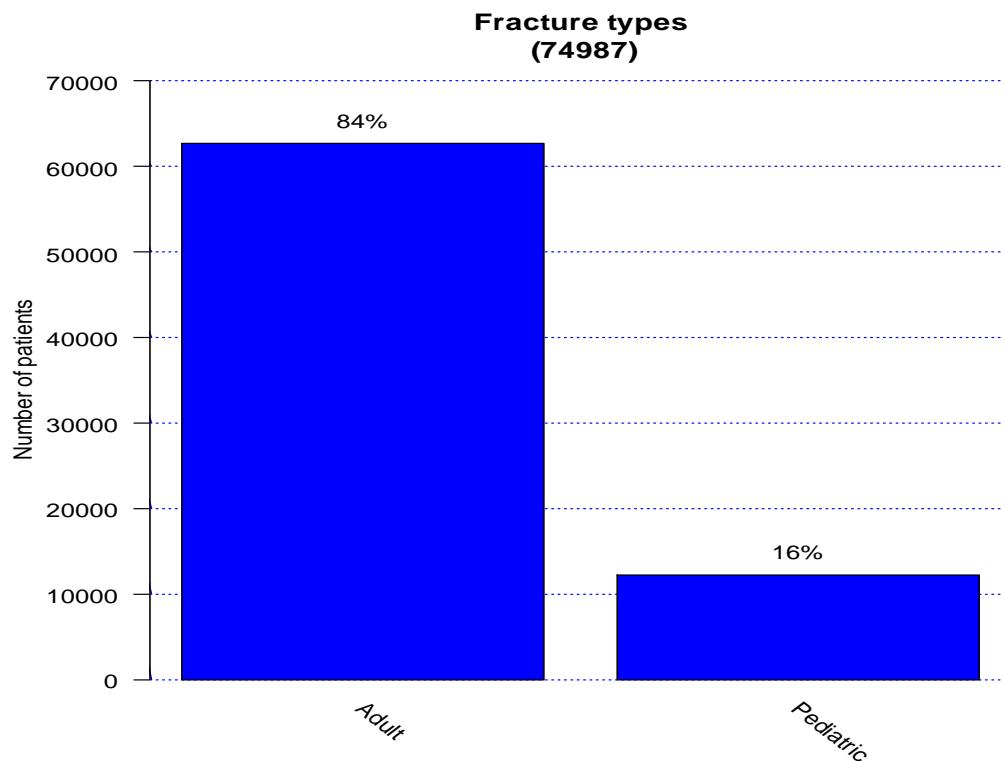
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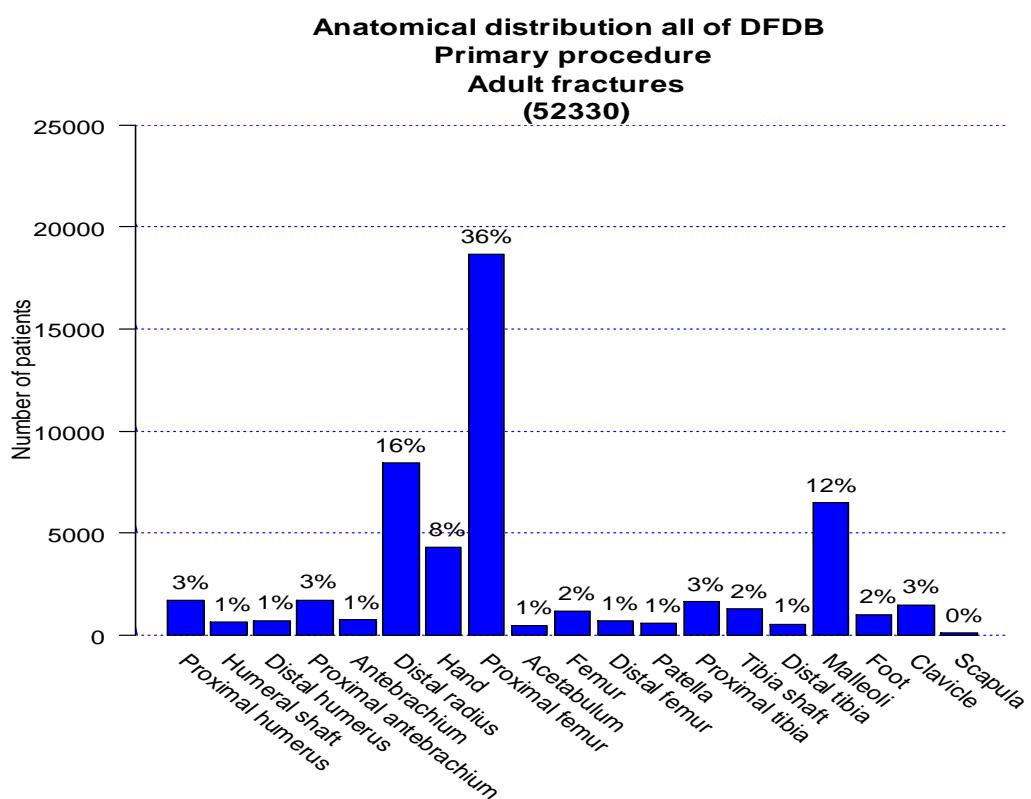
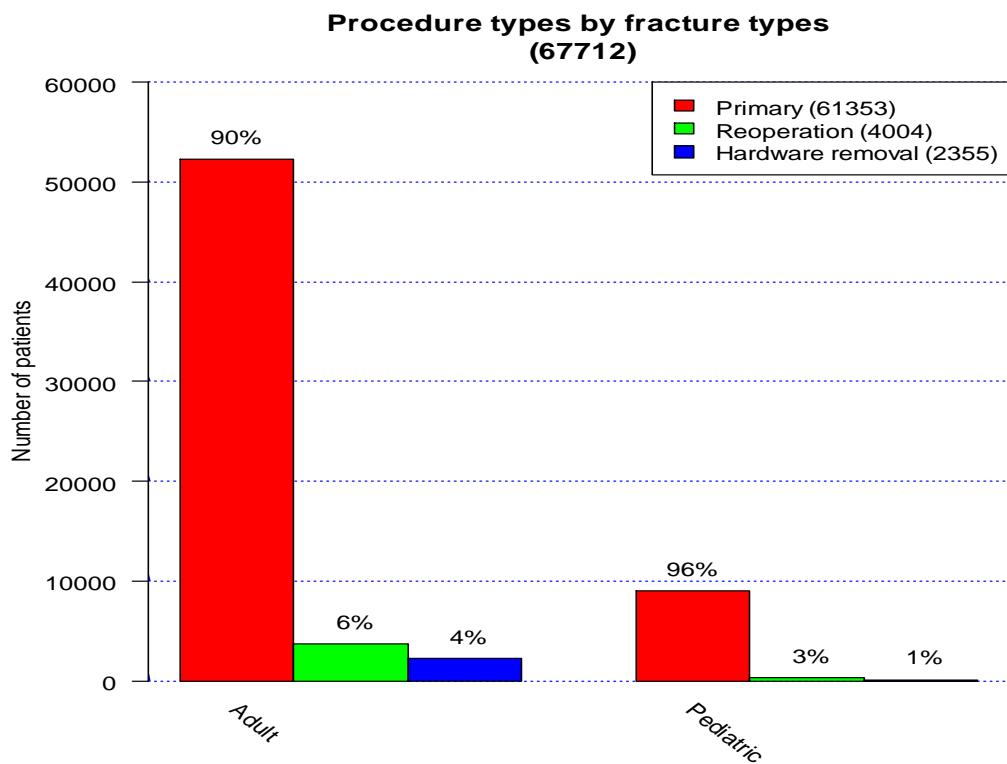
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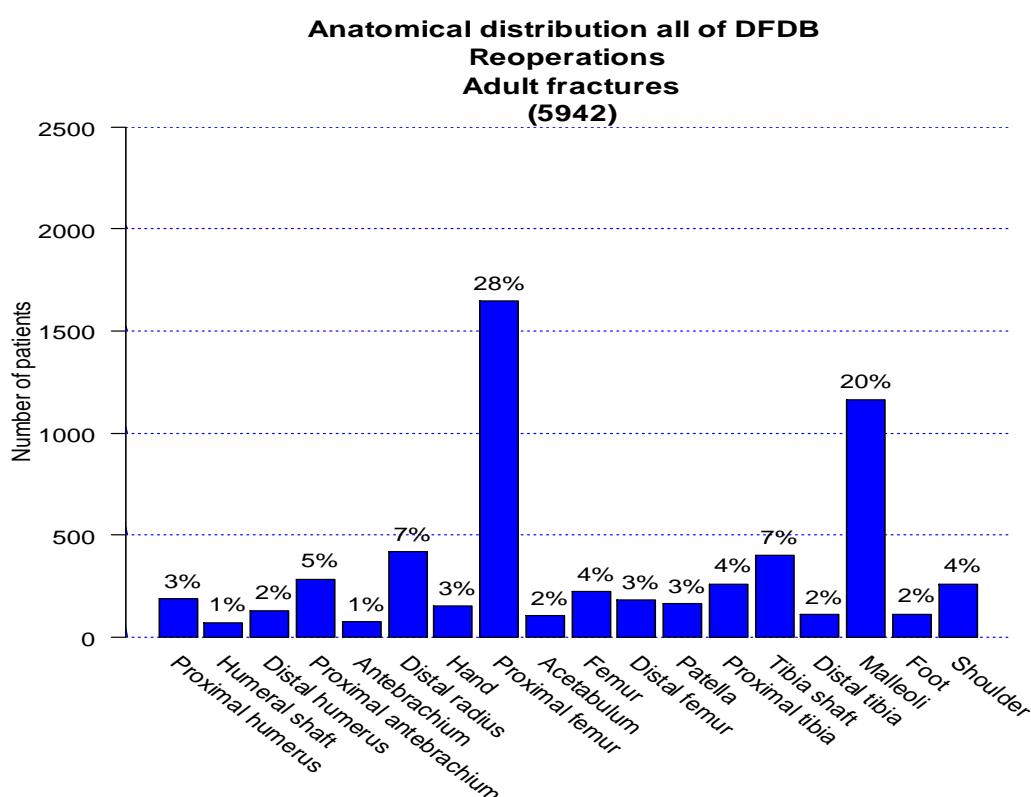
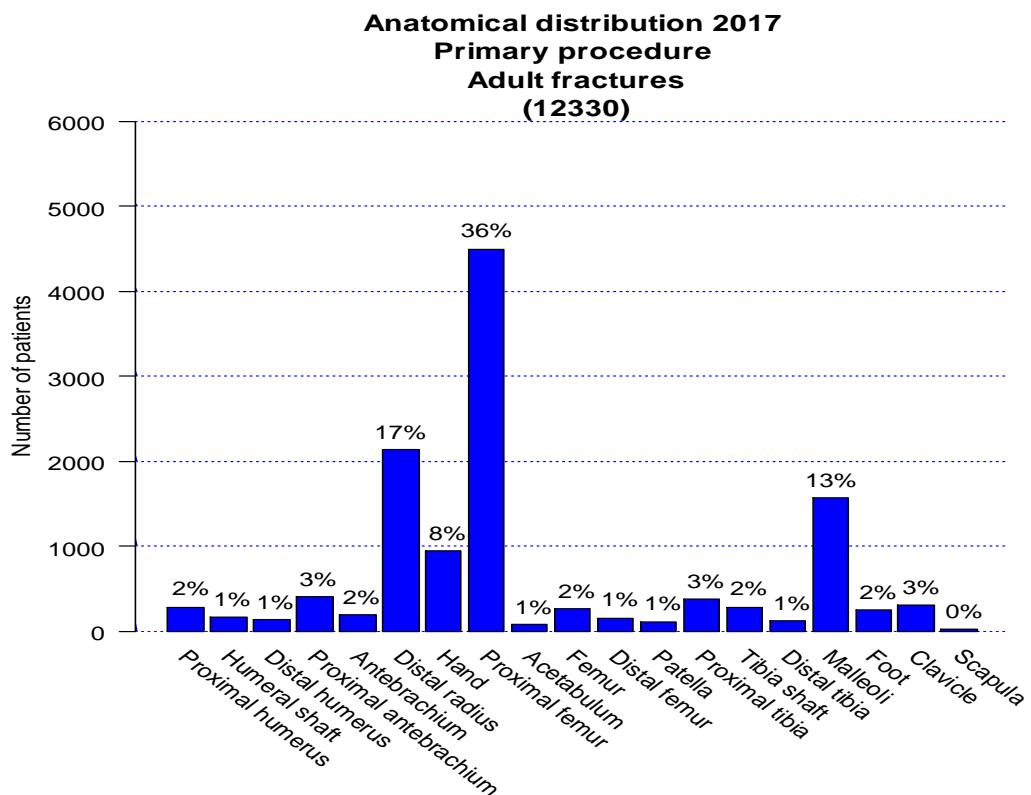
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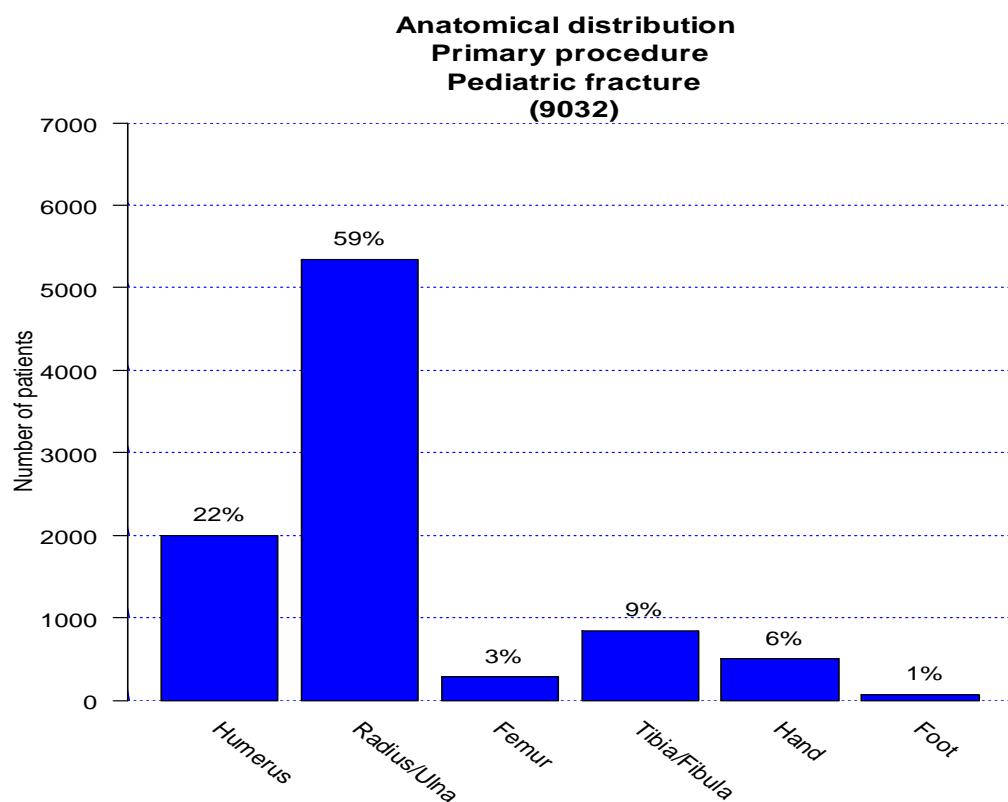
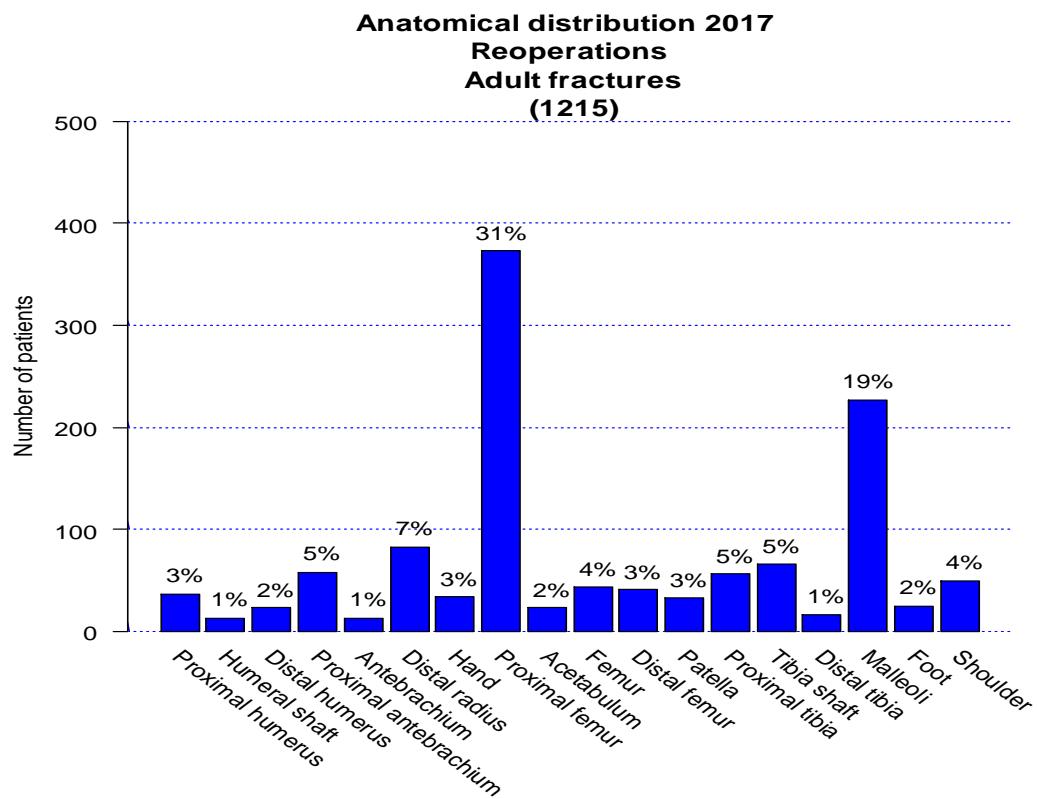
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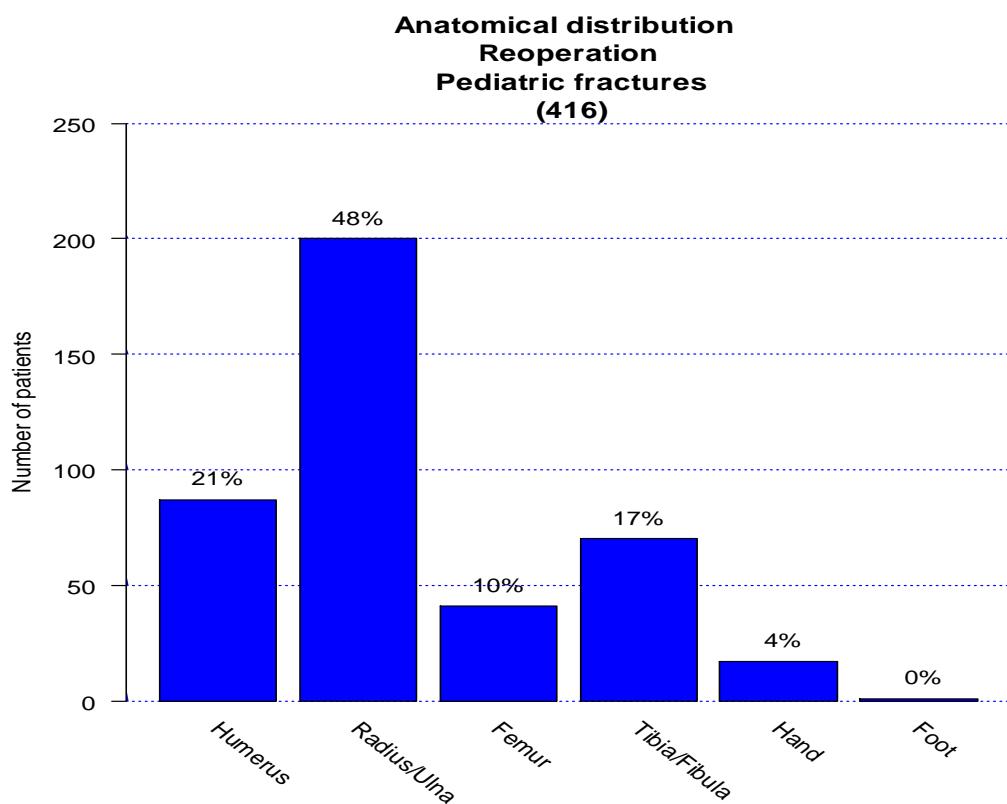
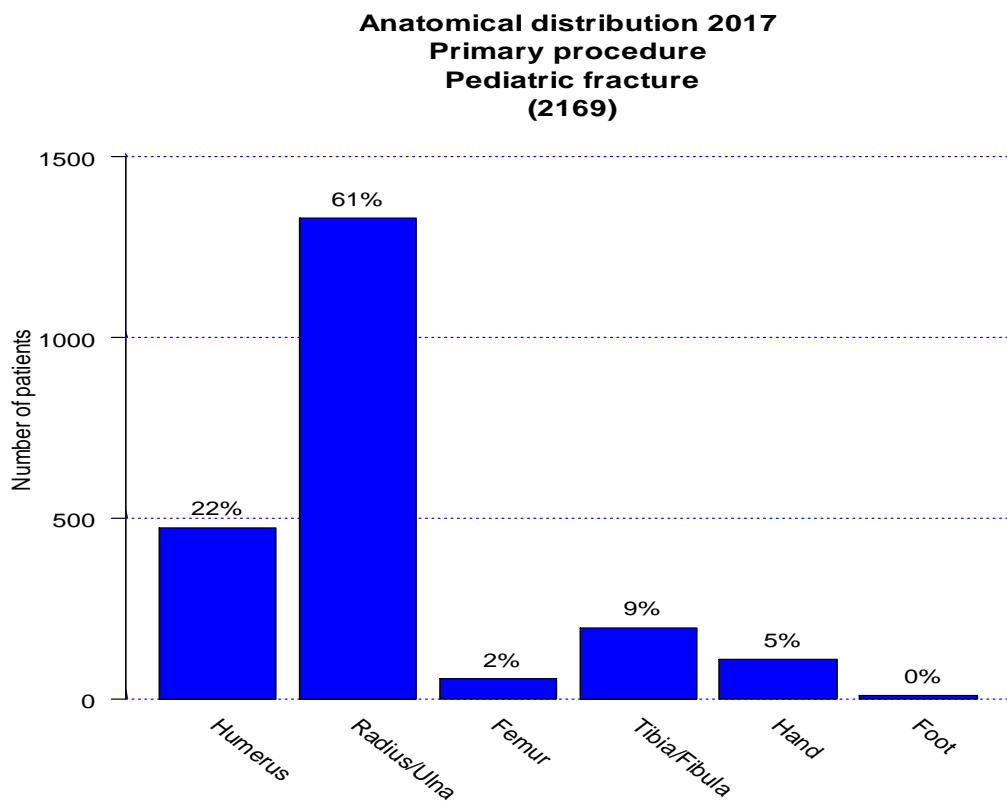
The graphs in this section covers general areas such as surgery type distribution, primary indication for re-operation, and primary surgeon, which uses data from all participating departments.

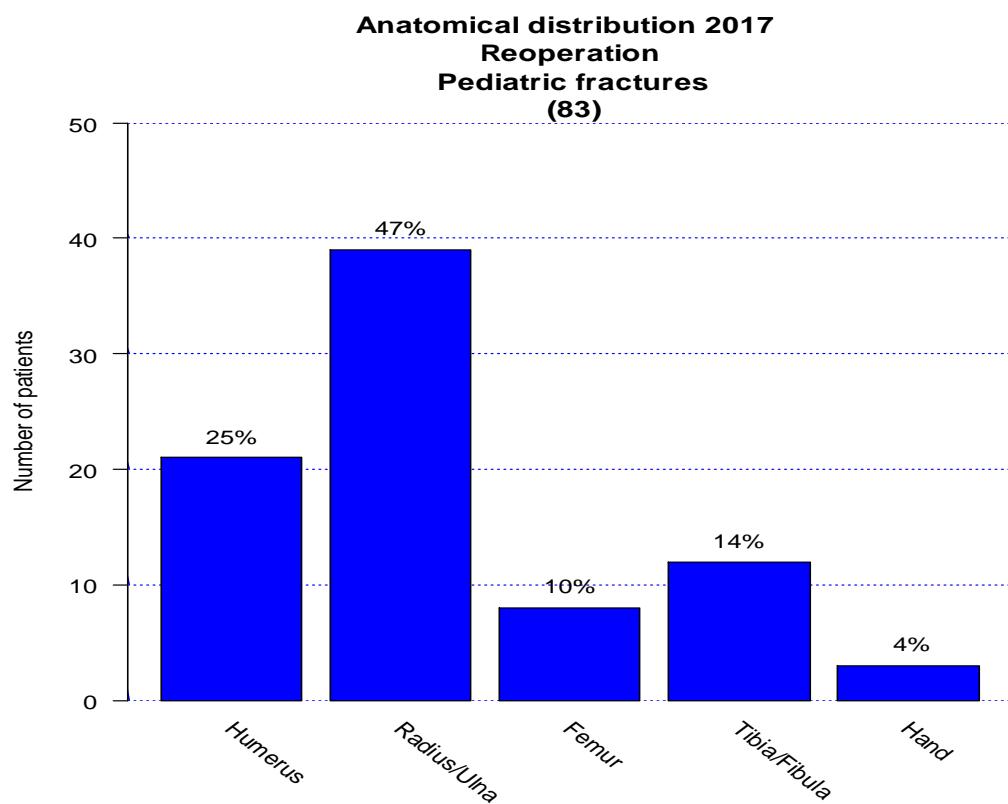
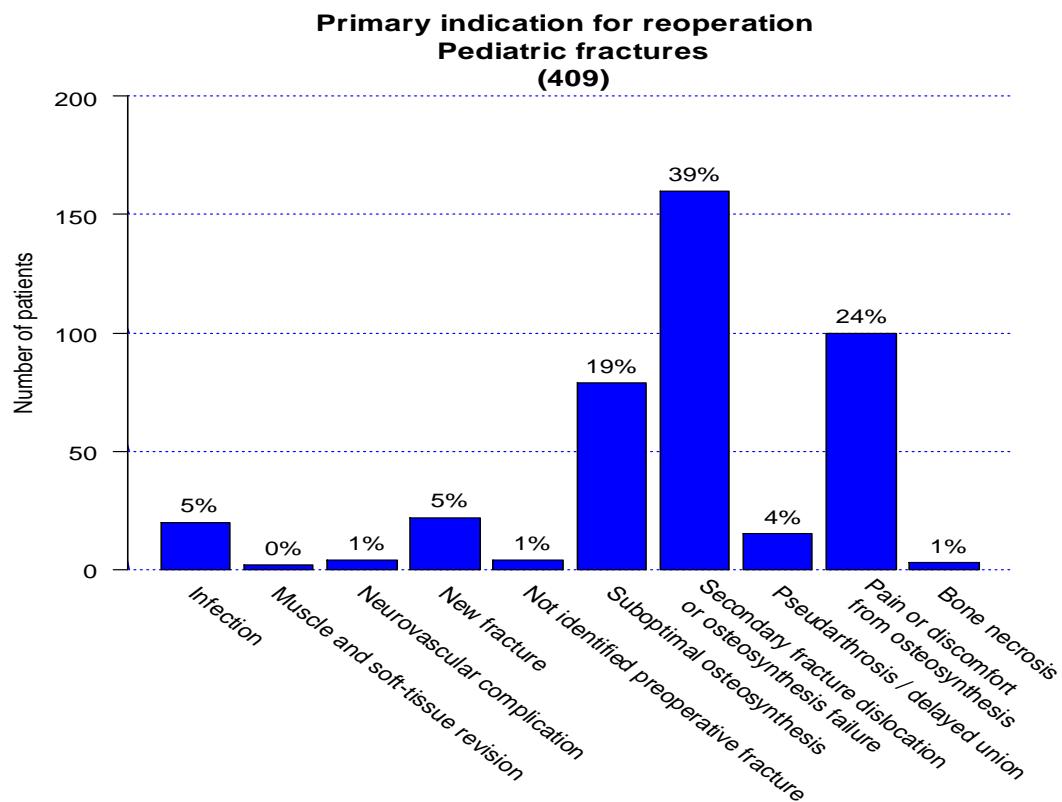


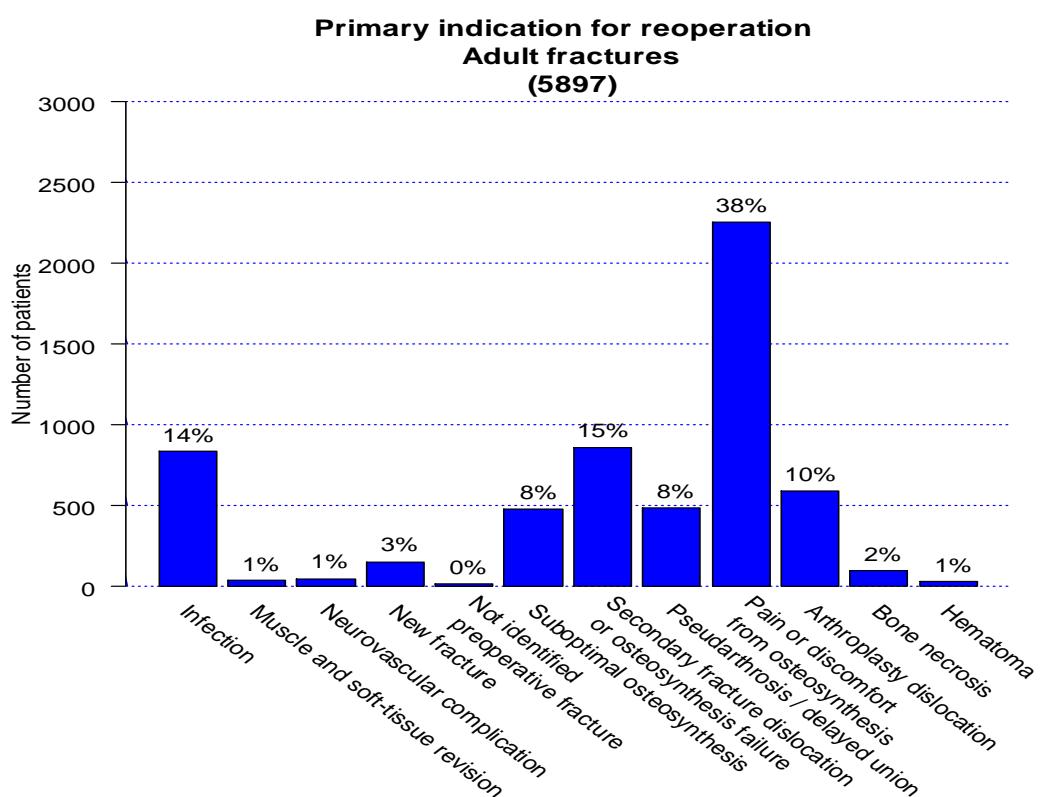
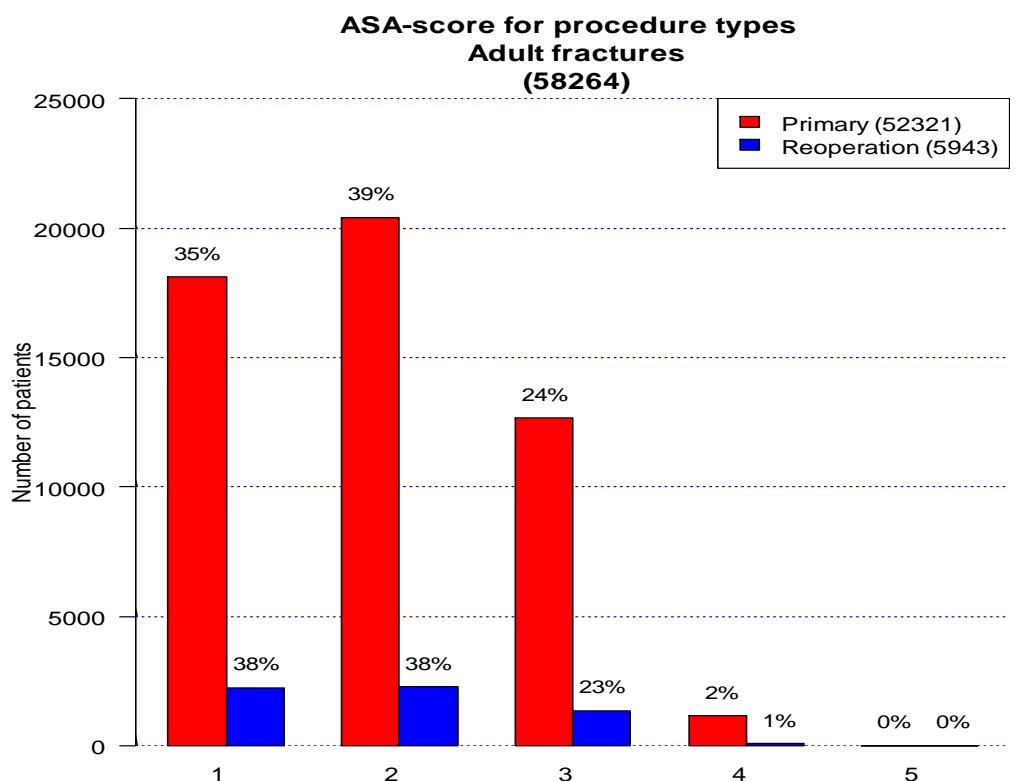


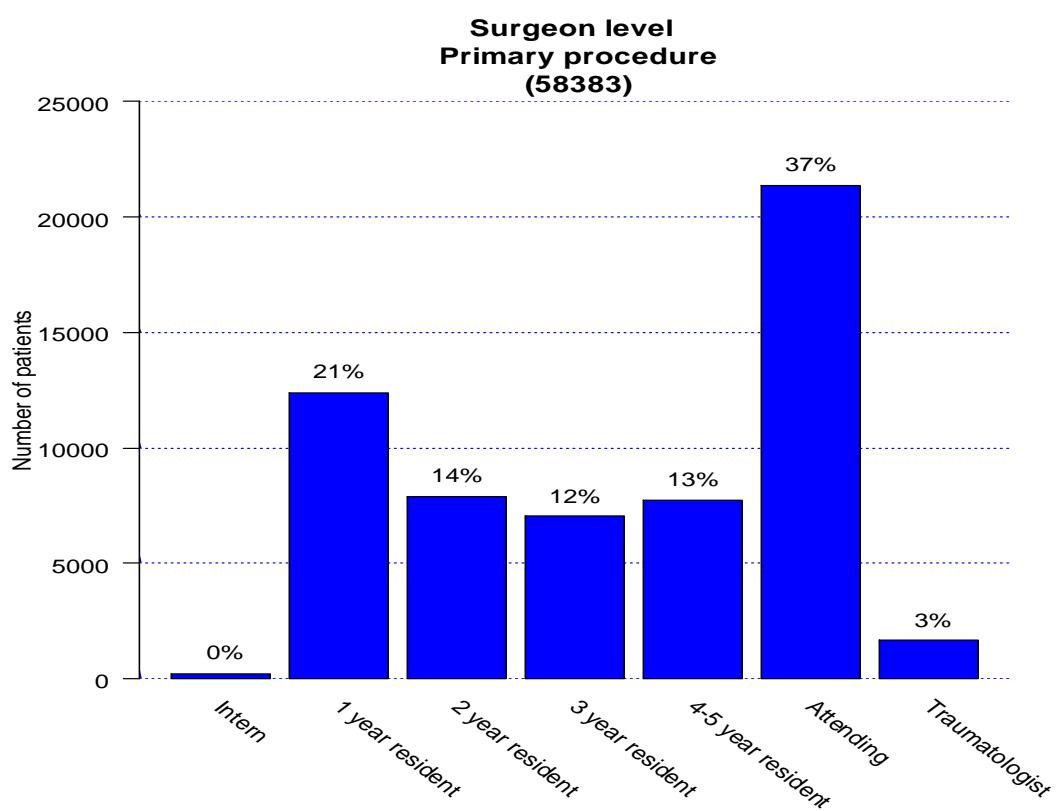
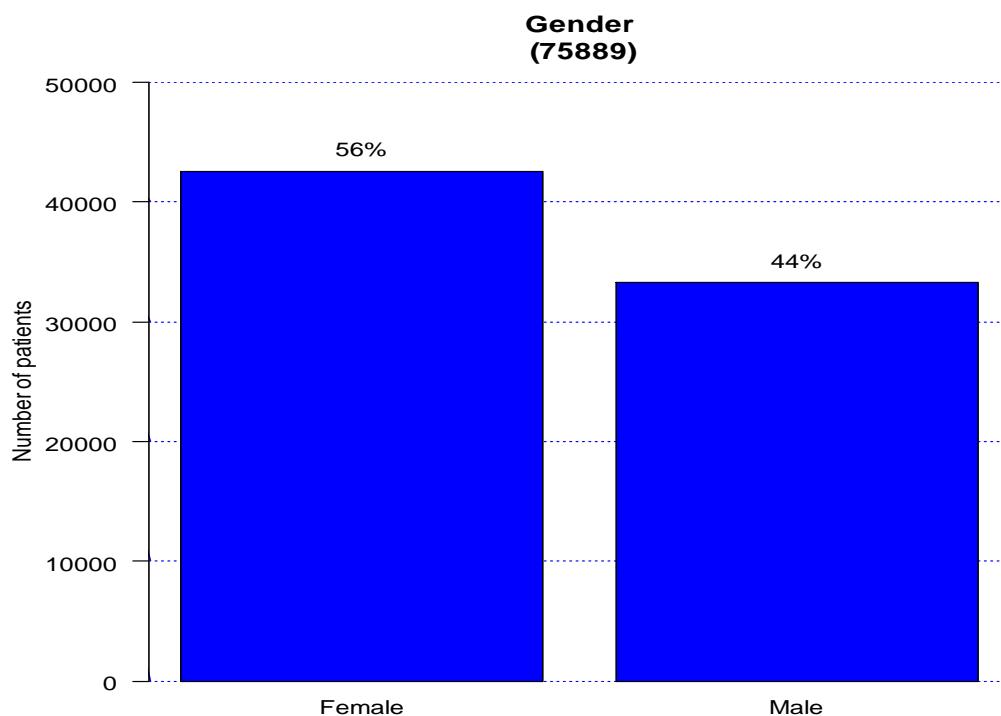


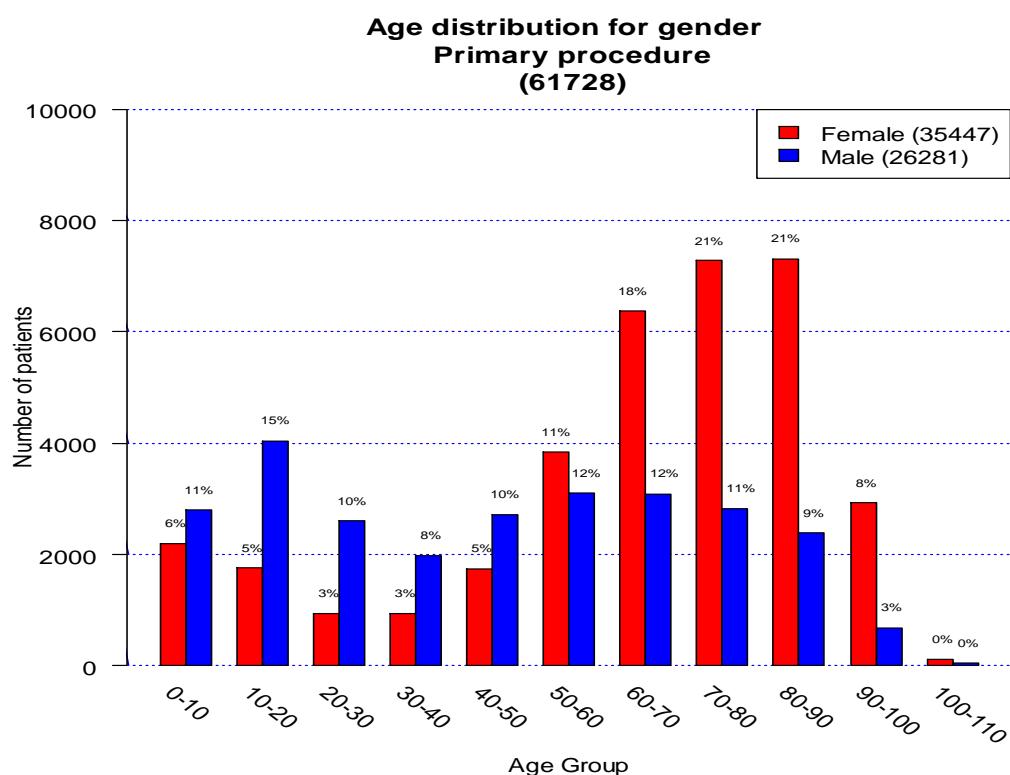
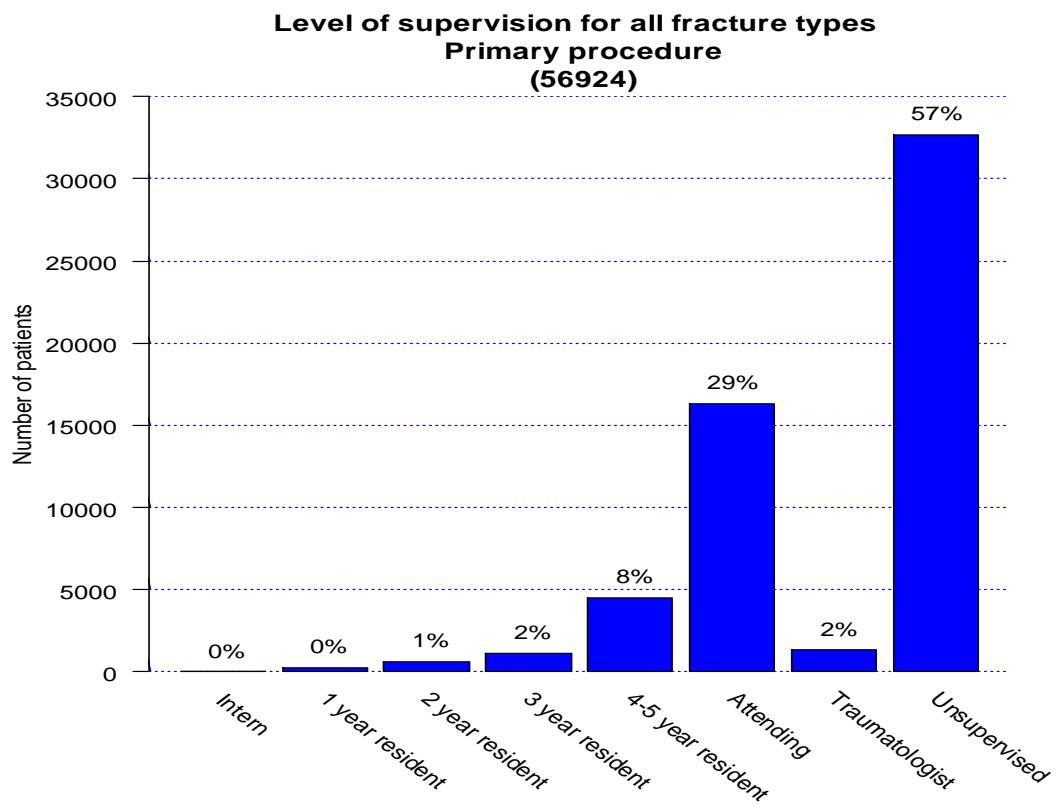








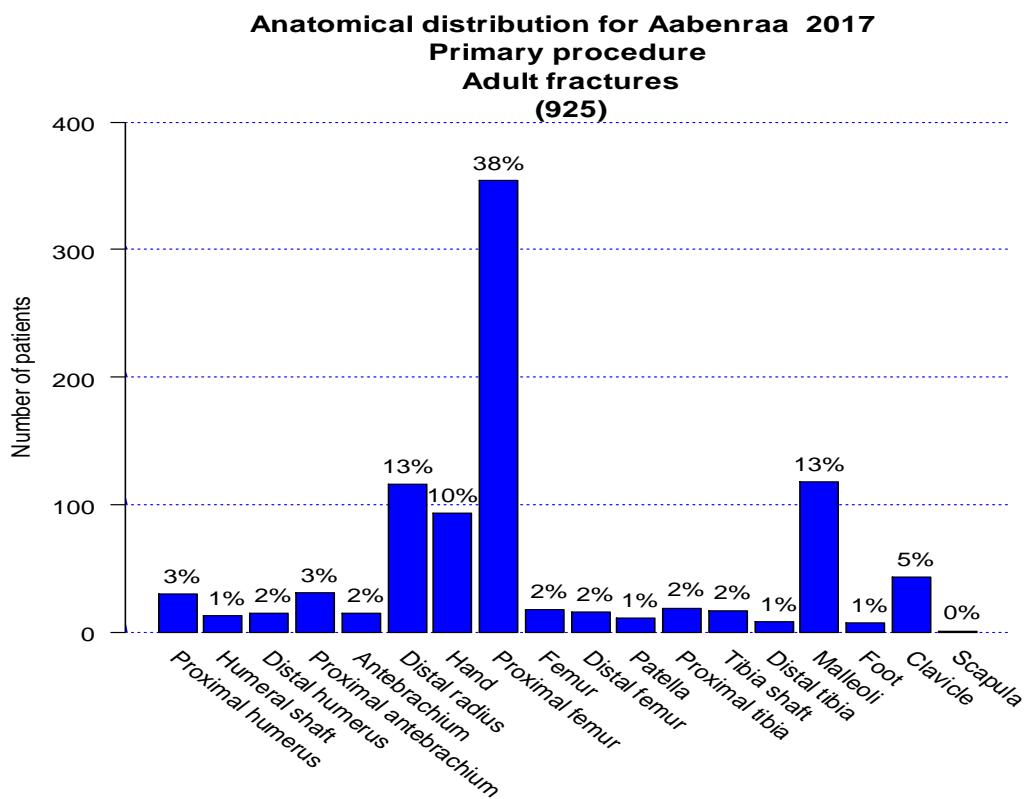




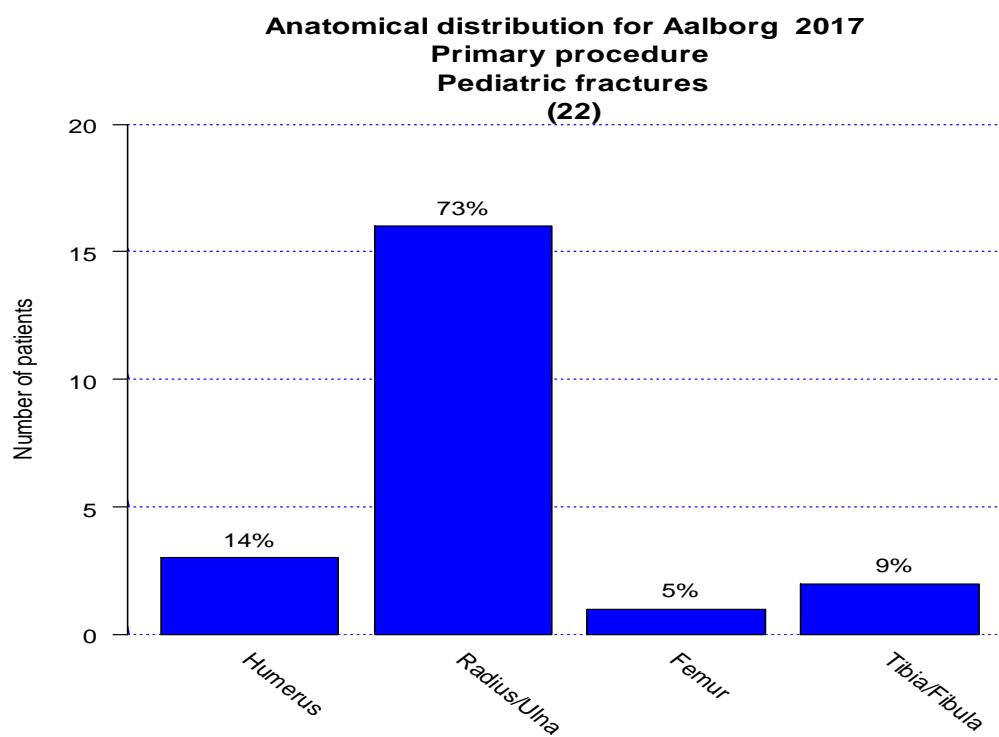
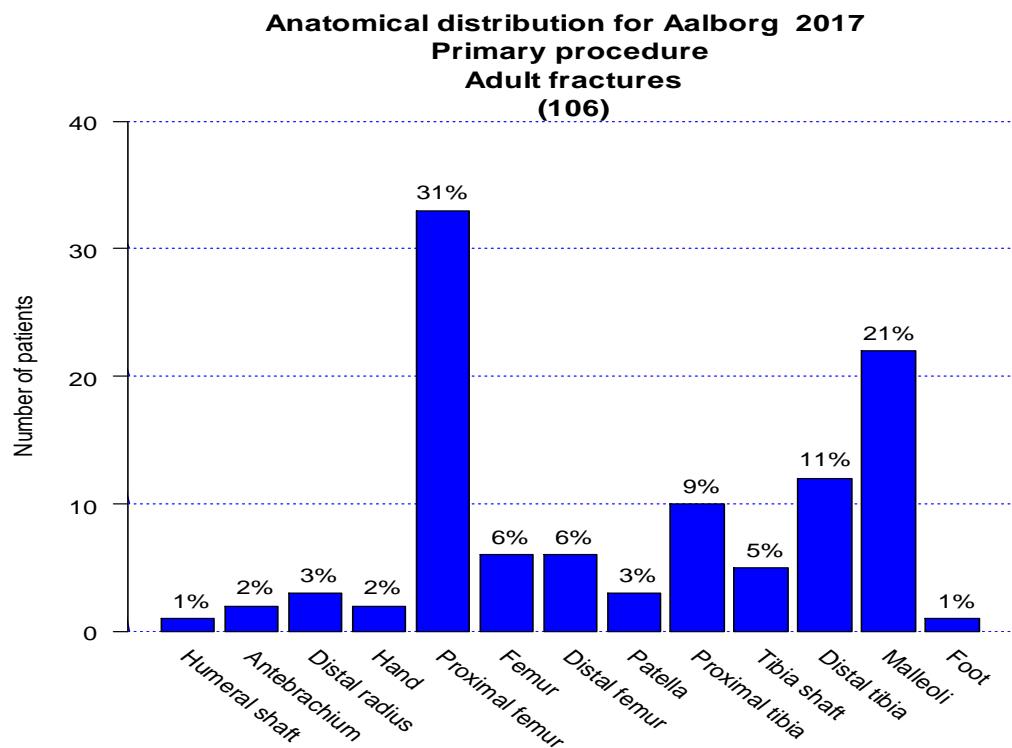
# Department specific data

This section provides department specific data for all 20 participating departments. The data covers anatomical distribution for primary procedure for adults and pediatric.

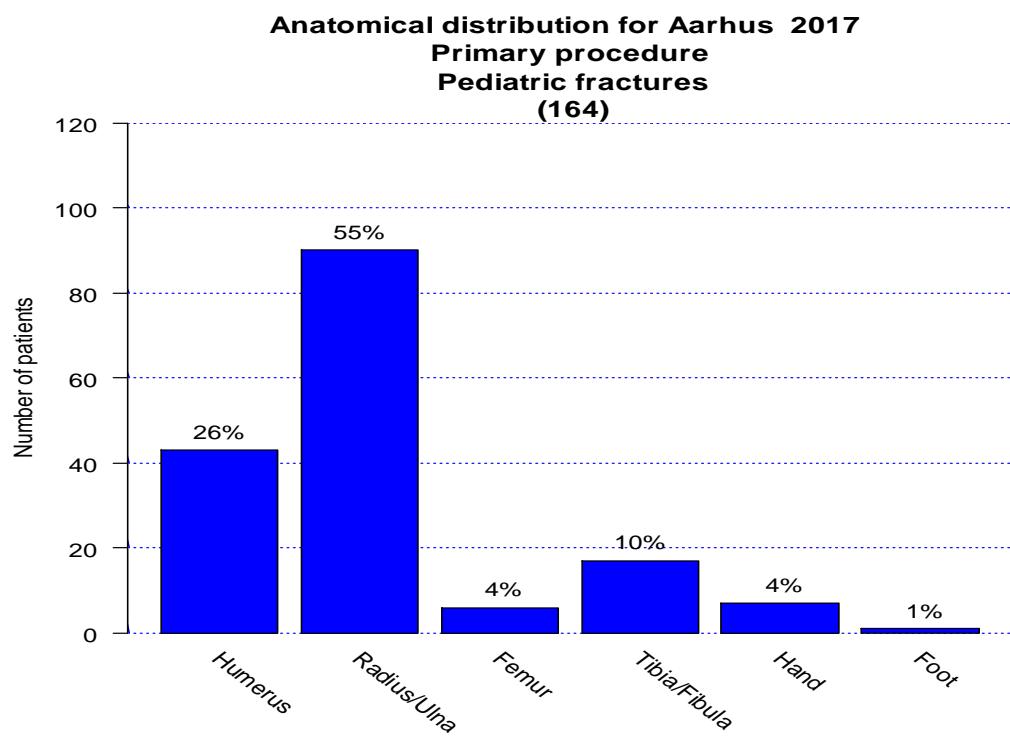
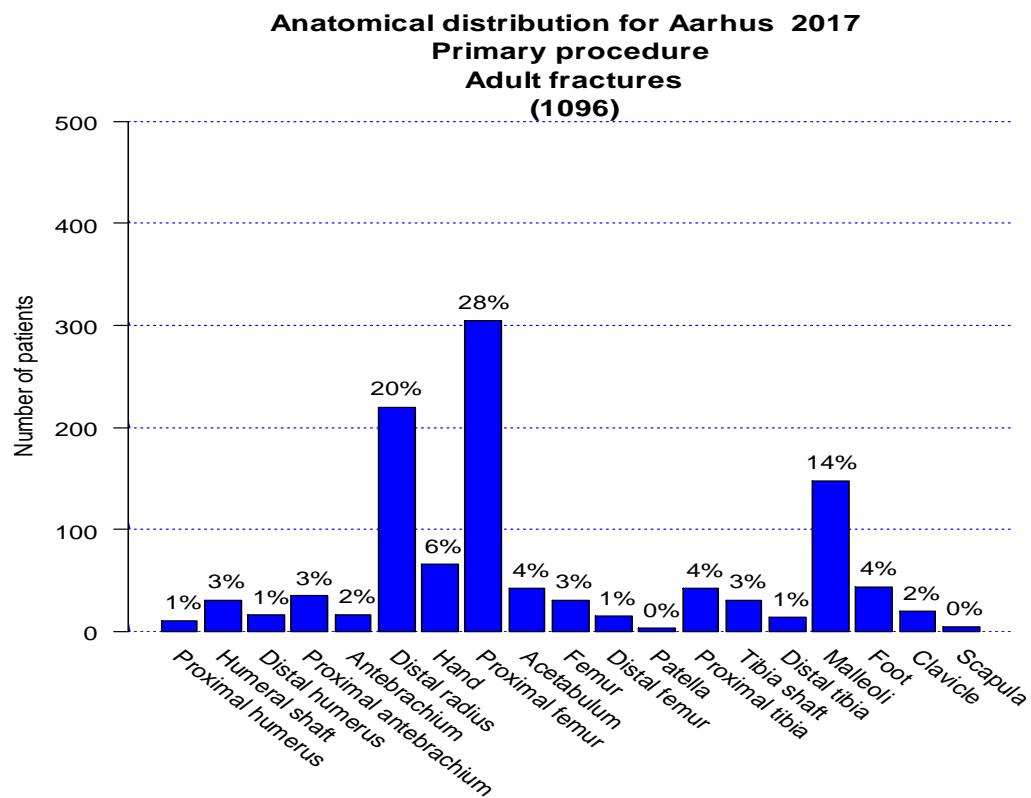
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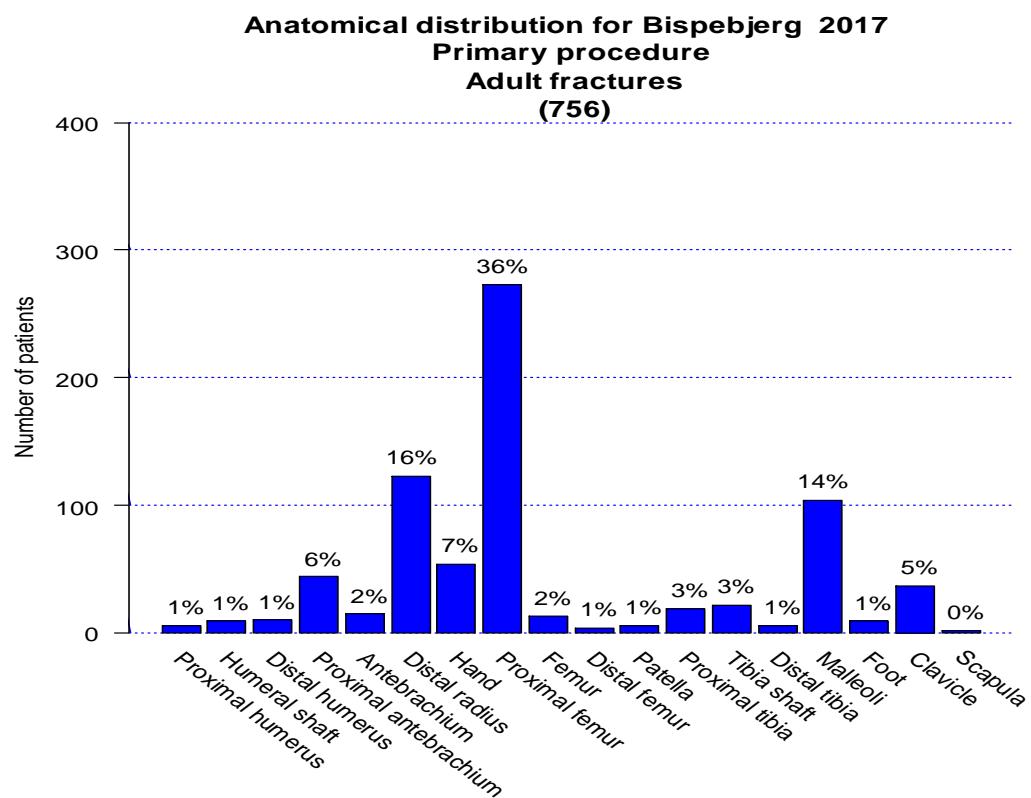
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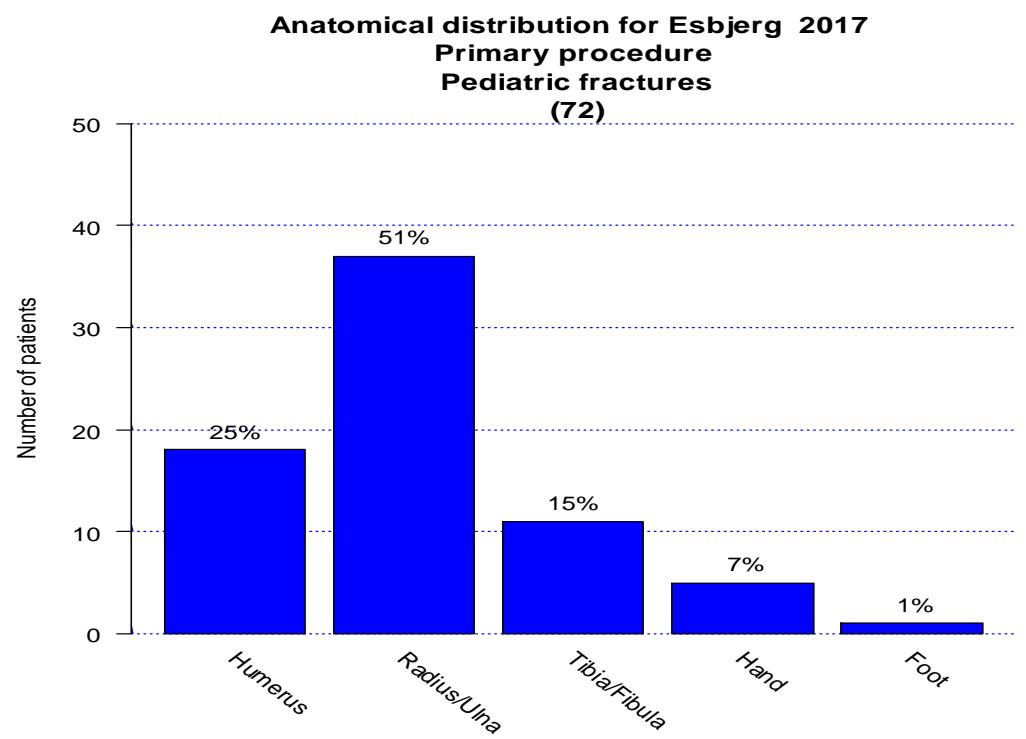
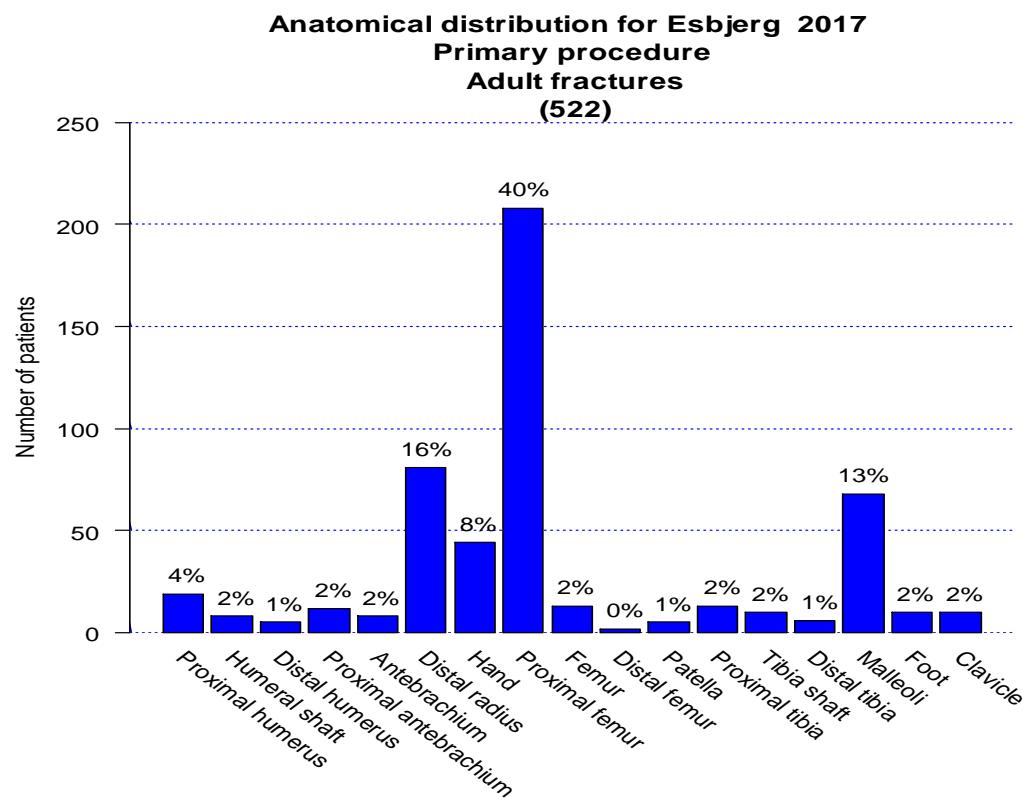
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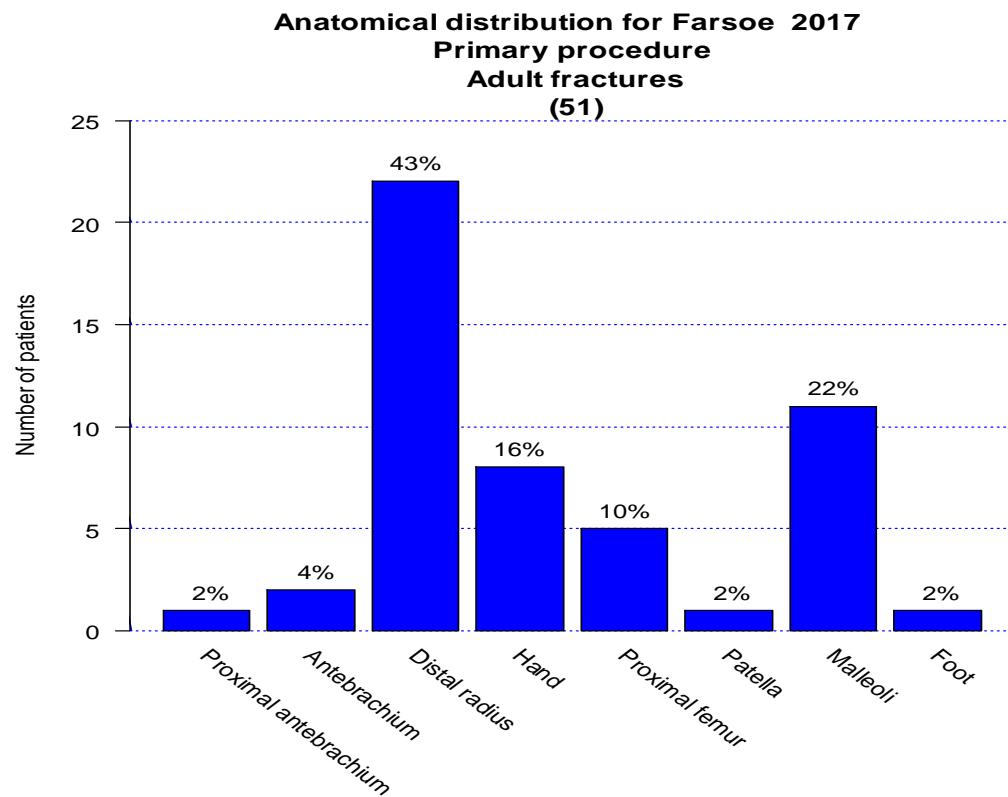


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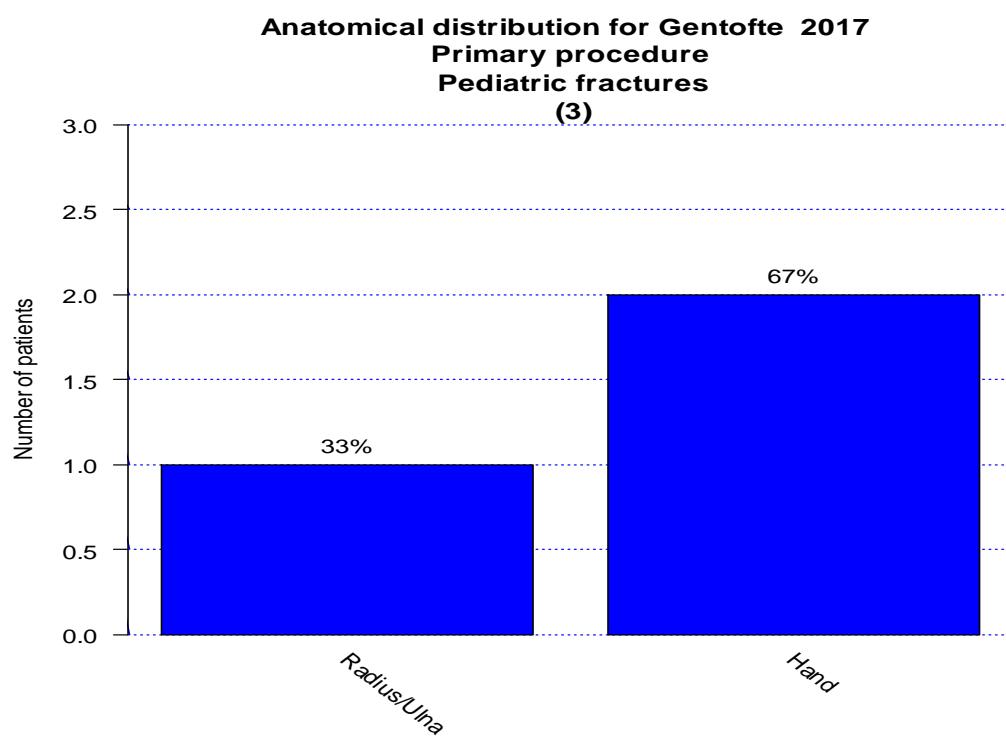
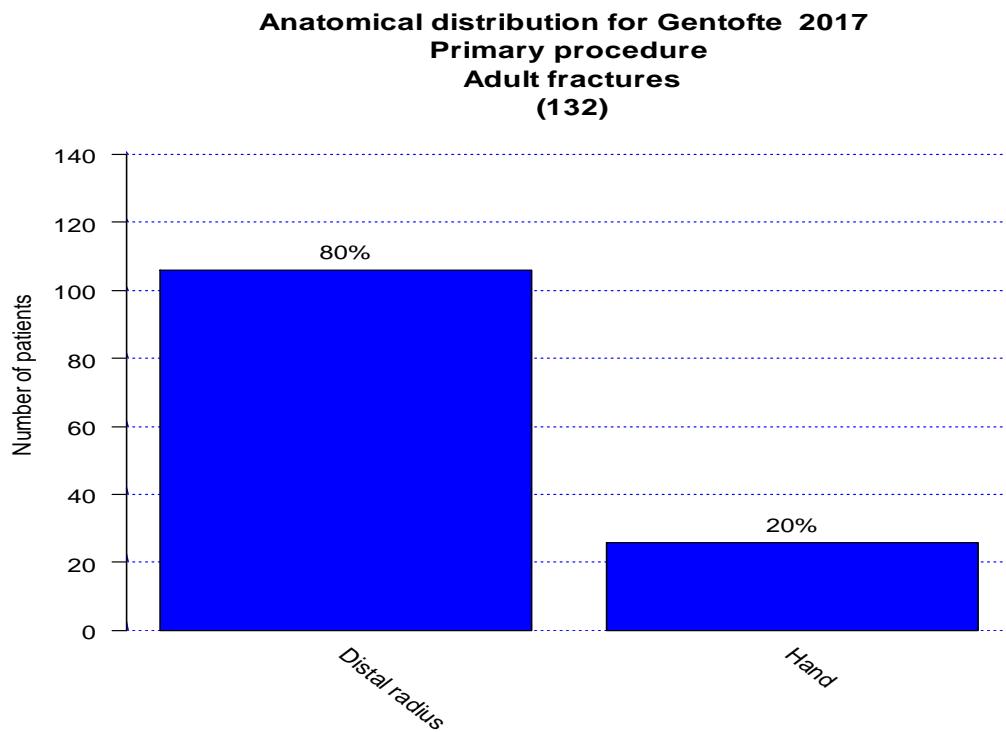


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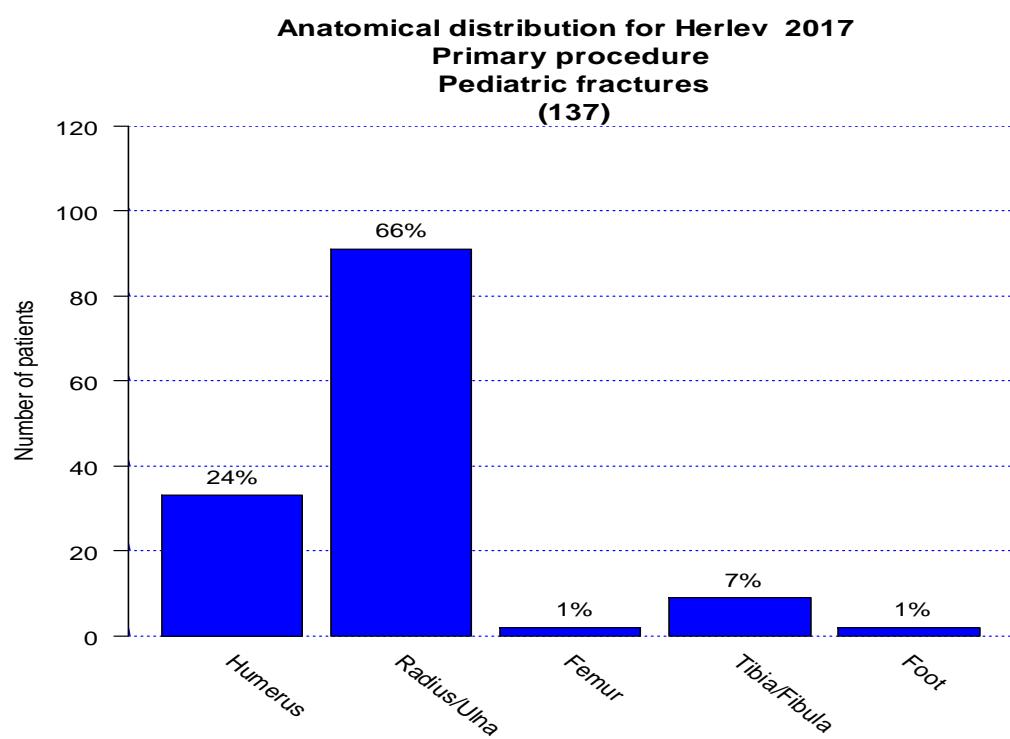
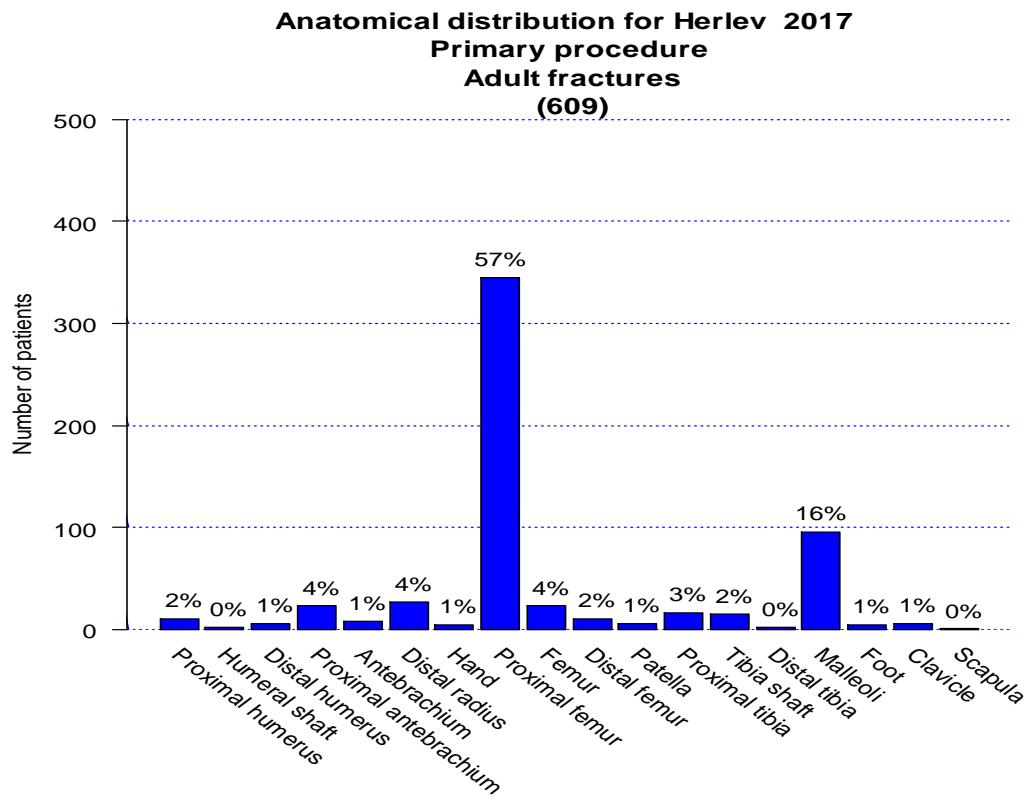


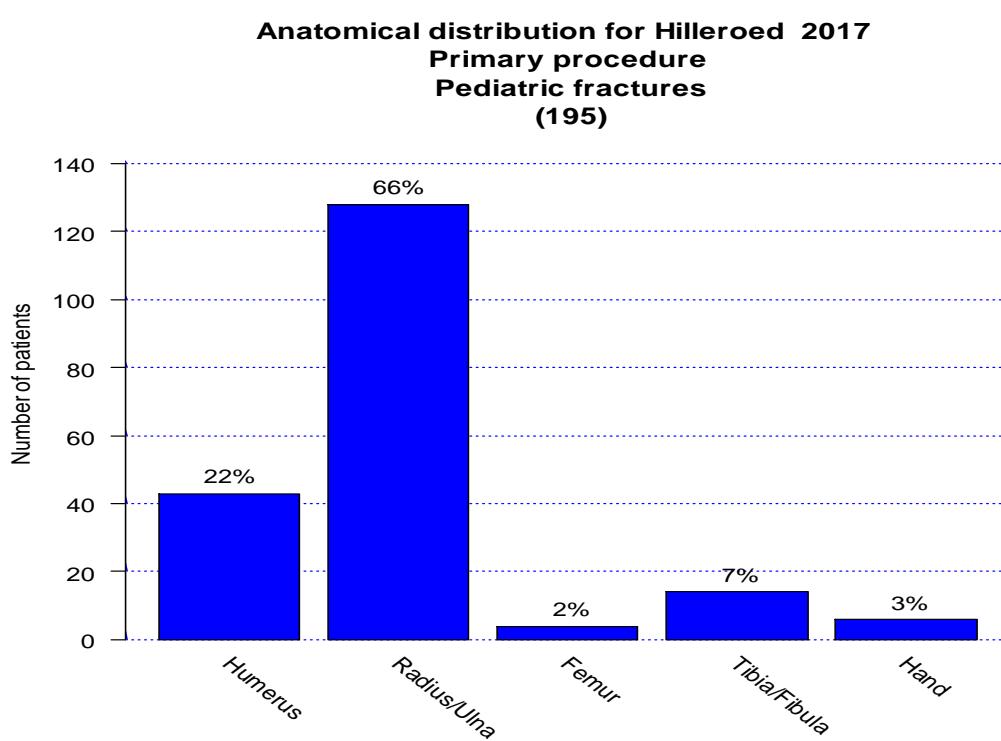
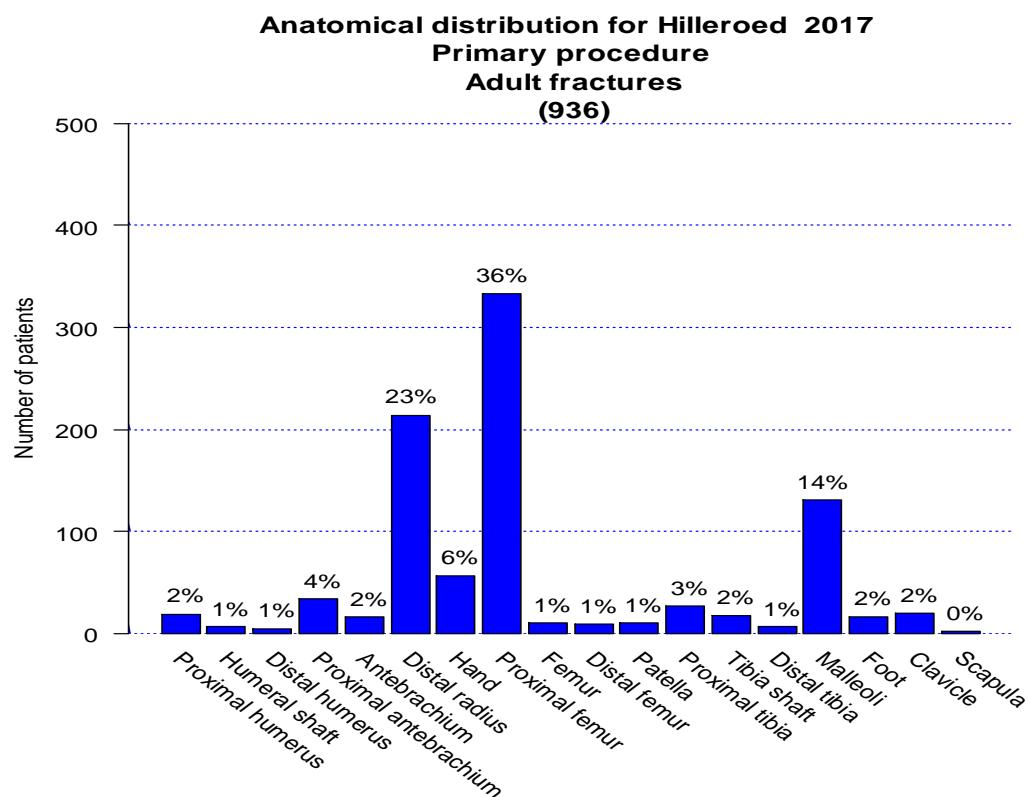


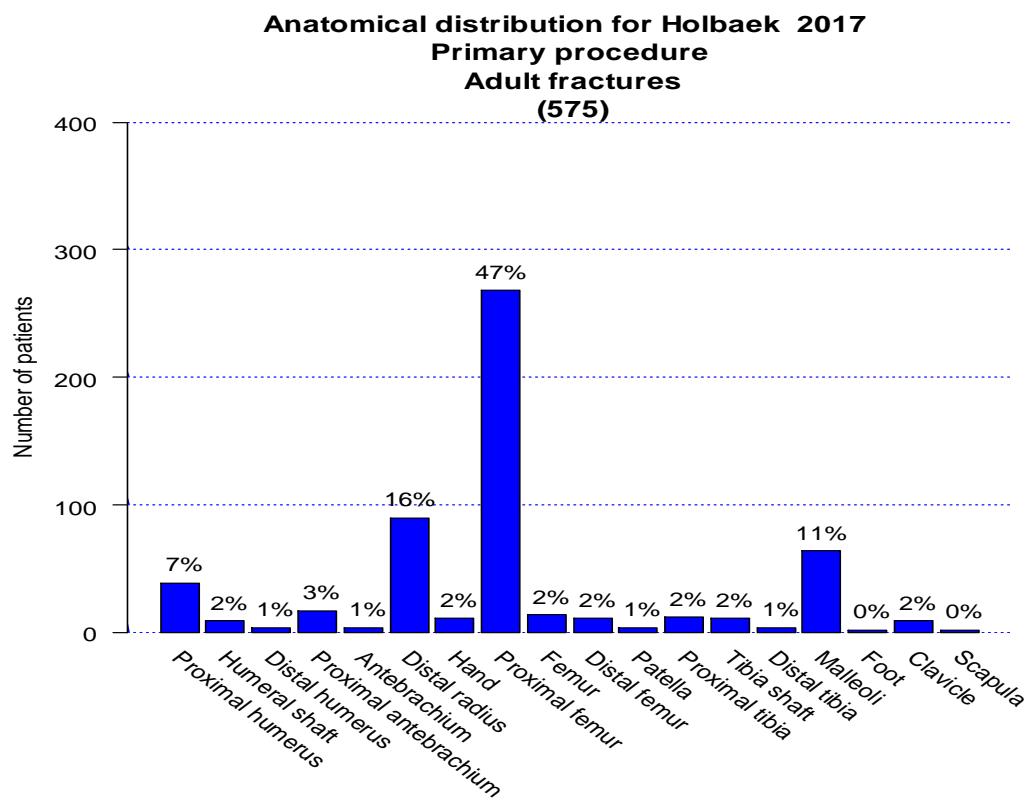
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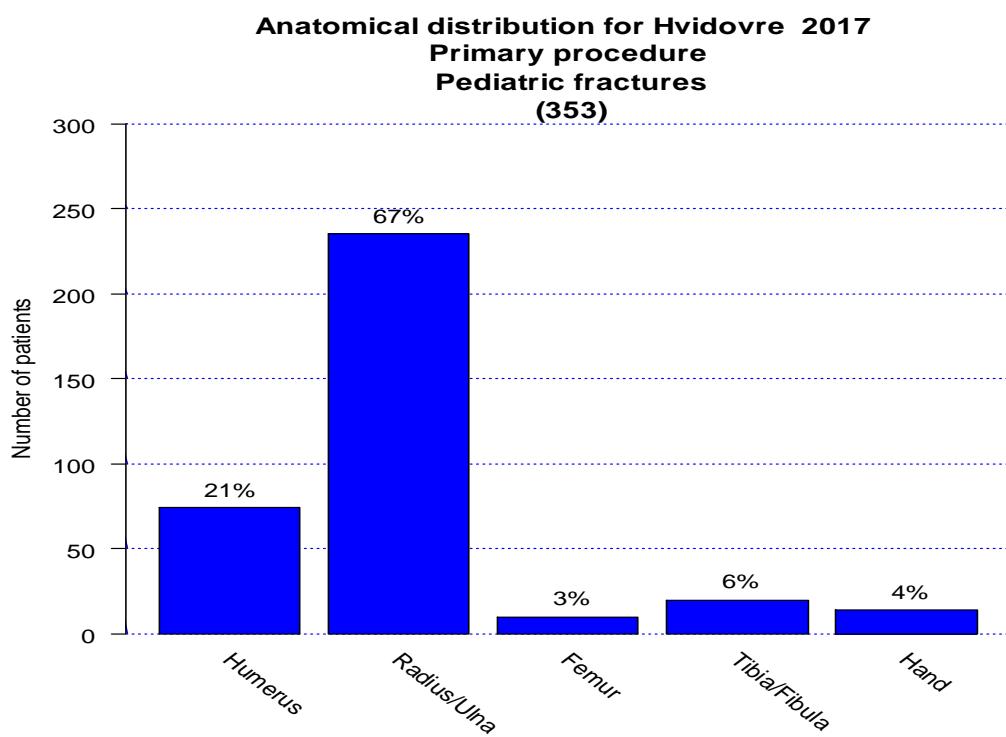
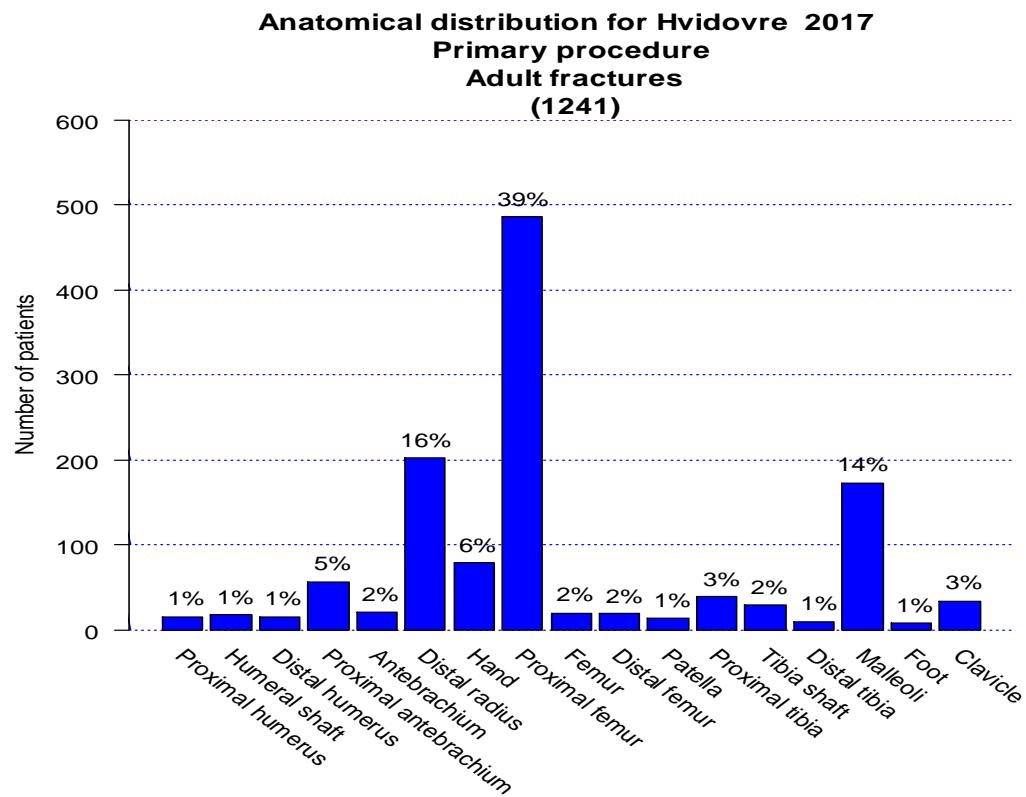
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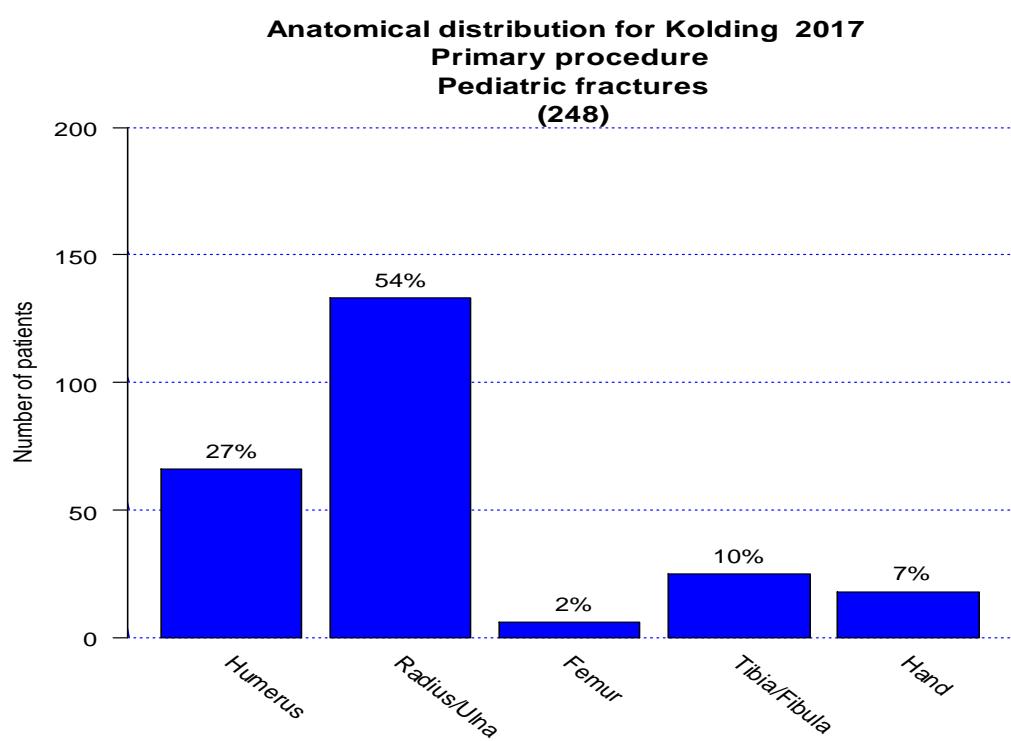
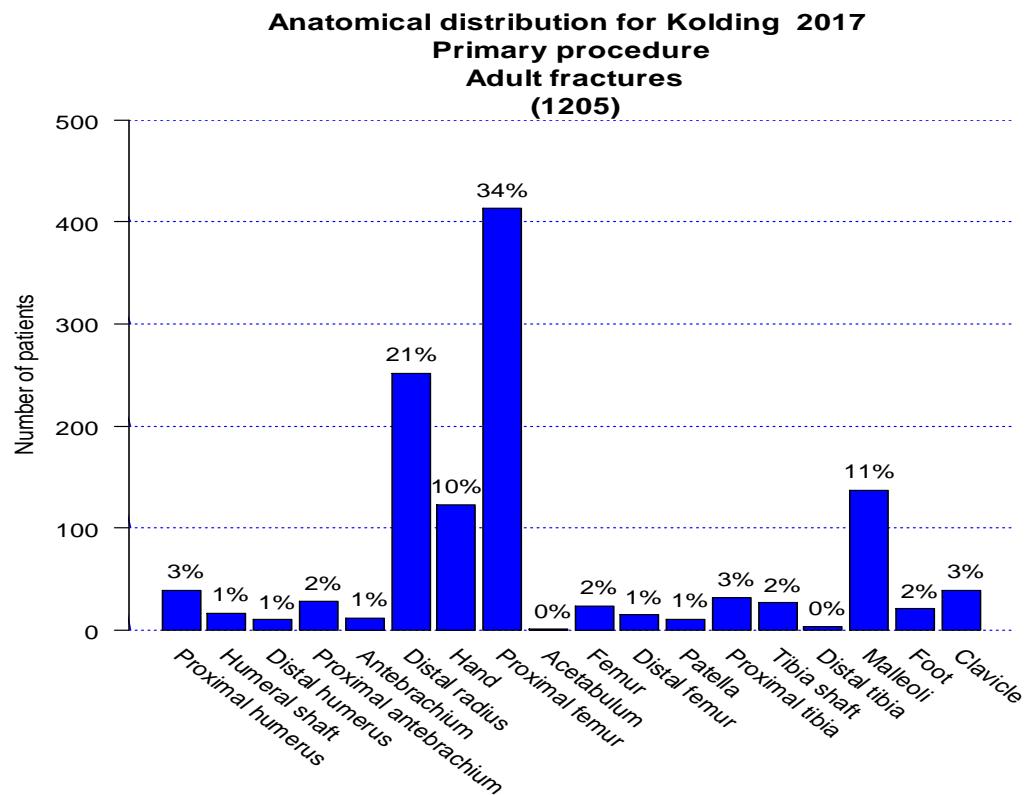




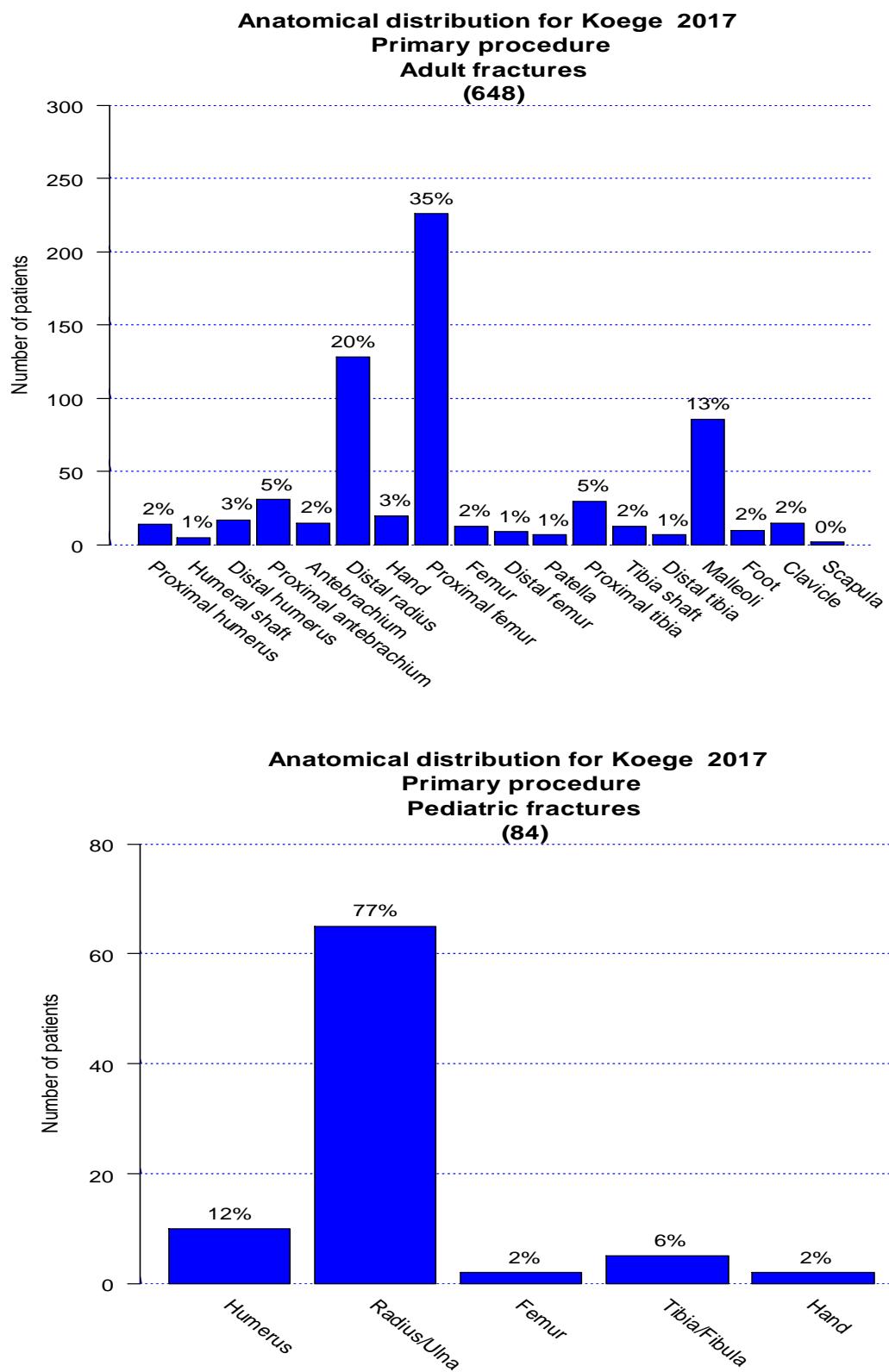
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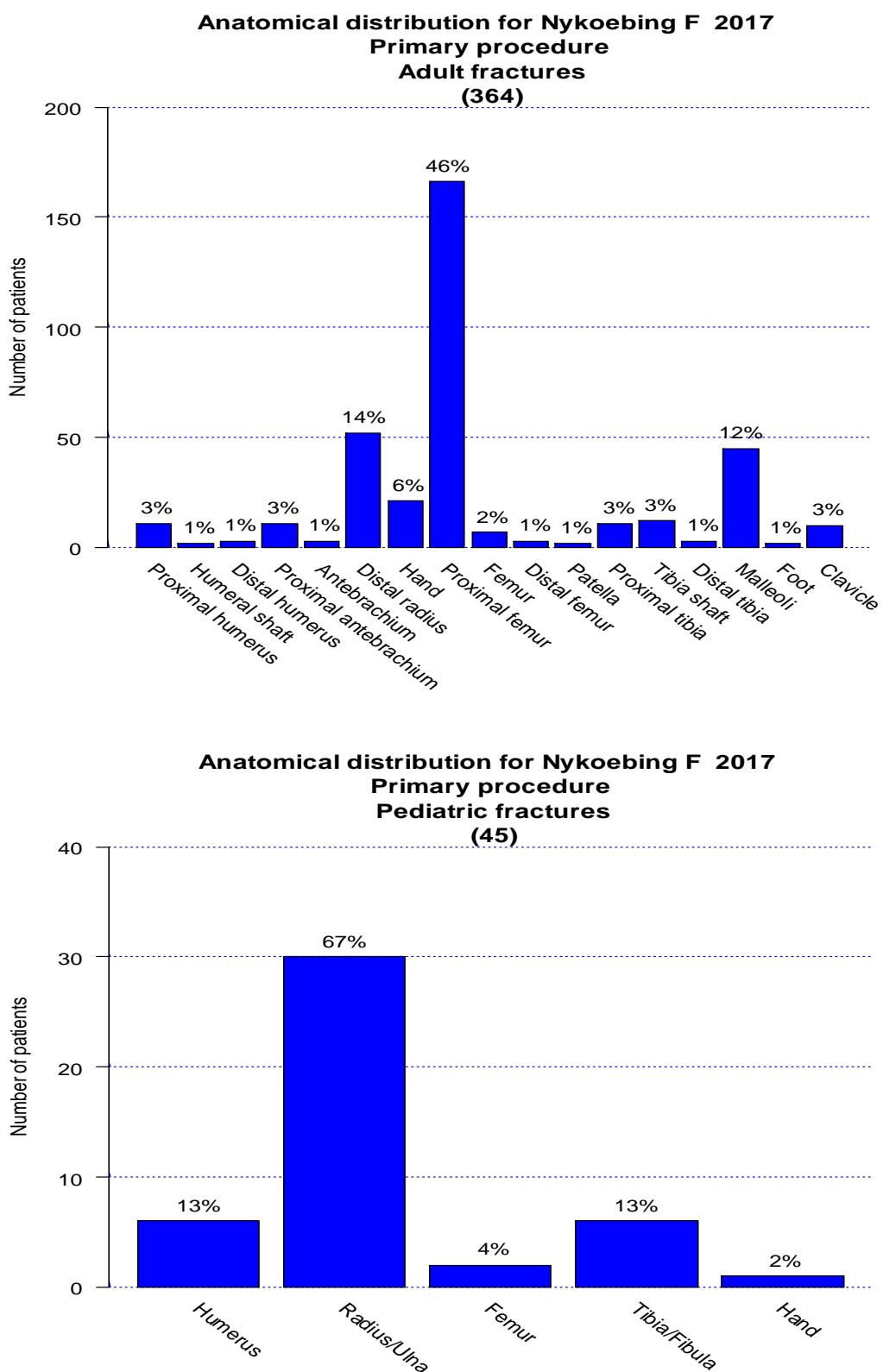
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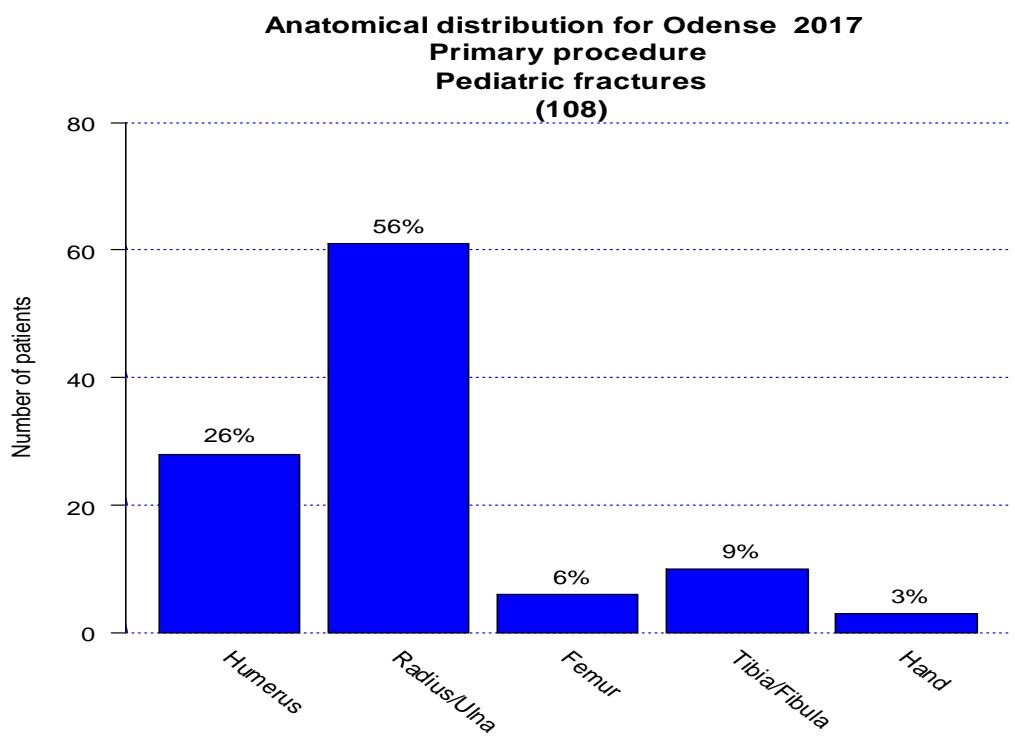
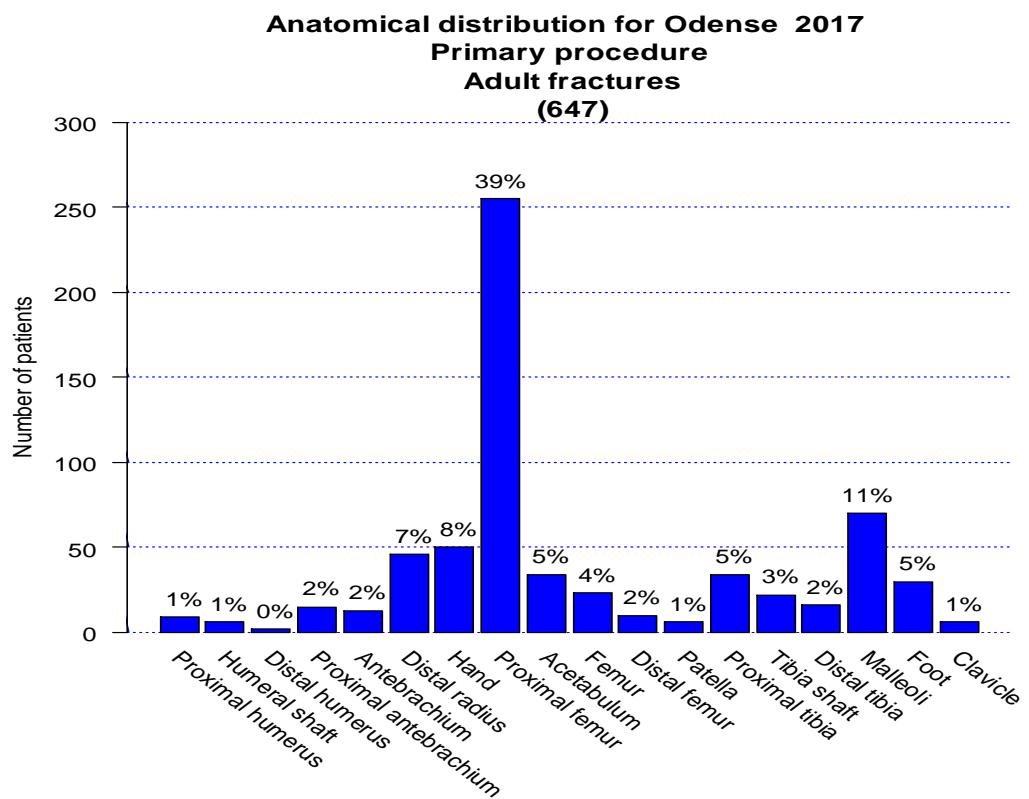
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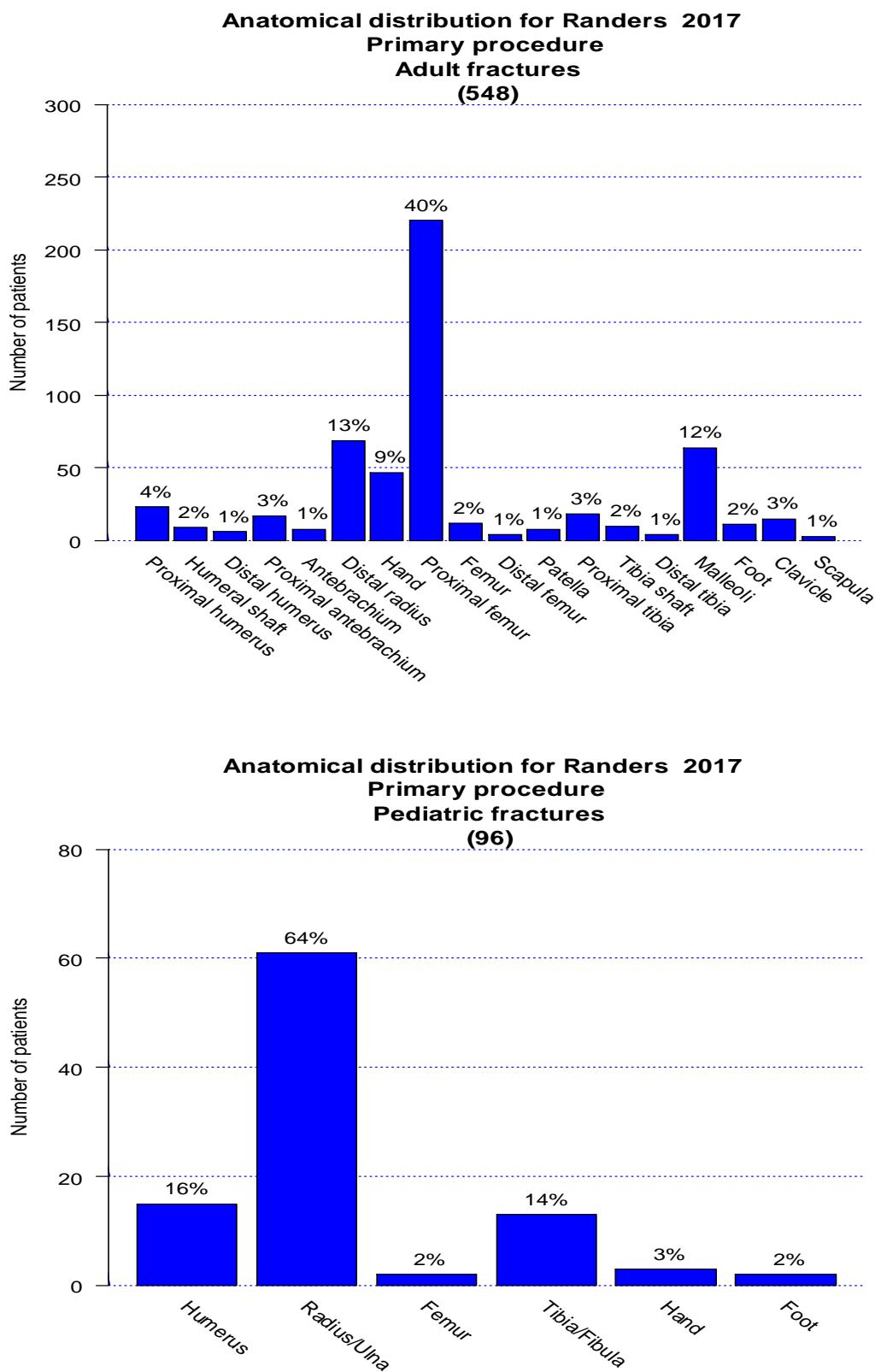
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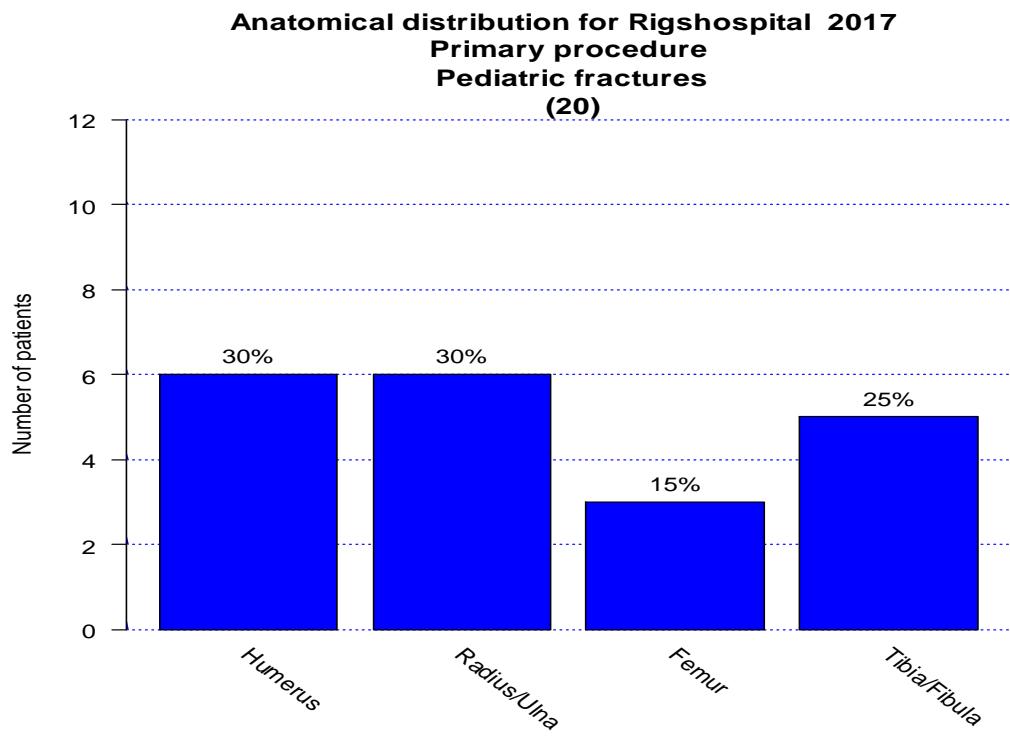
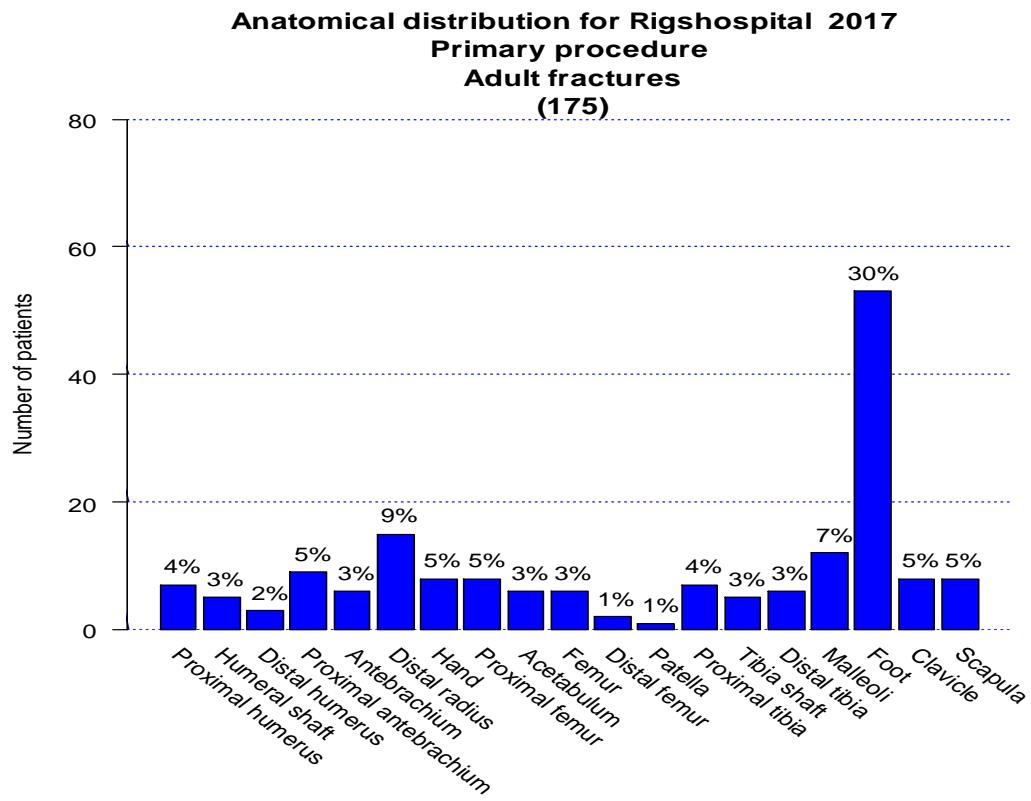


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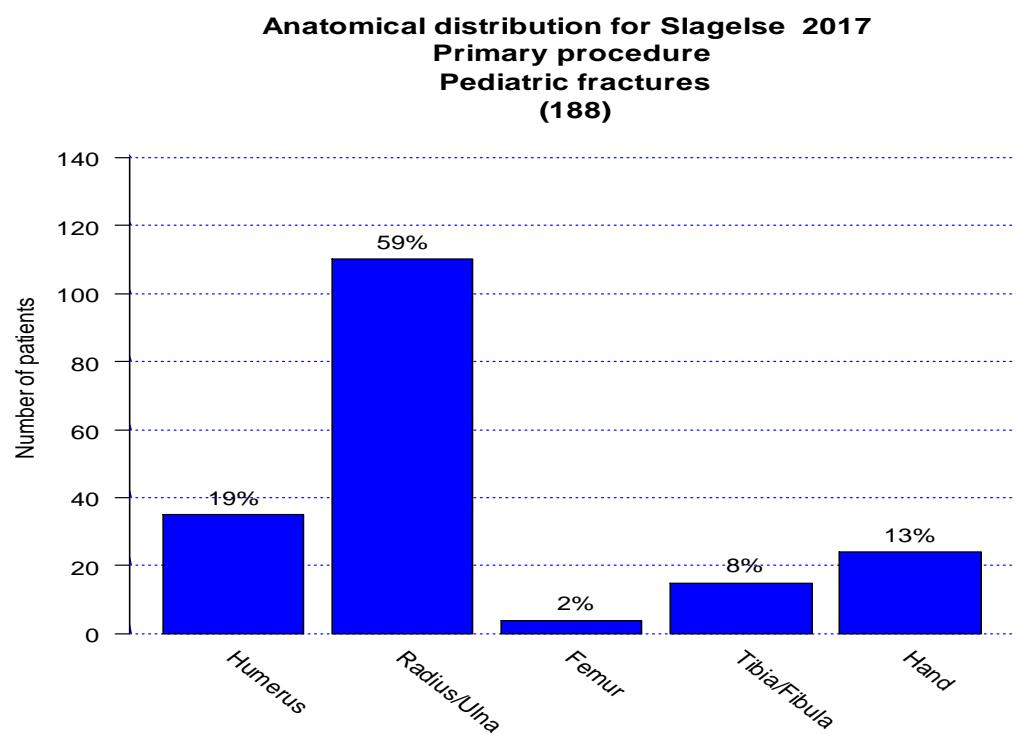
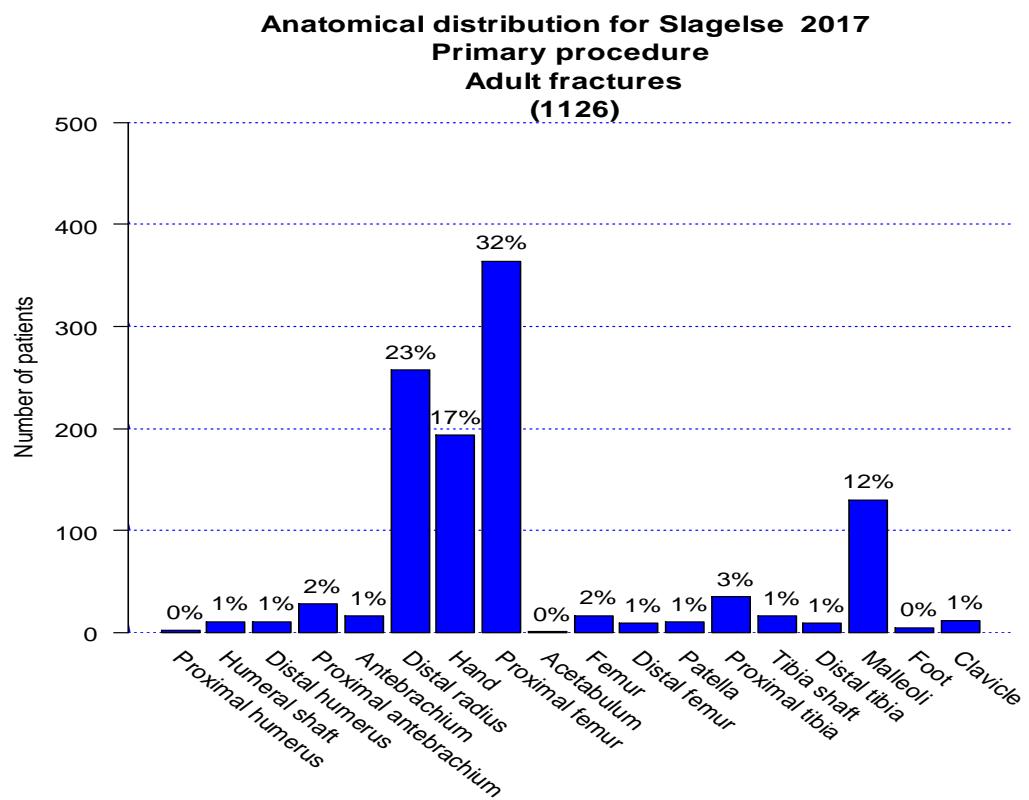


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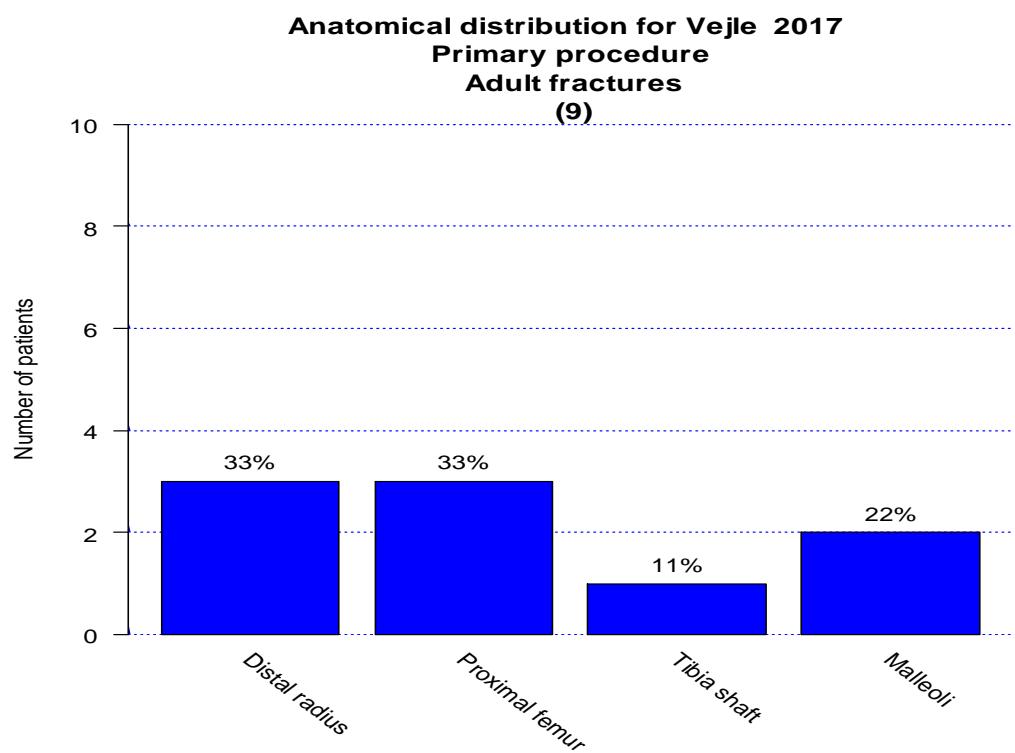




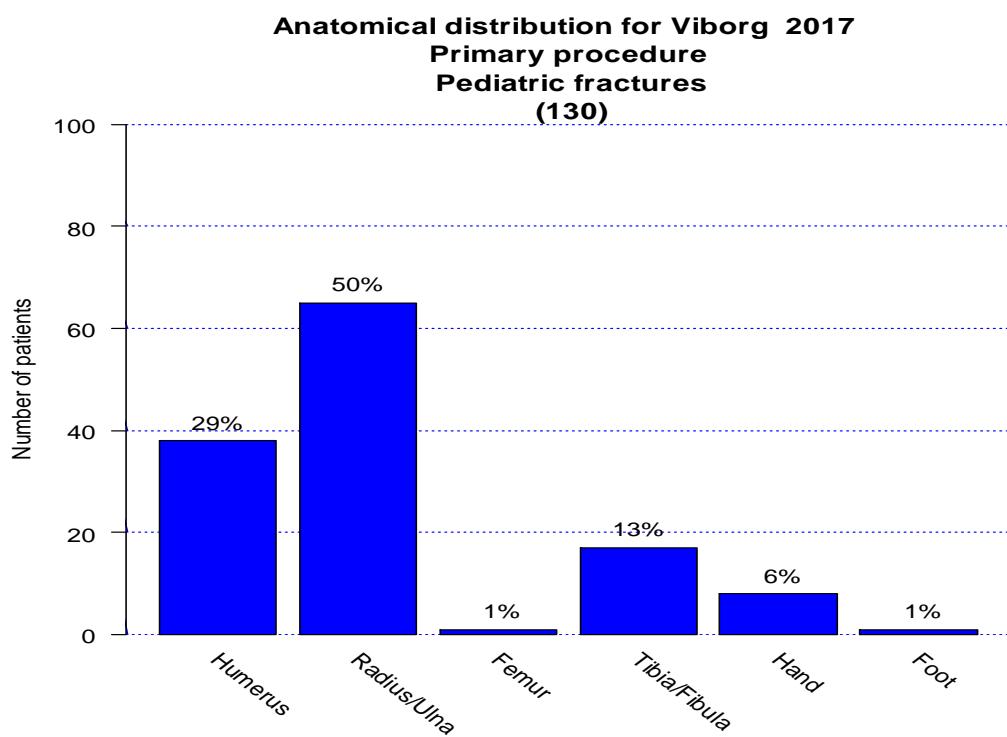
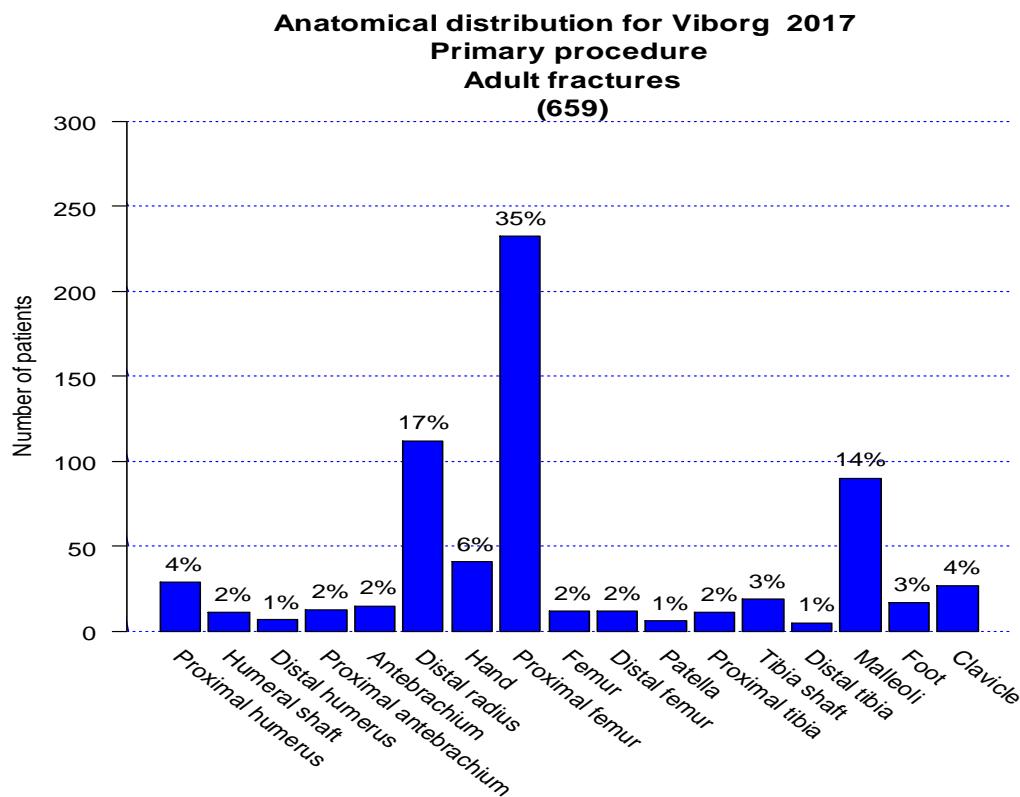
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# Vejle

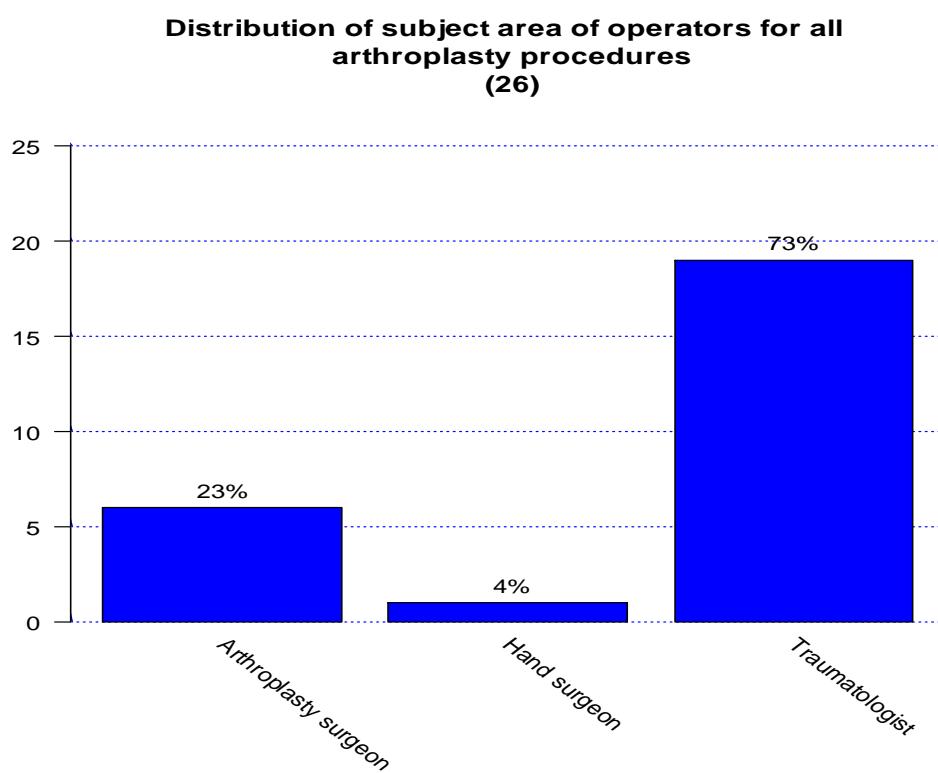
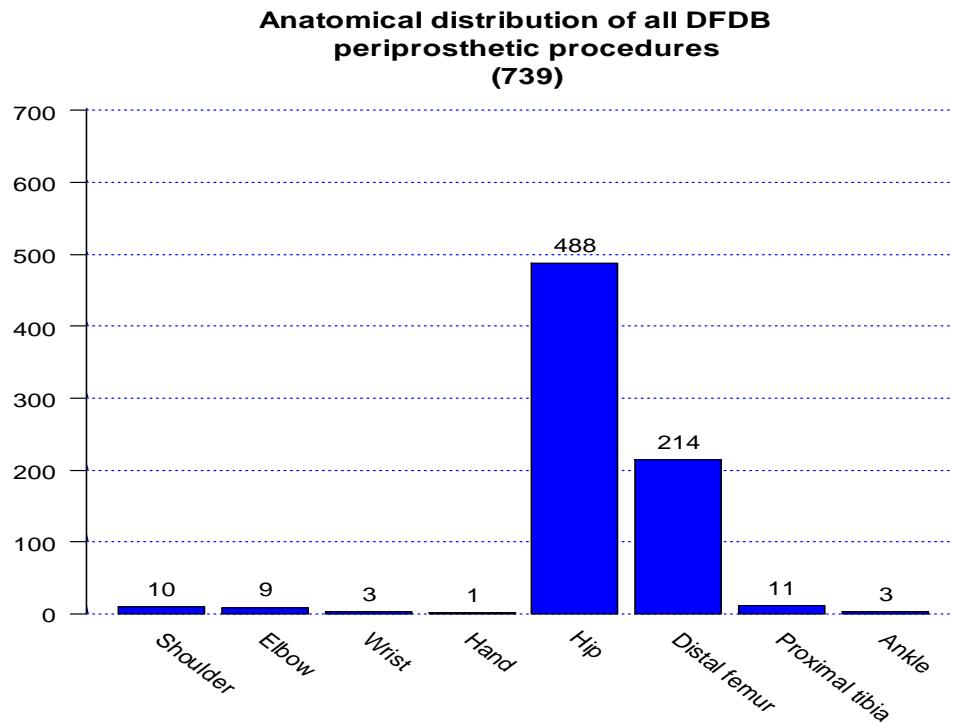


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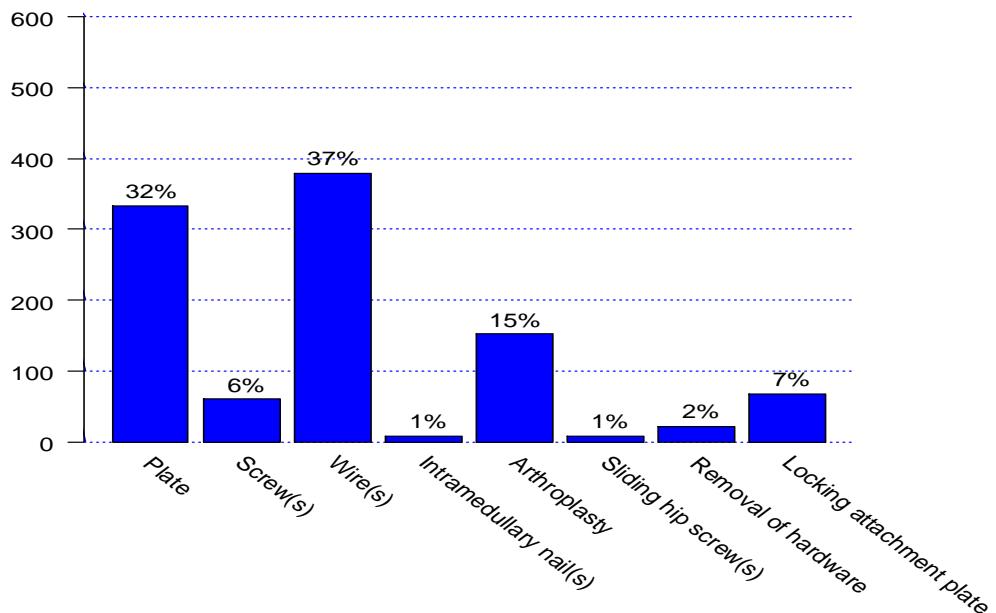




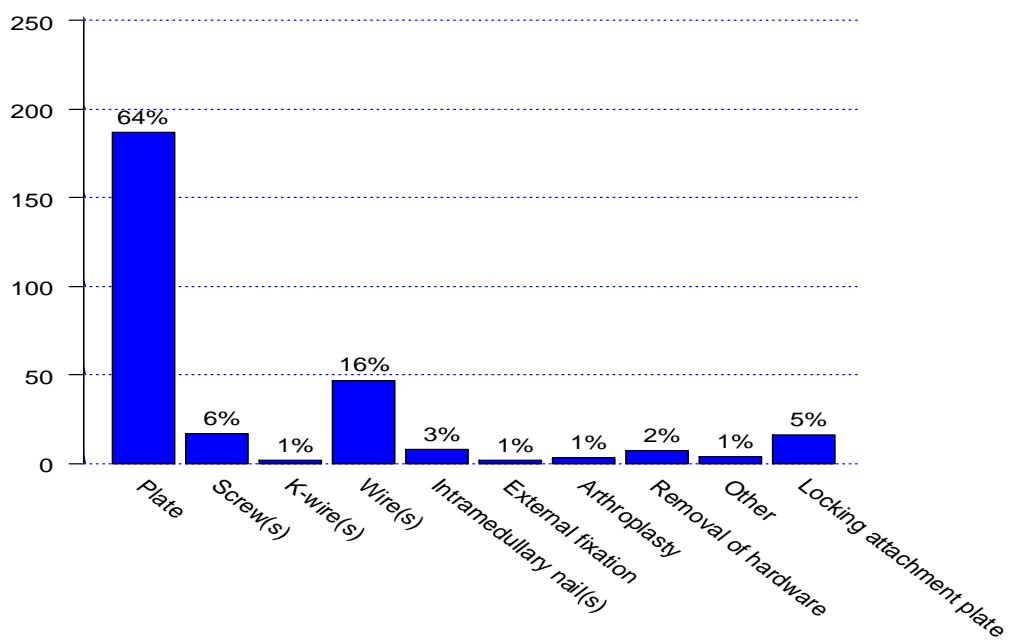
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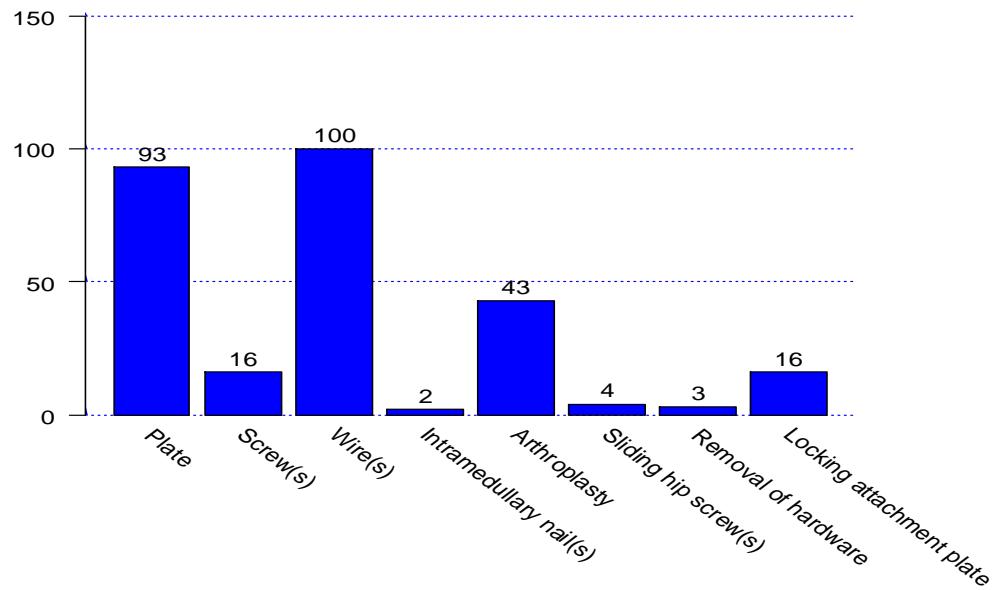
**Method of osteosynthesis for a periprosthetic hip fracture (1030)**



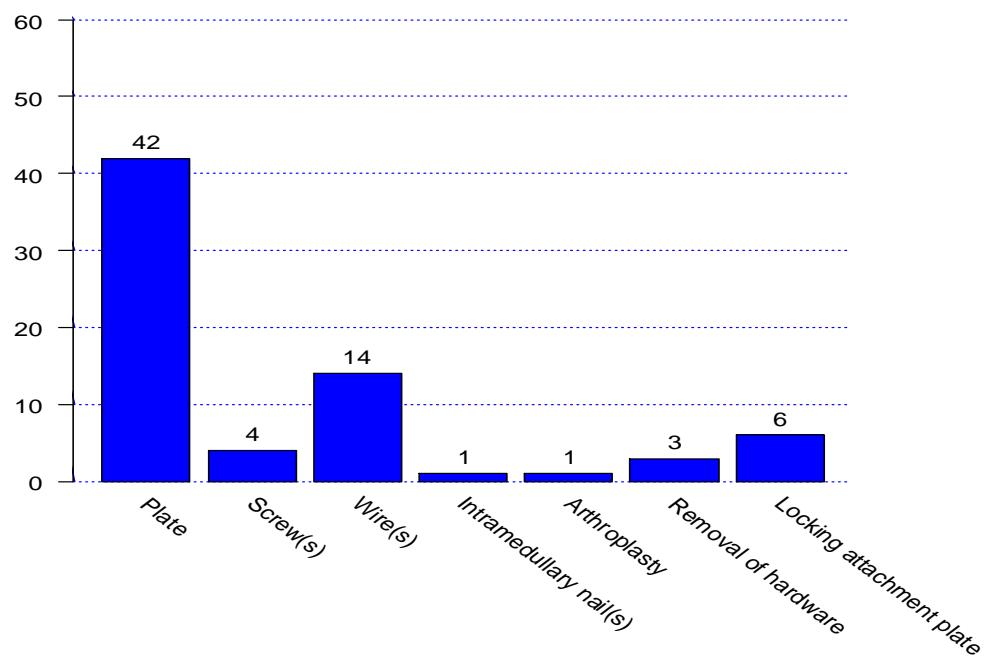
**Method of osteosynthesis for a periprosthetic distal femur fracture (293)**



**Method of osteosynthesis for a periprosthetic hip fracture in 2016  
(277)**



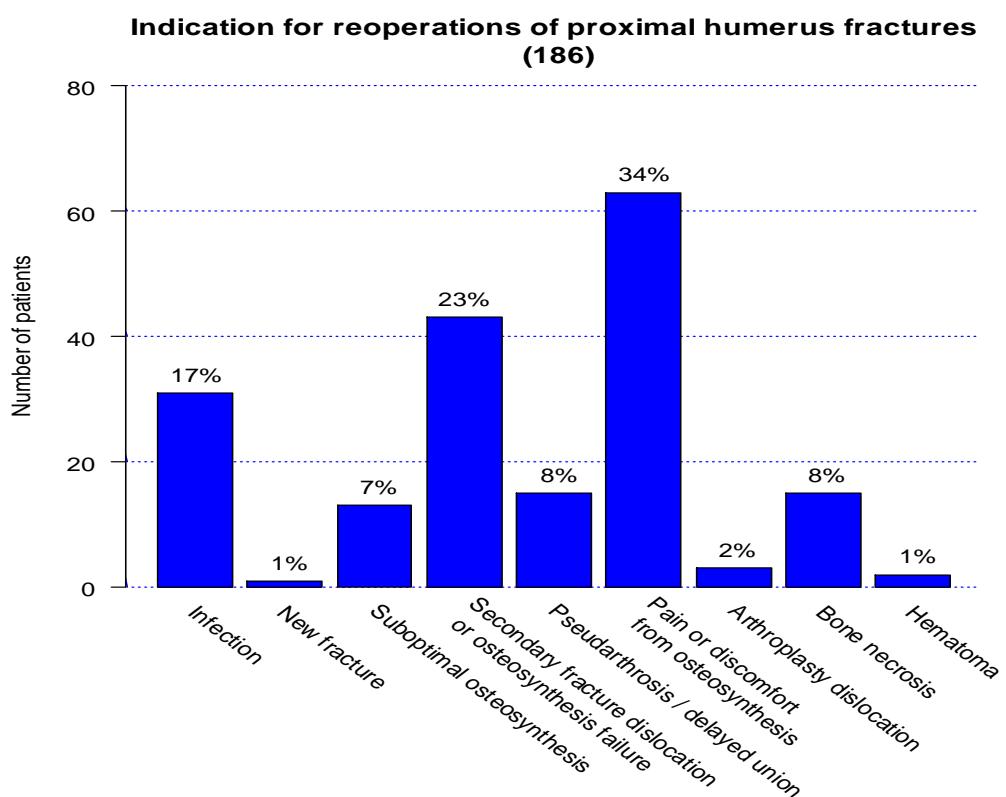
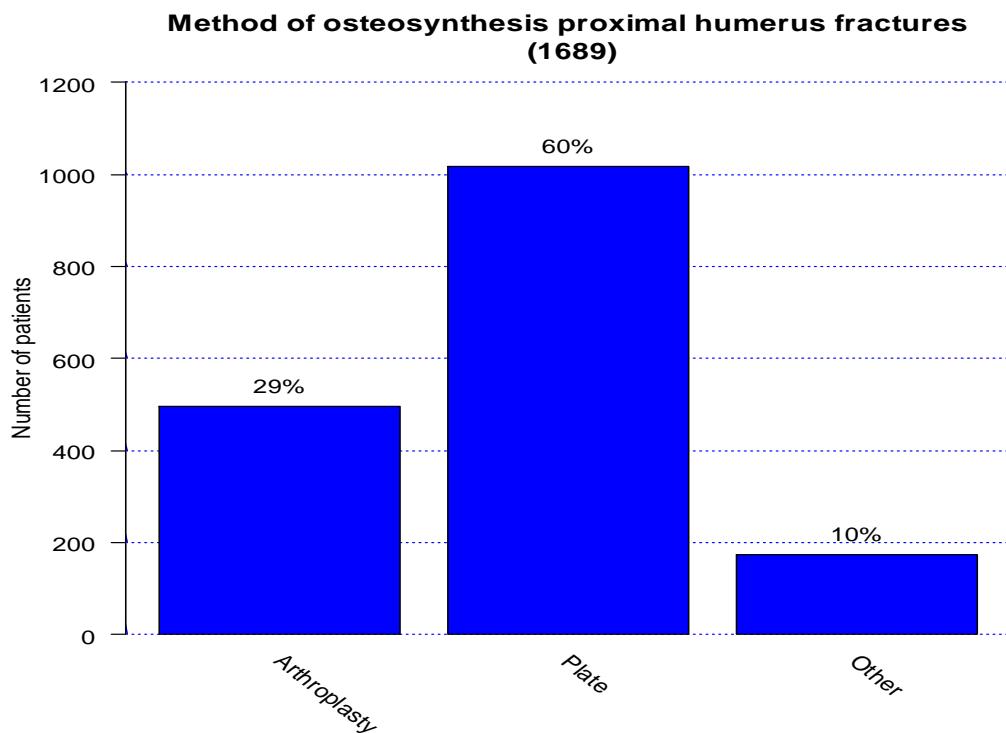
**Method of osteosynthesis for a periprosthetic distal femur fracture in 2016  
(71)**

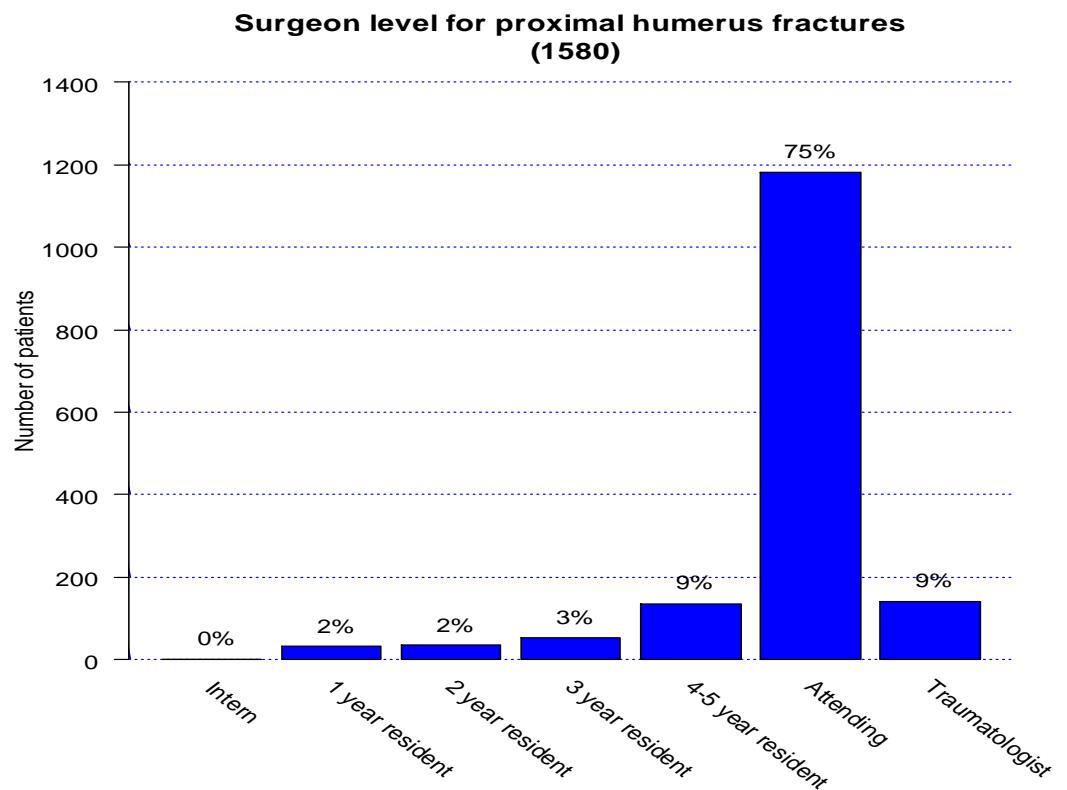




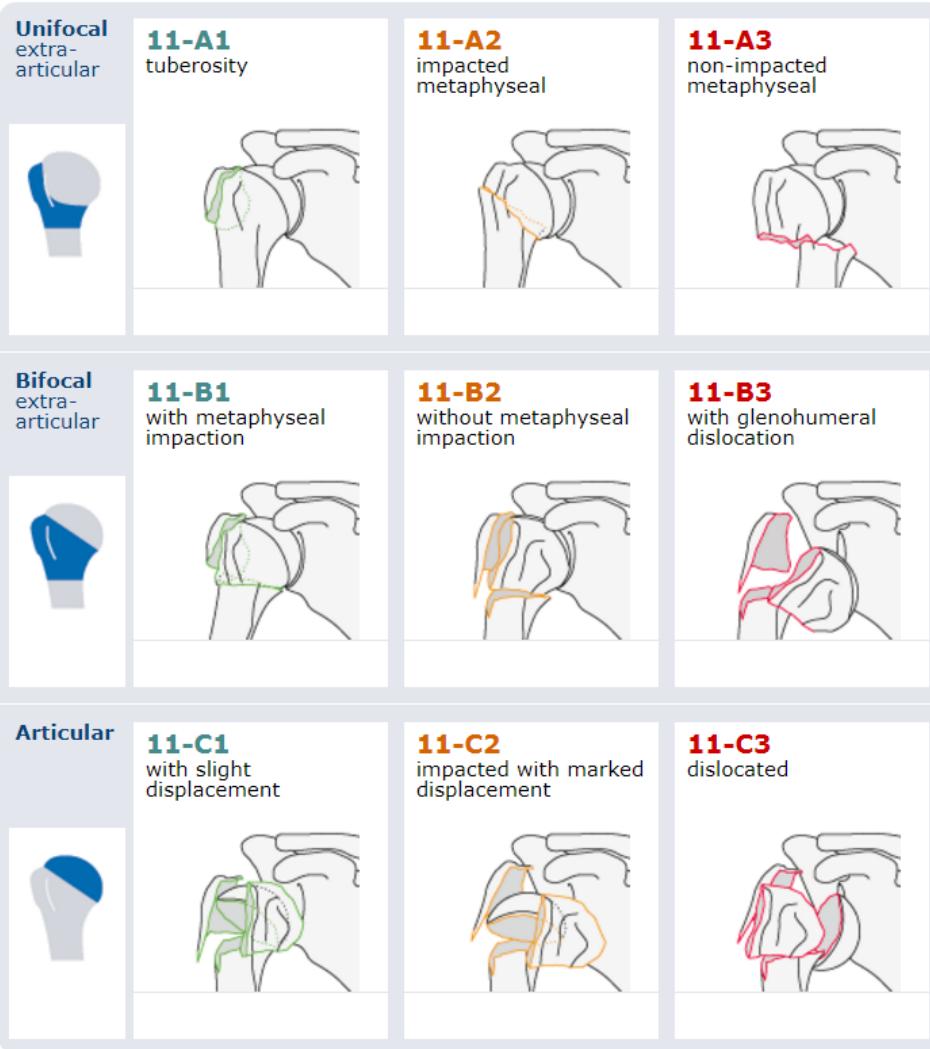
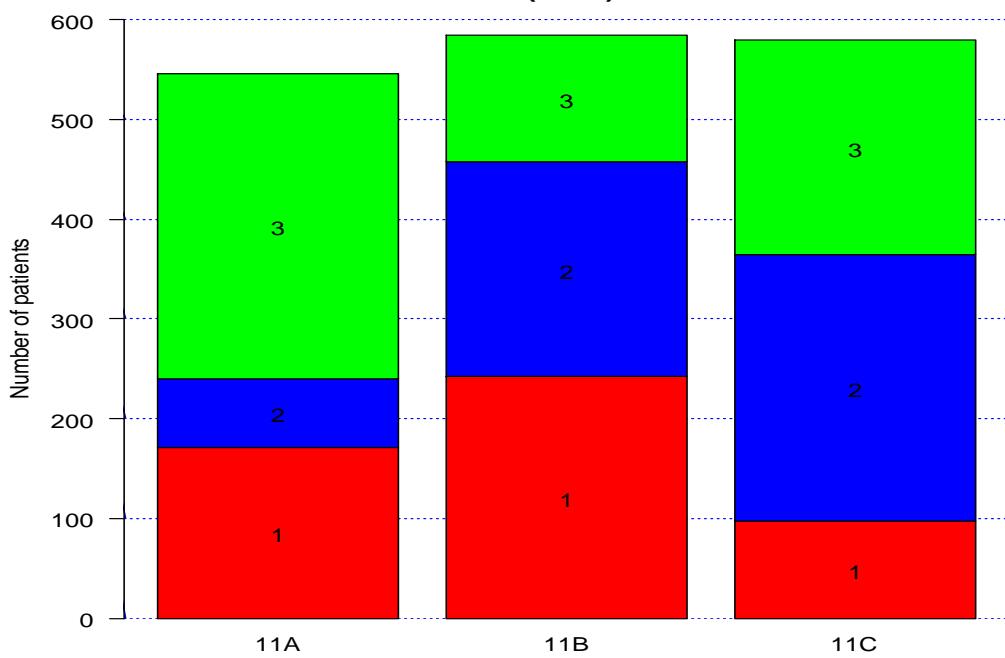
# Adult

## Proximal Humerus



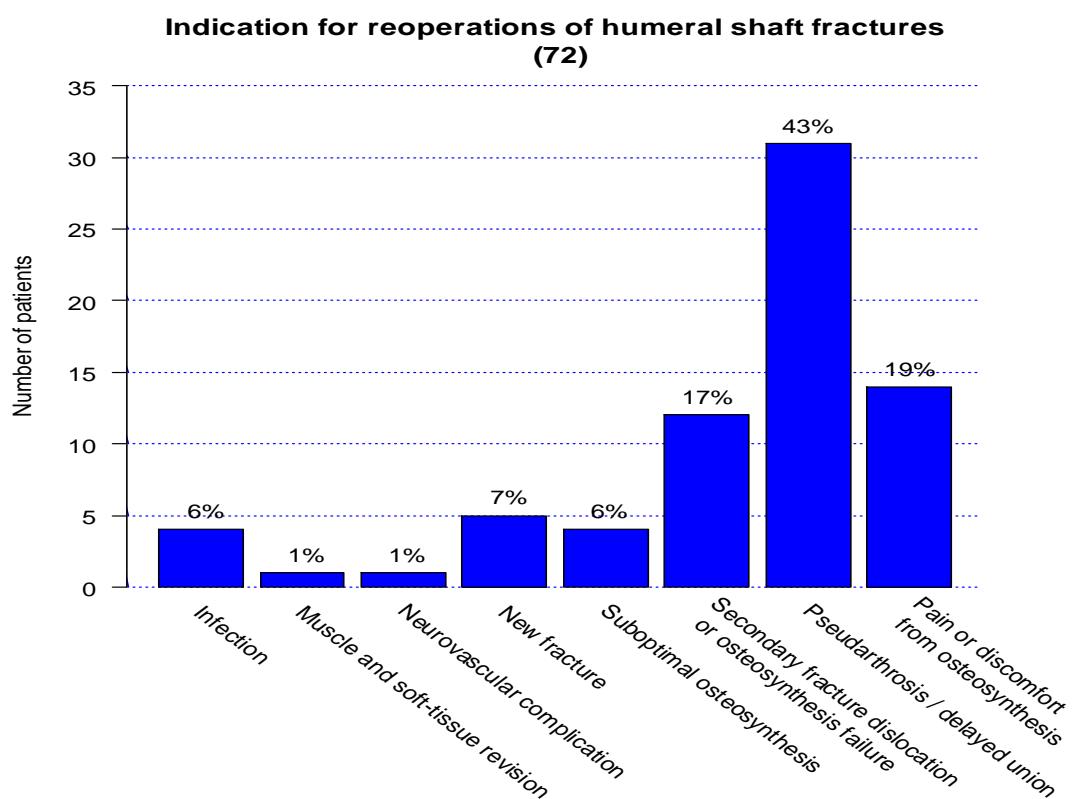
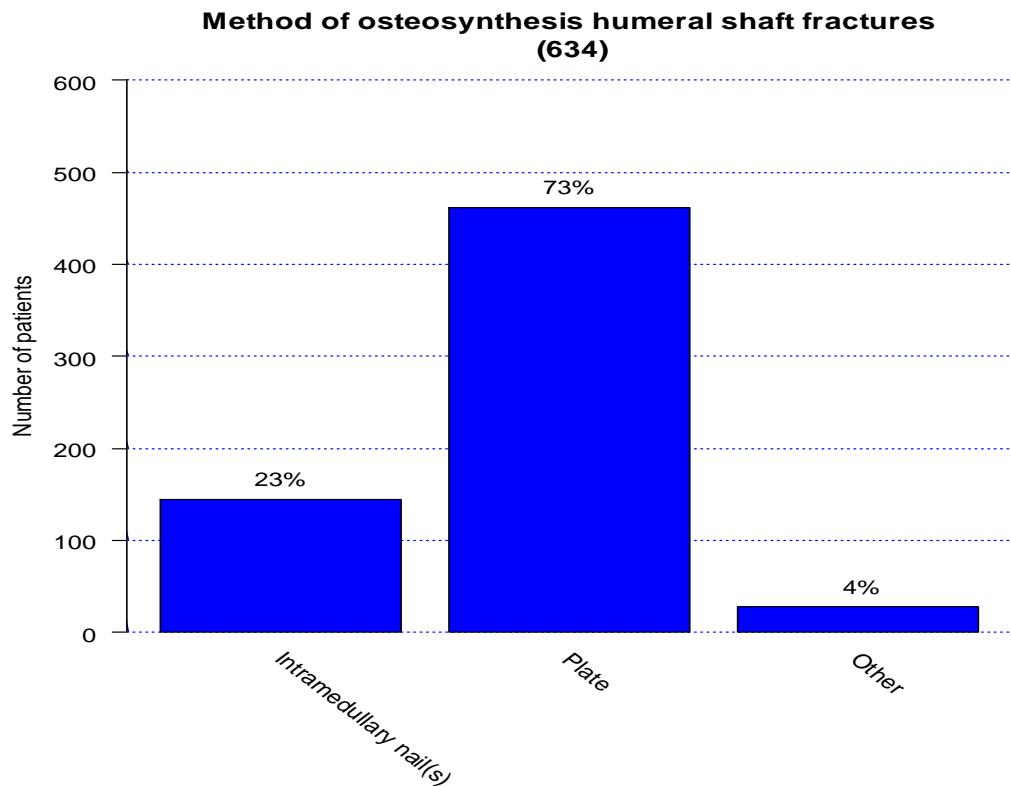


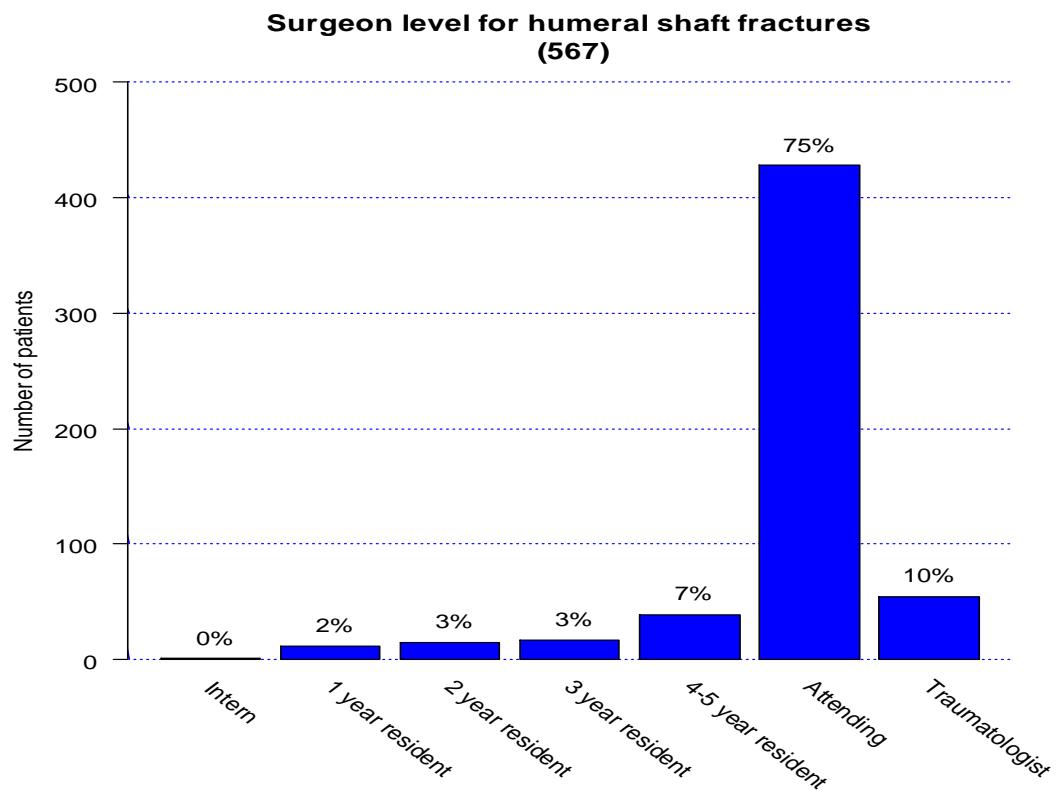
### Fracture classification for proximal humerus fractures (1710)

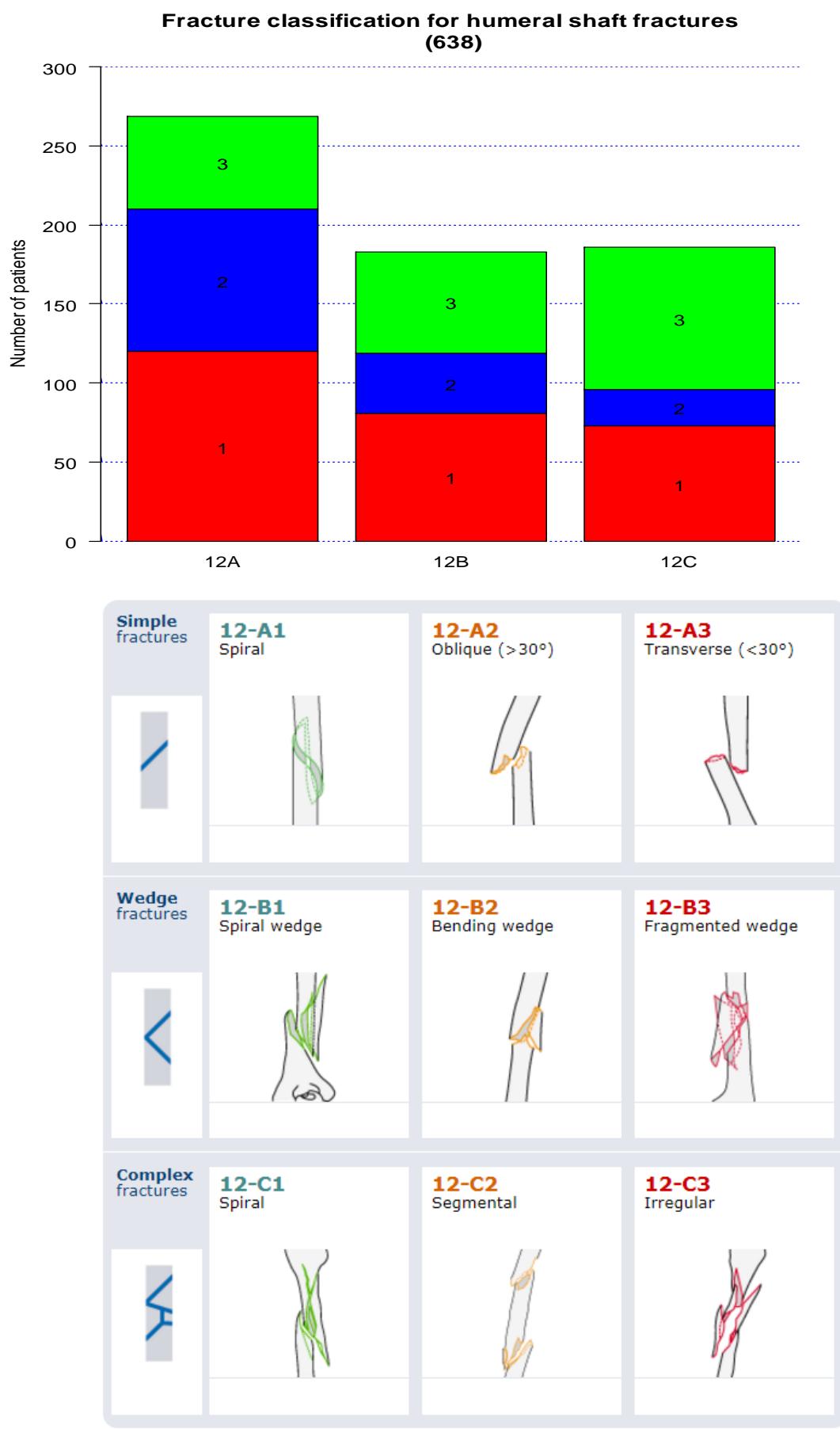


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# Humeral shaft

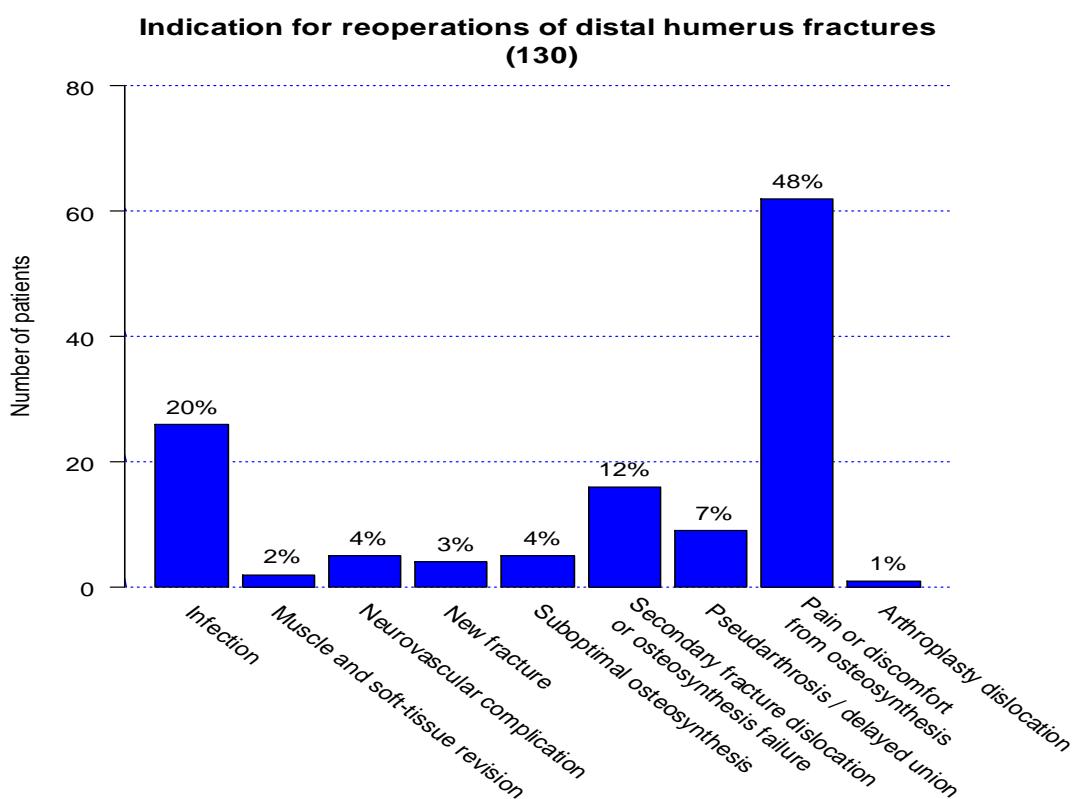
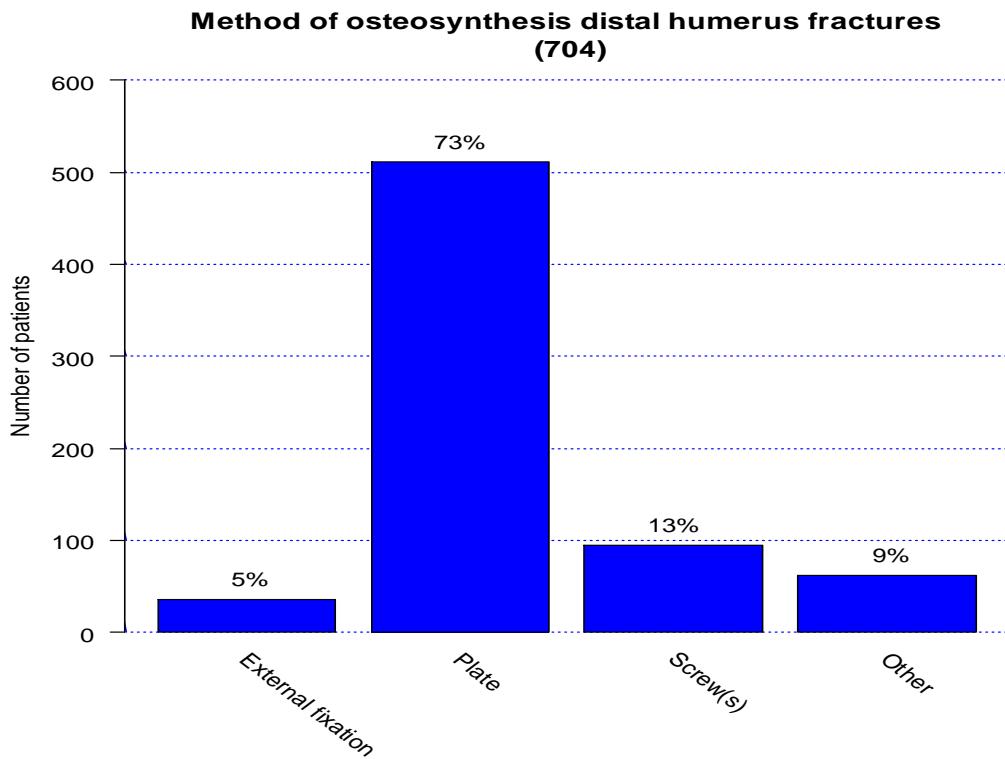


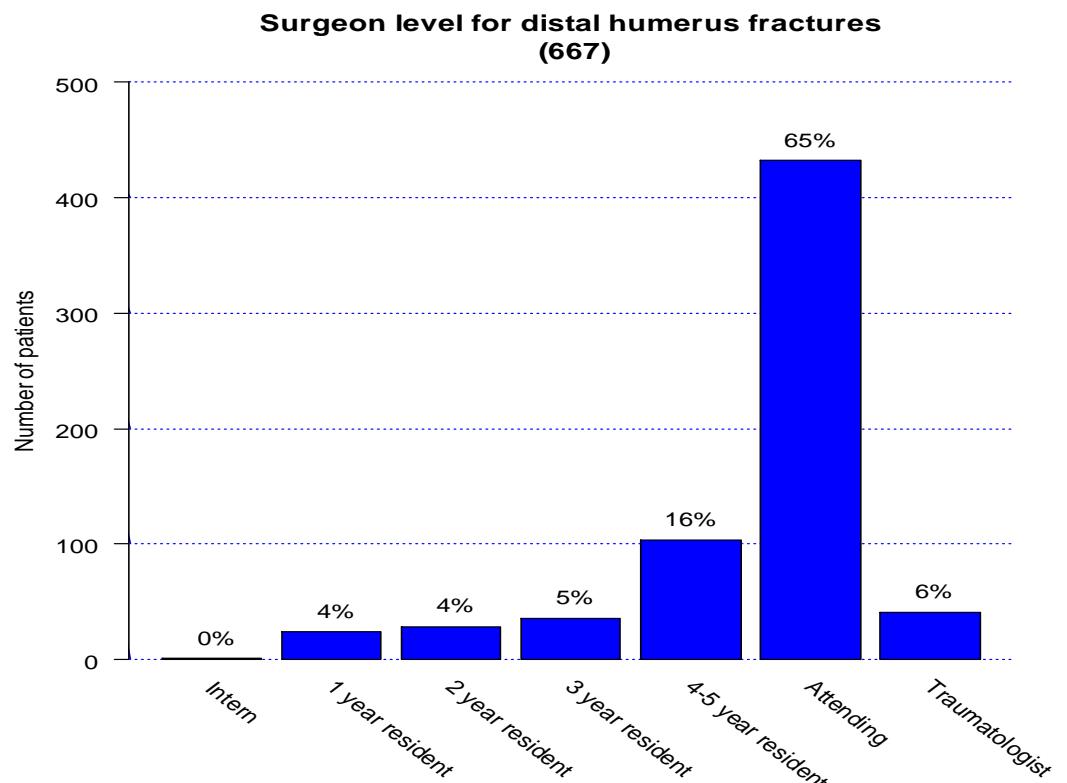




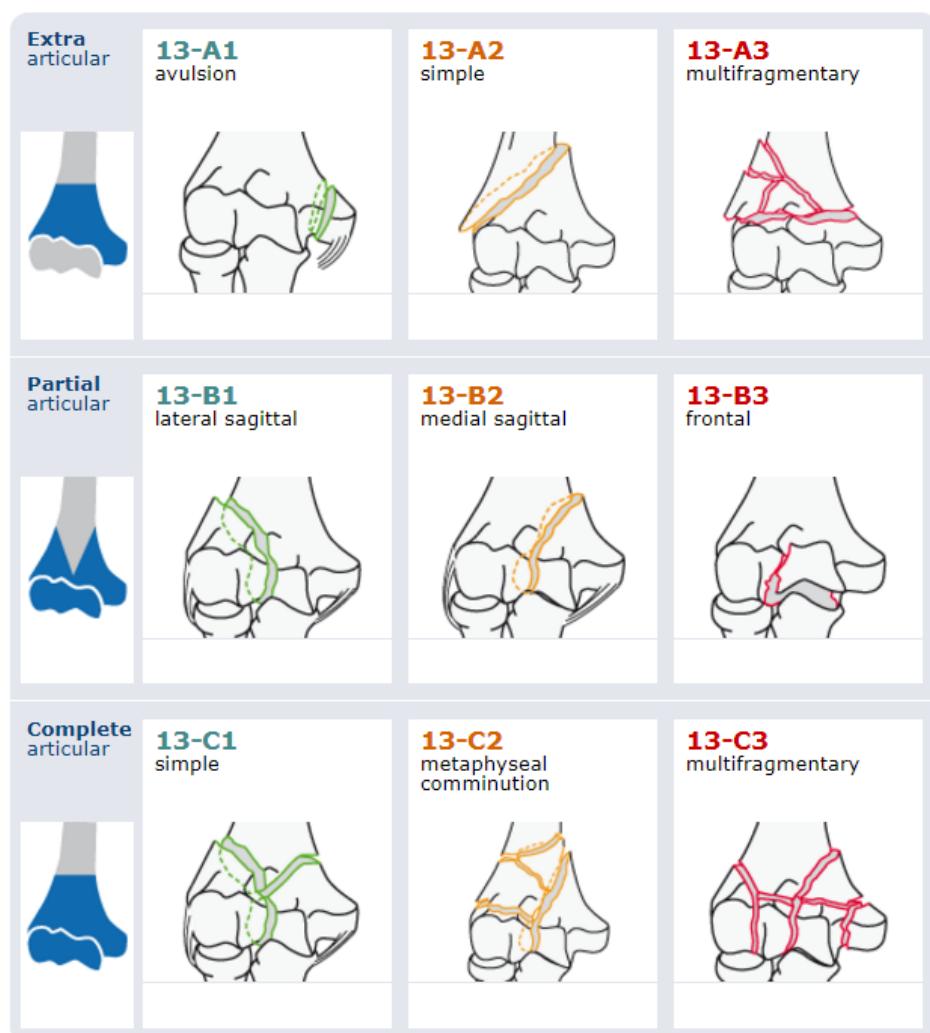
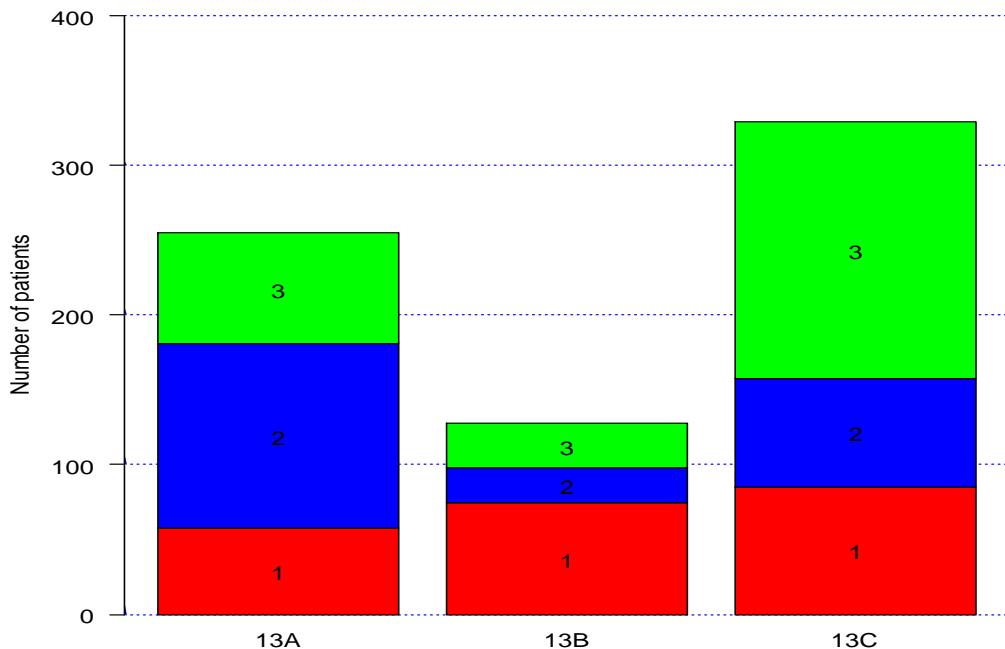
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# Distal Humerus



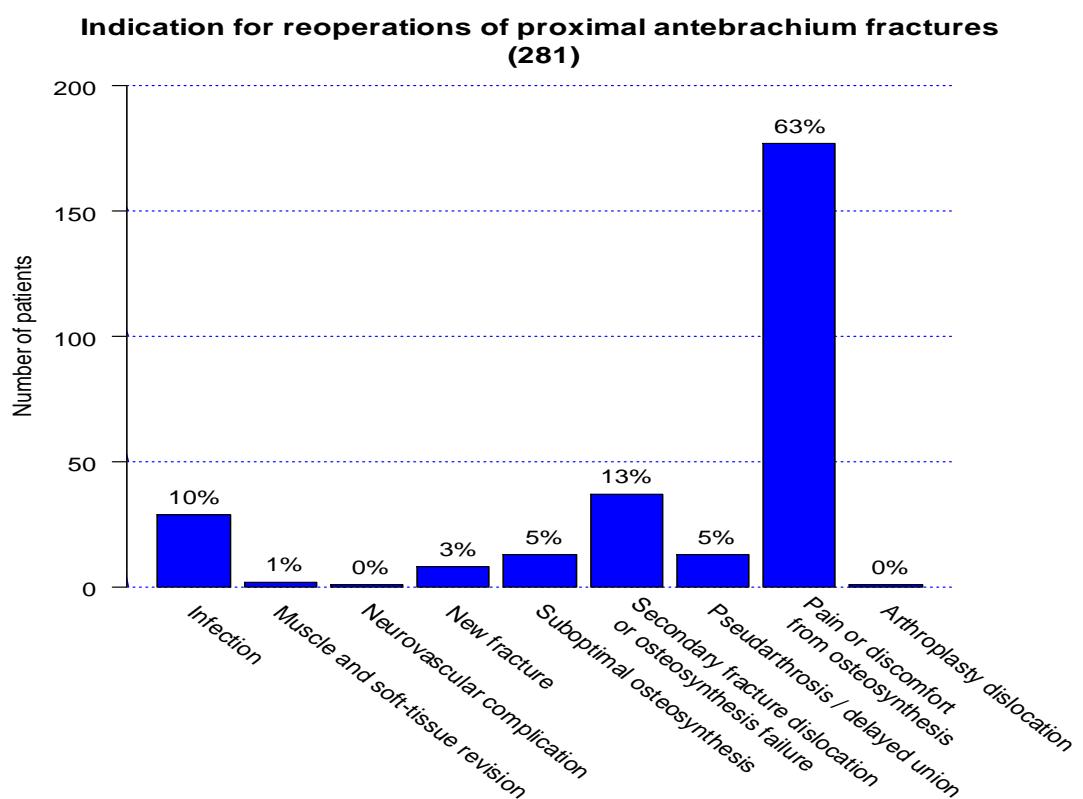
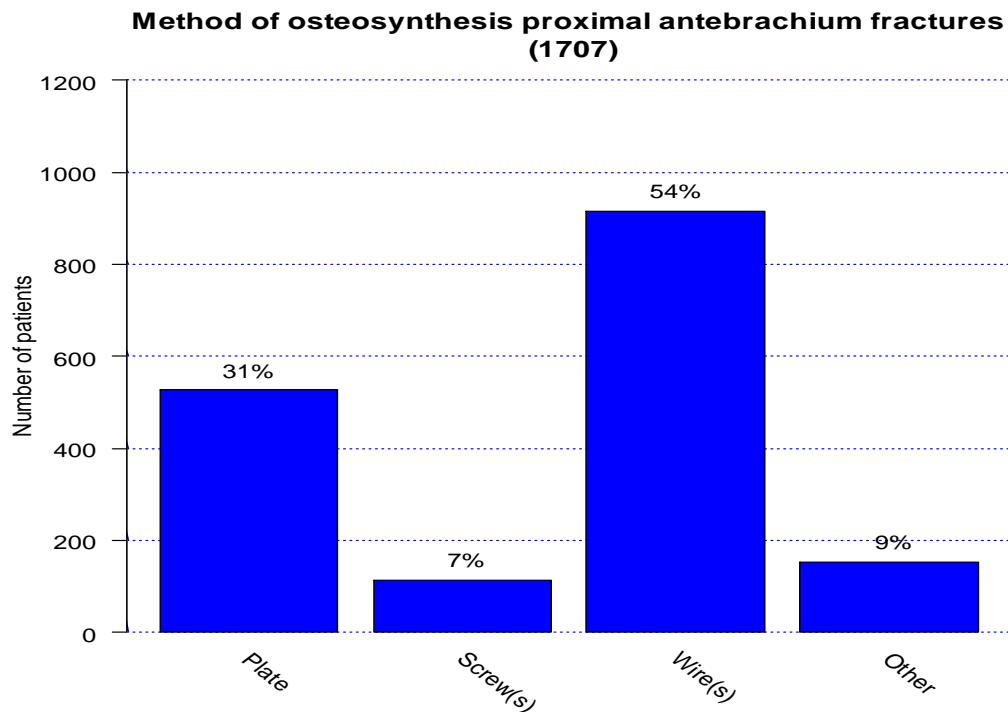


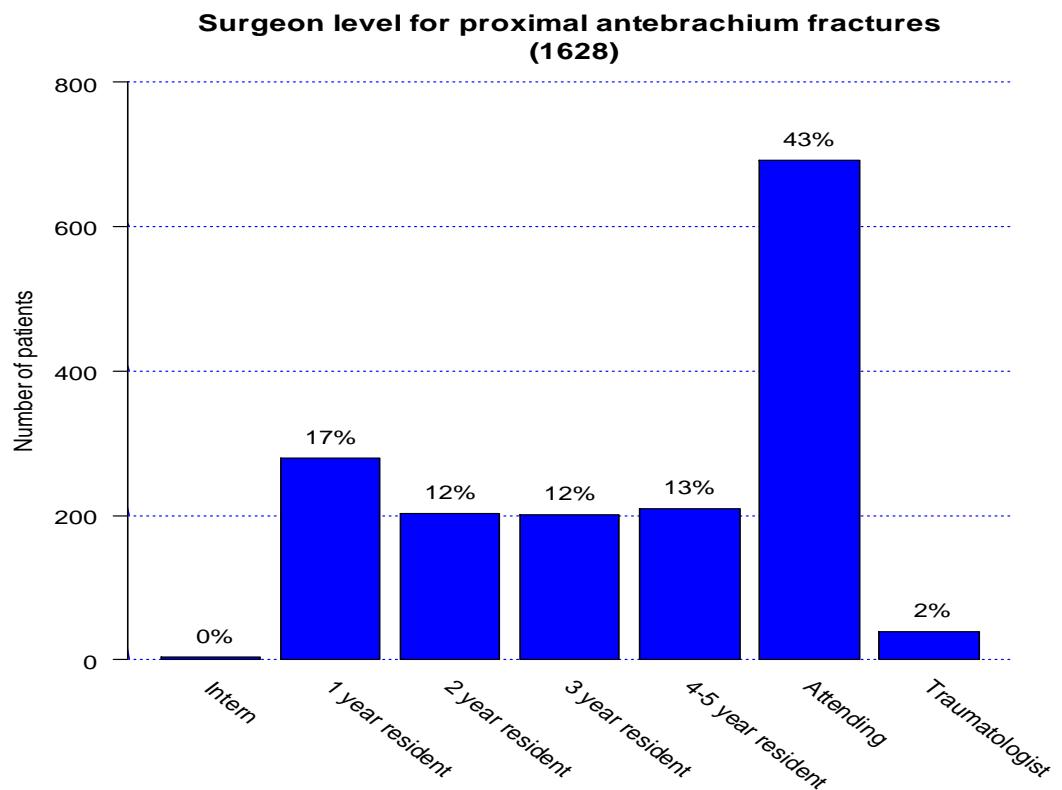
**Fracture classification for distal humerus fractures  
(712)**



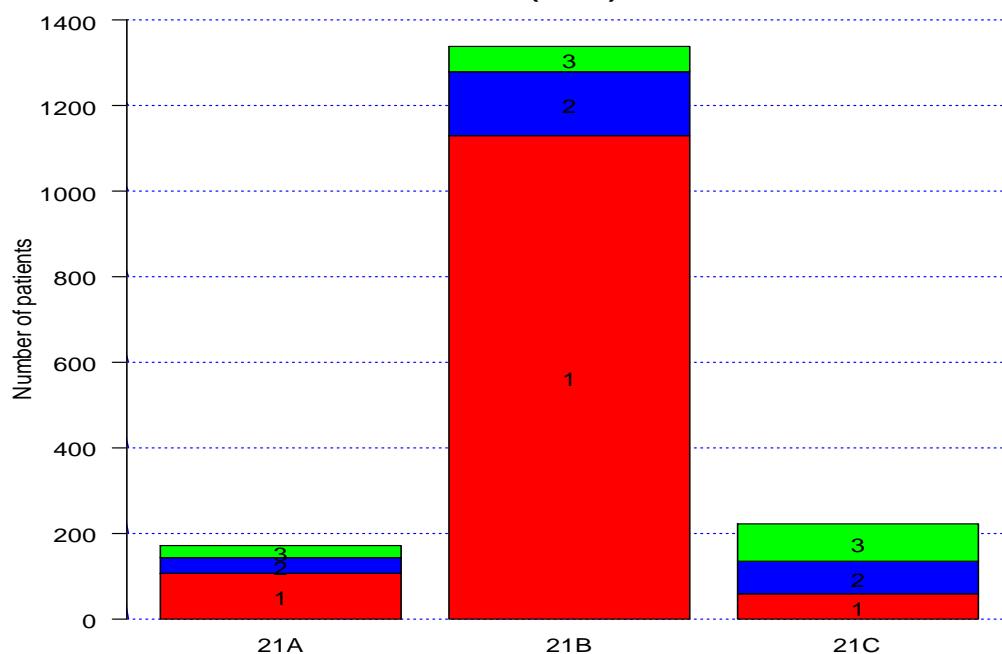
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## Proximal antebrachium



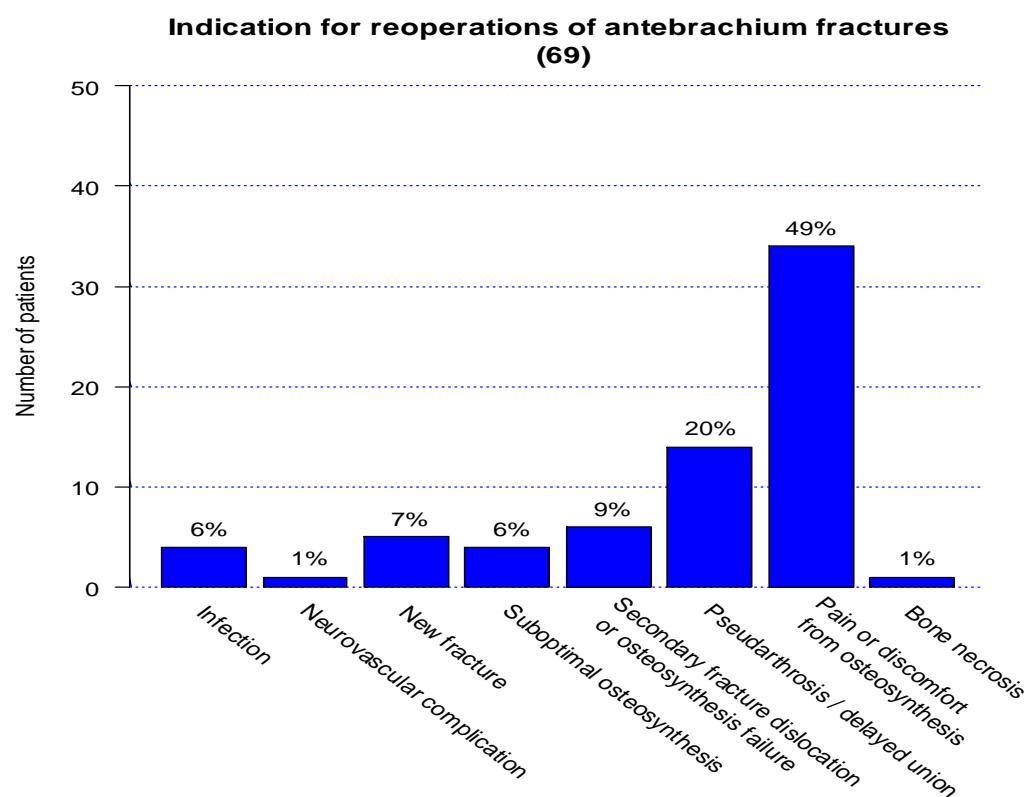
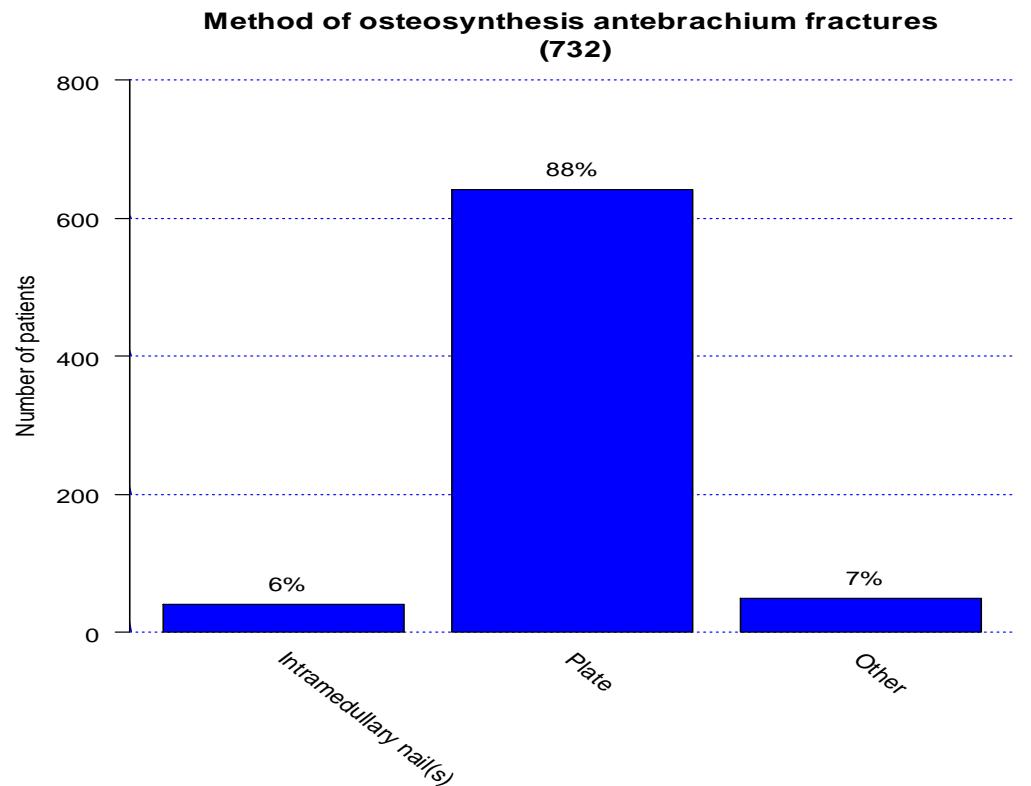


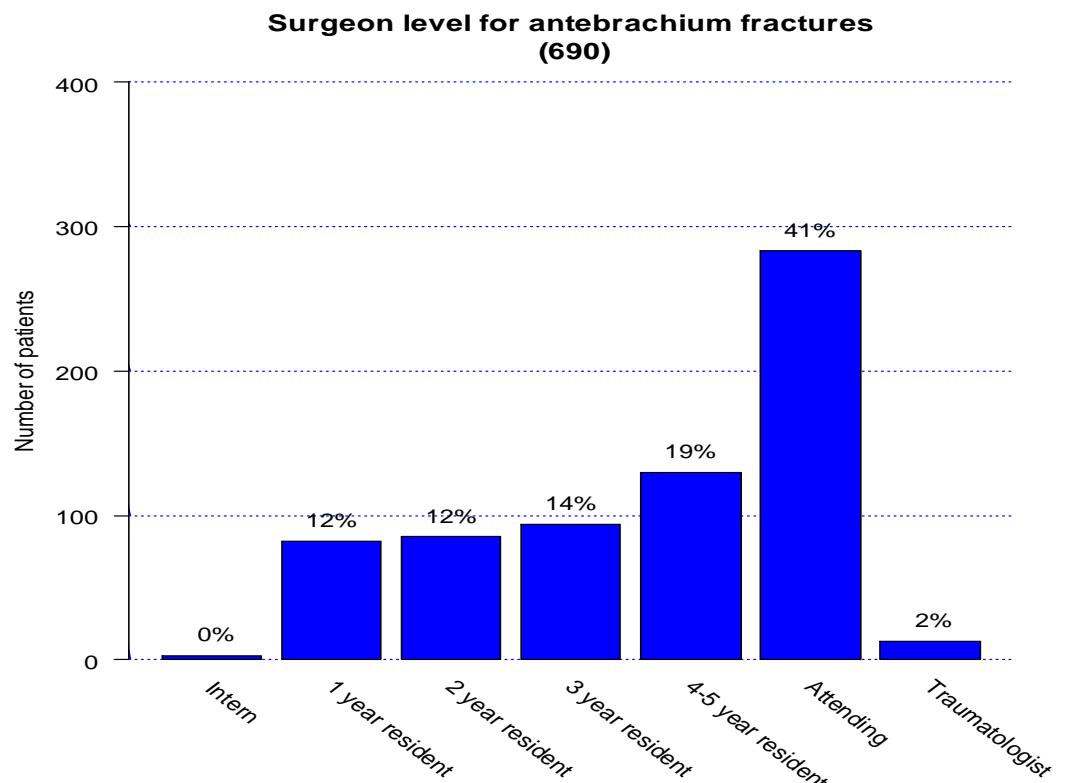
**Fracture classification for proximal antebrachium fractures  
(1732)**

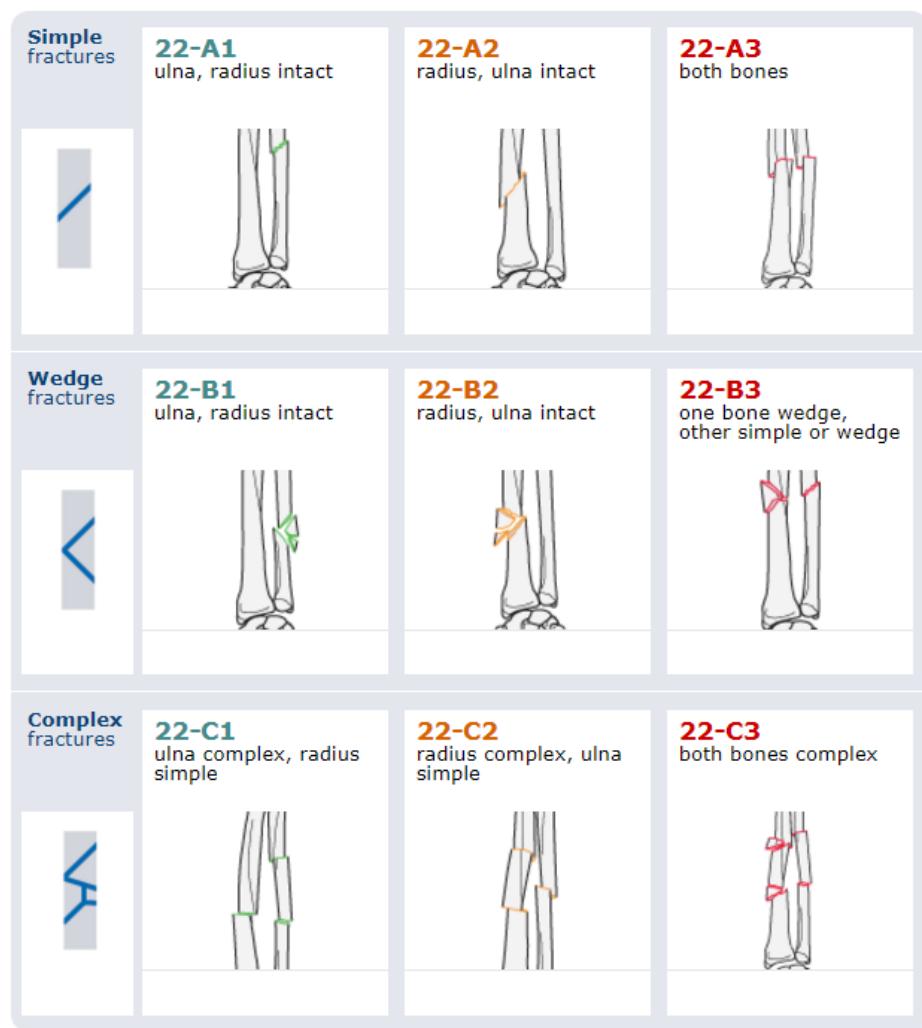
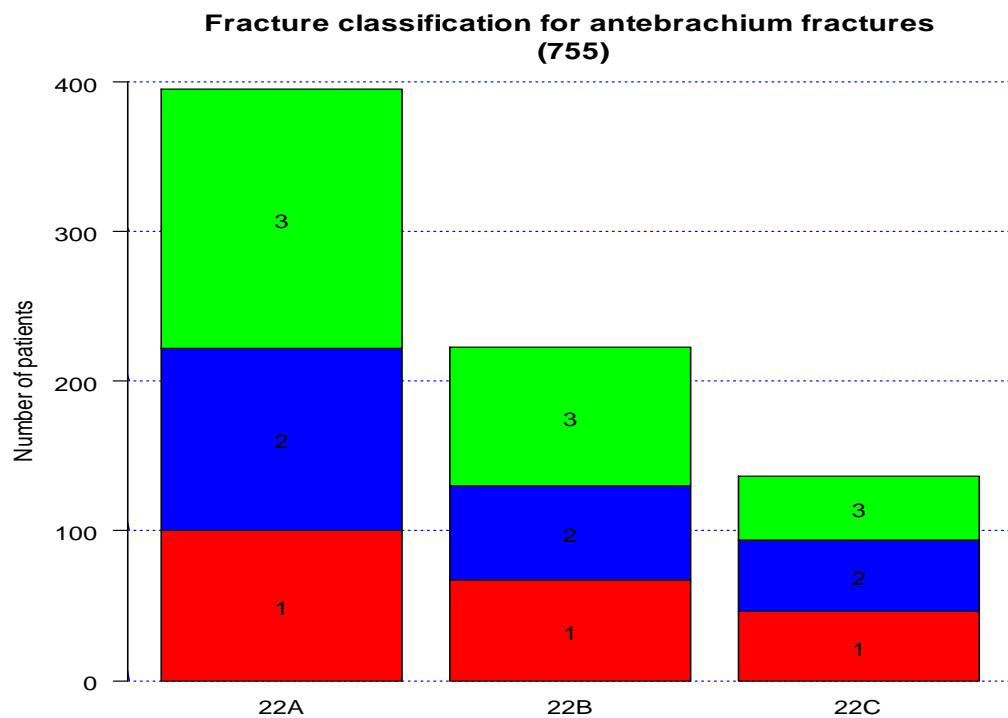


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# Antebrachium

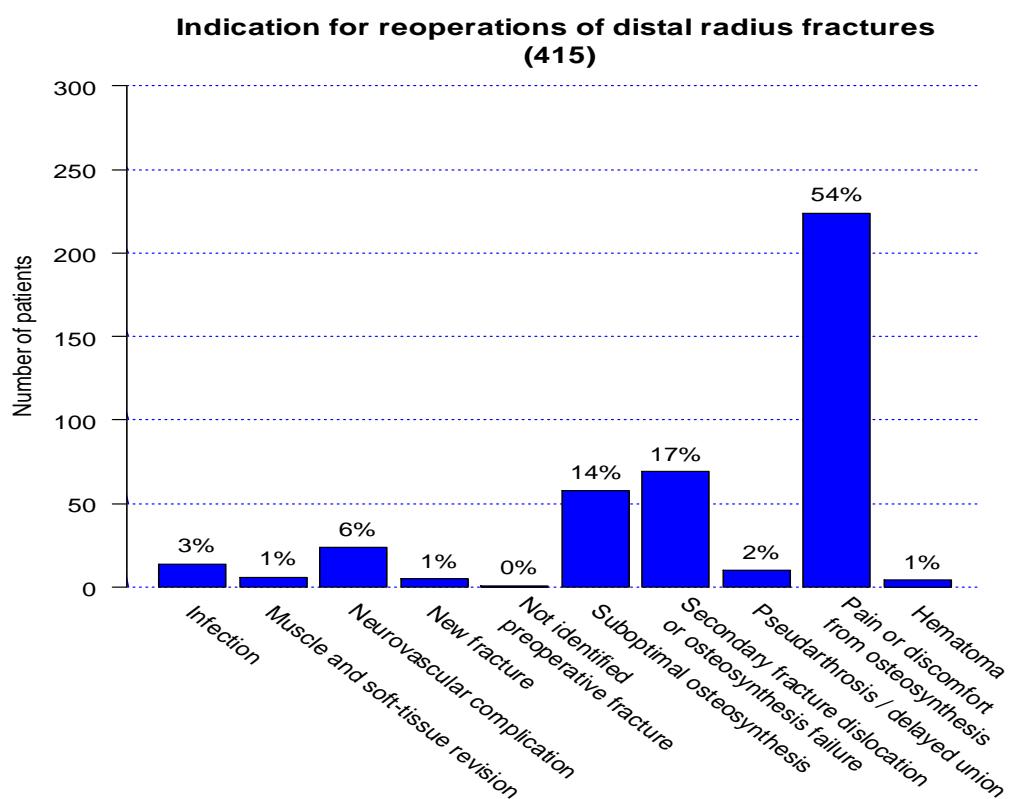
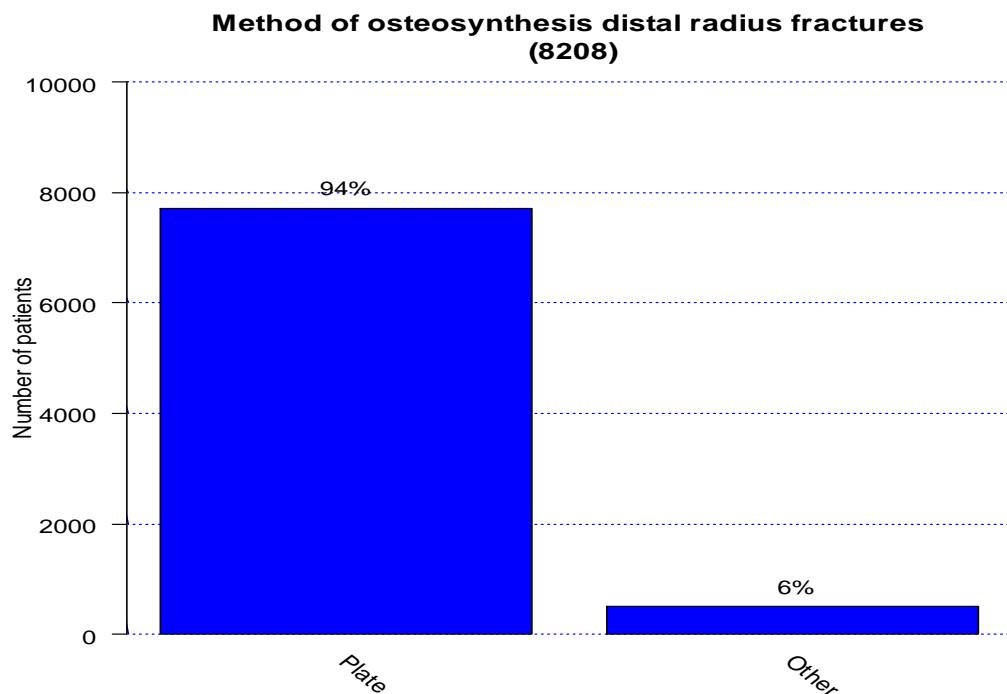


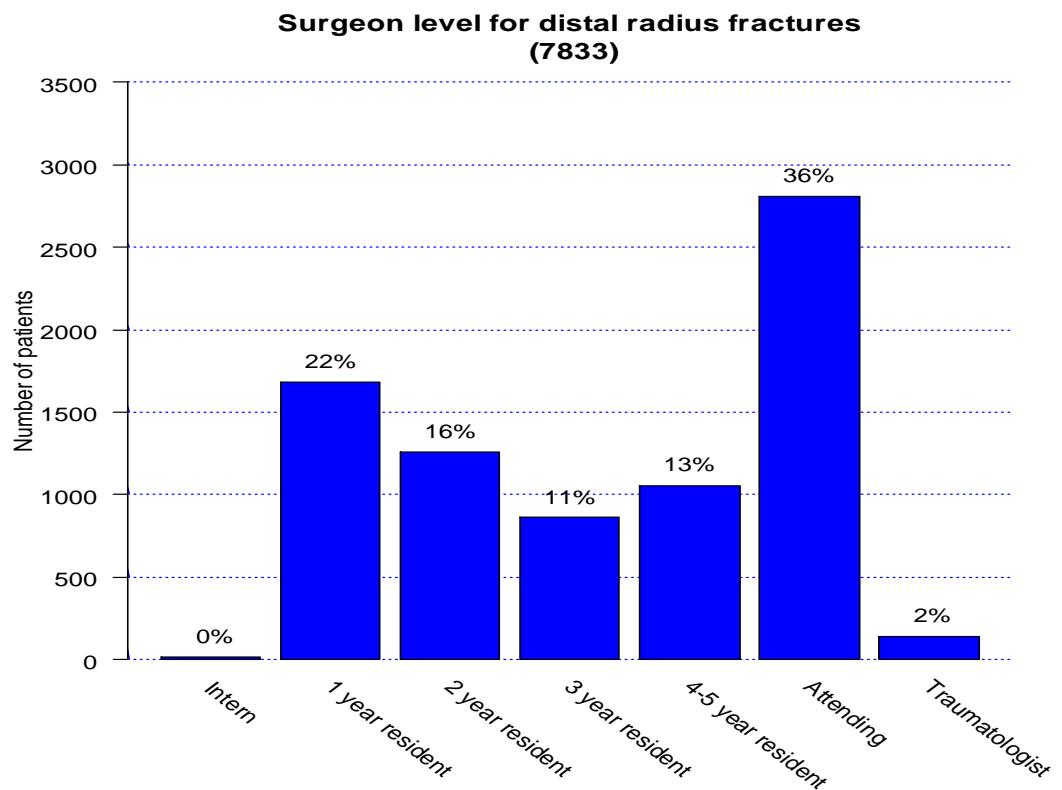


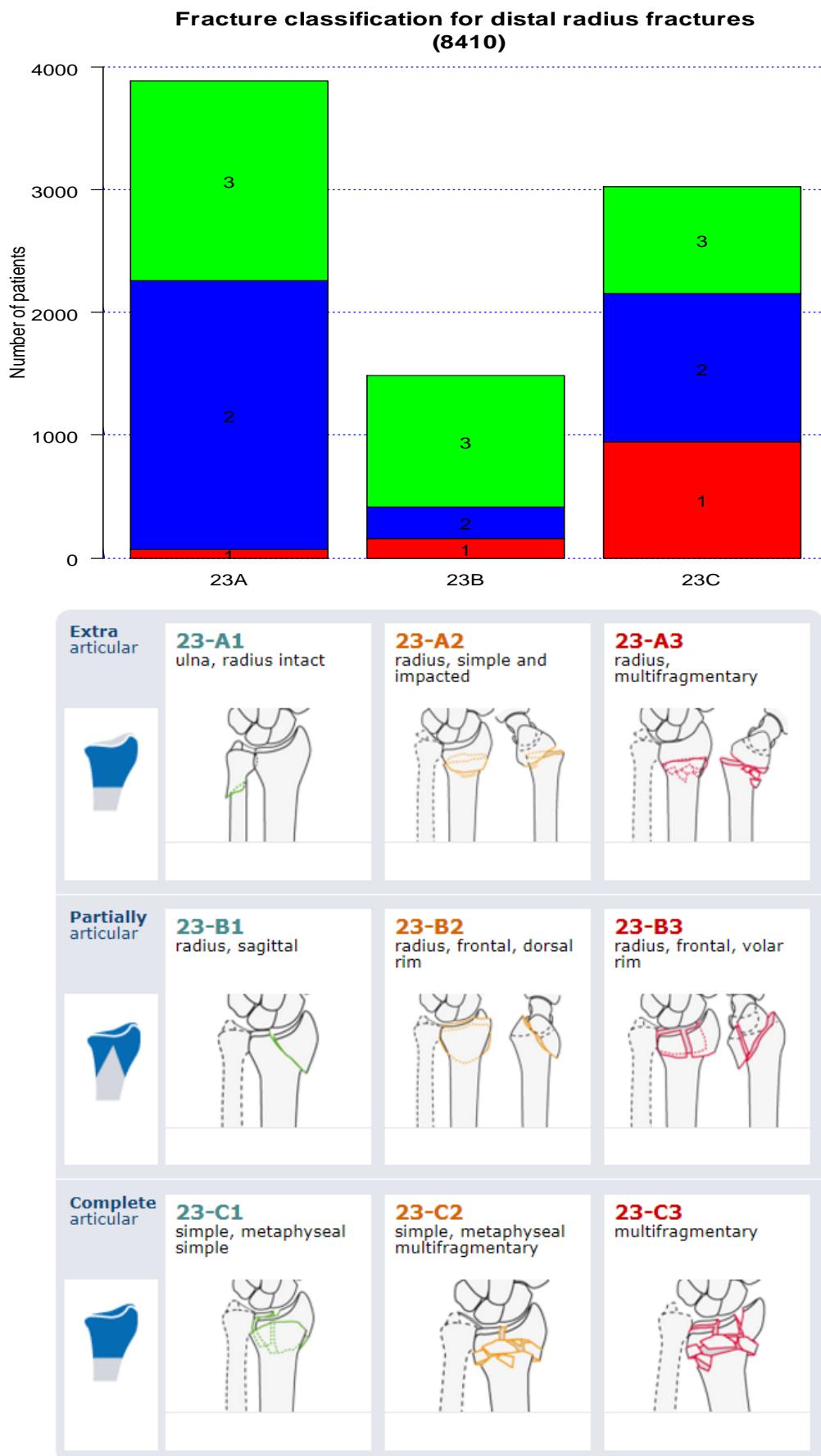


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## Distal radius

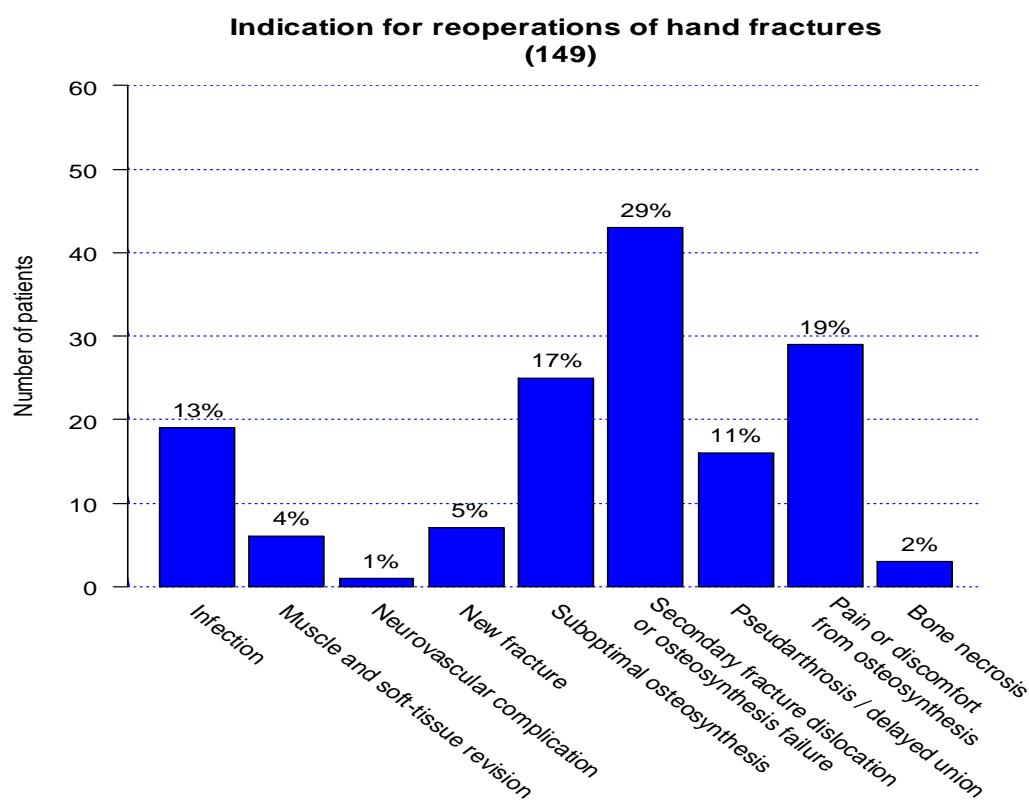
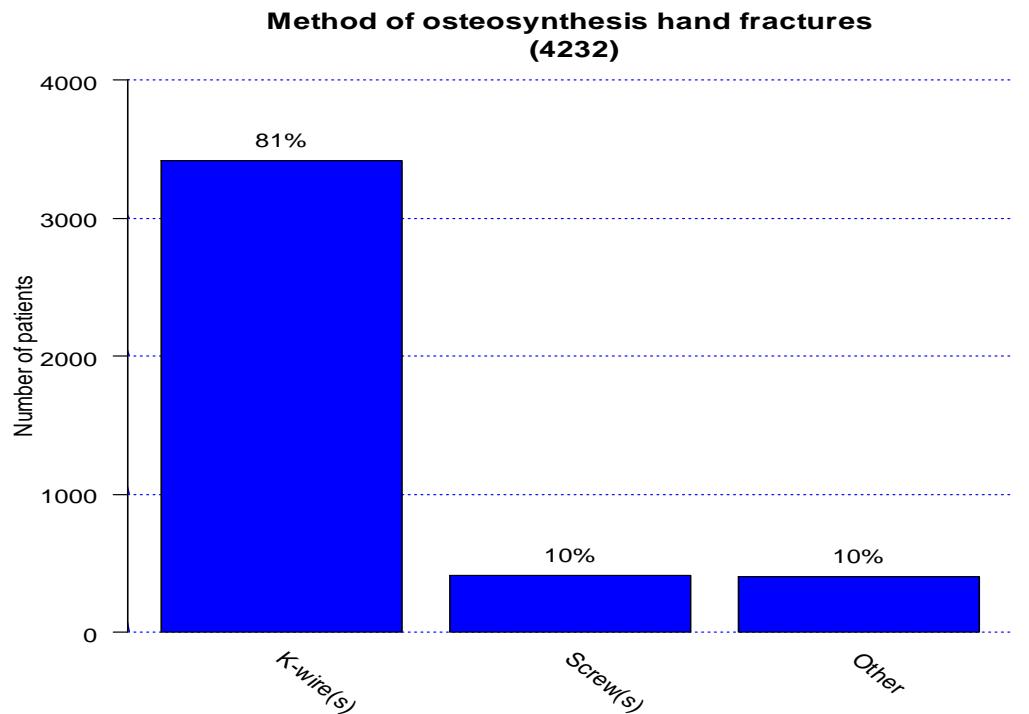


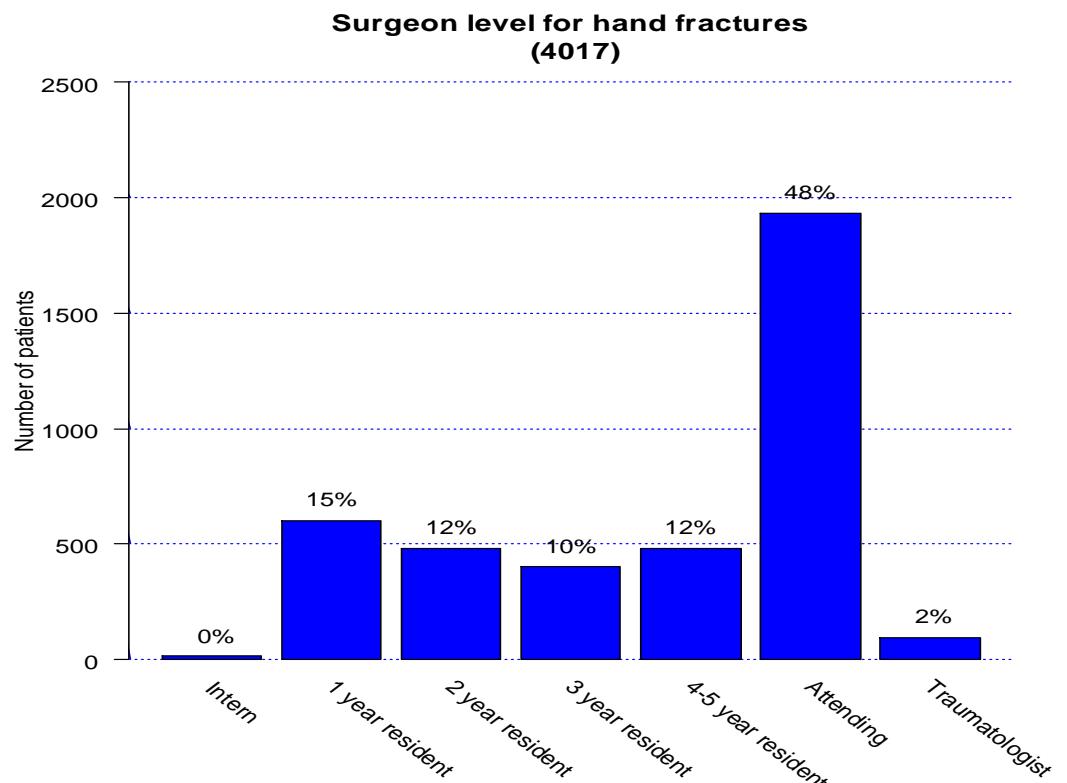


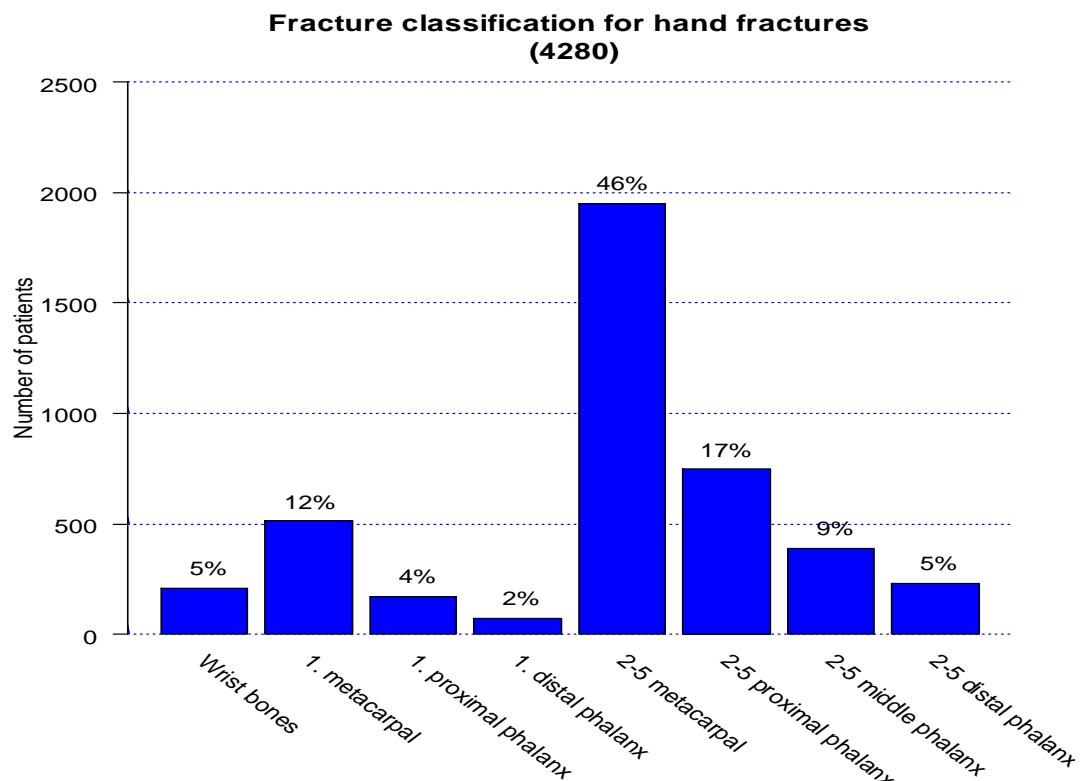


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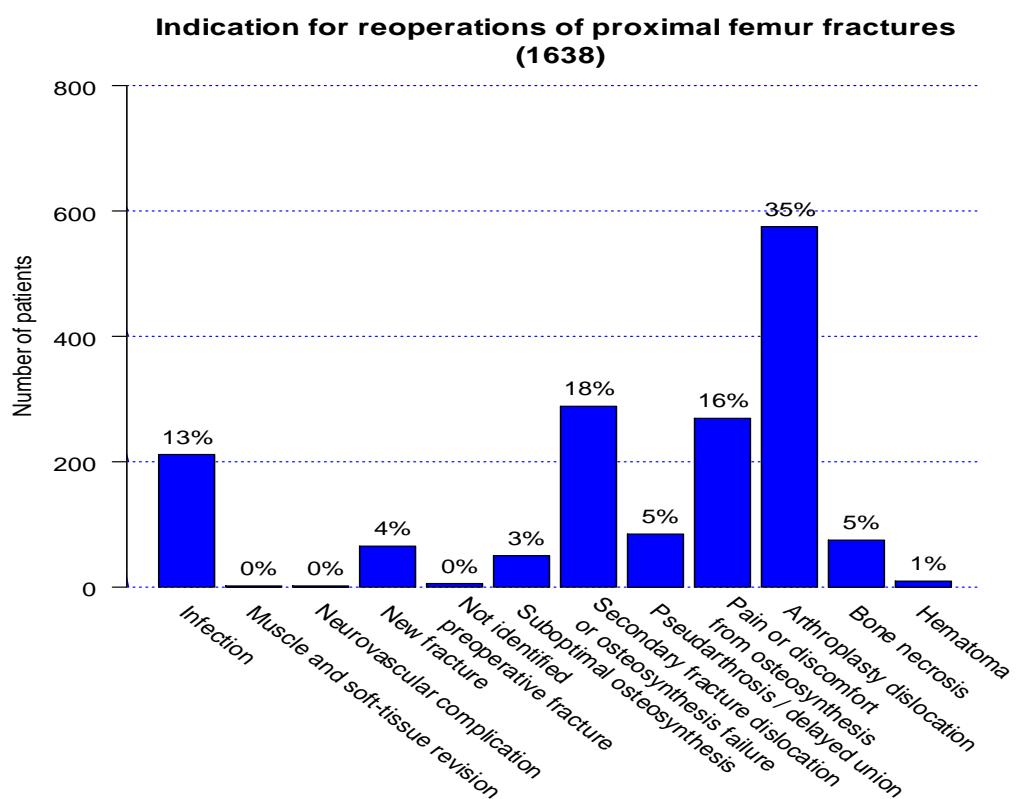
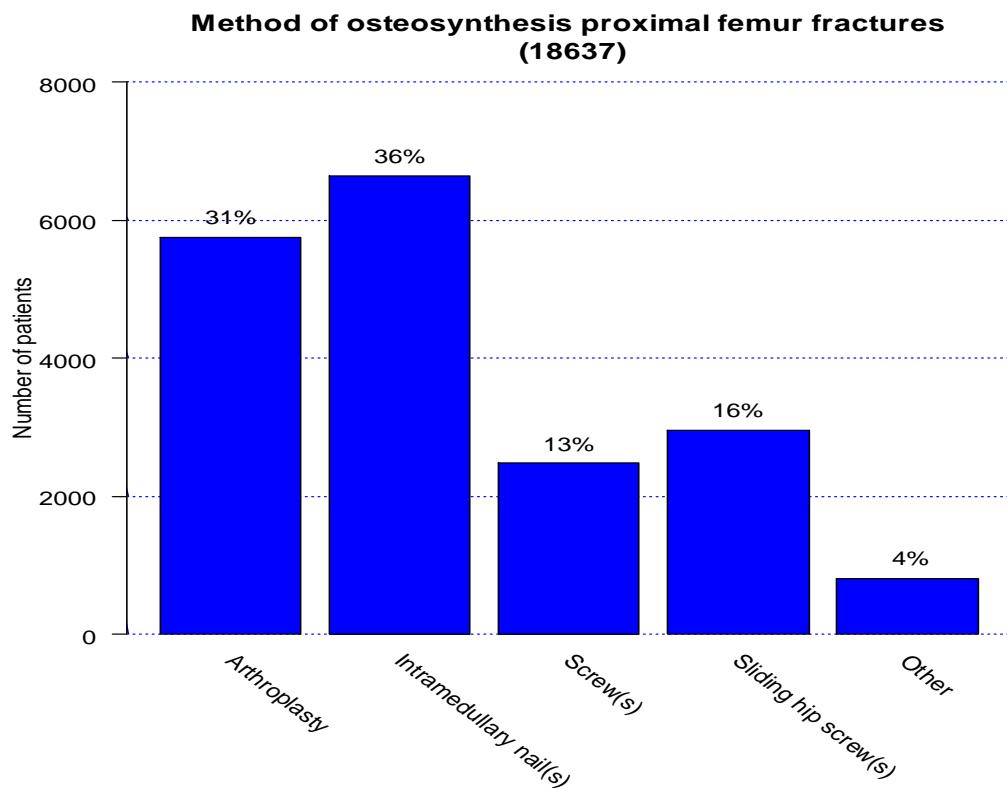
# Hand

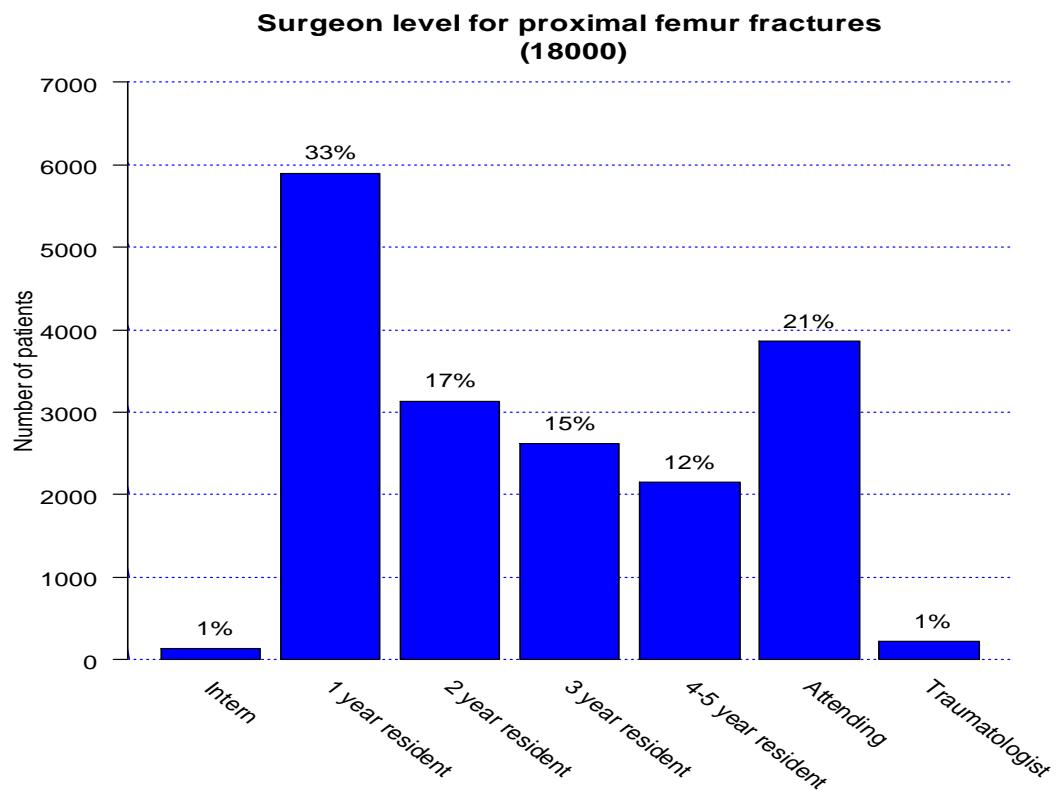


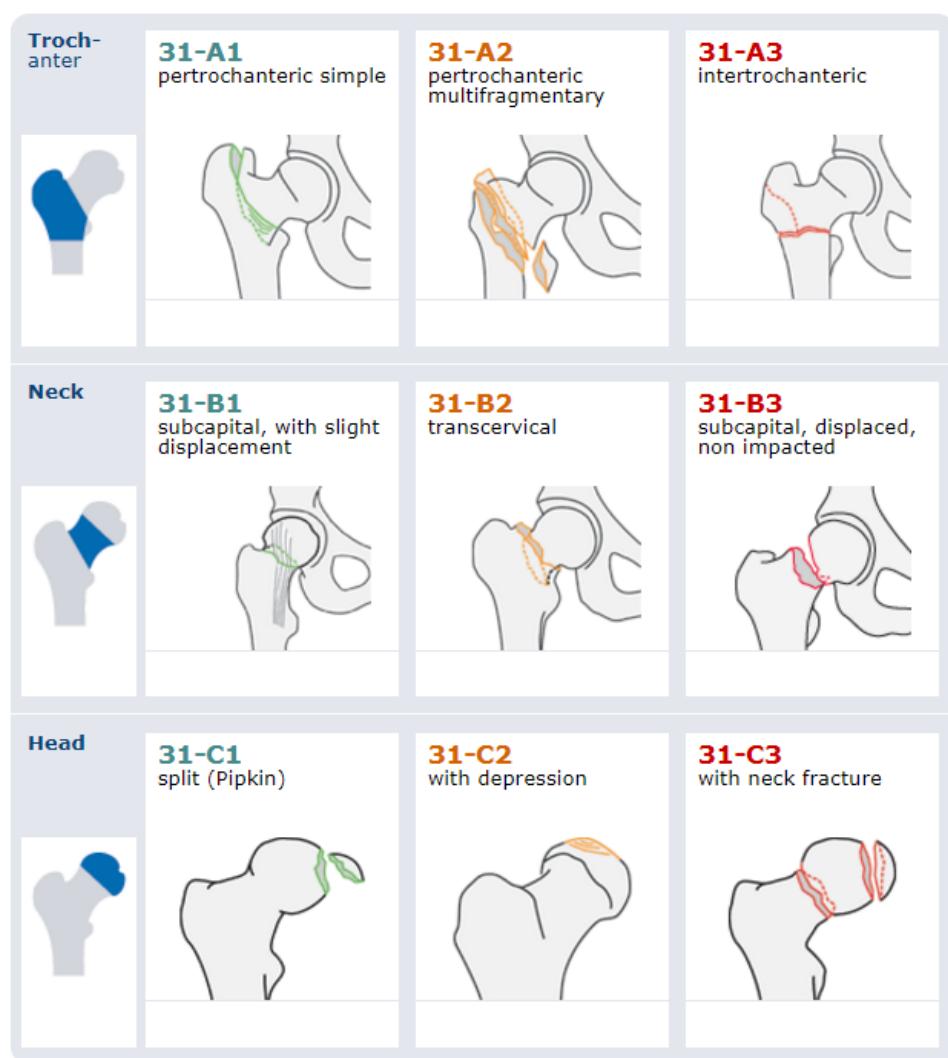
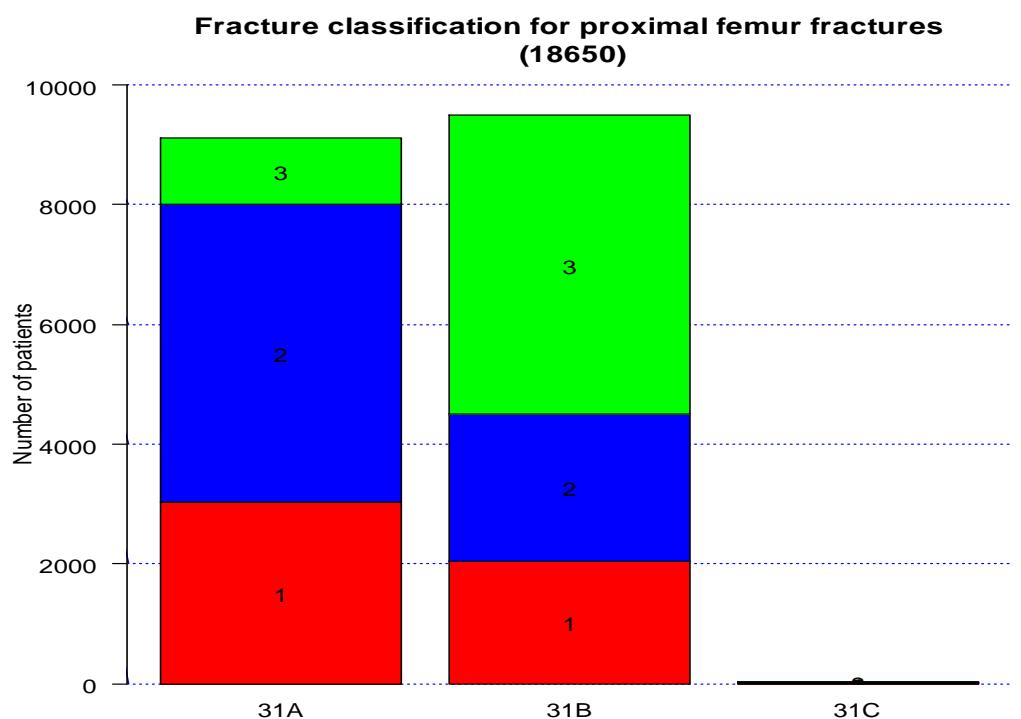




## Proximal femur

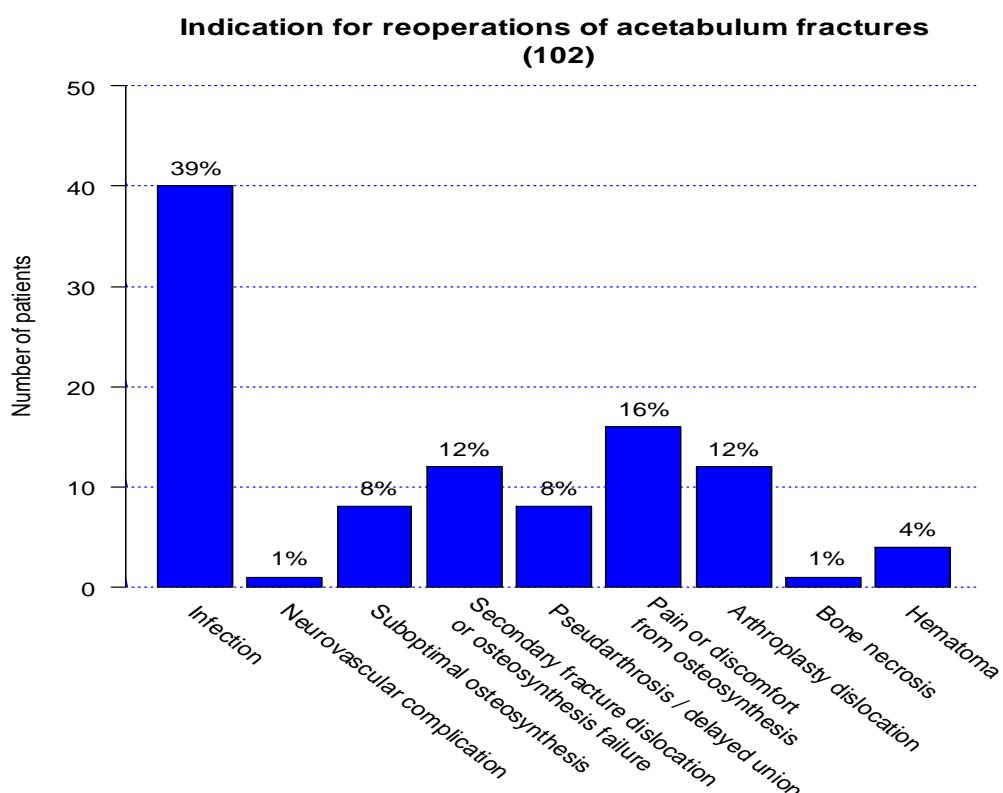
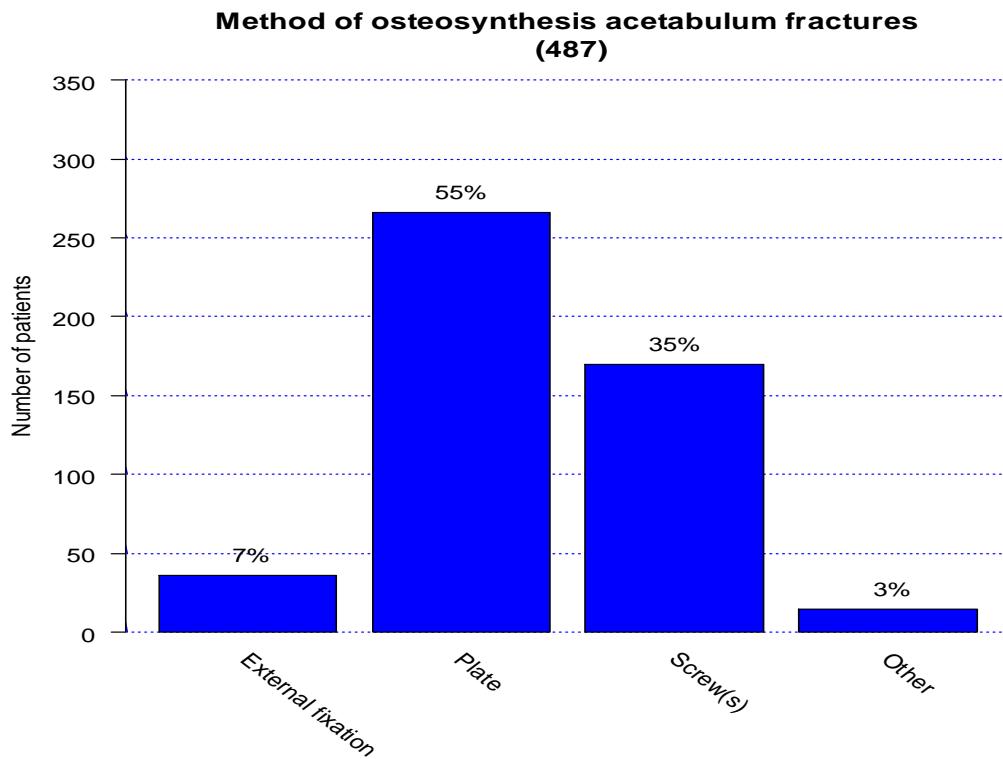


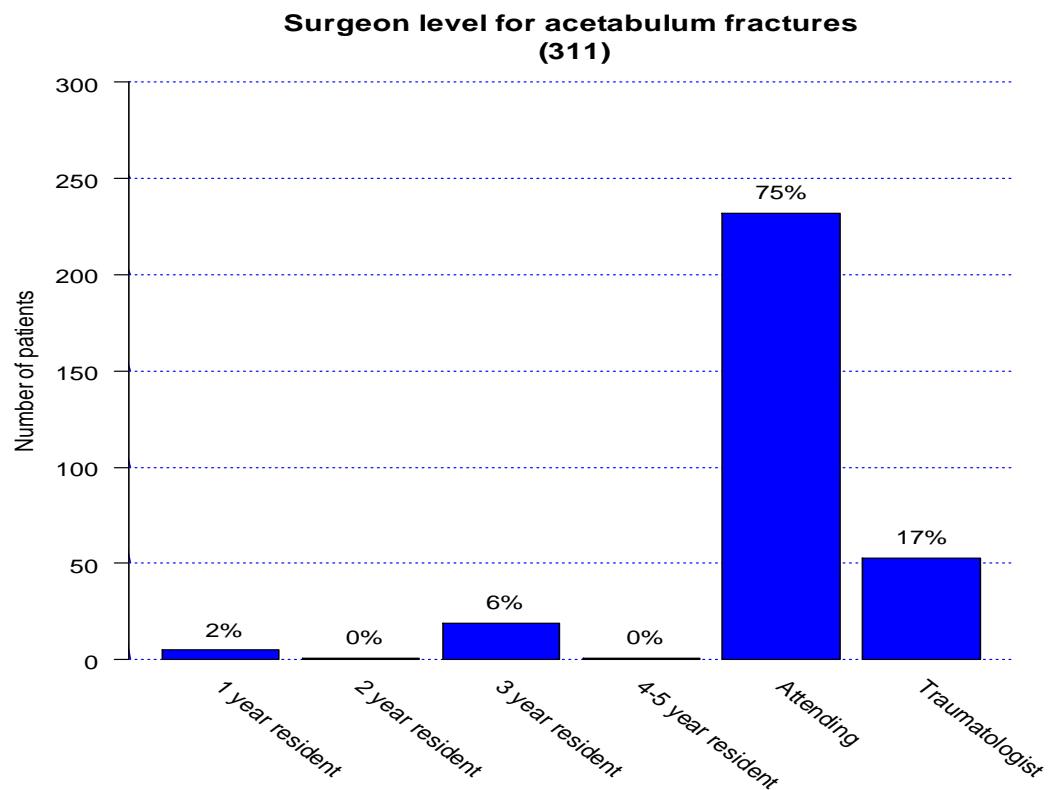


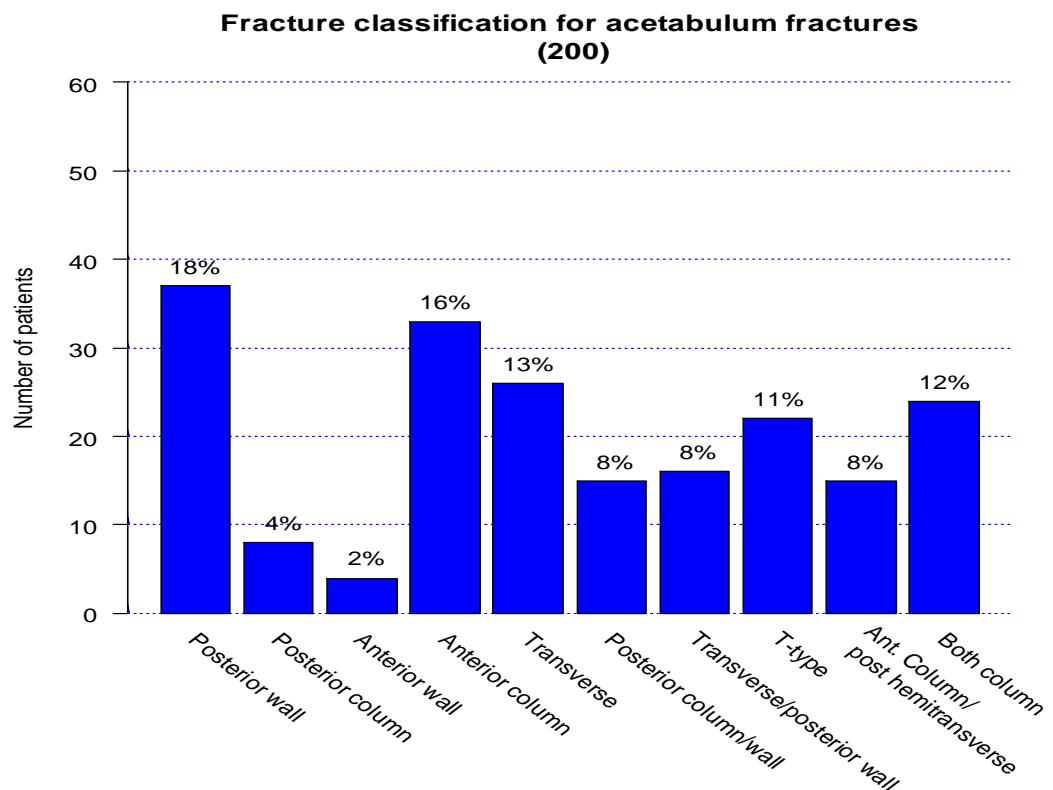


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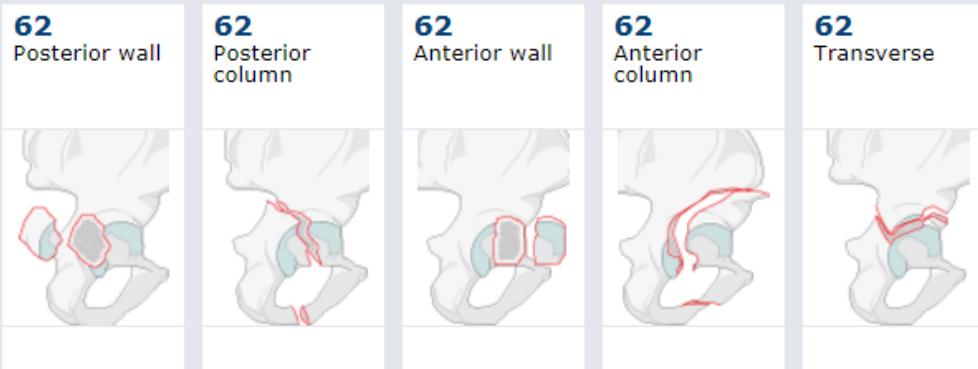
# Acetabulum



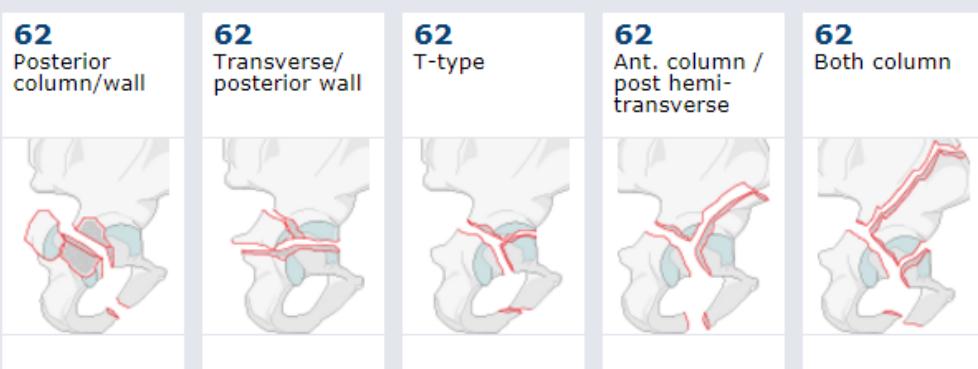




#### Elemental fracture types

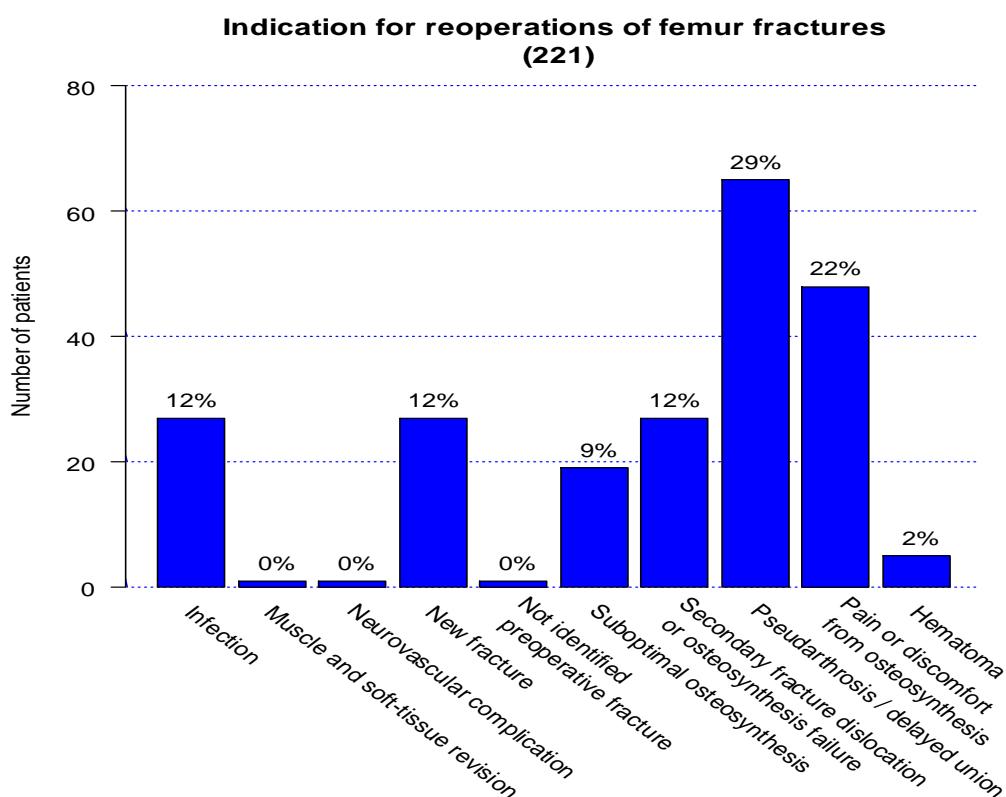
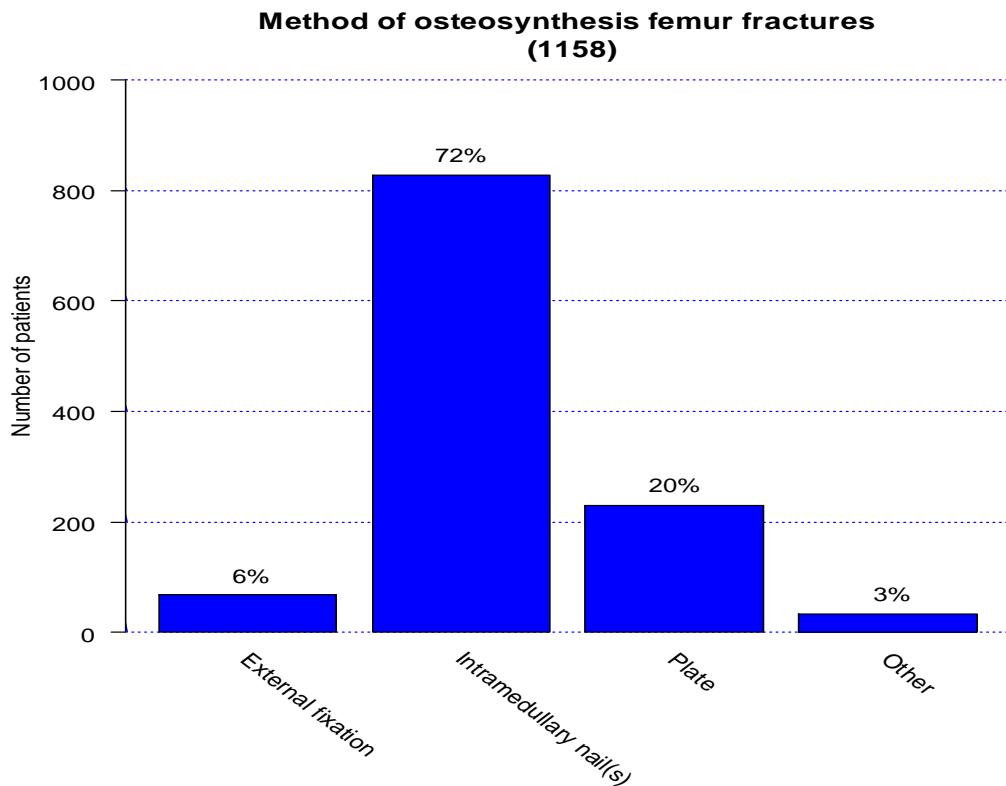


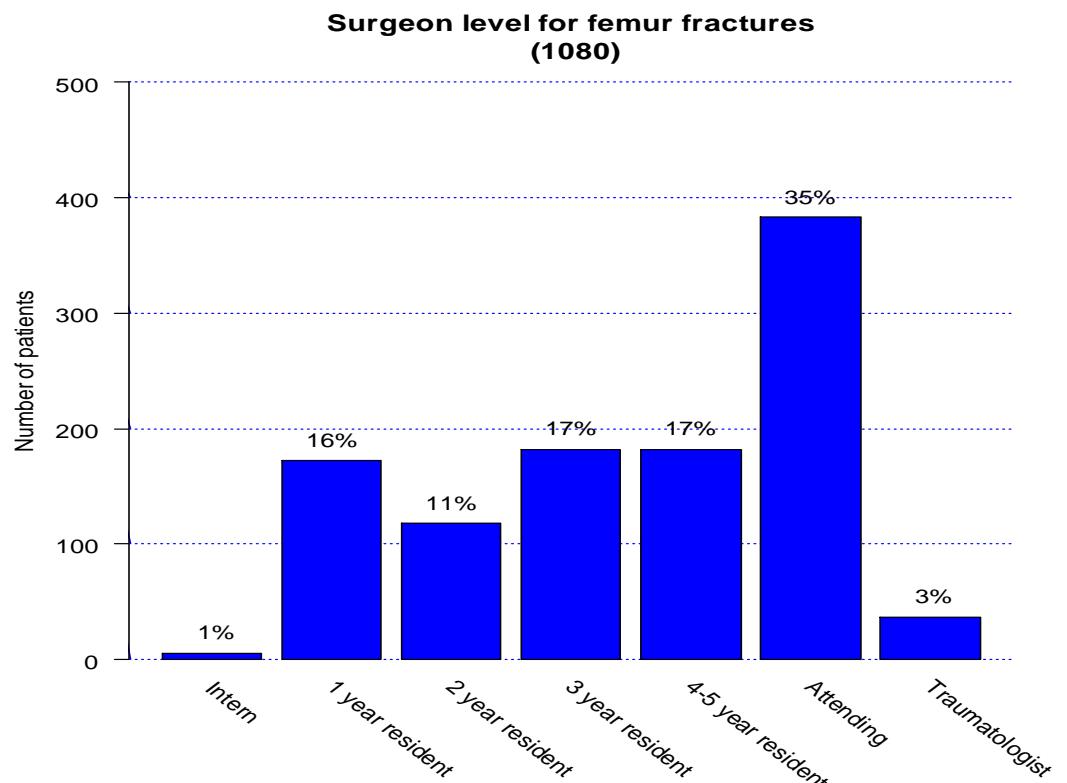
#### Associated fracture types

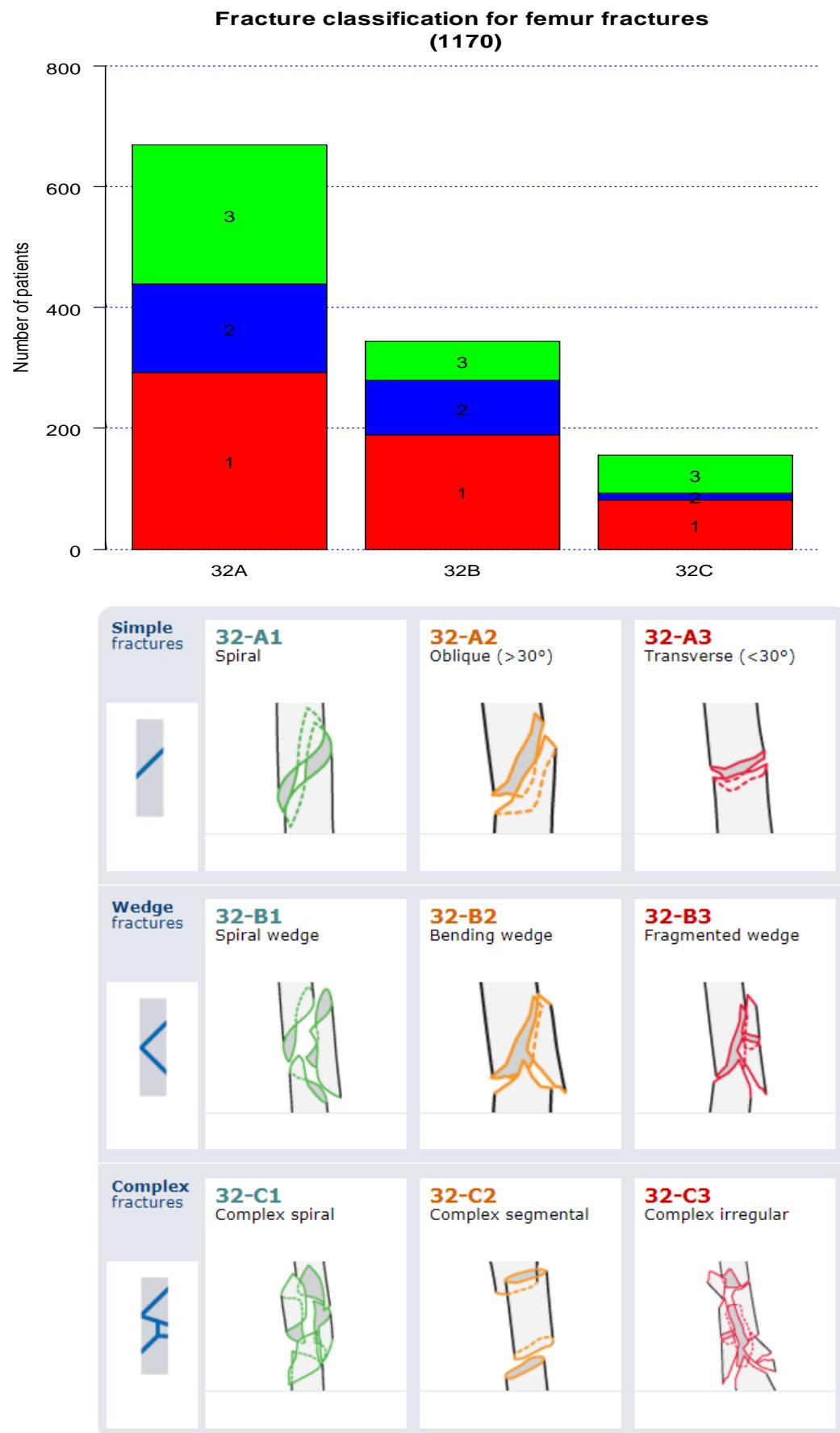


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# Femur

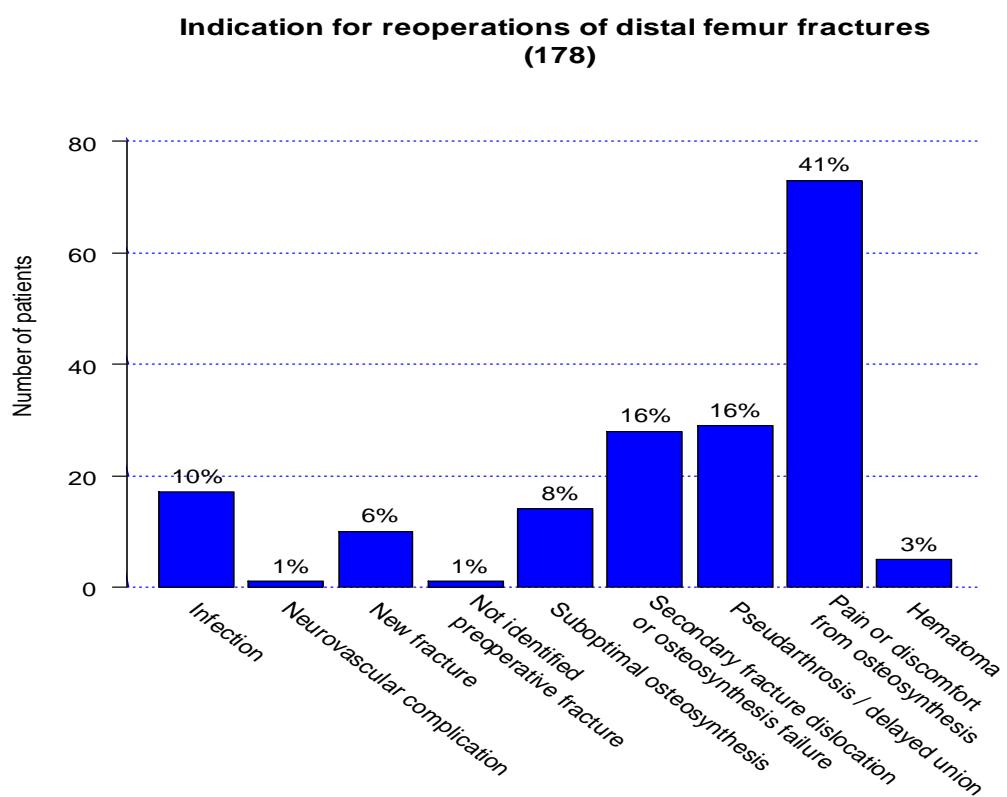
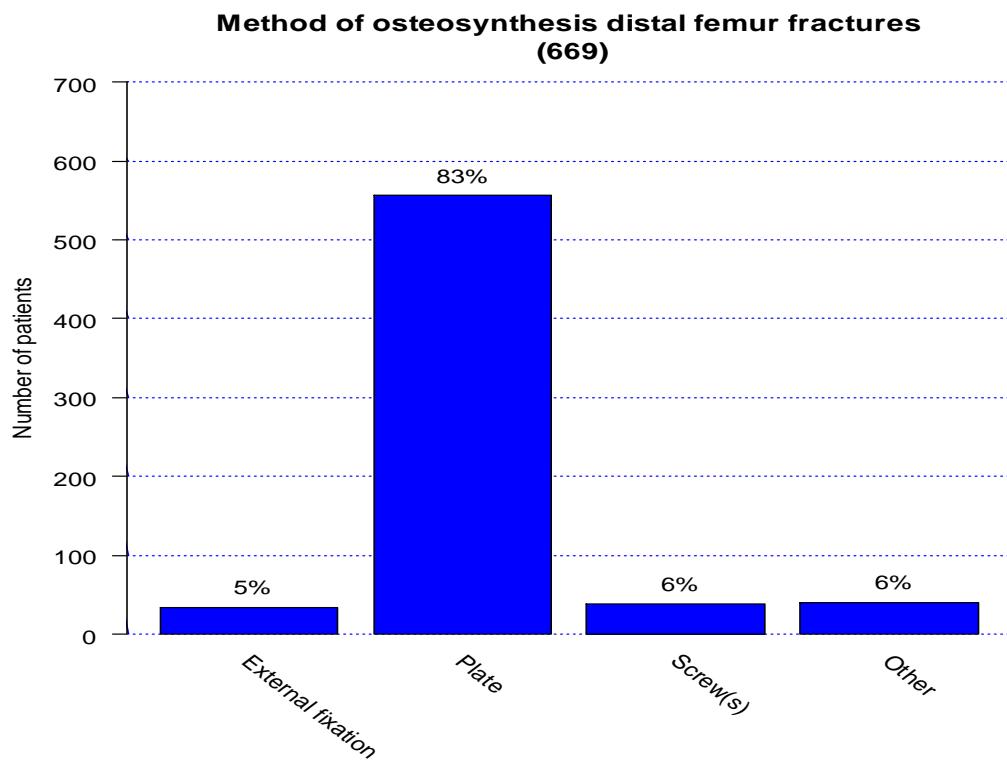


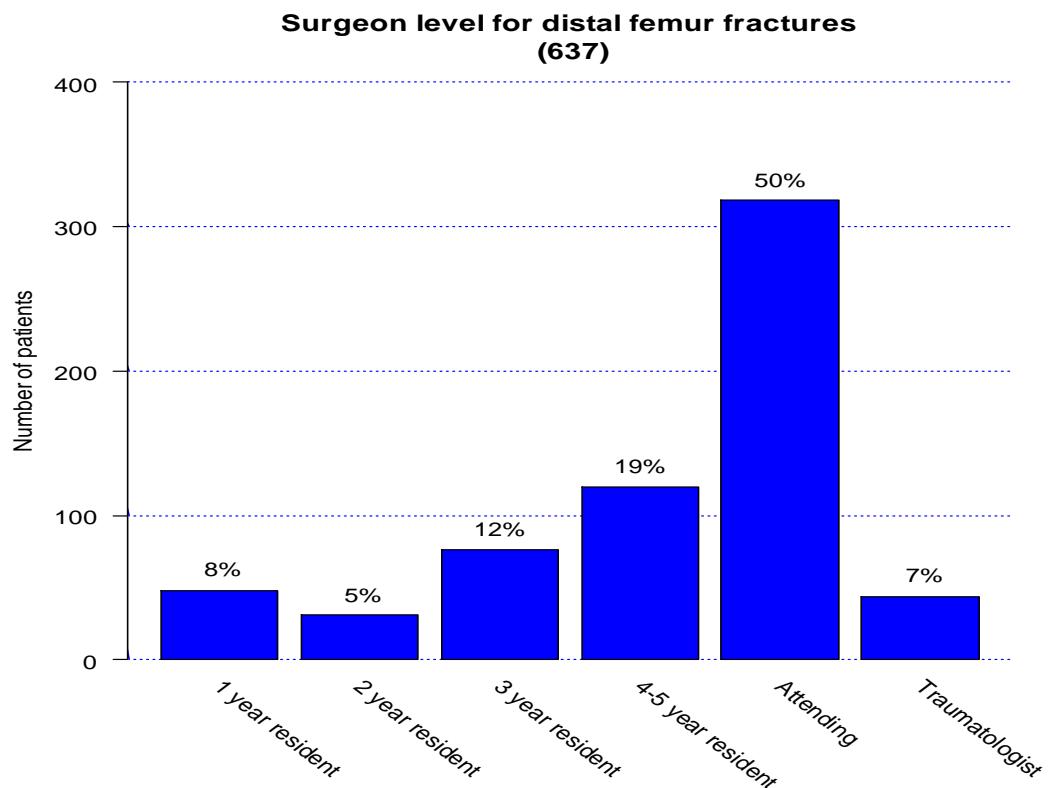


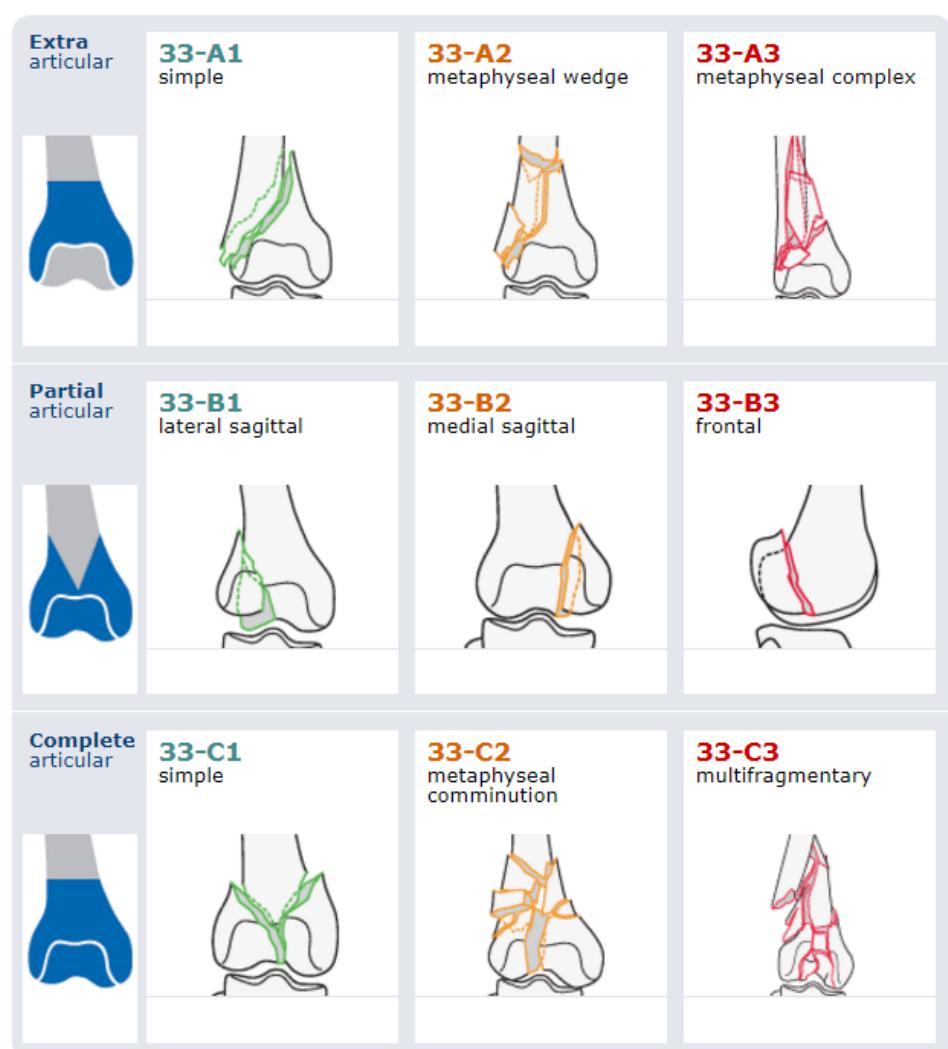
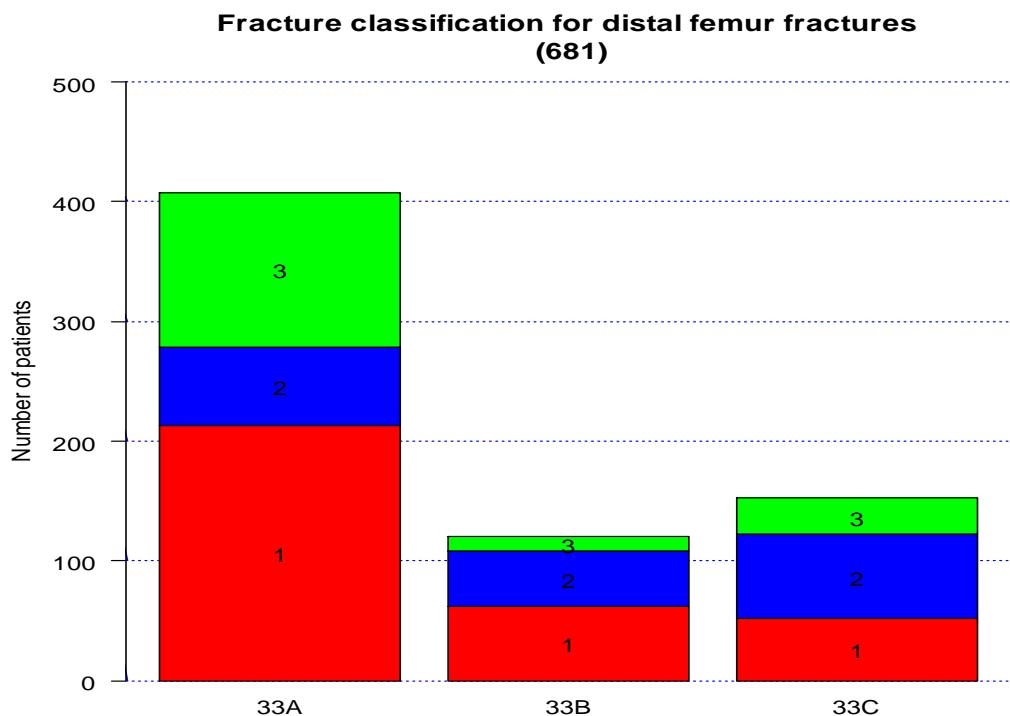


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## Distal femur

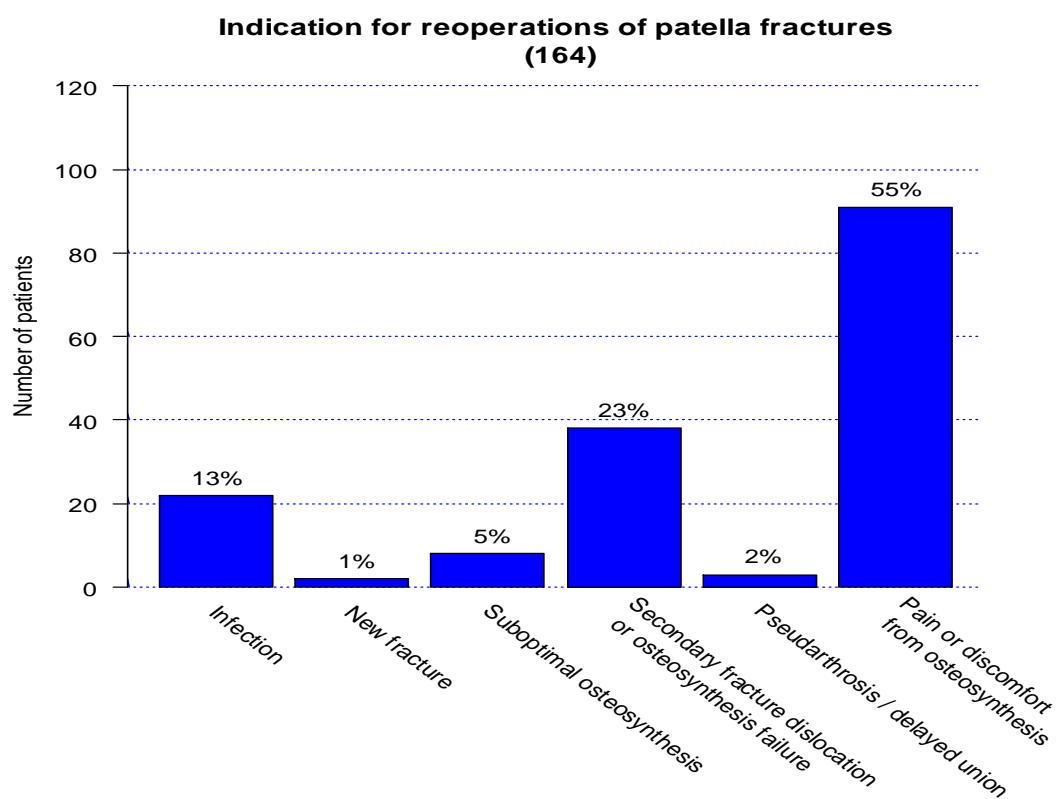
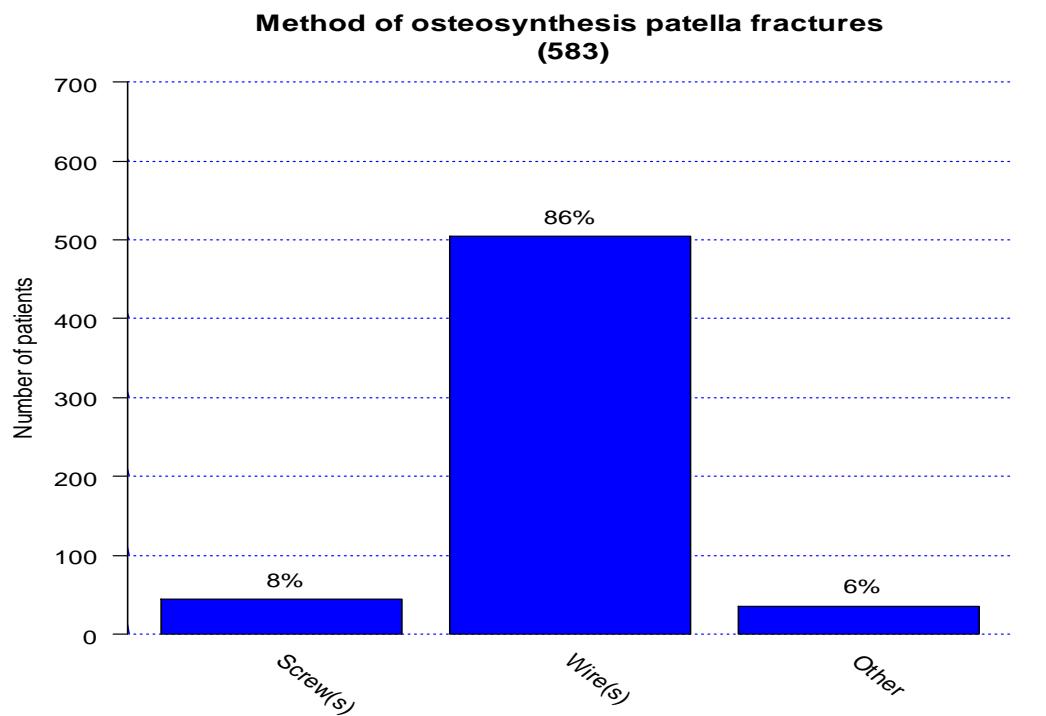


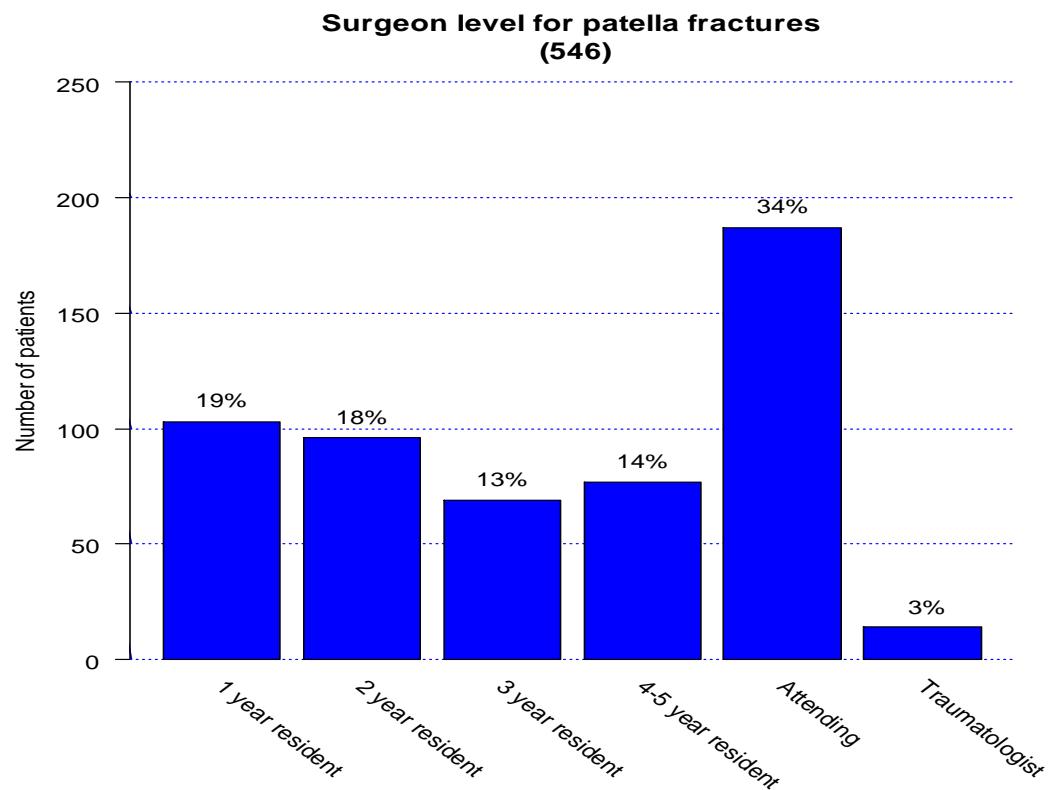


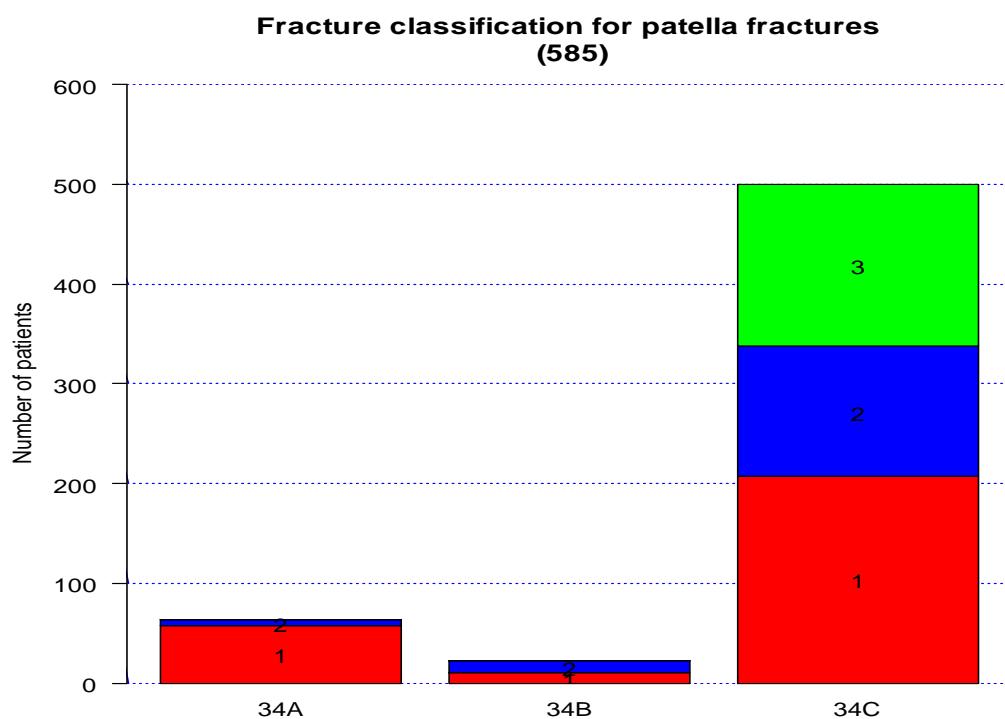


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# Patella

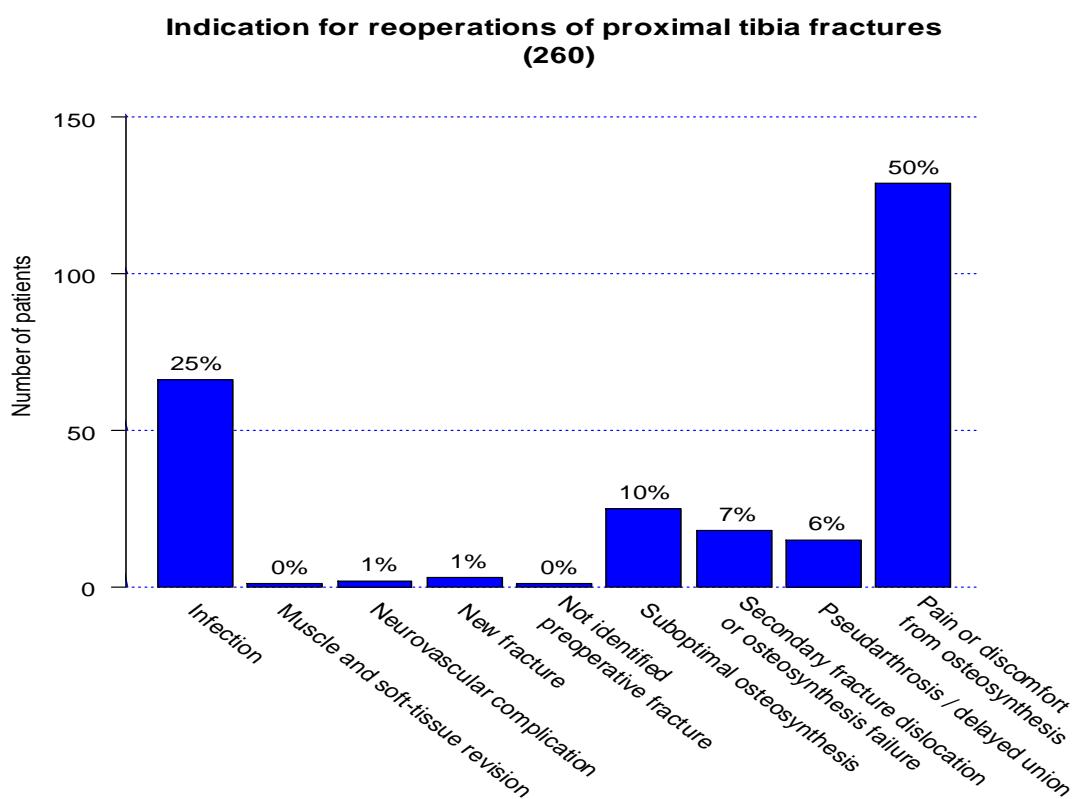
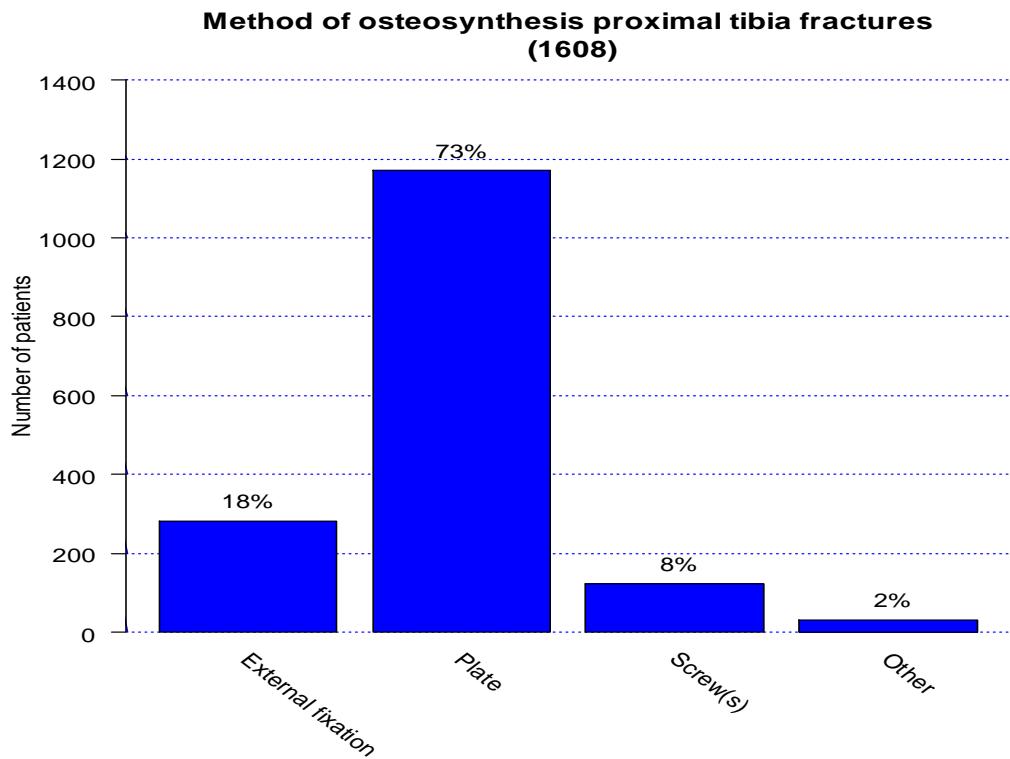


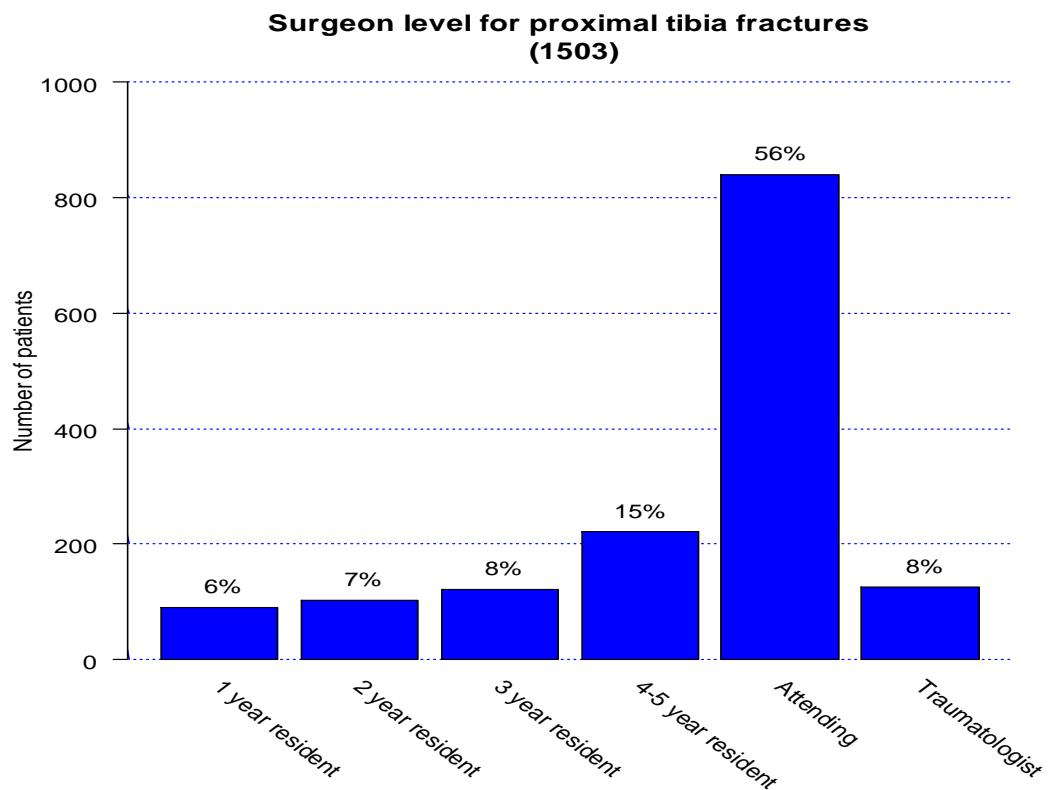




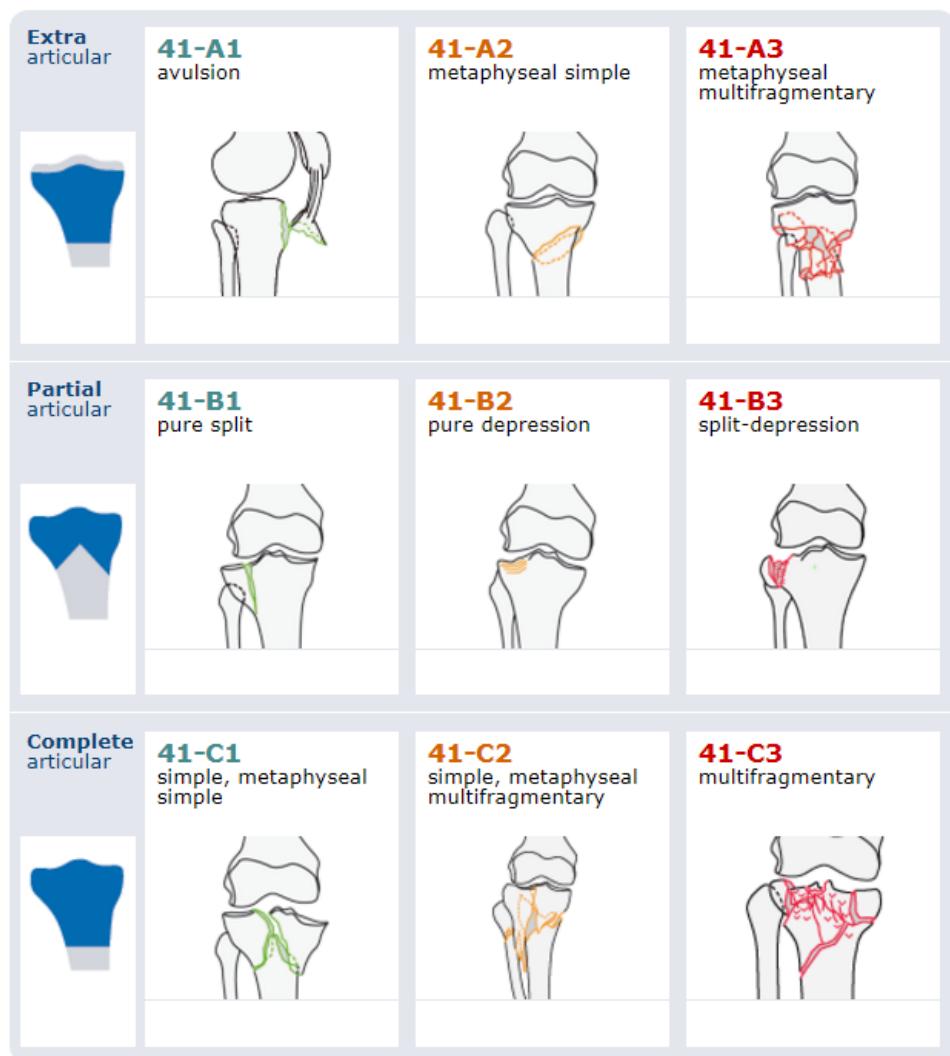
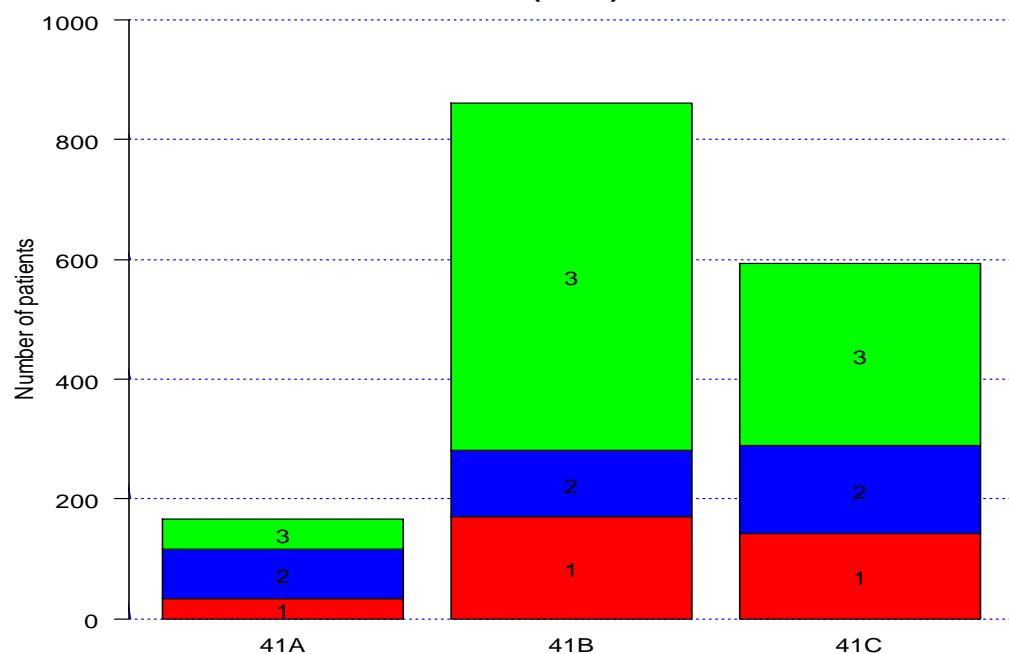
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## Proximal tibia



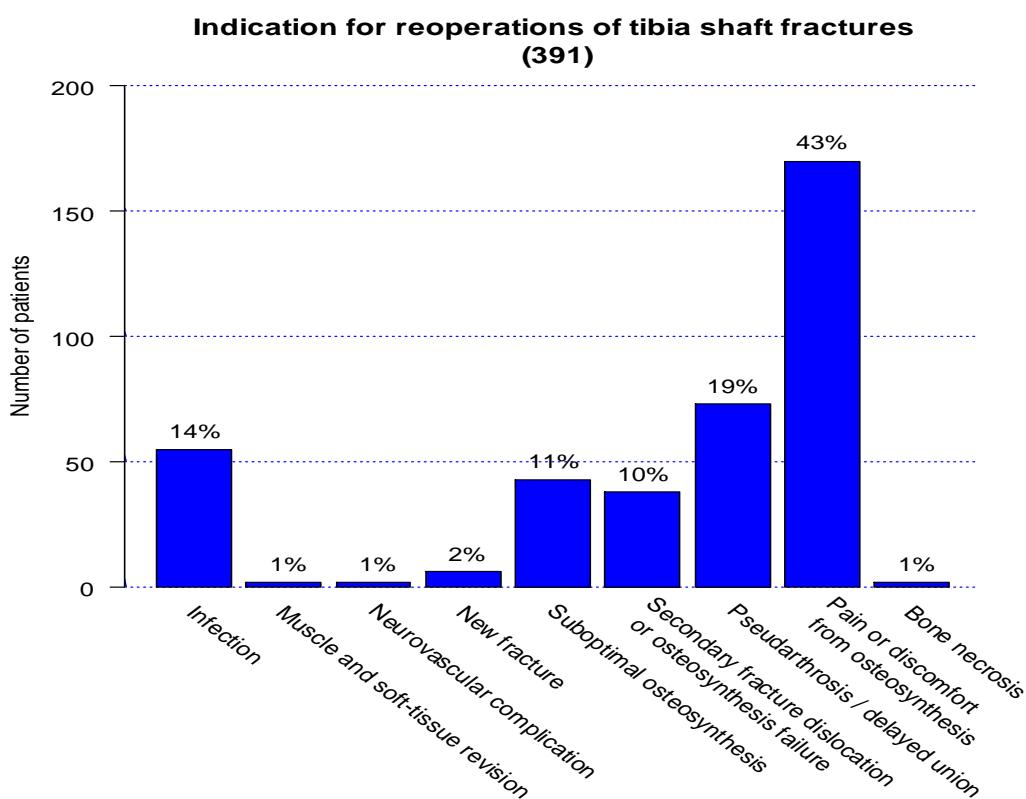
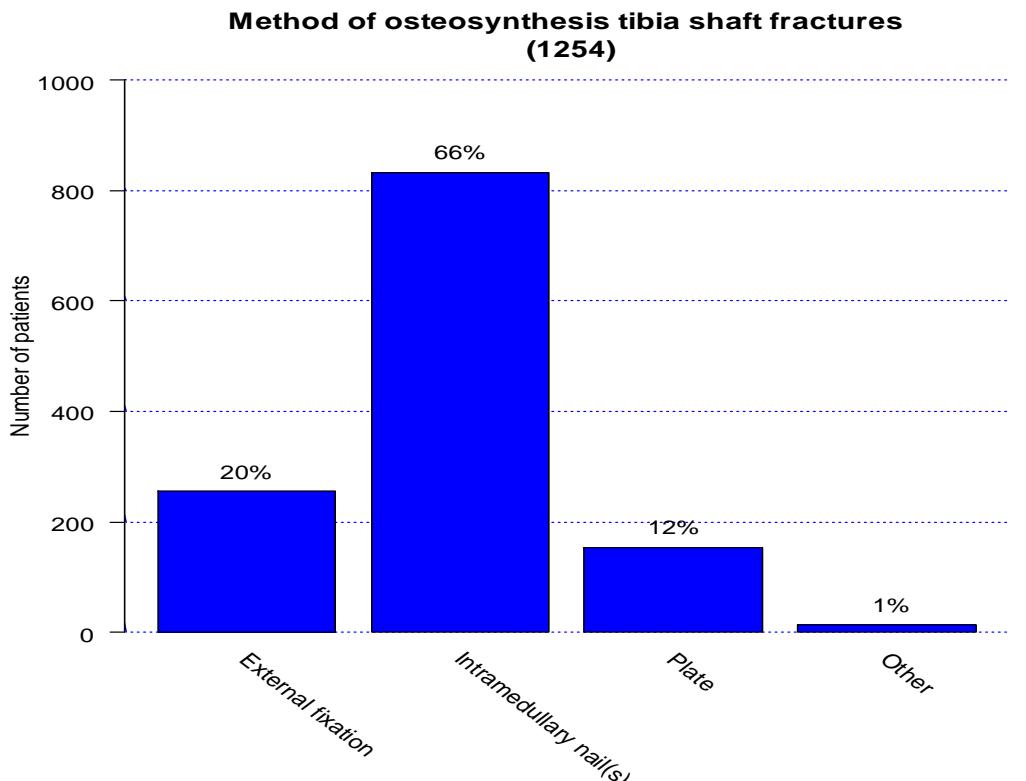


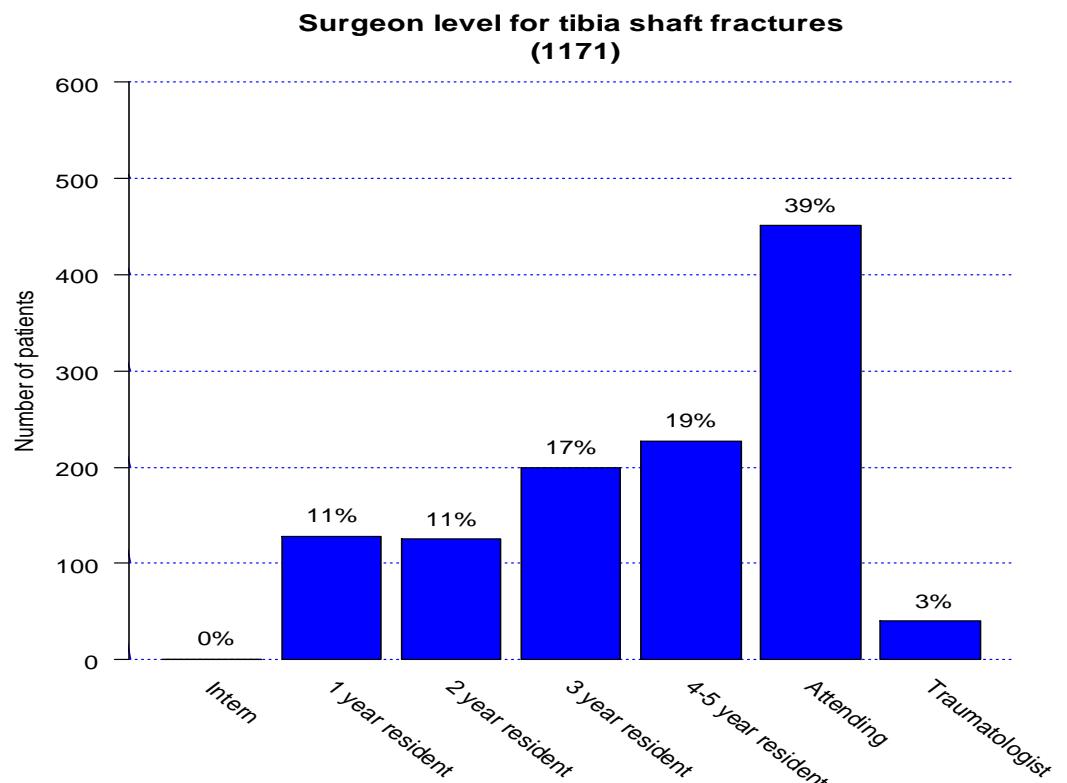
**Fracture classification for proximal tibia fractures  
(1621)**

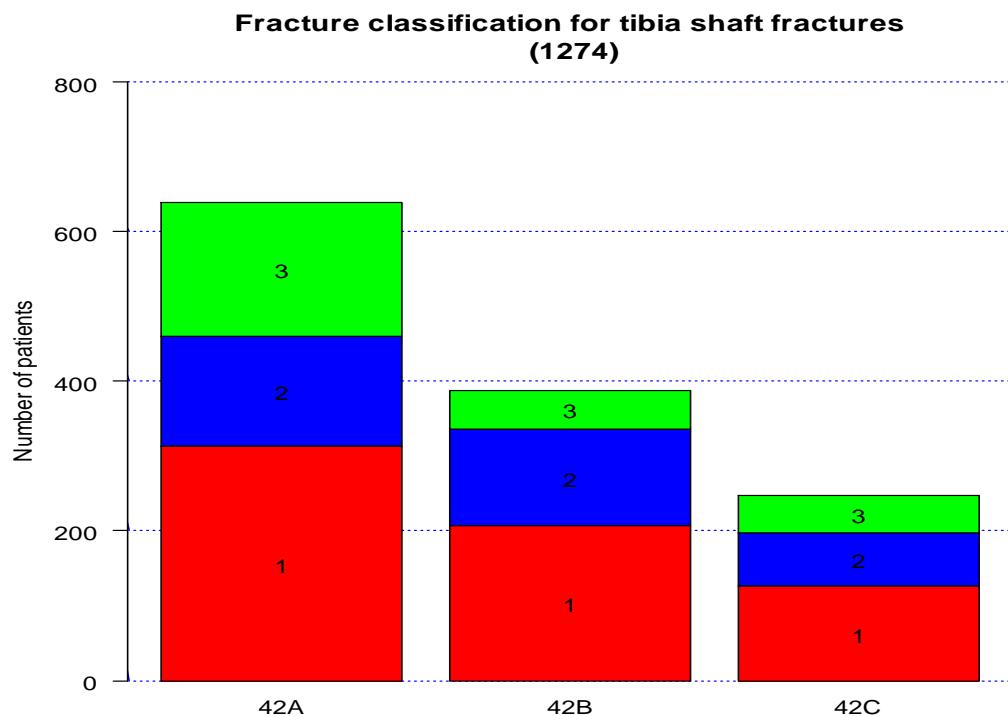


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## Tibia shaft

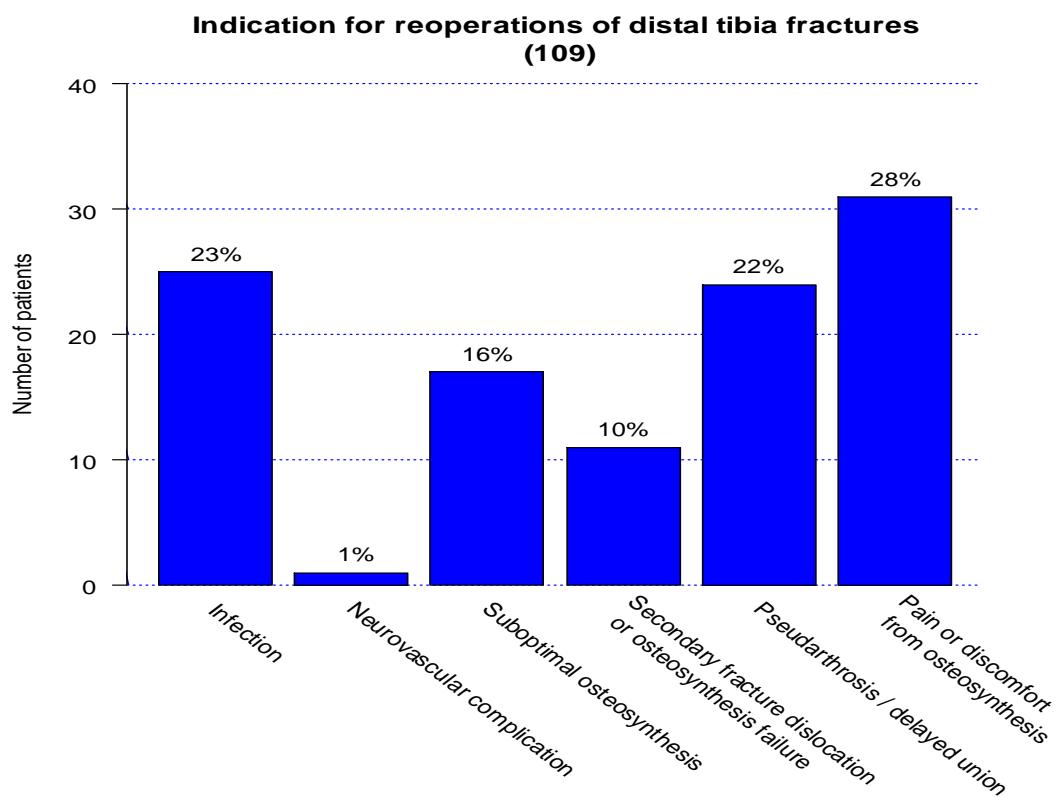
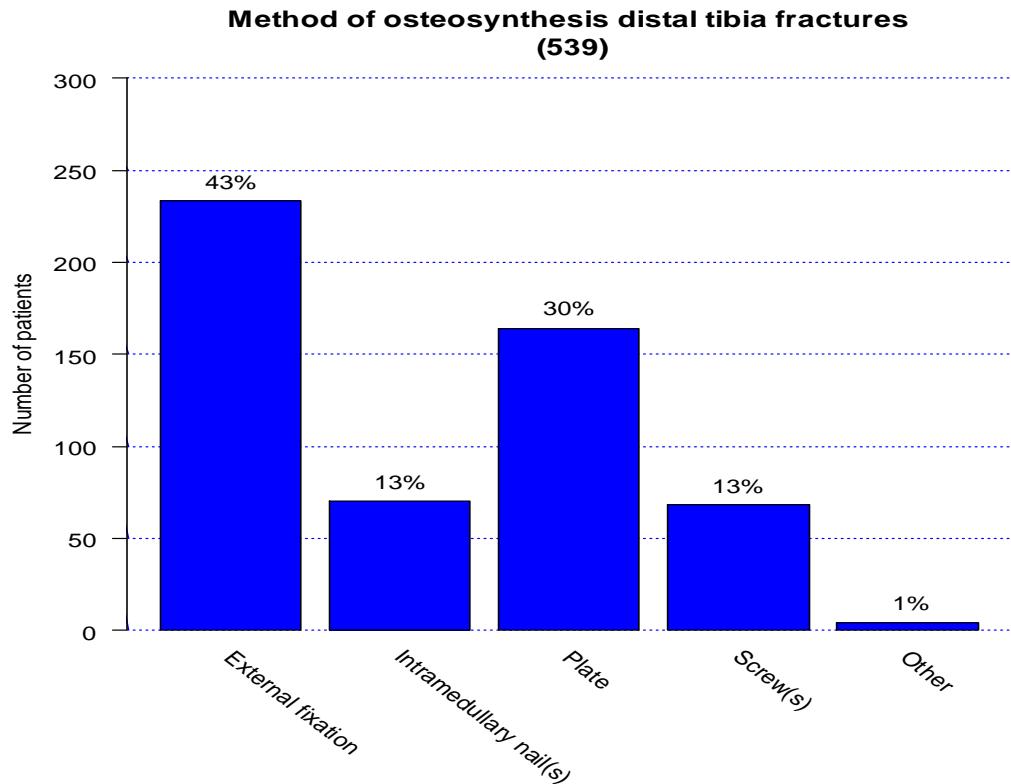


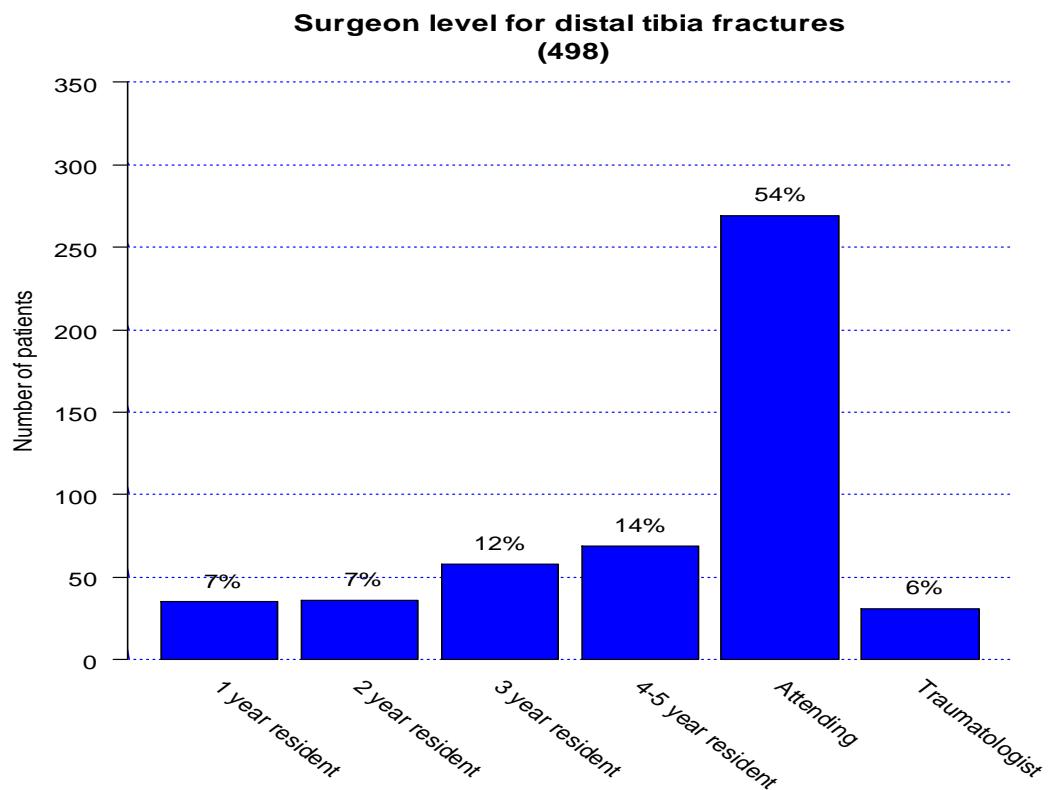


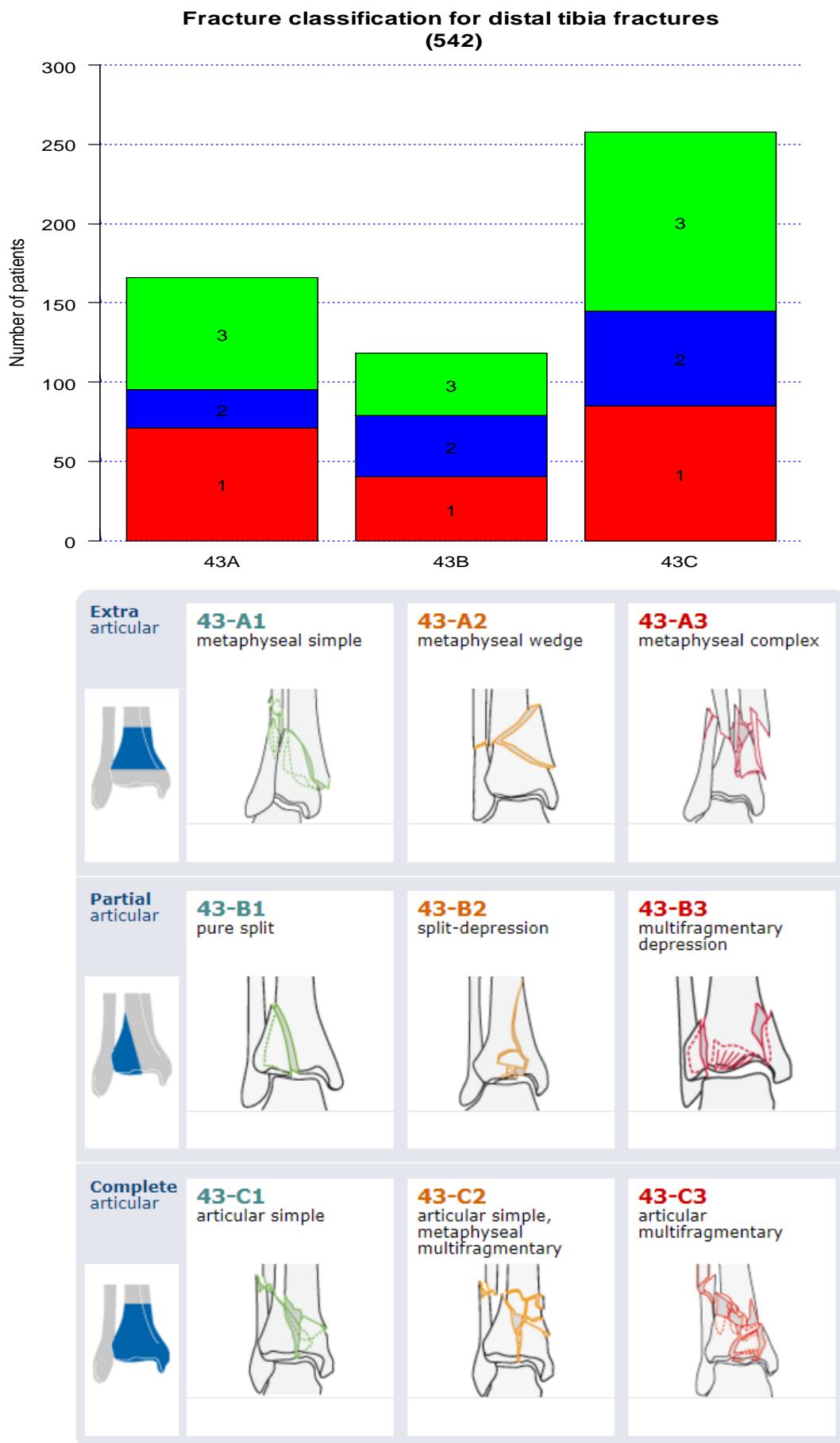


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## *Distal tibia*

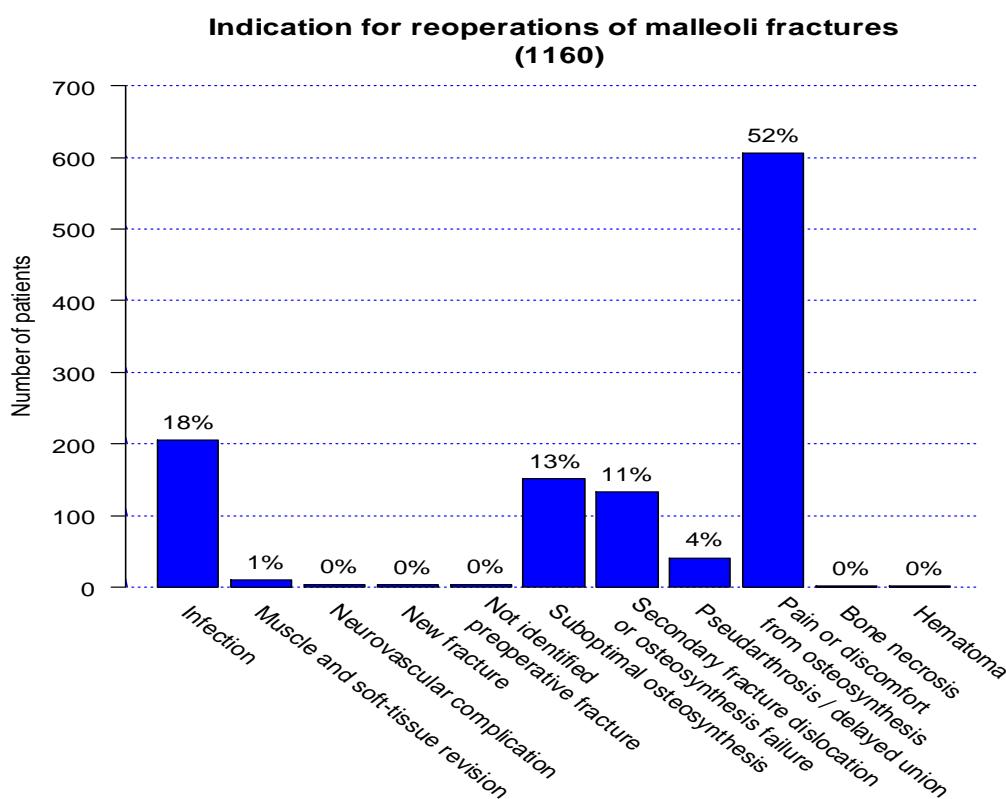
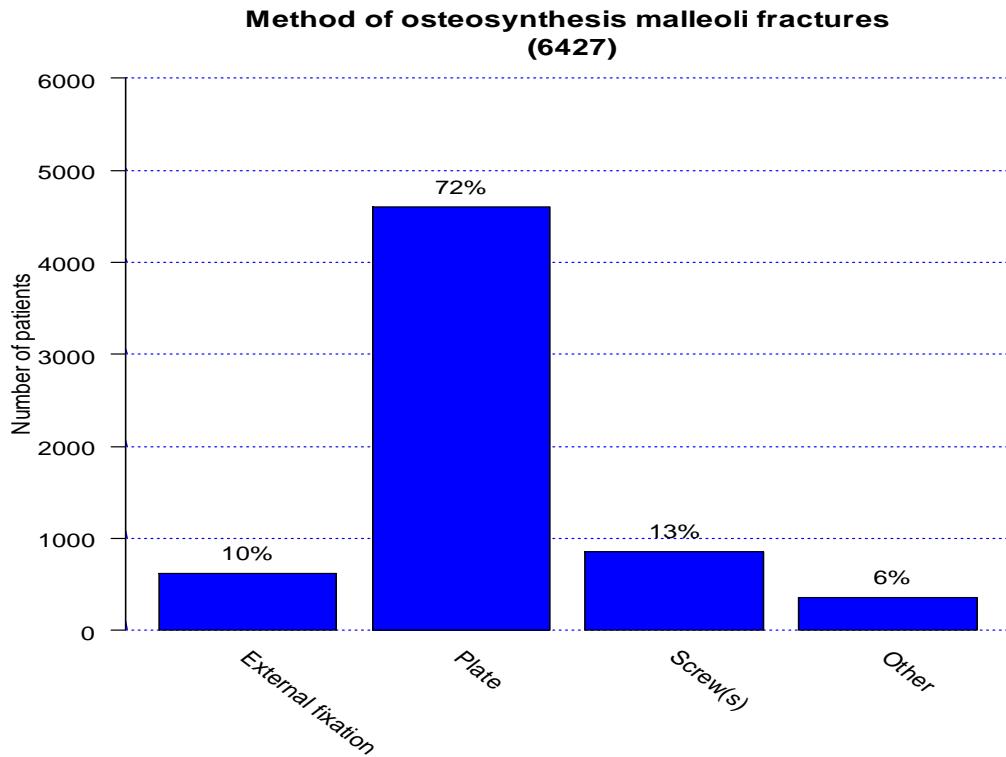


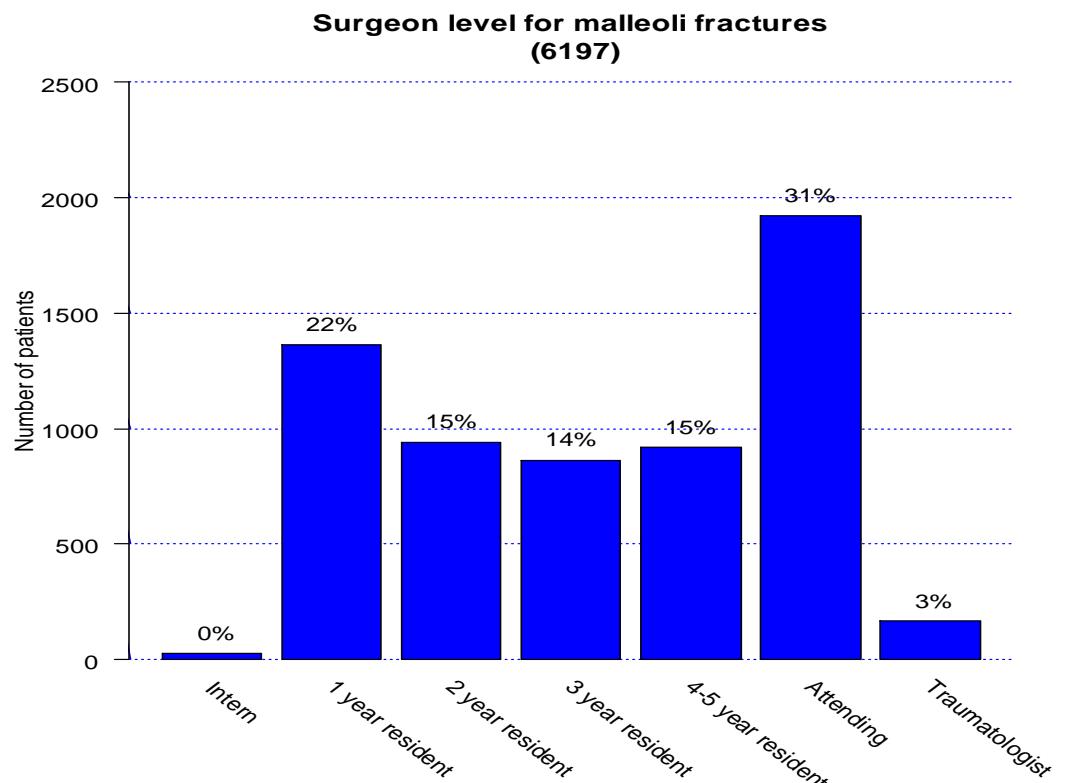


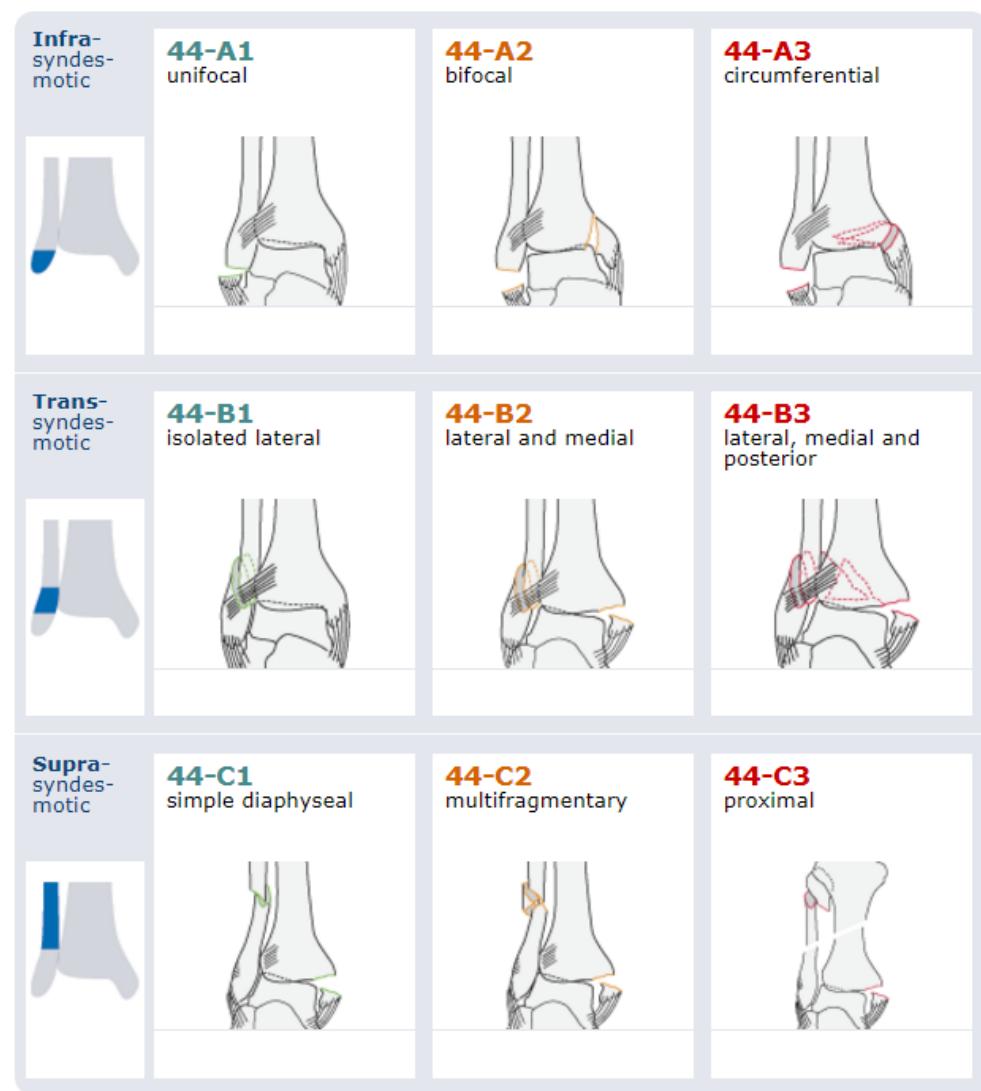
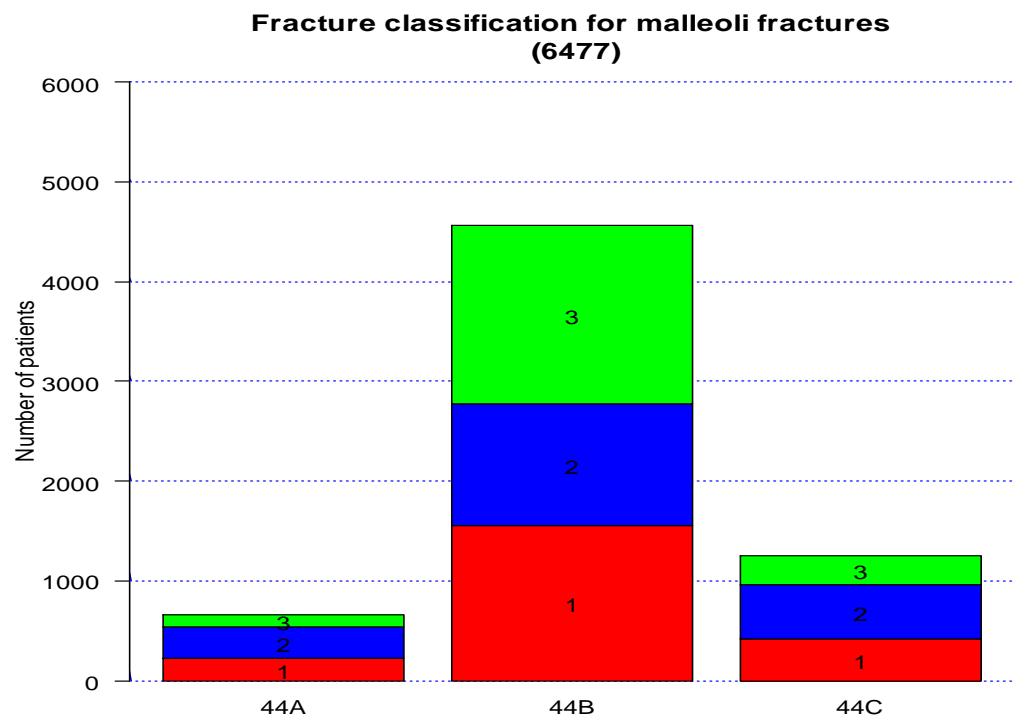


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# Malleoli

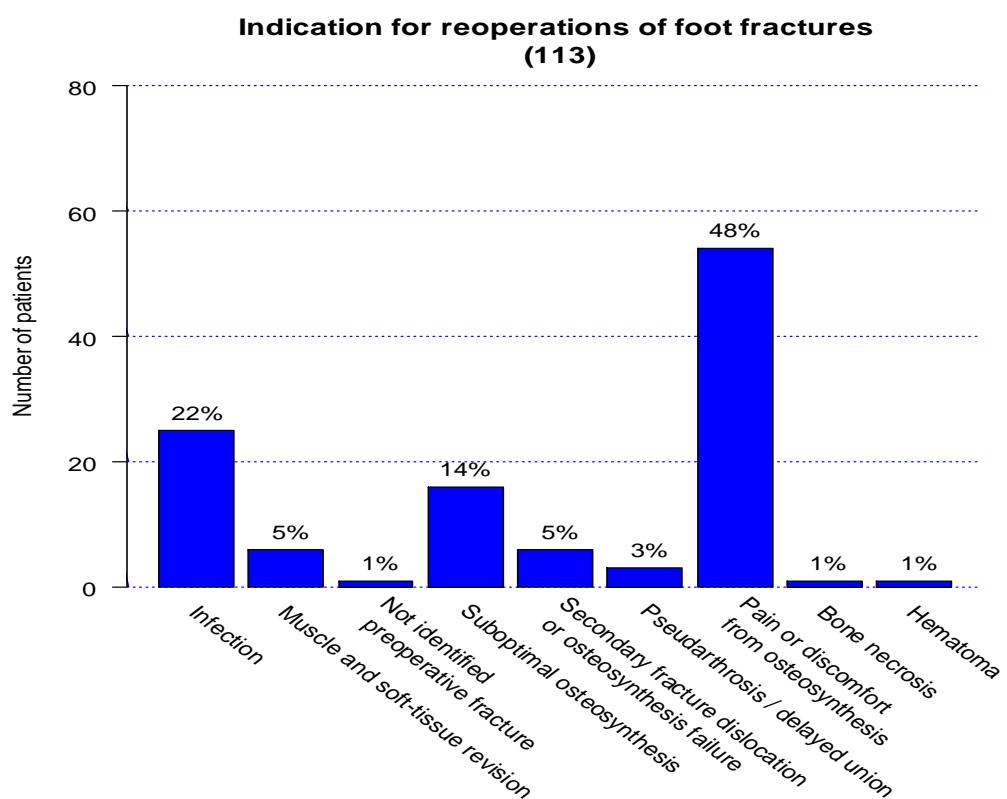
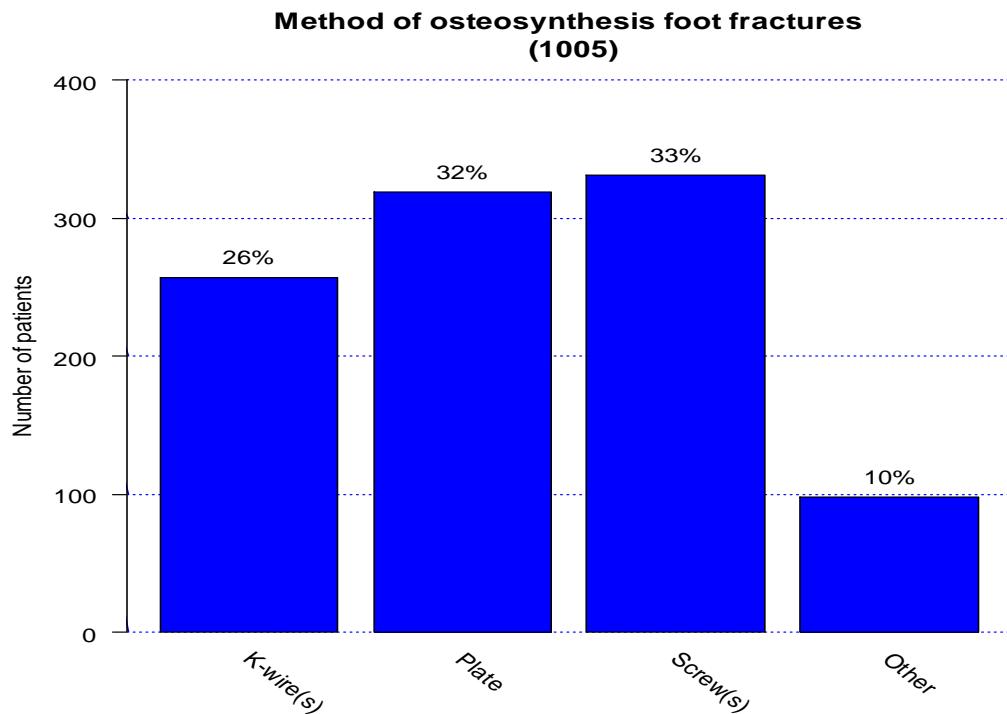


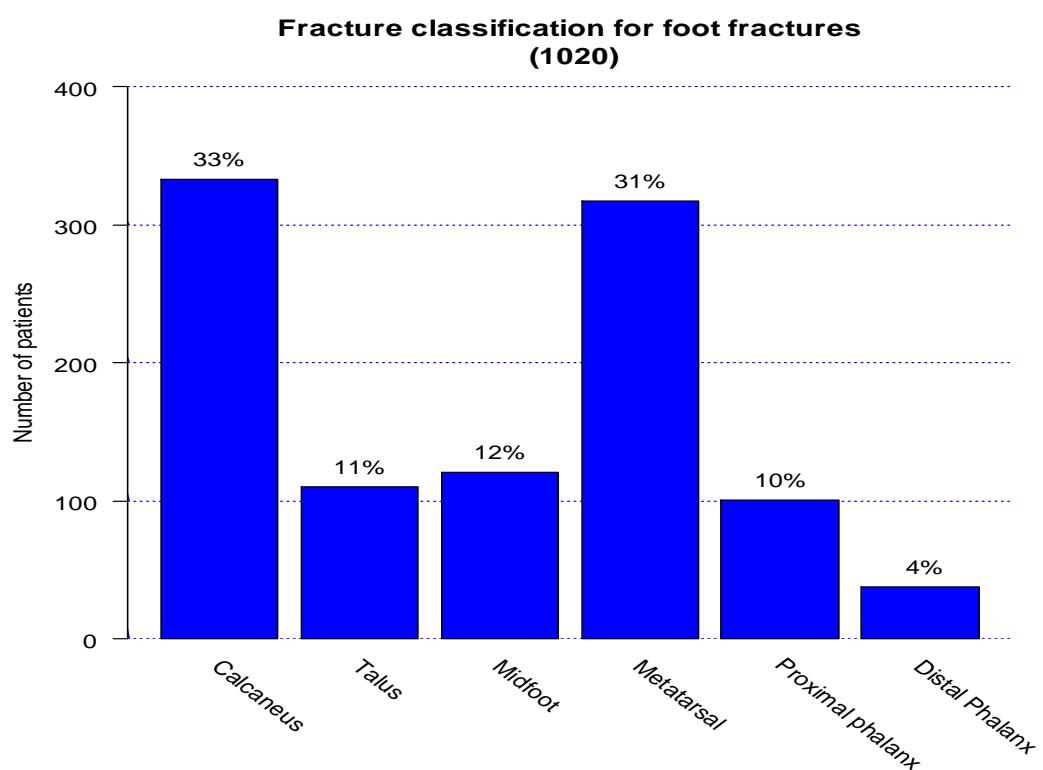
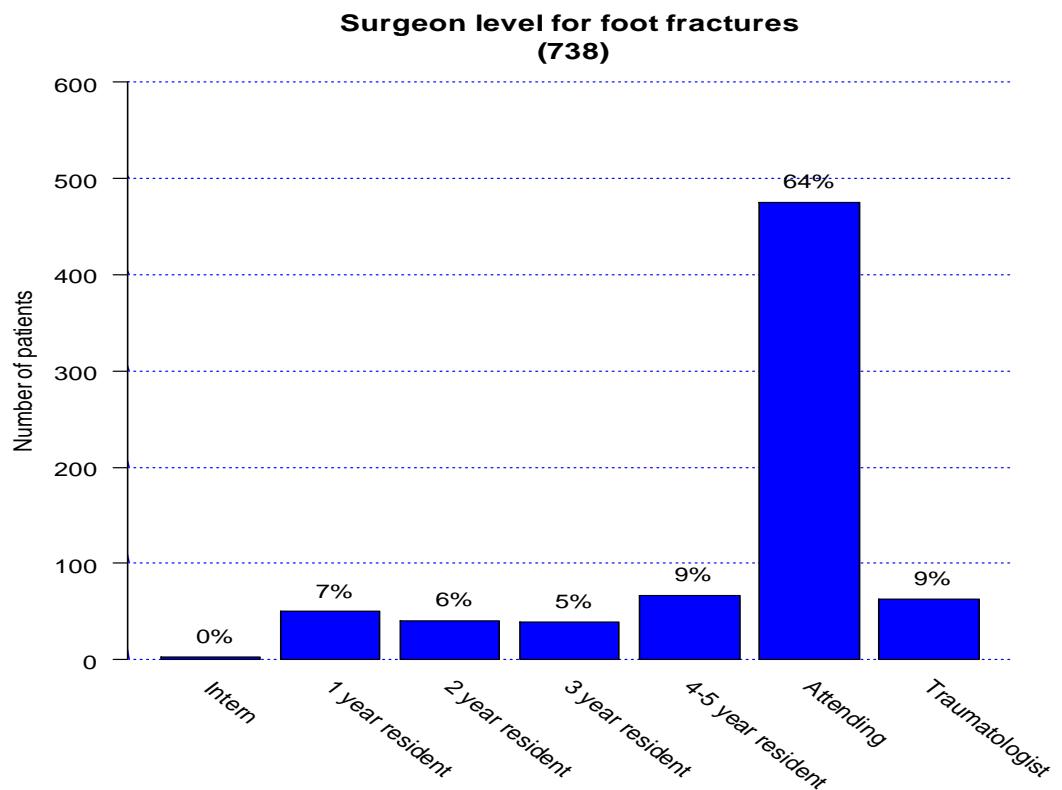




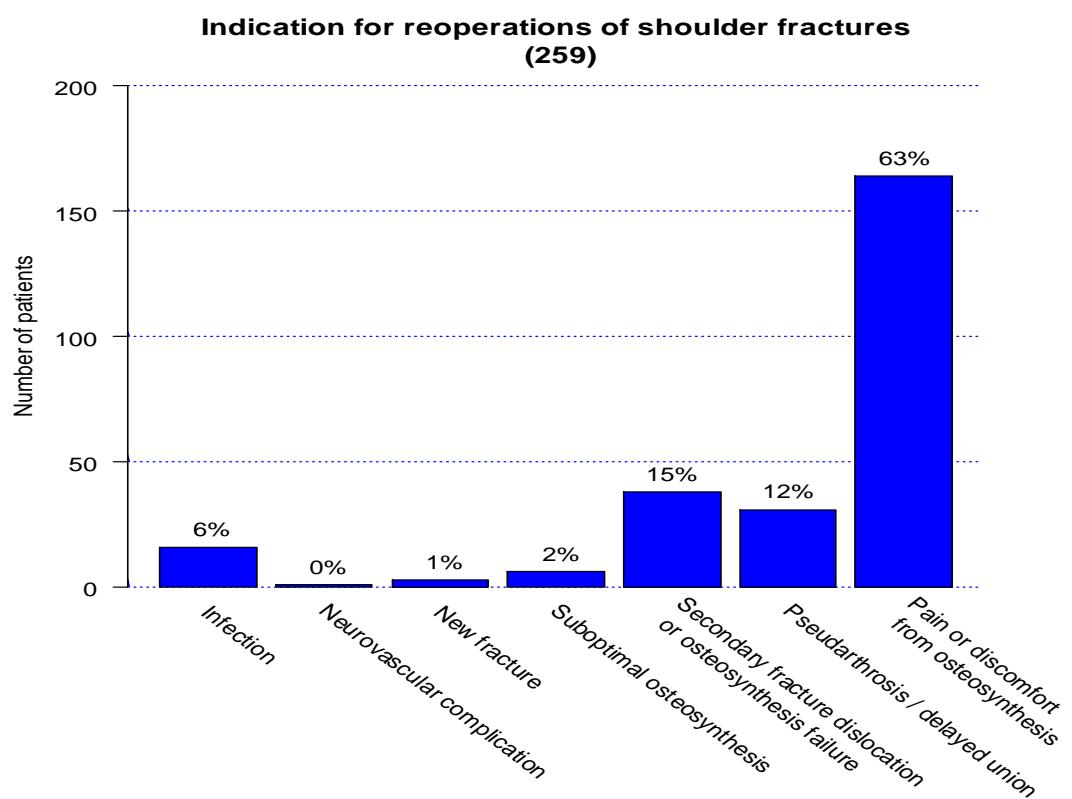
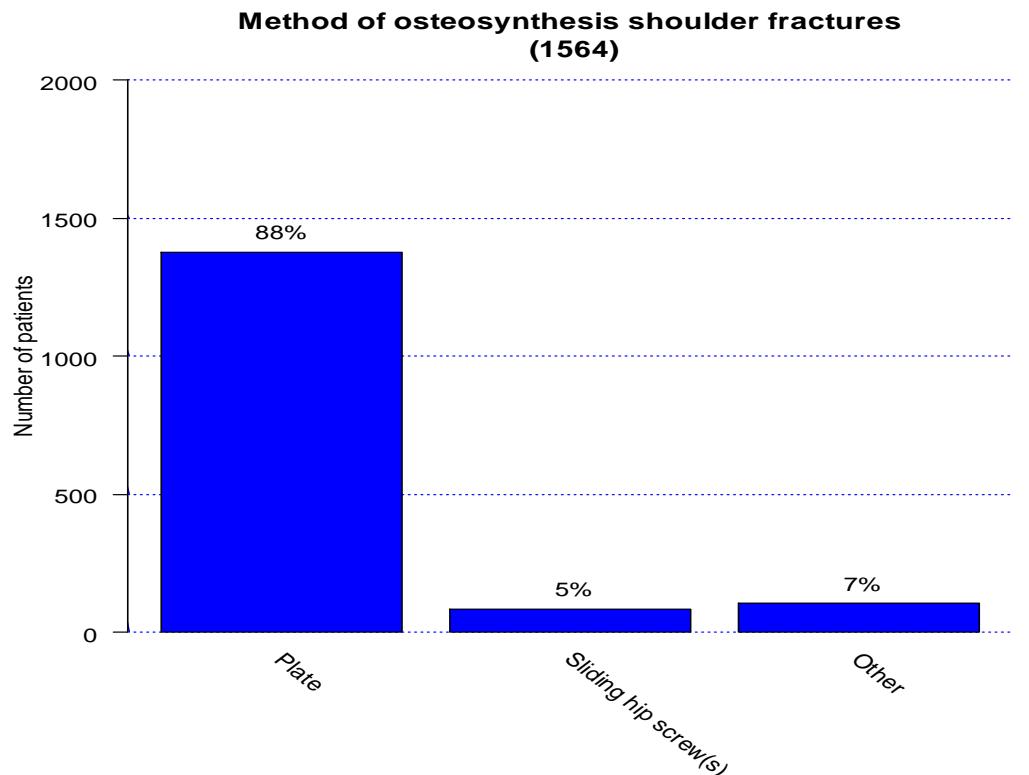
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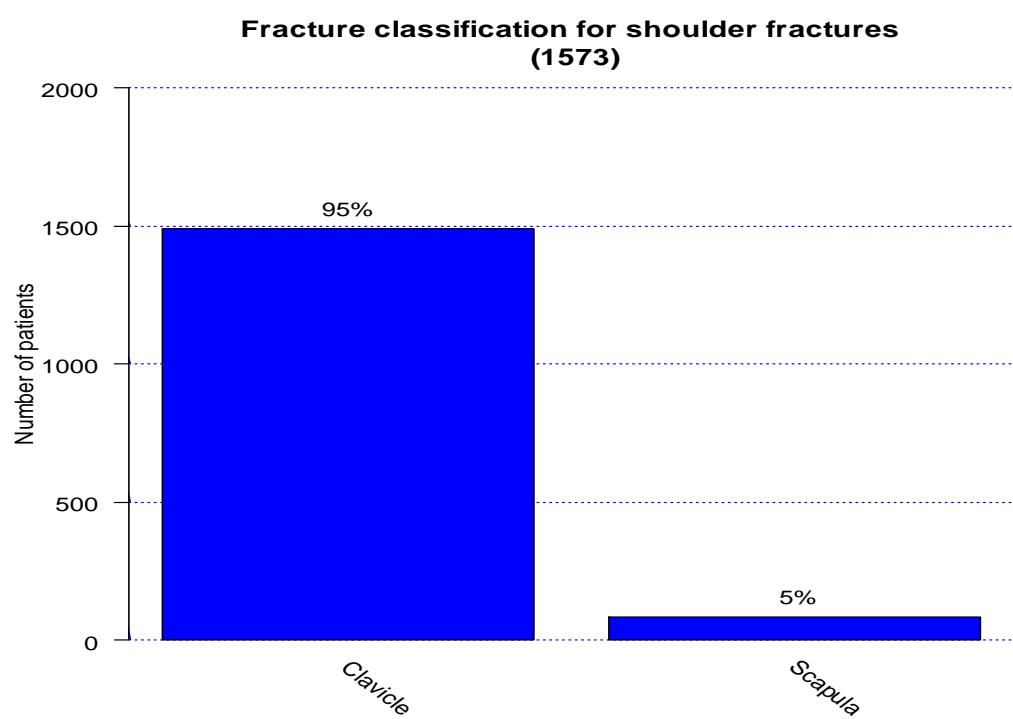
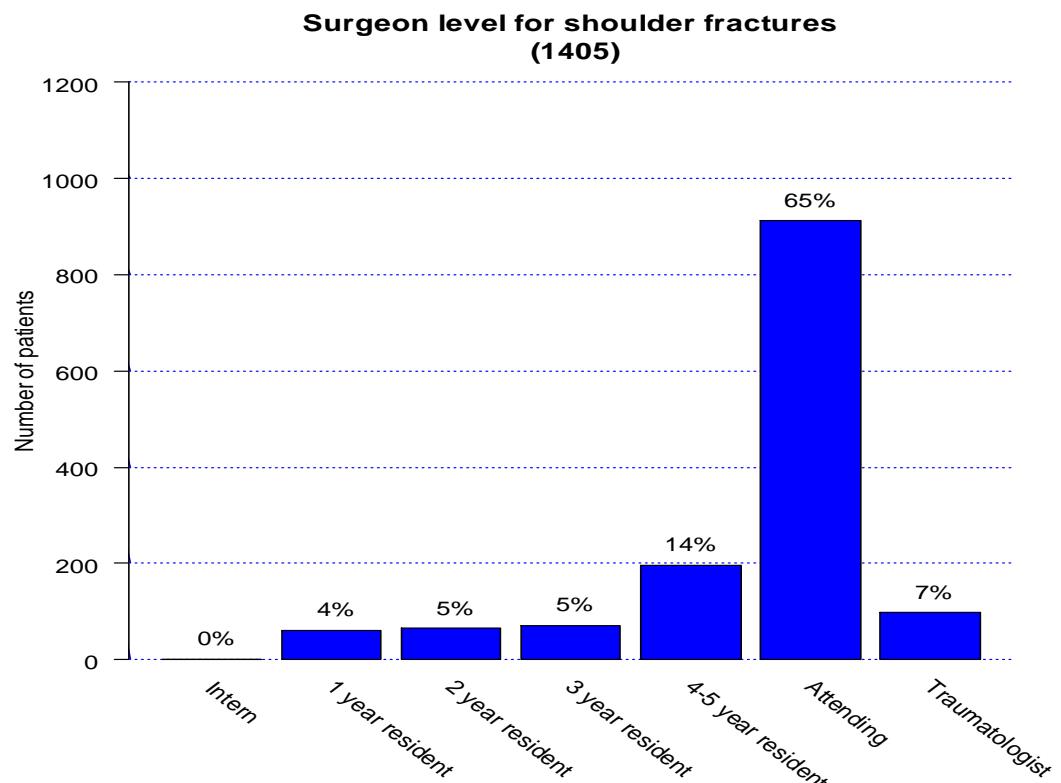
# Foot





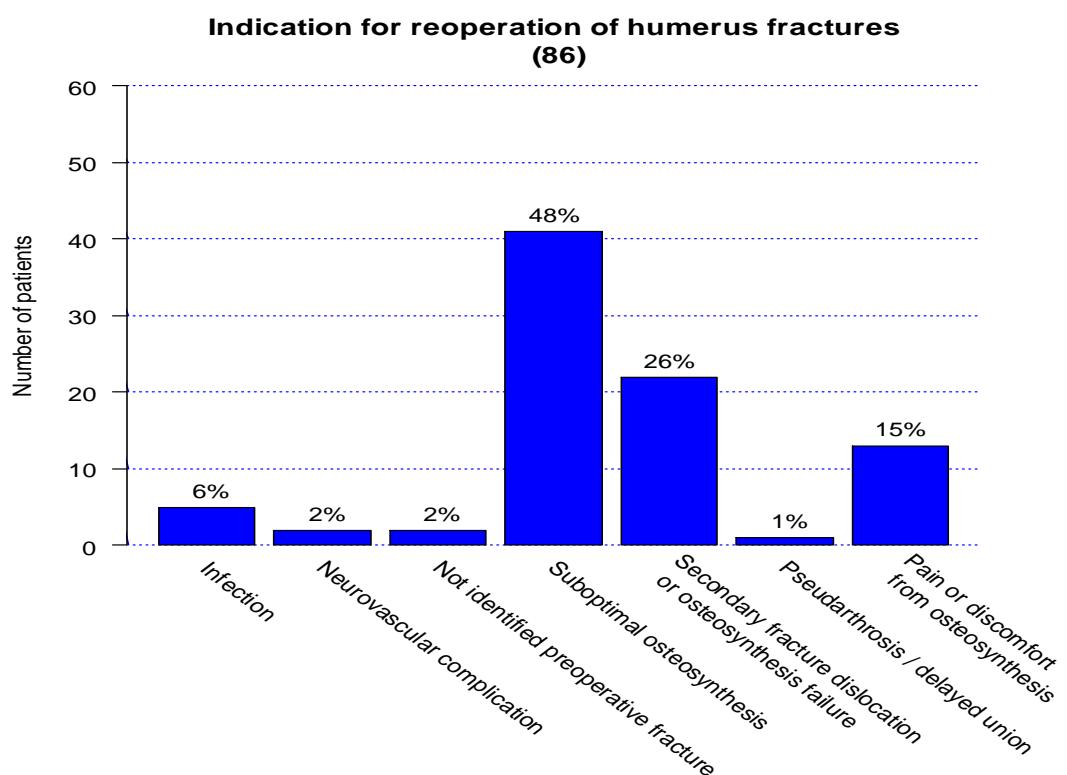
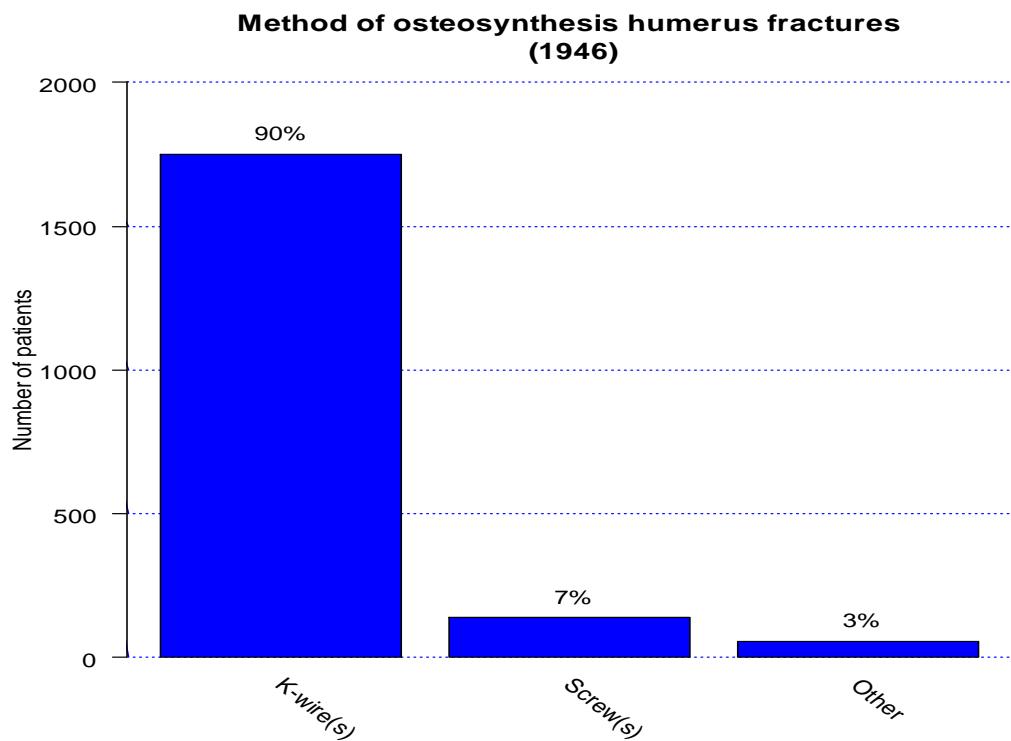
## Shoulder

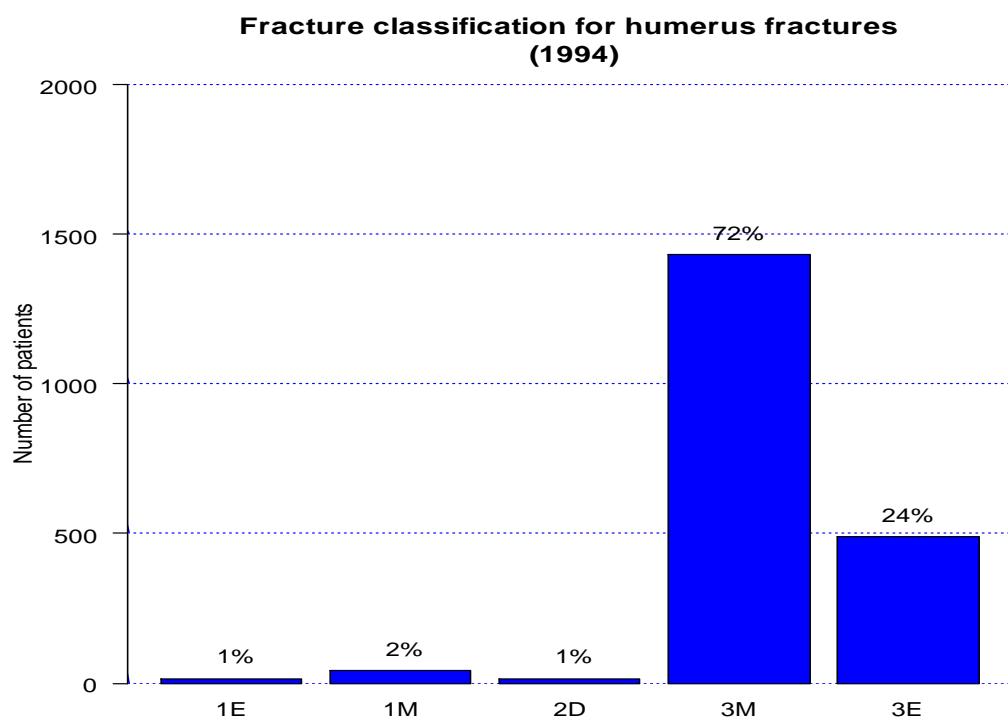
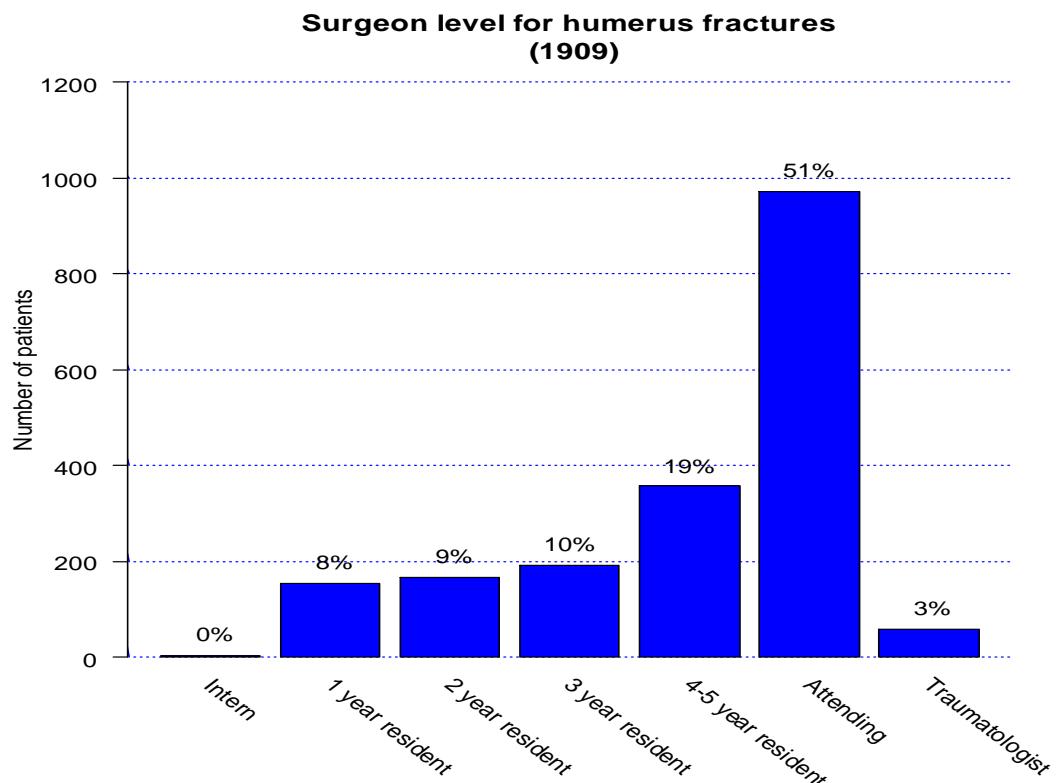




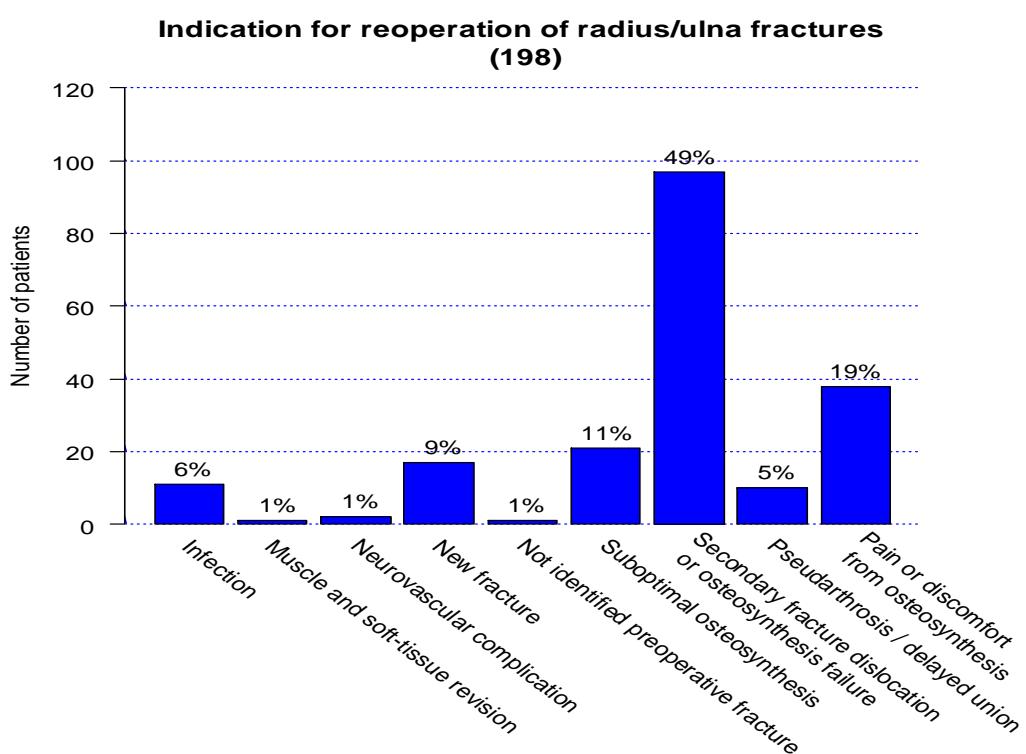
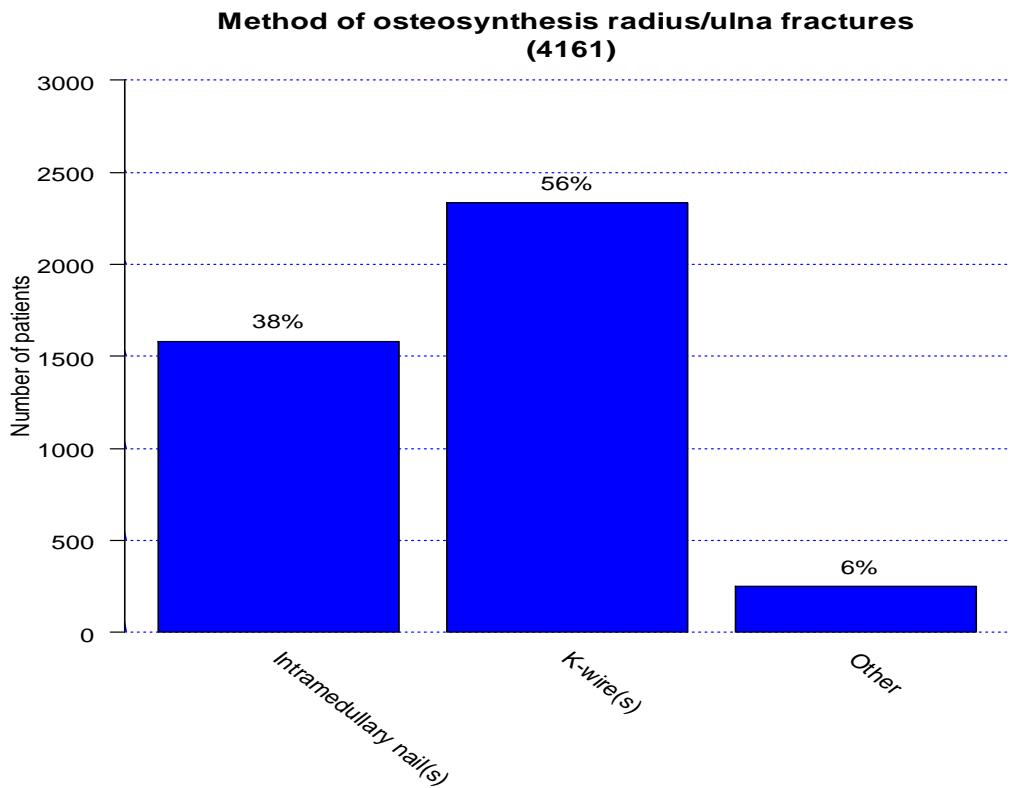
# Pediatric

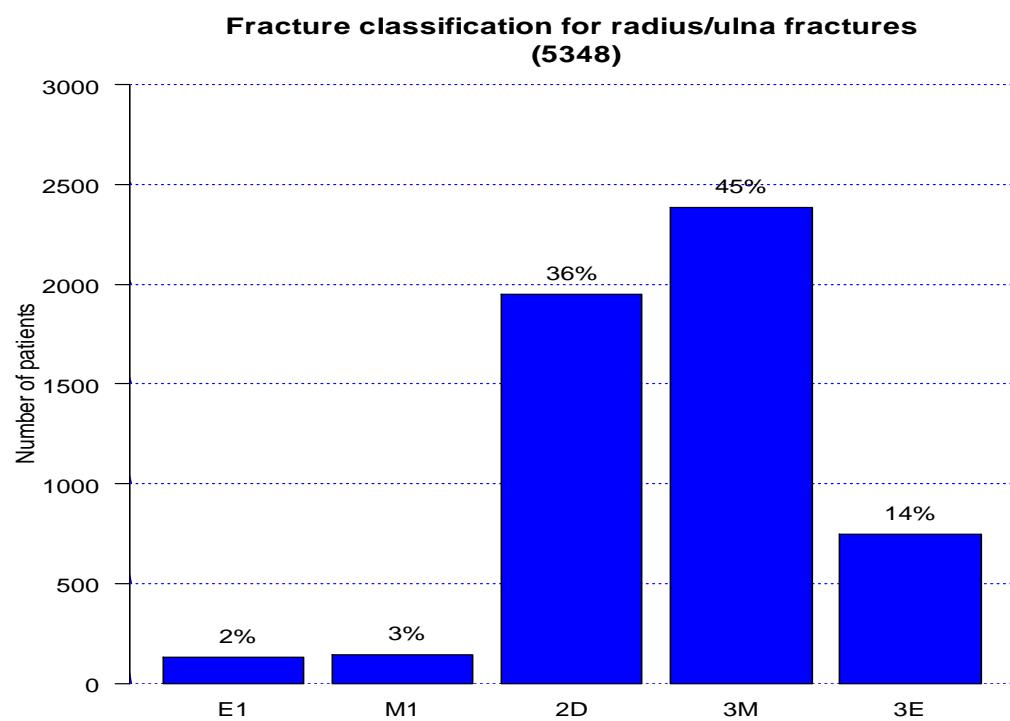
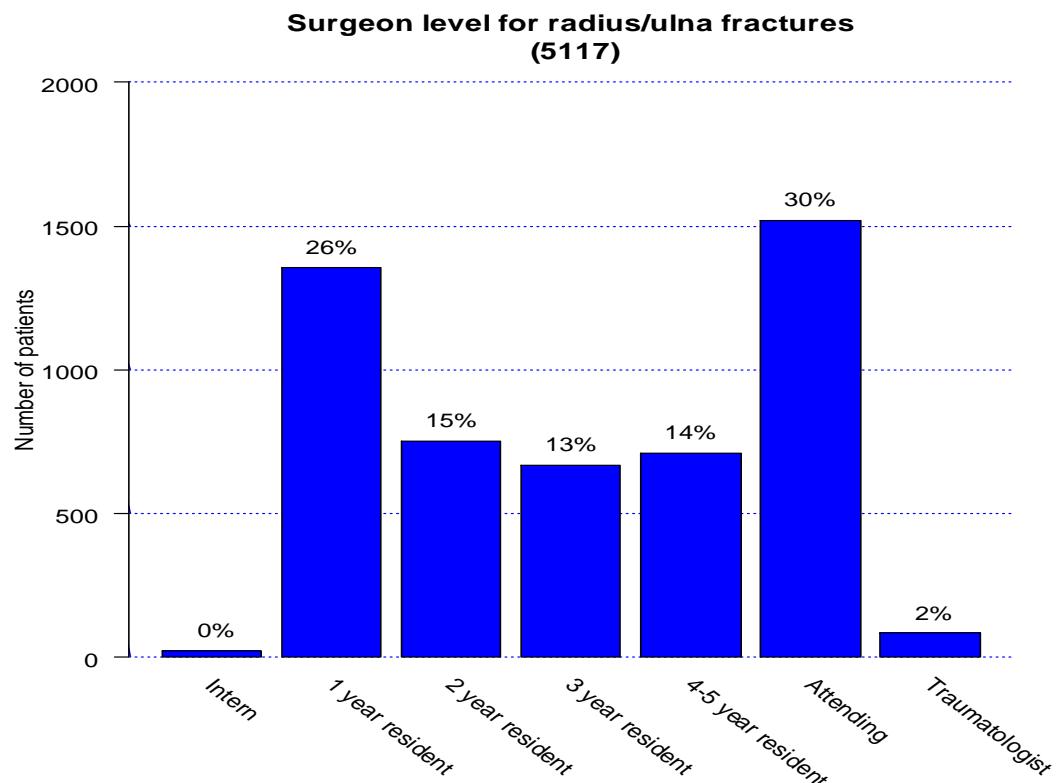
## Humerus



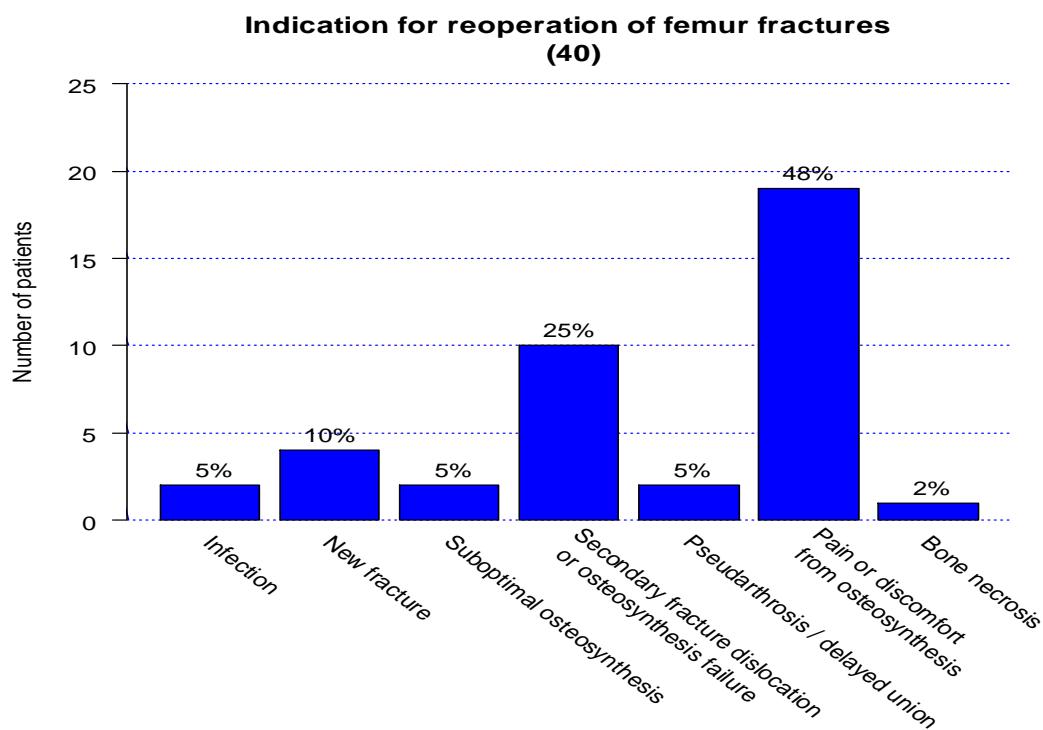
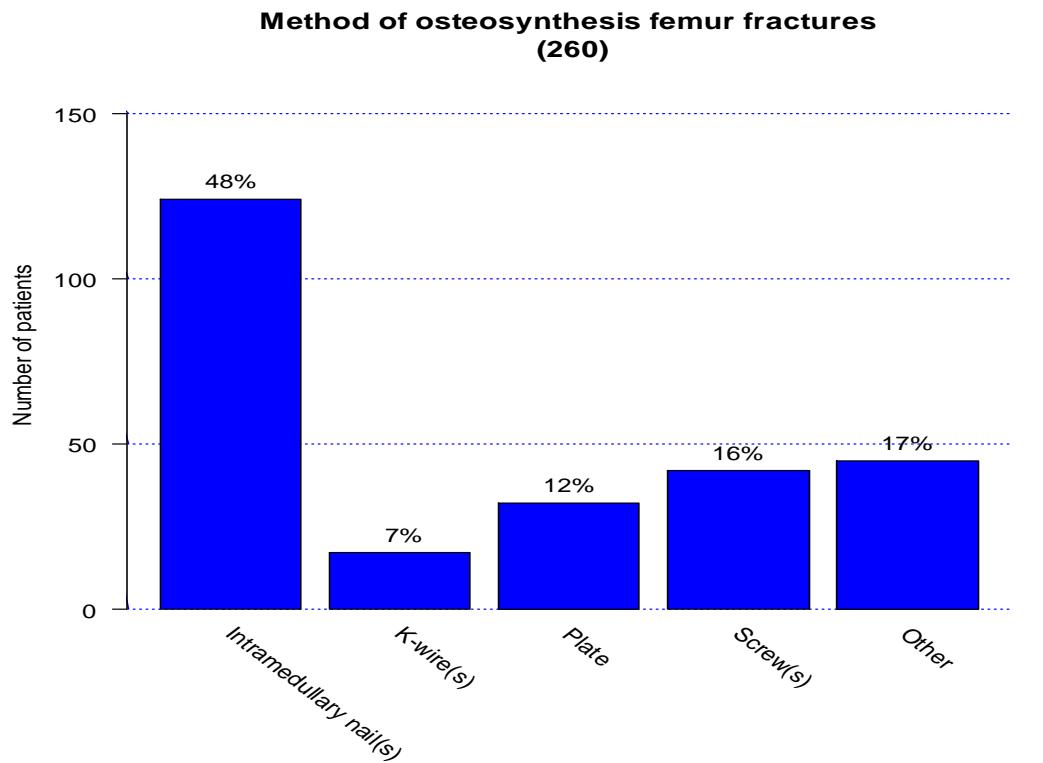


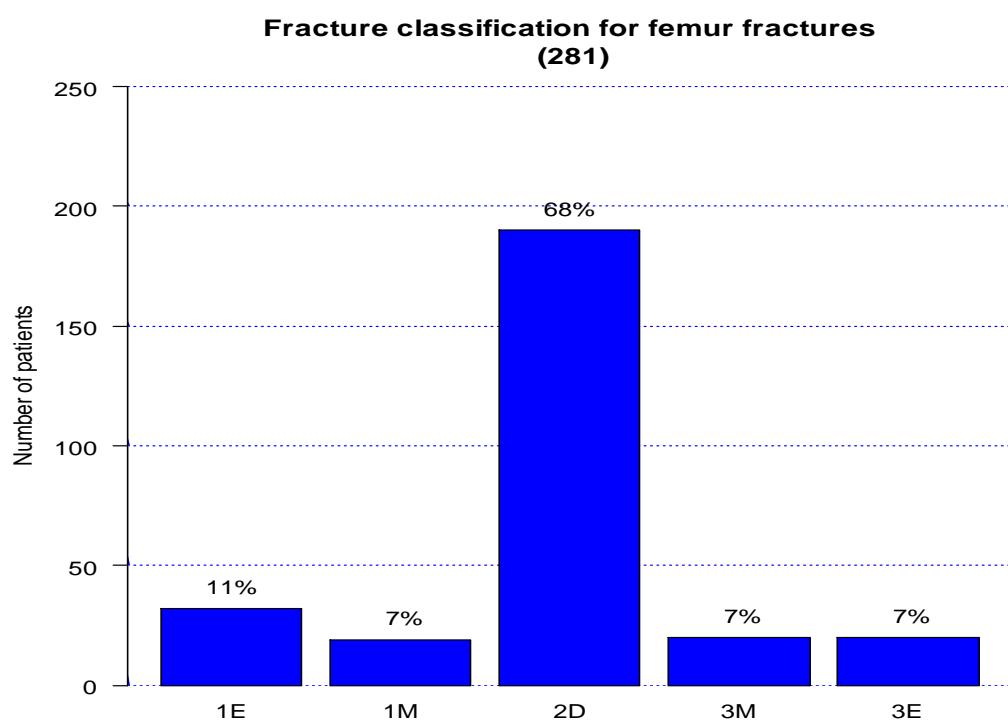
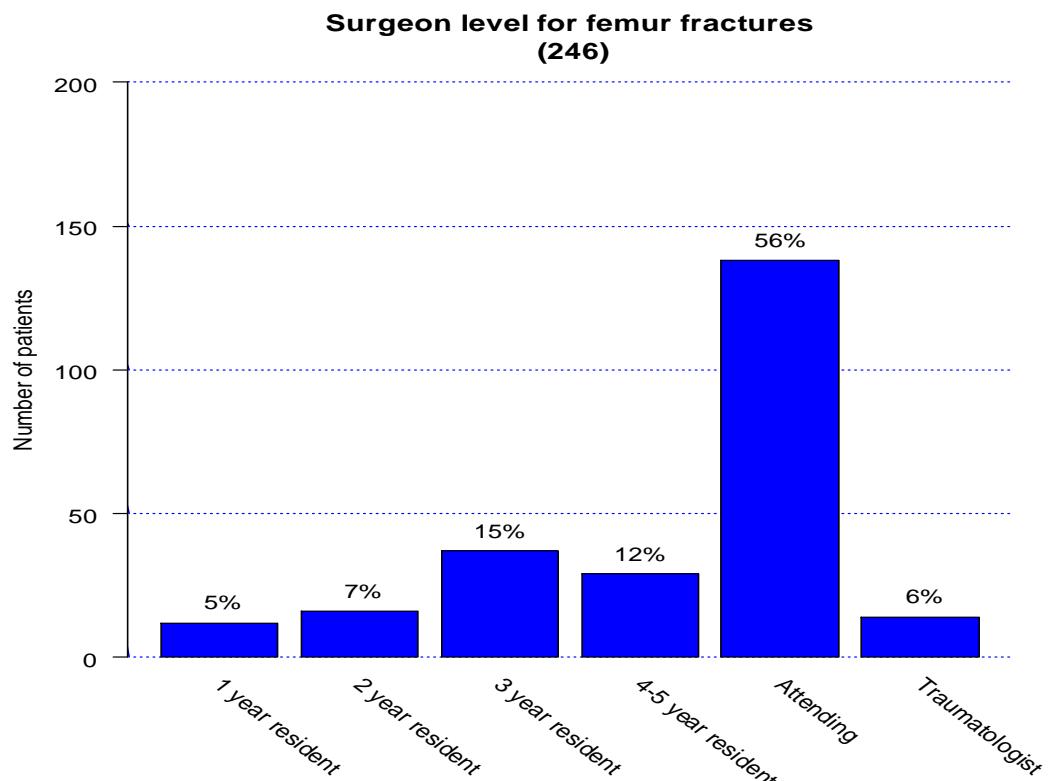
## Radius/Ulna



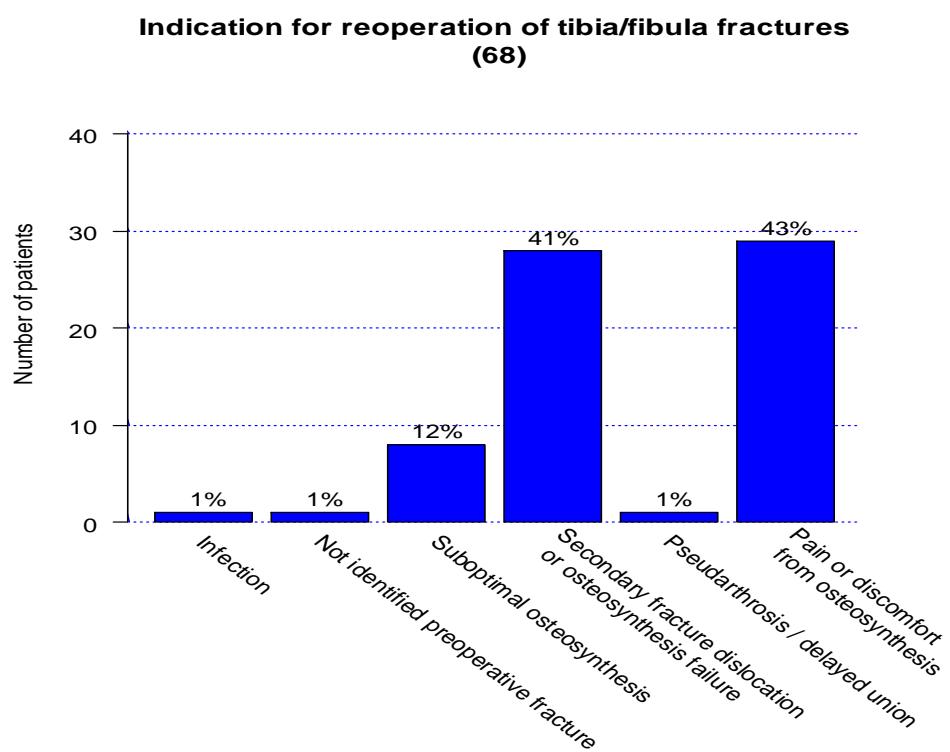
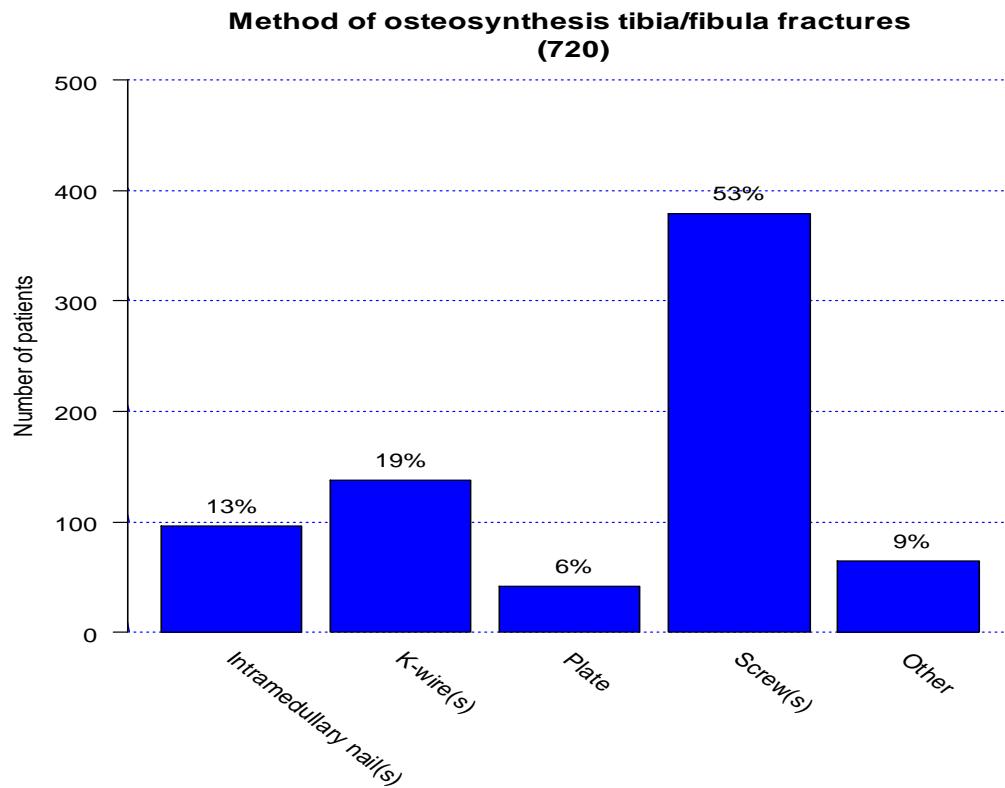


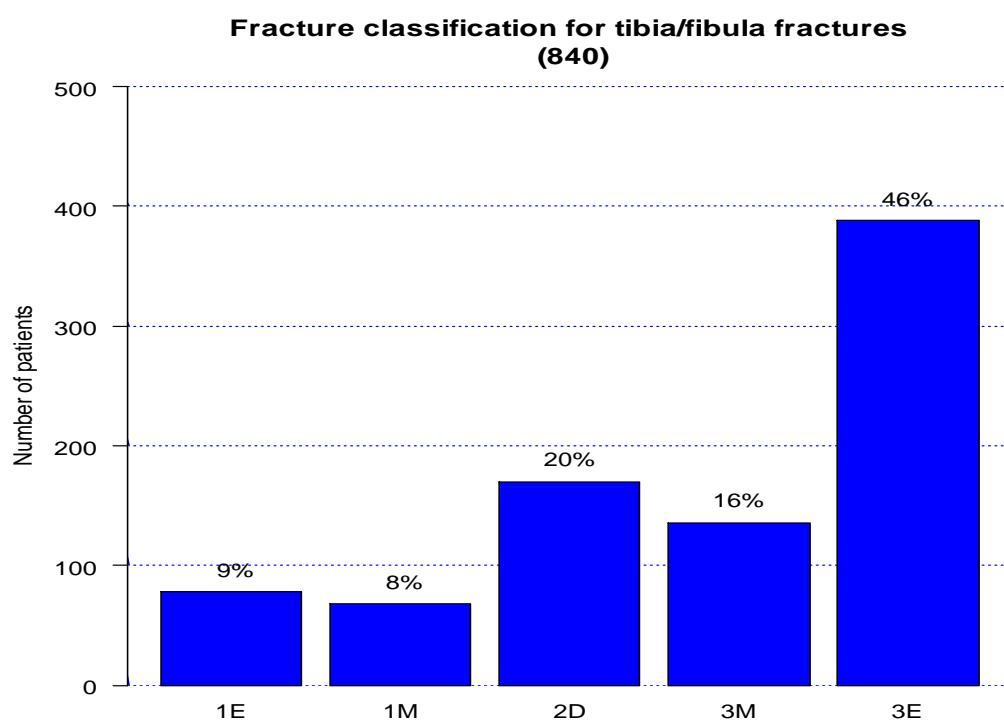
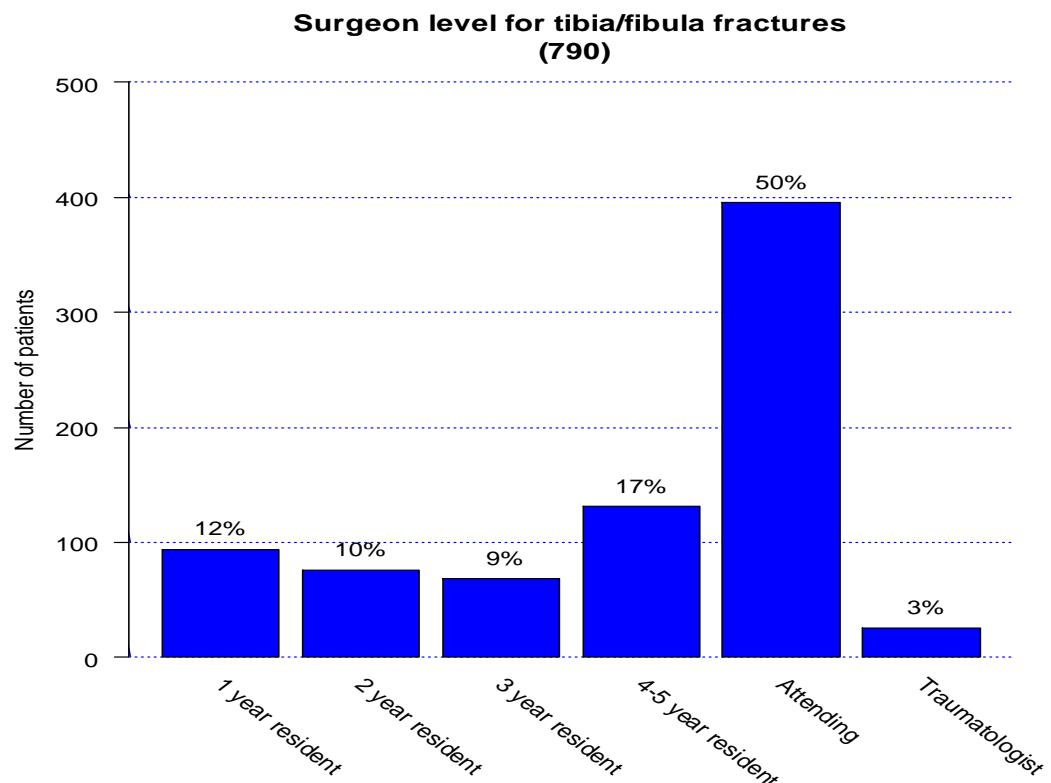
# Femur



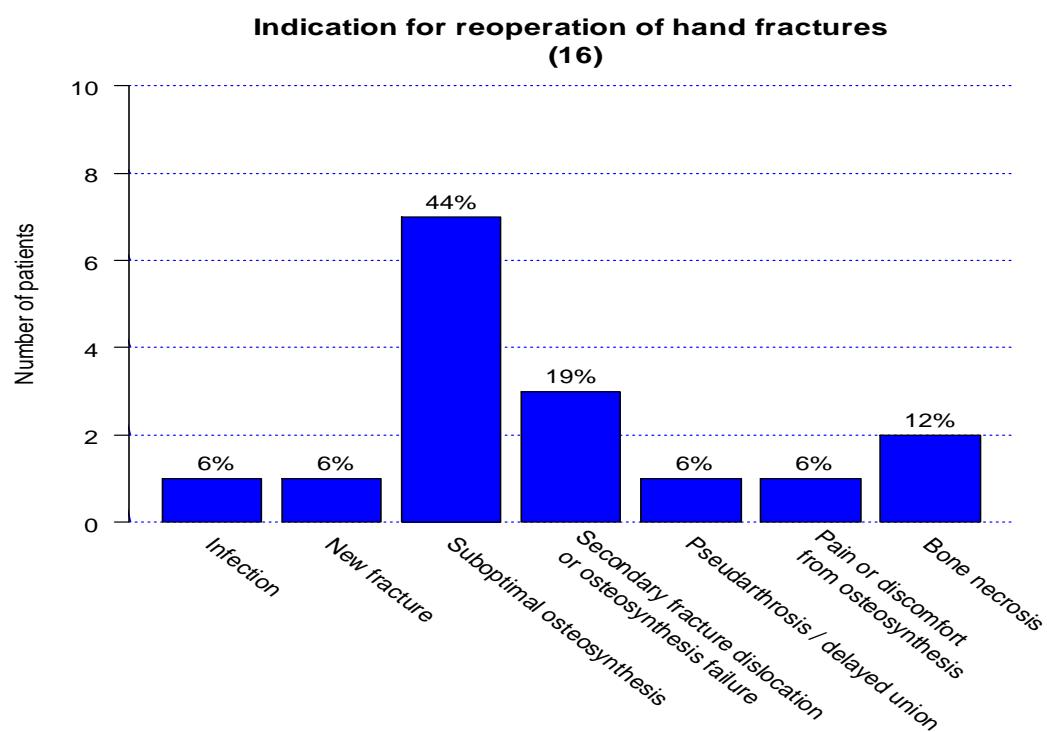
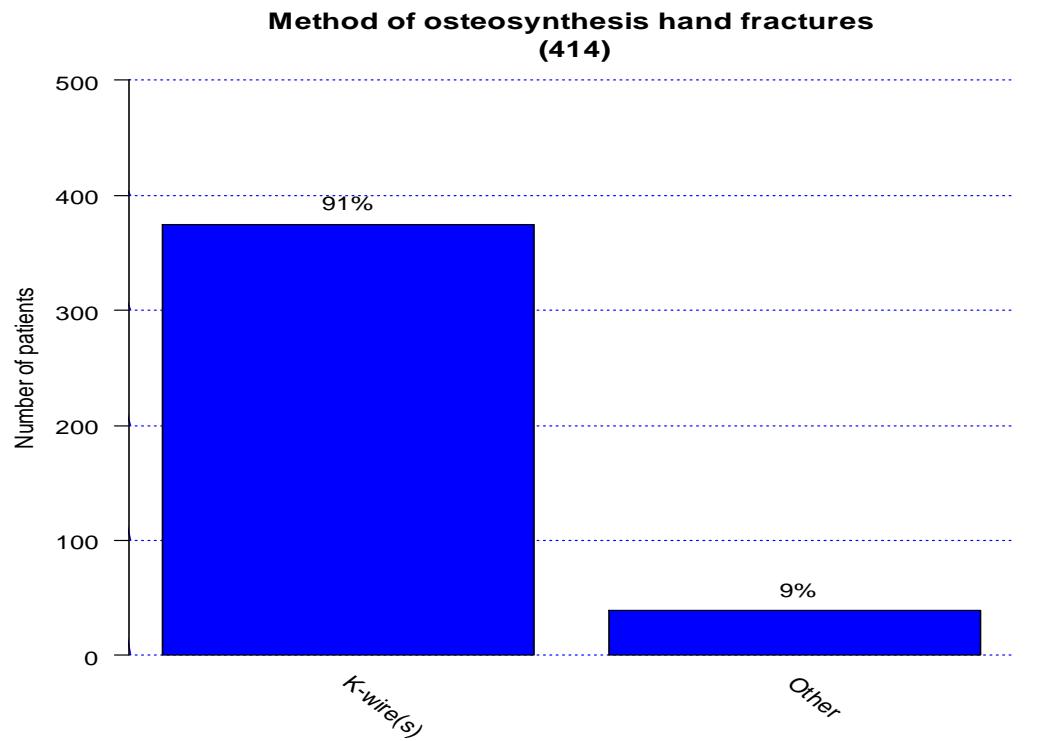


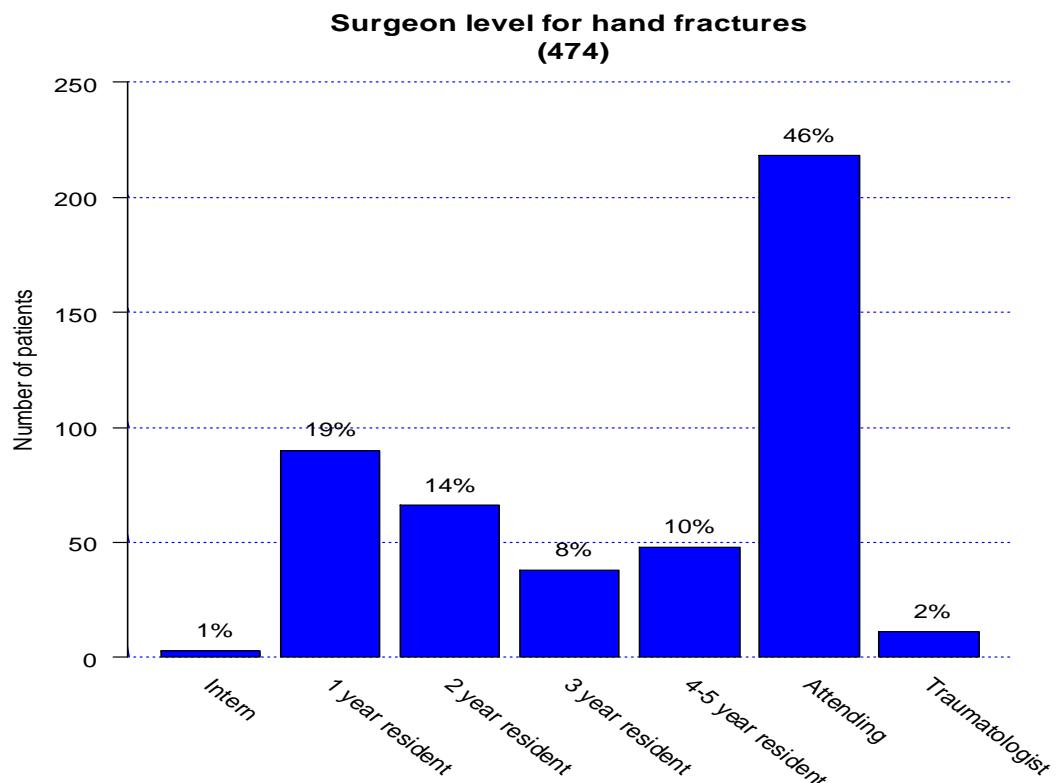
## Tibia/fibula



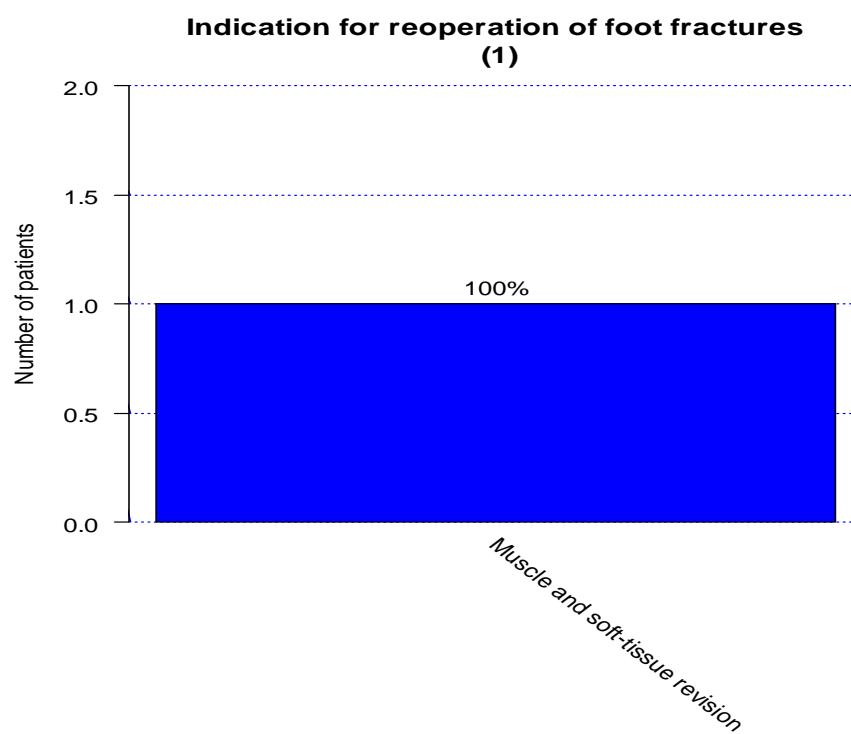
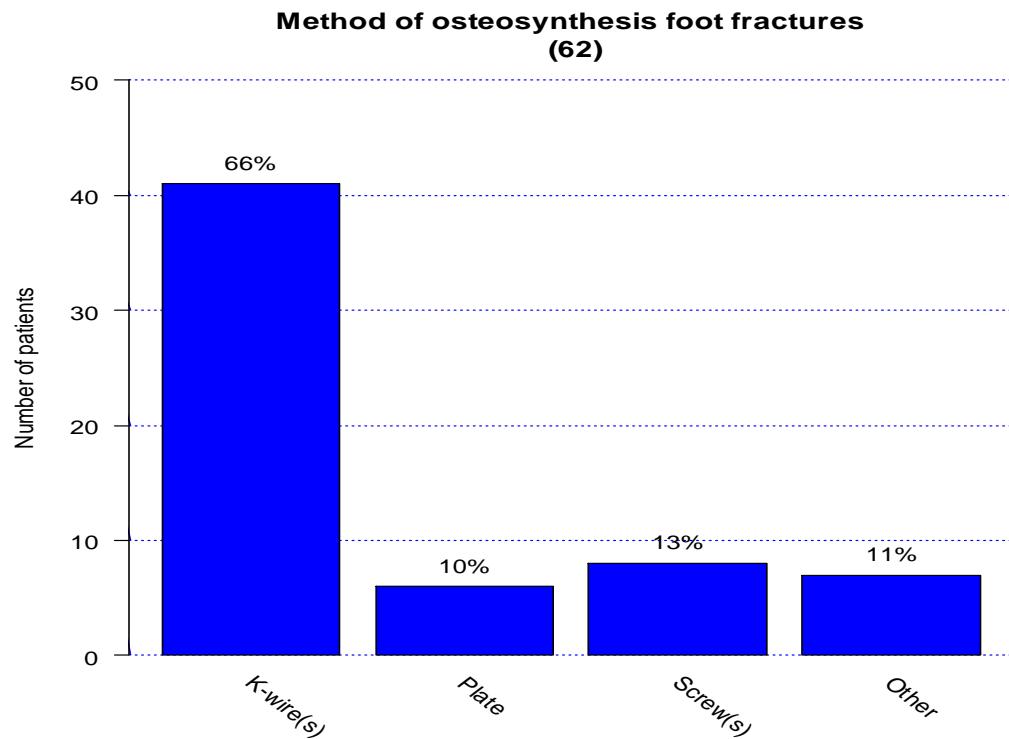


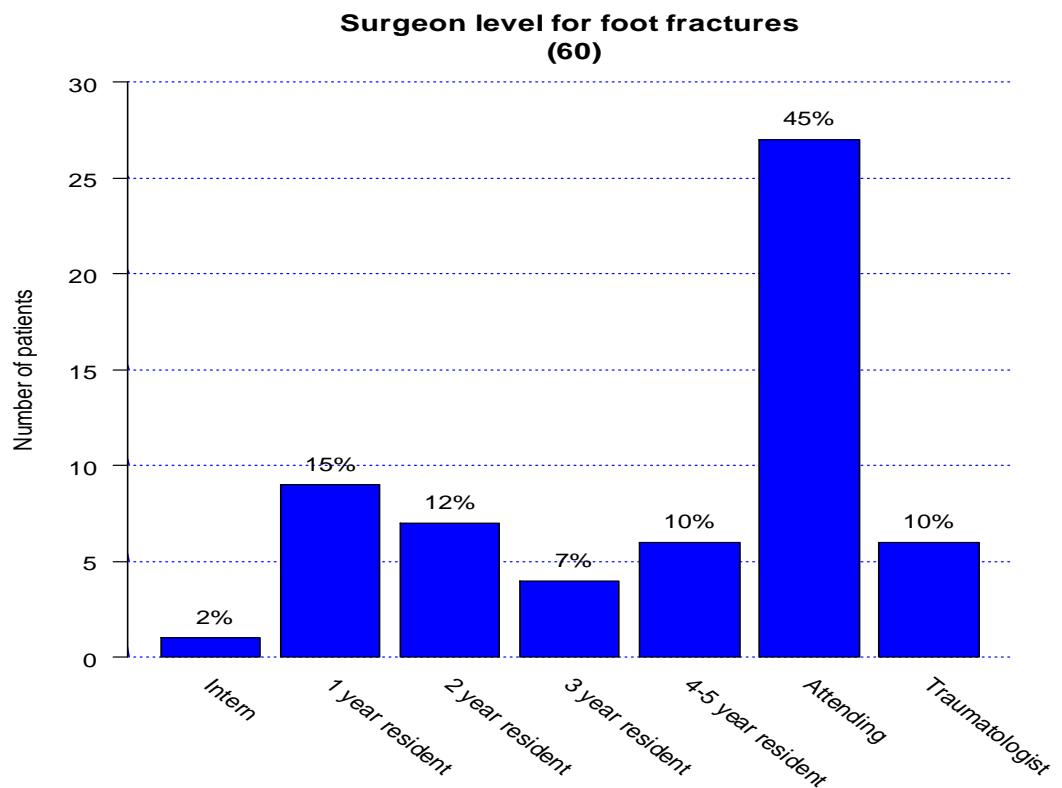
# Hand





# Foot





# 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 / paresthesia / 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 / periprosthetic  |
|                            | 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, 1 <sup>st</sup> year resident, 2 <sup>nd</sup> year resident, 3 <sup>rd</sup> year resident, 4-5 <sup>th</sup> year resident, attending, traumatologist*****  |
|                            | Educational level of the supervisor if present | Intern, 1 <sup>st</sup> year resident, 2 <sup>nd</sup> year resident, 3 <sup>rd</sup> year resident, 4-5 <sup>th</sup> 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.

| <b>Indications for reoperation:</b>                      |
|--|
| 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.