Sepsis epidemiology: an update

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Vila Franca Xira Hospital

“You’re only given a little spark of madness. You mustn’t lose it.”
Robin Williams
2004-2005
17 ICUs
Identification of 897 (22%) patients with community-acquired sepsis

2009-2010
15 ICUs
Identification of 1556 (44%) patients with sepsis on ICU admission
### SAC UCI vs INFAUCI

<table>
<thead>
<tr>
<th></th>
<th>SAC UCI</th>
<th>INFAUCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>4142</td>
<td>3572</td>
</tr>
<tr>
<td>Age (years)</td>
<td>60 (±18)</td>
<td>61 (±17)</td>
</tr>
<tr>
<td>SAPS II</td>
<td>44 (±18)</td>
<td>45 (±18)</td>
</tr>
<tr>
<td>SOFA</td>
<td>7.4 (±3)</td>
<td>7 [1-15]</td>
</tr>
<tr>
<td>Charlson Score</td>
<td></td>
<td>5 [0-15]</td>
</tr>
<tr>
<td>Lenght of stay (ICU)</td>
<td>6 [2-21]</td>
<td>6 [2-34]</td>
</tr>
<tr>
<td>Lenght of stay (H)</td>
<td>19 [3-86]</td>
<td>19 [3-86]</td>
</tr>
<tr>
<td>Year</td>
<td>2005</td>
<td>2010</td>
</tr>
</tbody>
</table>

**INFAUCI Diagram:**
- Medical
- Coronary
- Trauma
- Elective surgery
- Emergent surgery
Infection Incidence

**SAC UCI**

- Infection: 78%
- Community: 22%
- N=4142

Cardoso, Crit Care, 2010, 14: R83

**INFAUCI**

- Infection: 56%
- Community: 30%
- Hospital: 14%
- N=3572

Gonçalves-Pereira, Clin Microbiol Infect 2014, 12: 1308
Infection Incidence

SAC UCI

Infection

- Community: 17%
- Health Care associated: 5%
- Total: 22%

N=4142

INFAUCI

Infection

- Community: 6%
- Health Care associated: 24%
- Total: 30%

N=3572

HCA/CAI – 23% (SAC UCI), 20% (INFAUCI)

Gonçalves-Pereira, Clin Microbiol Infect 2014, 12: 1308
Roughly 60% of infections were from the pulmonary tract (either pneumonia or tracheobronchitis)
# INFAUCI data

<table>
<thead>
<tr>
<th>Source of Infection</th>
<th>Place of acquisition</th>
<th>Hospital Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Community</td>
<td>HCA</td>
</tr>
<tr>
<td>Total</td>
<td>898 (54.9%)</td>
<td>228 (13.9%)</td>
</tr>
<tr>
<td>Pneumonia (N=745)</td>
<td>59.7%</td>
<td>12.4%</td>
</tr>
<tr>
<td>Tracheobronchitis (N=102)</td>
<td>67.6%</td>
<td>14.7%</td>
</tr>
<tr>
<td>Intra-Abdominal (N=436)</td>
<td>44.0%</td>
<td>12.0%</td>
</tr>
<tr>
<td>Endovascular (N=101)</td>
<td>29.7%</td>
<td>30.7%</td>
</tr>
<tr>
<td>Skin and soft tissue (N=93)</td>
<td>59.1%</td>
<td>16.1%</td>
</tr>
<tr>
<td>Urological (N=92)</td>
<td>57.6%</td>
<td>19.6%</td>
</tr>
<tr>
<td>Neurological (N=43)</td>
<td>81.4%</td>
<td>7.0%</td>
</tr>
<tr>
<td>Other (N=28)</td>
<td>75.0%</td>
<td>7.1%</td>
</tr>
</tbody>
</table>

Gonçalves-Pereira, Clin Microbiol Infect 2014, 12: 1308
## INFAUCI data

<table>
<thead>
<tr>
<th>Stratification of sepsis</th>
<th>Positive Microbiology</th>
<th>Appropriate Antibiotic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td></td>
<td>312 (19.0%)</td>
<td>478 (29.1%)</td>
</tr>
<tr>
<td>Pneumonia (N=745)</td>
<td>21.1%</td>
<td>34.0%</td>
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<tr>
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<td>30.4%</td>
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<td>18.5%</td>
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<td>39.5%</td>
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<td>17.9%</td>
<td>25.0%</td>
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Gonçalves-Pereira, Clin Microbiol Infect 2014, 12: 1308

**SAC UCI**
- Positive microbiology 40.5%
- Appropriate antibiotic 81.6%
Isolated Microrganisms

- Gram +
- Gram -
- Fungi
- Virus
- Others

SAC UCI
INFAUCI
Isolated Resistant Microorganisms

SAC UCI

- Acinetobacter spp
- Pseudomonas spp
- Klebsiella spp
- Staphylococcus aureus MR (20%)

Oxacillin resistance:
- CAI: 31.9%
- HCA: 60.7%
- H: 67.9%
Sepsis Estratification on ICU admission

**Sepsis Stratification**

- Sepsis
- Severe sepsis
- Septic Shock

**Length of Stay**

- ICU 9 (10) vs 8 (36)
- Hospital 19 (9) vs 22 (86)
# Impact of Infection on the mortality

<table>
<thead>
<tr>
<th>SAC UCI</th>
<th>No infection</th>
<th>Infection</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICU mortality</td>
<td>23%</td>
<td>30%</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hospital mortality</td>
<td>32%</td>
<td>38%</td>
<td>0.003</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Total (n=1651)</th>
<th>Survivors (n=1020; 62%)</th>
<th>Non Survivors (n=631; 38%)</th>
<th>AOR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs), median (P05-P95)</td>
<td>64 (31-84)</td>
<td>61 (29-82)</td>
<td>70 (36-86)</td>
<td>1.03</td>
<td>1.02-1.04</td>
</tr>
<tr>
<td>SAPS II mean±sd</td>
<td>49±18</td>
<td>43±15</td>
<td>58±17</td>
<td>1.04</td>
<td>1.03-1.05</td>
</tr>
<tr>
<td>Dependent Functional status</td>
<td>12%</td>
<td>9%</td>
<td>17%</td>
<td>1.73</td>
<td>1.16-2.56</td>
</tr>
<tr>
<td>SOFA Day 1:</td>
<td>8 (3-17)</td>
<td>7 (2-14)</td>
<td>10 (4-18)</td>
<td>1.07</td>
<td>1.01-1.12</td>
</tr>
<tr>
<td>Chronic Hepatic Failure</td>
<td>6%</td>
<td>4%</td>
<td>10%</td>
<td>3.469</td>
<td>1.97-6.11</td>
</tr>
<tr>
<td>Neurological disease</td>
<td>12%</td>
<td>9%</td>
<td>15%</td>
<td>1.66</td>
<td>1.07-2.58</td>
</tr>
<tr>
<td>Imunosupression</td>
<td>11%</td>
<td>8%</td>
<td>14%</td>
<td>1.80</td>
<td>1.13-2.87</td>
</tr>
<tr>
<td>Chronic Renal Failure</td>
<td>10%</td>
<td>7%</td>
<td>14%</td>
<td>2.43</td>
<td>1.53-3.86</td>
</tr>
<tr>
<td>Septic Shock</td>
<td>52%</td>
<td>43%</td>
<td>66%</td>
<td>1.79</td>
<td>1.14-2.81</td>
</tr>
<tr>
<td>Nosocomial infection</td>
<td>23%</td>
<td>19%</td>
<td>29%</td>
<td>1.81</td>
<td>1.33-2.47</td>
</tr>
<tr>
<td>Inappropriate Antibiotics</td>
<td>12%</td>
<td>9%</td>
<td>17%</td>
<td>2.29</td>
<td>1.49-3.51</td>
</tr>
</tbody>
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Gonçalves-Pereira, Clin Microbiol Infect 2014, 12: 1308
## Impact of Infection on the mortality

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<td>32%</td>
<td>38%</td>
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160 patients with Positive Blood Cultures

### Mortality

**Gonçalves-Pereira, Clin Microbiol Infection, 2013, 19: 242**

- **OR 1.7**
- **p<0.05**

### Graph

- **No BSI**
- **BSI**

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*João G. Pereira*
Seasonal distribution of infections

SAC UCI

INFAUCI

Respiratory
Intra-Abdominal
Endovascular
Neurologic
Skin and soft tissues
Gynecologic-obstetric
Endovascular
Other

Other
Urological
Skin
Bacteremia
Abdominal
Pneumonia
Seasonal distribution of infections

INFAUCI

INFAUCI

0 50 100 150 200 250 300 350 400 450 500

Spring Summer Fall Winter

Other Urological Skin Bacteremia Abdominal Pneumonia

INFAUCI

Spring Summer Fall Winter

Pneumonia

37.8%

Abdominal

31.6%

41.5%

37.1%

Death Survivors

INFAUCI

INFAUCI

INFAUCI
Process of Care

Early appropriate antibiotic therapy

Mortality and Time of Antibiotic Therapy (<3h/≥3h)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>&lt;3h</th>
<th>≥ 3h</th>
<th>OR</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>707</td>
<td>24.2%</td>
<td>32.6%</td>
<td>1.52</td>
<td>1.05-2.20</td>
<td>0.026</td>
</tr>
<tr>
<td>Documented Infection</td>
<td>364</td>
<td>24.3%</td>
<td>37.9%</td>
<td>1.90</td>
<td>1.04-3.45</td>
<td>0.035</td>
</tr>
<tr>
<td>Septic Shock</td>
<td>452</td>
<td>36.7%</td>
<td>45.4%</td>
<td>1.433</td>
<td>0.91-2.27</td>
<td>0.124</td>
</tr>
</tbody>
</table>

Antibiotic adequacy 81.6%

CRP ratio over time:

- <3h
- 3-12h
- >12h

Gonçalves-Pereira, ATS 2011 P B104
Process of Care

Early appropriate antibiotic therapy

Time until antibiotic therapy – 2.30h

ICU Mortality

OR – 2.75 (1.89-3.99)
The mortality rate was similar in those admitted directly to the ICU or first to the ward (32% vs. 29%).

An increase in CV failure was noted, from 8.6% at D0 to 51% at admission to the ICU.
Microbiology

Only 48.3% documented infections
(50.9% of hospital-acquired infections)

Blood cultures were collected in 48% of CAI patients
Collection was associated with a decrease in mortality
OR 0.57 (0.33-0.97)

Cardoso, Crit Care, 2010, 14: R83

Post ICU Mortality

SAC UCI – 11.4% (infected) vs. 11.4% (non infected)
INFAUCI – 14.2% (infected) vs. 9.6% (non infected), p<0.001
Process of Care

ICU acquired infection

<table>
<thead>
<tr>
<th>Infection</th>
<th>Total (n=3757)</th>
<th>None (n=1631; 43%)</th>
<th>ICU-acquired (n=474; 13%)</th>
<th>On admission (n=1652; 44%)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male gender (%)</td>
<td>61</td>
<td>58</td>
<td>69</td>
<td>62</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Age (yrs), median (P05-P95)</td>
<td>63 (29-84)</td>
<td>63 (27-83)</td>
<td>61 (25-83)</td>
<td>64 (31-84)</td>
<td>0.002§</td>
</tr>
<tr>
<td>SOFA, median</td>
<td>7 (1-15)</td>
<td>5 (1-13)</td>
<td>8 (3-14)</td>
<td>8 (3-17)</td>
<td>&lt;0.001§</td>
</tr>
<tr>
<td>ICU length of stay</td>
<td>6 (2-34)</td>
<td>3 (1-13)</td>
<td>18 (6-54)</td>
<td>18 (2-38)</td>
<td>&lt;0.001§</td>
</tr>
<tr>
<td>Hospital length of stay</td>
<td>19 (3-87)</td>
<td>13 (2-84)</td>
<td>35 (8-106)</td>
<td>22 (3-89)</td>
<td>&lt;0.001§</td>
</tr>
<tr>
<td>ICU Mortality</td>
<td>23</td>
<td>19</td>
<td>22</td>
<td>28</td>
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<td>32</td>
<td>26</td>
<td>33</td>
<td>38</td>
<td>&lt;0.001*</td>
</tr>
</tbody>
</table>

- In the overall population an ICU acquired infection was associated with an increase in mortality OR 1.55 (1.32-1.82)
- In the infected population a new ICU acquired infection increase mortality OR 2.16 (1.74-2.67)

Gonçalves-Pereira, Clin Microbiol Infection, 2013, 19: 242
Conclusions

- Population characteristics were similar in SAC UCI (2005) and INFAUCI (2010) studies.

- Infected patients are roughly 40% of all ICU admissions and 50% presented in septic shock.

- Health care associated infections are frequent and commonly present resistant microorganisms.

- Changes in the process of care may help to improve the outcome of the infected population.
V-FIB
GODS Ctrl/Alt/Delete