Nosocomial Urinary Tract Infection
What can we improve?

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Technical University of Munich, Germany

The First International Congress of Central Asia
Infectious Diseases
Bishkek, Kyrgyzstan
30 OCT – 02 NOV 2006
International Society of Chemotherapy for Infection and for Cancer

66 national and regional societies with about 25‘000 members

www.ischemo.org

International Congresses of Chemotherapy
Disease Management Symposia
Working Groups
International Journal of Antimicrobial Agents
International Society of Chemotherapy
for Infection and for Cancer
Working Groups

- ISC - Cancer Section
- ISC - Virology Section
- ISC - WG Urinary Tract Infections
- ISC - WG Endocarditis
- ISC - WG Pharmacokinetics/Pharmacodynamics
- ISC - WG Catheter related infections
- ISC - WG Infections in Areas with Limited Resources
- ISC - WG Antimicrobials of the Future
- ISC - WG MRSA
- ISC - WG Infections in ICU
Submit your paper online
http://ees.elsevier.com/ijaa/
10th Western Pacific Congress on Chemotherapy and Infectious Diseases

in conjunction with

54th Annual Meeting of the Western Chapter of the Japanese Society of Chemotherapy (54th WC-JSC)
4th Asian UTI/STD Forum (AAUS 2006)

Sunday, December 3 - Wednesday, December 6, 2006
Munich, Germany
March 11-April 03 2007

25th International Congress of Chemotherapy

17th ECCMID
17th European Congress of Clinical Microbiology and Infectious Diseases

First Announcement

Munich/Germany, March 31—April 3, 2007

Website
www.eccmid-icc.org

deadline for abstract submission
16 Nov 2006
Complicated/Nosocomial UTI

- **Causes:**
  - complicating factors (e.g. obstruction, stone)
  - urologic interventions
  - catheters or splints

- **Localisations:**
  - lower urinary tract
  - upper urinary tract

- **Complications:**
  - change of pathogen
  - development of resistance
  - biofilm infection
  - urosepsis
Pope John Paul II
died on Saturday, April 2, 2005, from „septic shock“ (urosepsis) and „irreversible cardio-circulatory collapse ...... because of an overwhelming infection“

„Contributing causes:
- Parkinson‘s disease for over a decade;
- episodes of respiratory insufficiency and constriction of the trachea; signs of heart damage;
- and enlarged prostate gland, which made him vulnerable to the kind of urinary tract infection that killed him“
- „He had been admitted twice to the Gemelli hospital clinic since Feb 1, the start of a slow two-month decline toward his death.“

Urosepsis due to catheter associated UTI
NIDEP 1
One Day Prevalence Study

EPIC
One Day Prevalence Study

Intensive Care Aquired Infections (Total = 20.6%)

Nosocomial Infections - Urosepsis

- Nosocomial infections
- 2,000,000
  - UTI 800,000
  - Bacteremia 8,000-20,000
  - Urosepsis 4,000-8,000
  - Death 800-2,000

Prevalence Study of NAUTI in Urological Departments (since 2003)

Internet based Study (www.uroweb.org)
sponsored by

European Association of Urology (EAU)

in cooperation with

International Society of Chemotherapy (ISC)
European Society of Clinical Microbiology and Infectious Diseases
Federation of European Societies of Chemotherapy and Infection
Interregional Association of Clinical Microbiology and Antimicrobial Chemotherapy (IACMAC)
Asian Association of UTI and STD (AAUS) (since 2004)
Confederacion Americana de Urologia (CAU) (since 2005)
Log on to uroweb.org.
Go to sections - ESIU
Click on Scientific studies
### PEP/PEAP Study (2003/04):

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<th>Asia:</th>
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<td>Gibraltar 1</td>
<td>Sweden 10</td>
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| Others:                                    |                                              |           |                 |
|--------------------------------------------|                                              |           |                 |
| Brazil 1                                   |                                              |           |                 |
| Canada 1                                   |                                              |           |                 |
| Ghana 1                                    |                                              |           |                 |
| Egypt 1                                    |                                              |           |                 |
| Nigeria 2                                  |                                              |           |                 |
| Somalia 1                                  |                                              |           |                 |
| USA 1                                      |                                              |           |                 |
Study population

• 6033 patients on study days

• 152 hospitals
  (42 took part in both studies)

• 727 patients with NAUTI
Types of patients

• Sex
  – Males 74%
  – Females 26%

• Age
  <16 years 3%
  16-60 years 40%
  >60 years 56%
Type of hospitals

- University hospitals 44%
- Teaching hospitals 31%
- District hospitals 22%
- Others 3%
CDC Definitions for NAUTI

1. Symptomatic UTI:
   - symptoms AND bacteriuria
   - two of 7 criteria indicating UTI

2. Asymptomatic Bacteriuria:
   - indwelling urinary catheter present
   - no indwelling urinary catheter present

3. Other infections of the urinary tract:
   - positive culture of fluid (other than urine) or tissue
   - abscess or other evidence of infection
   - two of 5 criteria indicating other infection

Prevalence of NAUTI

- Prevalence in PEP-study: 10%
  322 cases in 3124 hosp. patients

- Prevalence in PEAP-study: 14%
  401 cases in 2909 hosp. patients

- Prevalence in combined analysis: 11%
  528 cases in 4662 hosp. patients
Contamination status

81% (588/727) of NAUTI-patients having undergone surgery

% of total

- Clean: 38%
- Clean cont.: 35%
- Cont.: 7%
- Infected: 20%
Catheters on study day (n=2849)

- Closed transurethral: 51%
- Open transurethral: 10%
- CIC: 2%
- Suprapubic: 11%
- Nephrostomy: 12%
- Ureteral: 14%
Characteristics of patients

- Urinary catheter 74%
- Average catheter duration 6-11 days
- Urinary tract obstruction 49%
- Previous UTI 44%
- Hospitalisation in prev. 6 months 45%
- Urinary stones 20%
Characteristics of patients with NAUTI

Risk factors

- No or minor differences as to age and gender
- A higher rate of procedures and catheters among patients with NAUTI (p<0.001)
Weighted importance of urological risk factors for NAUTI

Previous UTI | Antibiotics during prev. 3 months | Hosp. within 6 months

Component 1, Loadings

Sum Weighted Com | III.a | III.b | Sum III c | III.d | III.e | Sum III f | III.g varighet k

0.1 | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 | 0.5 | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 | 0.5
Clinical presentation of NAUTI

- ABU: 33% of total
- Pyelon: 22% of total
- Cystitis: 20% of total
- Urosepsis: 11% of total
- Other: 14% of total
Indications for antibiotics
Average urological patient population

% of total

Prophylaxis 50
Proven UTI 22
Suspected UTI 22
Other 6

58% of patients are receiving antibiotics
Use of antibiotics when NAUTI was diagnosed (n=207)

- Others
- Aminoglykoside
- Imi-/meropenem
- Ceftazidim
- Cefotax/ceftriaxon
- Am/ampi+BLI
- Cipro-/ofloxacin
- Co-trim/Trim
- Nitrofurantoin
E. coli – Ciprofloxacin (n=132)

- Germany
- Hungary
- Russia
- Turkey
- Others

- Resistant
- Intermediate
- Sensitive
Conclusions

• The prevalence of NAUTI is 11% (10-14%)

• ABU accounts for 29%, urosepsis 12%

• Urinary catheters are the most common risk factors

• There are significant regional variations in antibiotic usage and antimicrobial susceptibility of pathogens
Prevalence Study on NAUTI in Urology

• Next study will be performed Wednesday
  either 15 or 22 or 29 November 2006

• To all urologists
  • Please join the next Prevalence Study of NAUTI in Urology!

www.uroweb.org/gpiu2006
There is a clear correlation between Antibiotic Consumption and Antibiotic Resistance.
A

[Graph showing imipenem resistance and consumption for Pseudomonas aeruginosa from July 97 to July 00]

Lepper et al 2002 AAC 46: 2920-5
Antibiotic resistance depends on the environment

- Spontaneous mutations - genetic uptake
- Hygienic factors
- Selective antibiotic pressure

Survival and spread of resistant clones

Björn Wullt
Epidemiological analysis of the spread of pathogens from a urological ward using genotypic, phenotypic and clinical parameters

F.M.E. Wagenlehner, S. Krcmery, C. Held, I. Klare, W. Witte, A. Bauernfeind, I. Schneider, K.G. Naber

International Journal of Antimicrobial Agents
2002: 19: 583-591
Material and Methods

- 12 months 1996/7
- Urine isolates from all hospitalised urological patients
- Pathogen: identification
- Pathogen: susceptibility test
- Pathogen: typing

Wagenlehner et al 2002 IJAA 19: 583-91
Results

• 144 patients
  – 250 urine isolates
### Clonally Related Urine Isolates*

<table>
<thead>
<tr>
<th>Species</th>
<th>N / Isolates</th>
<th>%</th>
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<tbody>
<tr>
<td>Gram-negatives</td>
<td>76/ 147</td>
<td>52 %*</td>
</tr>
<tr>
<td>Staphylococci</td>
<td>5/ 40</td>
<td>13 %*</td>
</tr>
<tr>
<td>Enterococci/ B-Streptococci</td>
<td>21/ 63</td>
<td>33 %*</td>
</tr>
<tr>
<td>total</td>
<td>102/ 250</td>
<td>41%</td>
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*and cultured from different patients

*p < 0.001
Origine of NAUTI

• NAUTI is mainly catheter related

• Transmission/cross infection plays a major role in pathogenesis of NAUTI

• NAUTI is often a biofilm infection
Experimental Setup of Catheter-associated Infection Model

Teflon Catheters and Biofilmformation

Pre. 4th 8th day

Time-kill Courses of Piperacillin and Ceftazidime Against Biofilm Cells of *P. aeruginosa* No. 02 in Artificial Urine

Time-kill Courses of Papipenem and Amikacin against Biofilm Cells of *P. aeruginosa* No. 02 in Artificial Urine

Time-kill courses of Ciprofloxacin and Levofloxacin against biofilm cells of *P. aeruginosa* No. 02 in artificial urine

Nosocomial Urinary Tract Infection
What can we improve?

• Improve catheter care
• Optimize hygiene in urology
  - to reduce infections after urological interventions
  - to reduce transmission/crossinfection
• Prudent use of antimicrobials for
  - perioperative prophylaxis
  - treatment of NAUTI