Misclassification of Place of Onset of Bacteremia Using Computer-Generated Duration Between Admission and Laboratory-Identified Bloodstream Infection

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Introduction

Bloodstream infection (BSI) is classified as community-associated (CA-BSI) and healthcare associated (HCA-BSI) which includes community onset (HCA-CO). Blood culture [BC] was collected within 3 days after admission and hospital onset [HO] if ≥4 days). This classification aims at distinguishing patients at risk for hospital-associated pathogens and monitoring healthcare facility performance measures.

Accurate classification requires historical information of individual patients. Many HO-BSI studies are based on a computer-generated subtraction of admission and BC collection dates in laboratory-identified bloodstream infections (LAB-ID-BSI). This method may miss recent hospitalizations and classify BSI as HCA-CO although they may be acquired in the hospital. We looked at community onset bloodstream infection (CO-BS) to determine the frequency of recent hospital stay.

Methods

- We reviewed BC results from 2010-2016.
- Included were patients with BSI (the isolation of a pathogen in ≥1 BC and a commensal organism in ≥ 2 BC within 48 h).
- Records were examined for patients with CO-BSI to determine if they were hospitalized ≤14 days.
- The source, microbiology and antibiotic susceptibility of the recently discharged patients were compared with HO-BSI.
- The differences were assessed by the chi-square test using the statistical software SPSS. A p ≤0.05 was considered significant.

Results

- Of 5258 BSI episodes, 3911 were CO (74.4%).
- Hospitalization within 14 days of the implicated LAB-ID-BSI was noted in 662 (16.9%) cases.
- The implicated BSI was acquired during prior hospital stay in 297 (44.9%) cases.
- Urinary tract and soft tissue/bone sources were more common in recently discharged (RD) patients, whereas IVC, abdominal sources and pneumonia were more frequent in HO cases (Table 1).
- BSI source in cases whose BSI was related to prior hospital stay were closer to HO (Figure 1).
- Table 2 shows selected microbiology and antibiotic susceptibility.
- *S. aureus, P. aeruginosa* and *Candida* spp. were more common in HO, whereas *E. coli, E. faecalis* and polymicrobial BSI were more frequent in RD.
- Antibiotic resistance was comparable in both group (Figure 2).

Table 1: **Distribution of BSI source in CO-recently discharged and HO cases**

	Onset: n (%)		
BSI source	CO n=662	HO n=1347	p
Intravenous catheter	101 (15.3)	264 (19.6)	0.02
Soft tissue/bone	118 (17.8)	178 (13.2)	0.007
Urinary tract	139 (21.0)	165 (12.2)	<0.001
Abdomen	73 (11.0)	231 (17.1)	<0.001
Pneumonia	49 (7.4)	137 (10.2)	0.05
Endocarditis	27 (4.1)	46 (3.4)	0.4
Miscellaneous/ uncertain	154 (23.3)	326 (24.2)	NA

Table 2: **Selected microbiology of BSI in CO-recently discharged and HO cases**

	Onset: n (%)		
Organism	CO	HO	p
Staphylococcus aureus	131 (19.8)	319 (23.7)	0.05
Enterococcus faecalis	74 (11.2)	99 (7.3)	0.005
Enterococcus faecium	31 (4.7)	51 (3.8)	0.3
Escherichia coli	130 (19.6)	165 (12.2)	<0.001
Pseudomonas aeruginosa	26 (3.9)	105 (7.8)	0.001
Cipro-R *Pseudomonas*	8/26 (30.8)	27/105 (25.7)	0.6
Klebsiella pneumoniae	71 (10.7)	146 (10.8)	0.5
Enterobacter cloacae	18 (2.7)	48 (3.6)	0.4
Acinetobacter baumannii	32 (4.8)	41 (3.6)	0.06
Candida spp.	29 (4.4)	96 (7.1)	0.01
Polymicrobial BSI	129 (19.5)	194 (14.4)	0.004

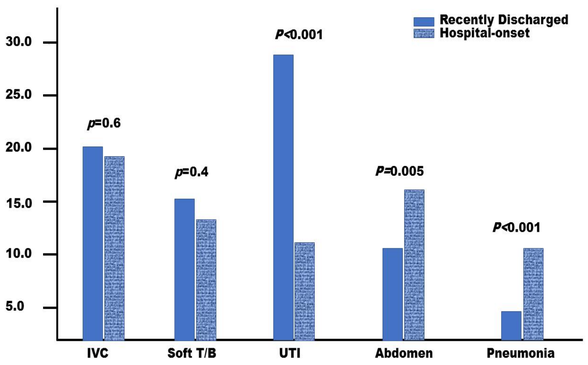

Figure 1: **Source of BSI (%)**

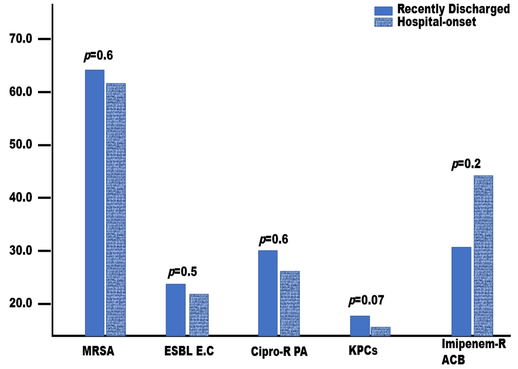

Figure 2: **Resistant pathogens (%)**

Conclusions

- Using subtraction of admission date from Lab-ID event date to classify BSI, one in 6 patients may risk being misclassified as CO.
- This underestimates BSI related to hospital setting and the risk for less-susceptible hospital-associated pathogens.
- Onset classification should be based on thorough historical information and not a computer-generated subtraction of admission and Lab event dates.
- A consensus for classifying BSI in recently discharged patients is needed.