Trends in HAI Etiologic Organisms at a Pediatric Medical Center – 2004-2015

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Background

- Healthcare-associated infection (HAI) prevention efforts are usually directed towards likely sources and causative pathogens
- Over the last decade, our institution has implemented numerous different strategies and practices to prevent HAIs
- The effect of interventions on causative organisms of HAI prevention efforts is unknown

Objective

- To explore the effect of HAI prevention activities on the organisms identified in HAIs occurring at our institution from 2004 to 2015

Methods

Study Design

- Retrospective analysis of HAI culture data

Case Identification

- HAIs were defined according to national standard definitions at the time of occurrence
- Pathogens were identified using our local Infection Control database

Inclusion Criteria

- Any of the following HAIs detected between January 1, 2004-December 31, 2014 at our institution that had an associated pathogen identified:
  - Central line-associated catheter infection (CLABSI)
  - Catheter-associated urinary tract infection (CAUTI)
  - Surgical site infection (SSI)
  - Ventilator-associated pneumonia (VAP)

Exclusion Criteria

- Any HAI that was not CLABSI, CAUTI, SSI, or VAP
- Any of the selected HAIs with no associated pathogen identified

Analysis

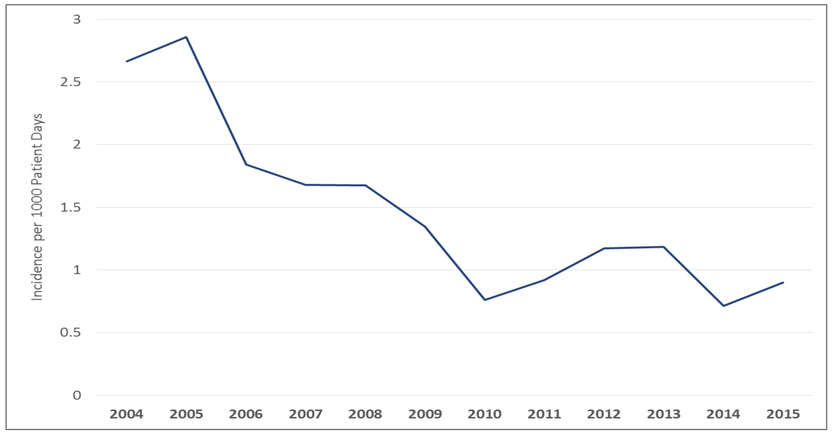
- Annual rates for all HAIs combined were calculated by organism identified
- Organism predominance was calculated by year as well as in three 4-year periods to compare proportions of HAI by organism
- Poisson regression analysis was used to assess trends among the ten most frequently identified organisms

Results

Overall HAI Incidence (Figure 1)

- Over the 12 year period, combined incidence of the 4 HAIs decreased from a peak of 2.86 in 2005 to 0.90 per 1000 patient days in 2015

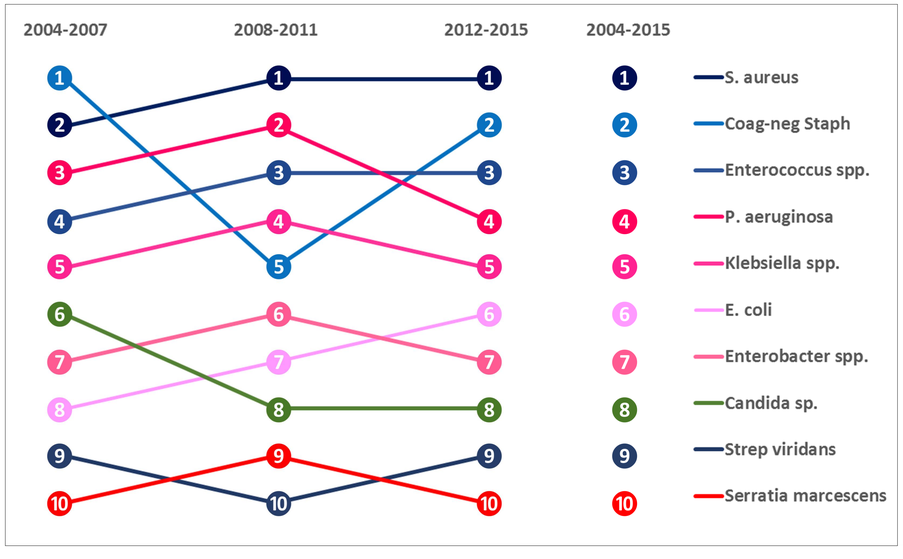
Figure 1 – Combined Annual HAI Incidence



Pathogen Rank (Figure 2)

- Over the 12 year period, the frequency of the 10 most commonly identified organisms fluctuated but changed little
- *S aureus* predominated throughout the time period

Figure 2 – Pathogen Rank by Incidence per 1000 Patient Days



Pathogen Trends (Table 1)

- Over the 12 year period, the proportion of HAIs with *S aureus* identified increased significantly (15.8% to 24.8%, p<0.01)
- Concomitantly, the proportion of coagulase-negative staphylococci (CoNS) identified decreased significantly (20.9% to 12.3%, p<0.01)
- No other organism demonstrated a significant change in proportion

Table 1 – Pathogen Trend by Proportion of All HAIs

	Proportion of all HAIs (%)			
Organism	2004-2007	2008-2011	2012-2015	p-value
S aureus	15.8	21.4	24.8	**<0.01**
CoNS	20.9	8.8	12.3	**<0.01**
Enterococcus spp	10.5	10.8	12.0	0.64
P aeruginosa	10.7	11.3	10.8	0.93
Klebsiella spp	8.6	10.2	9.7	0.53
Enterobacter spp	6.9	8.5	6.6	0.37
E coli	6.0	7.7	8.1	0.23
Candida spp	7.5	7.2	5.5	0.29
Strep viridans group	5.6	3.6	3.5	0.07
S marcescens	2.1	3.8	3.0	0.16

Limitations

- Single center analysis, limited generalizability
- Decrease in absolute number of HAIs may decrease analysis power
- Different HAIs have different pathogen profiles
  - Future study will examine pathogen incidence and trends by each HAI

Conclusions

- Annual HAI incidence
  - Decreased during the 12-year study period
  - Concomitant change in proportion of identified organisms was not observed
- Stratification into 3 4-year periods
  - Overall staphylococcal predominance was unchanged
  - *S aureus* replaced CoNS by ~10%
- Measures to prevent HAIs in our institution have decreased the annual HAI incidence, but have had little impact on the relative proportion of etiologic organisms