

Indirect Standardization to Improve Comparison of Children's Hospitals' Antimicrobial Use

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Introduction:

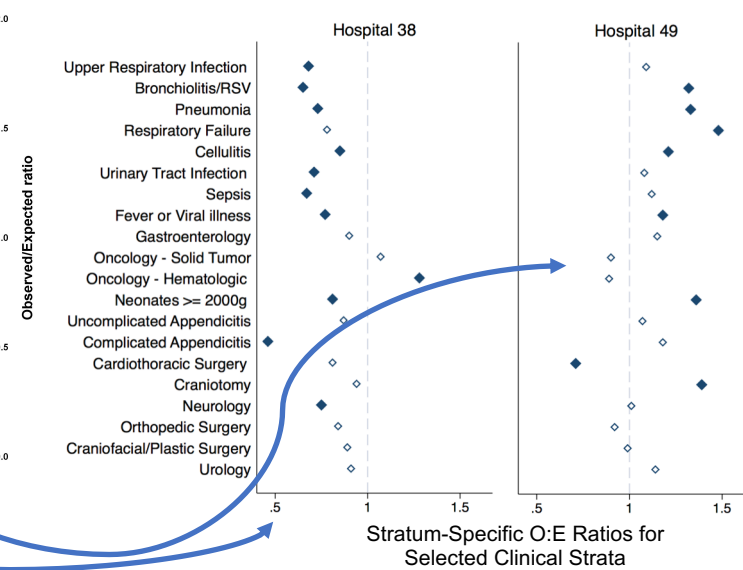
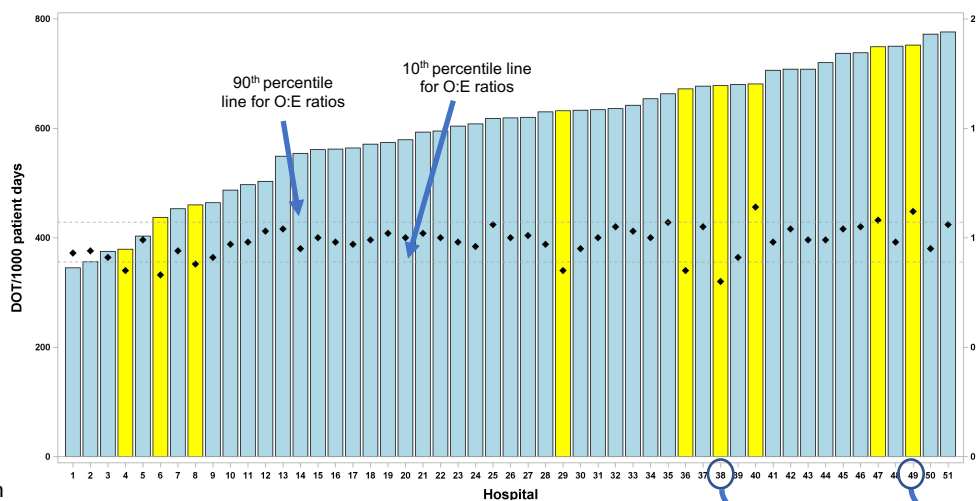
- Unadjusted antimicrobial use (AU) in days of therapy per 1000 patient-days (DOT/1000pd) varies widely between children's hospitals
- Current risk adjustment methods do not account for patients' diagnoses and/or procedures that may appropriately drive AU variation

Methods:

- Indirect standardization approach adapted to adjust children's hospitals' AU for clinical diagnoses and procedures

Observed to expected ratios adjusted for diagnoses and procedures **reduce apparent variation in antimicrobial use and reveal unexpected outliers.**

Hospitals with high DOT/1000pd can have different outlier status (low vs. high) after adjusting for diagnoses and procedures



Data from each individual participating hospital in 2018

Pooled mean DOT/case for 51 hospitals participating in Pediatric Health Information System database 2016-2018

Clinical Strata	Hospital Observed DOT	Hospital Case Number	Reference Rate DOT/Case	Expected DOT = Reference Rate x Hospital Case Number
1st stratum	o1	c1	r1	e1 = c1 x r1
2nd stratum	o2	c2	r2	e2 = c2 x r1
...
Sum DOT from all strata	O = o1 + o2 + ...			E = e1 + e2 + ...
Hospital O:E ratio	O/E			

Clinical strata (N=85) based on all patients refined diagnosis related groups (APR-DRGs). Strata developed by predefined criteria & consensus-based process.

O:E ratios have a narrower range of variation than unadjusted DOT/1000pd

	Unadjusted DOT/1000pd	Indirectly Standardized O:E Ratios
Range	345-776 (2.2-fold)	0.80-1.14 (1.4-fold)
Interquartile Range	552-679 (1.2-fold)	0.93-1.05 (1.1-fold)

Only moderately positive correlation between unadjusted DOT/1000pd and O:E ratios

	Correlation Estimate	95% CI	P
Unadjusted DOT/1000pd vs. Indirectly Standardized O:E Ratios	0.45	0.19-0.64	0.0008

Conclusions:

- Indirectly standardized O:E ratios enable more informative peer comparison by adjusting children's hospitals' AU for clinical population differences.
- Outlier clinical conditions can be identified to target antimicrobial stewardship interventions.
- Clinical validation is needed to understand benefits of this benchmarking approach for antimicrobial stewardship programs.