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## Pilot infections of BFCC: the differences in care and outcome treating implant related infection in Baltic Sea Region countries

Sarunas Tarasevicius, Lithuania

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# Introduction

- In 2010, 3.5 million new fractures, including approximately 610,000 hip fractures
- 560,000 forearm fractures, 520,000 vertebral fractures and 1,800,000 other fractures were estimated in the EU
- The use of surgically implanted devices is also increasing

# Introduction

- Implant- related infections is one of the most challenging complication in orthopedic and trauma surgery
- Complex fractures have an overall 5% infection rate when treated with an implant
- Guidelines could assist in the prevention and treatment of implant related infection
- However, guidelines may be not followed accurately, and do not have answers to all possible treatment options.

# Introduction

- Changes for today's treatment regimens are necessary
- An evaluation of the current standard treatments and a comparison of treatment pathways between hospitals:
  - identify causes for infection
  - best-practice examples for infection control to reduce their overall occurrence

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# Study plan

- The questionnaire was developed and distributed to partner hospitals (Germany and Lithuania)
- Retrospective data were covered for outcome analysis of open tibial fractures (2015-2016)
- Current period for standards of infections prophylaxis and treatment comparison

# Study plan

- Questionnaire description:
  - I part (current situation) :
    - Preoperative process measures
    - Operative process measure
    - Postoperative process measure
    - Infection process measure
    - Outcome and cost-effectiveness measures
  - II part:
    - Retrospective analysis of all open tibial fracture's treatment
    - Retrospective analysis of infected tibial fractures treatment

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# Quest analysis and summarized results: GER vs LT (1)

- Both countries have adopted a/b prophylaxis guidelines
- A/b prohylaxis is used routinely in Lithuania and Germany
- Routine a/b prophylaxis: Lithuania – Cefazolin, Germany- Cefuroxim
- In Lithuania first dose of a/b is administred in >30 min. before skin incision, in Germany- just before the incision
- In both countries duration of a/b prophylaxis - 24 hours
- In Lithuania hair routinely is not removed, In Germany hairs are removed with callipers
- Tranexamic acid is not routinely used for trauma patients (depend on case)

# Quest analysis and summarized results: GER vs LT (2)

| | Lithuania | Germany |
|---|---|---|
| What kind of ventilatoin system is installed in operating room ? | Conventional (mixing) system | Passive air flow |
| Do you use tourniquet? | Depend on case | Depend on case |
| A/b prophylaxis dose injection in relation to tourniquet inflation | Before | Before |
| Do you use drains | Depend on case | Routinely |
| Drainage duration? | 24 hrs | 48 hrs |
| Operative field films? | Iodophor-impregnated | Not used |
| Surgical gloves | powder-free surgical glove with a gel coating | patented puncture indication system |
| How many pairs of surgical gloves you wear during operation? | 2 | 2 |
| Surgical gloves exchange frequency during operation | Each two hours | I don't care |
| Antiseptic used for surgical site preparation | Alcohol-CHG (ChloraPrep) | Alcohol-iodophor (DuraPrep, Prevail-FX) |
| Solution used for surgical site wash | Chlorhexidine | Other |
| How often nurse change surgical site wash solution during operation? | Never | I don't know |

# Quest analysis and summarized results: GER vs LT (3)

| | Lithuania | Germany |
|---|---|---|
| How many blades used for skin and subcutaneous tissue cutting? | 2 | 2 |
| Scalpel blades exchange frequency during operation | Each layer cut | Other frequency |
| Do you use coagulation for tissue cutting? | Depend on case | Depend on case |
| Surgical site drapes | Depend on case | Single-use |
| Trauma implants storage place | General sterile package | Special storage room |
| Operating theatre door type | Automatic | Automatic |
| Personal equipment (mobile phones, watches, bracelets) in OR | Special box in OR | Not allowed to bring |
| Does nurse cover unused instruments during operation? | Never | Depend on case |
| Local infiltration of anesthetic (LIA) in trauma cases | Never | Depend on case |

# Quest analysis and summarized results: GER vs LT (4)

| | Lithuania | Germany |
|---|---|---|
| **Who changes wound dressings for the operated patients, and where?** | Nurse in ward | Nurse in ward |
| **How often wound dressings change is performed?** | Every 24 hours | Every 24 hours |
| **Type of anticoaguliant** | Low molecular weight heparins | Low molecular weight heparins |
| **Location of trauma patients in the department** | **General wards** | **Specialized trauma wards** |

# Quest analysis and summarized results: GER vs LT (5)

| | Lithuania | Germany |
|---|---|---|
| **Most common bacteria for early surgical site infection** | S.Aureus | S.Aureus |
| **Most common bacteria for late surgical site infection** | S.Epidermidis | S.Epidermidis |
| **What are yours actions if you see the redness in area of surgical wound?** | **Local dressing with antiseptic** | **Give antibiotics** |
| **Most common diagnostic methods used a when you suspect an infection** | **Biopsy and culturing** | **Clinical expression** |
| **Do you have hospital/department algorithm/guidelines for trauma related implants infections?** | No | No |

# Quest analysis and summarized results: GER vs LT (5)

| | Lithuania | Germany |
|---|---|---|
| Average length of hospital stay for uncomplicated trauma patient | 4 days | 5 days |
| Average length of hospital stay for septic trauma patient | 21 days | 35 days |
| Average price of mid shaft tibial fracture treated operatively | **5120 €** | **30 047 €** |

# Comparison of clinical data

- Tibial fracture
  - Open
  - Closed
  - Infected

# Open/closed tibia fracture analysis

## Study rationale

- The tibia is the most commonly fractured long bone
- Treatment methods varies
- Outcome varies in different countries

# Study design

- One hospital for Germany and Lithuania
- Retrospective analysis of medical data
- Included all closed/open tibia fractures
- Inclusion period from 2015-01-01 till 2016-12-31

# Material and methods

- Prefilled excel file prepared questionnaire
- Sent over to two clinical partners (Lithuania and Germany)
- Germany extracted data from hospital charts
- LT reviewed individual patient charts

# Descriptive statistics

- 104 patients
- Germany – 69 (G); Lithuania - 35 (L)
- Males 68 (G 45; L 23);
- Females 36 (G 24; L 12)
- Age 49 year (G - 51 (CI 46-56); L - 47 (CI 41-53); p=0,9632).

# Results

- Fractures statistically significantly were caused by high energy trauma (p=0.003)
- Significantly higher rate of open fractures were in Germany (p=0.004).

| Tibial fracture classification | Lithuania | Germany | |
|---|---|---|---|
| Closed fracture | 29 | 33 | |
| Open: | | | |
| Grade I | 4 | 19 | p=0.004 |
| Grade II | 1 | 14 | |
| Grade III | 1 | 3 | |

# Results

- Reposition method (open vs closed) did not differ between countries (p=0.337)

- Implant choice did not differ among the countries (p=0.138)

| Implant choices | Lithuania | Germany | |
|---|---|---|---|
| Nonlocking plate | 11 | 20 | |
| Locking plate | 13 | 33 | |
| IMN | 8 | 15 | |
| Screws fixation | 0 | 1 | p=0.138 |
| External fixation | 3 | 0 | |
| Total | 35 | 69 | |

# Results

- No correlations between open fracture and treatment method (p=0.332)
- Fracture zone, fracture type and surgery duration do not have any impact on complication rate.

| Implant choices | Closed fracture | Open fracture classification: Grade I | Grade II | Grade III | |
|---|---|---|---|---|---|
| Nonlocking plate | 22 | 6 | 3 | 0 | |
| Locking plate | 27 | 9 | 8 | 2 | p=0.332 |
| IMN | 11 | 8 | 3 | 1 | |
| Screws fixation | 1 | 0 | 0 | 0 | |
| External fixation | 1 | 0 | 1 | 1 | |
| Total | 62 | 23 | 15 | 4 | |

| Fracture location | No complications | Implant failure |
|---|---|---|
| Proximal part | 20 | 0 |
| Shaft | 53 | 2 |
| Distal part | 19 | 0 |
| Total | 102 | 2 |

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# Comparison of infected tibial fractures

## Study design

- One hospital for Germany and Lithuania
- Retrospective analysis of medical data
- Included all complicated septic tibia fractures
- Inclusion period from 2015-01-01 till 2016-12-31

# Descriptive statistics

- 21 patients
- Germany – 15 (G); Lithuania - 6 (L)
- Males 19 (G 14; L 5);
- Females 2 (G 1; L 1)
- Age 53 yr. (G - 55 (CI 43-66); L – 50 (CI 32-69); p=0,4313).

# Results

- Age, gender, ASA, country, fracture type, reposition method and implant does not have impact on complications.

- In Germany the most common bacteria is S.Aureus (8 of 15 patients), in Lithuania- S.Epidermidis and Streptococcus respectively (4 of 6).

- A/b treatment: Lithuania – Cefazolin, Germany- Cefuroxim (p=0.001)

| A/b treatment | Lithuania | Germany |
|---|---|---|
| Cefazolin | 3 | 0 |
| Cefuroxim | 0 | 11 |
| Other | 3 | 4 |
| Total | 6 | 15 |

p=0.001

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# Results

- Microorganism, comorbidities, smoking and alcohol abuse does not have impact on complications.

| Alcohol use | No complication | Complication | |
|---|---|---|---|
| Abstinent | 8 | 9 | |
| Former use | 0 | 1 | |
| Ongoing use | 1 | 2 | |
| Total | 9 | 12 | p=0.612 |

| Smoking status | No complication | Complication | |
|---|---|---|---|
| Never | 5 | 8 | |
| Former use | 0 | 1 | |
| Ongoing use | 4 | 3 | p=0.488 |
| Total | 9 | 12 | |

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# Interpretations

- Certain differences in routines before and after the surgery were observed
- Differences in distribution of fracture types, while treatment methods are similar
- However not enough data to draw big conclusions
- The need of unified guidelines for infection management is undisputable

# Thank you for your attention

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