

Epidemiology of Infections in Pediatric Long-Term Care Facilities

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Background

The pediatric long term care (pLTC) population is increasing in size and medical complexity.¹ Few recent data describe the epidemiology and impact of infections in pLTC facilities. We performed a multicenter study to:

- Describe the types of infections diagnosed in residents of pLTCFs
- Calculate infection rates
- Identify potential risk factors for respiratory tract infections (RTIs).

Methods

Population, Sites, Study Period

This sub-study was part of a larger AHRQ-funded prospective surveillance study, *Keep it Clean for Kids* (PI Elaine Larson)² and included residents ≤ 21 year of age admitted to three pLTCFs in New York. Data were collected between September 2012 and December 2015.

Demographic Characteristics and Exposures

At enrollment, demographic and clinical characteristics were collected from the medical records and included age, chronic comorbid conditions (CCC),³ and use of medical devices.

Outcomes

- Infections diagnosed by treating clinicians
- Infection type
- Crude mortality
- Hospitalizations in acute care facilities (ACFs).

Diagnostic testing

Sites obtained clinical specimens which were processed at outside hospitals or commercial laboratories. Diagnostic testing included bacterial cultures and reverse transcriptase PCR for respiratory viruses.

Statistics

Infection rates were calculated per 1000 resident-days. The RTI infection rate was used as the outcome in multivariable risk factor analysis. The final model was a generalized linear mixed model regression using negative binomial distribution and site clustering to produce incidence rate ratios (IRR).

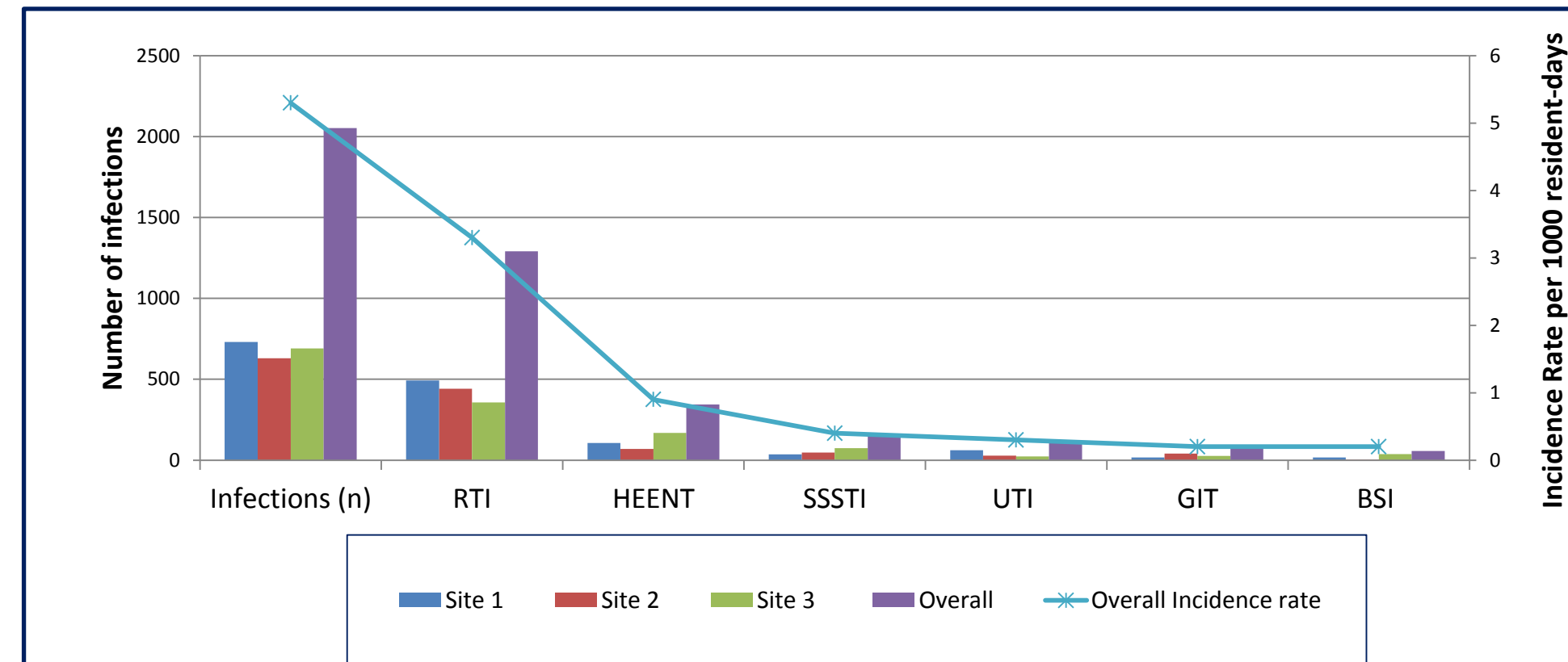
Results

Table 1: Demographic and Clinical Characteristics

Characteristics	Site 1	Site 2	Site 3	Overall
Number of beds/ residents enrolled	54/93	137/205	97/419	288/717
Mean length of observation (months)	24.6	32.1	9.7	18.0
Median age at enrollment	3.2 years	2.0 years	0.6 years	2.0 years
Male ³	50 (53.8%)	99 (48.3%)	209 (49.9%)	358 (49.9%)
Race ²				
Black/ African American	14 (15.1%)	69 (33.7%)	137 (32.7%)	220 (30.7%)
White	49 (52.7%)	28 (13.7%)	92 (22.0%)	169 (23.6%)
Asian	8 (8.6%)	27 (13.2%)	66 (15.8%)	101 (14.1%)
Hispanic Ethnicity ²	18 (19.4%)	83 (40.5%)	109 (26.0%)	210 (29.3%)
Number of chronic comorbid conditions				
2 conditions	10 (10.8%)	14 (6.8%)	57 (13.6%)	81 (11.3%)
3 conditions	26 (28.0%)	34 (16.6%)	80 (19.1%)	140 (19.5%)
≥ 4 conditions	53 (57.0%)	153 (74.6%)	254 (60.6%)	460 (64.2%)
Device use at enrollment				
Feeding tubes (GT/JT/GJ) ¹	73 (78.5%)	163 (79.5%)	192 (45.8%)	428 (59.7%)
Tracheostomies	35 (37.6%)	90 (43.9%)	90 (21.5%)	215 (29.9%)
Nasogastric tubes	10 (10.8%)	5 (2.4%)	94 (22.4%)	109 (15.2%)
Ventilators	9 (9.7%)	19 (9.3%)	20 (4.8%)	48 (6.7%)
Central venous catheters	5 (5.4%)	1 (0.7%)	40 (9.5%)	46 (6.4%)

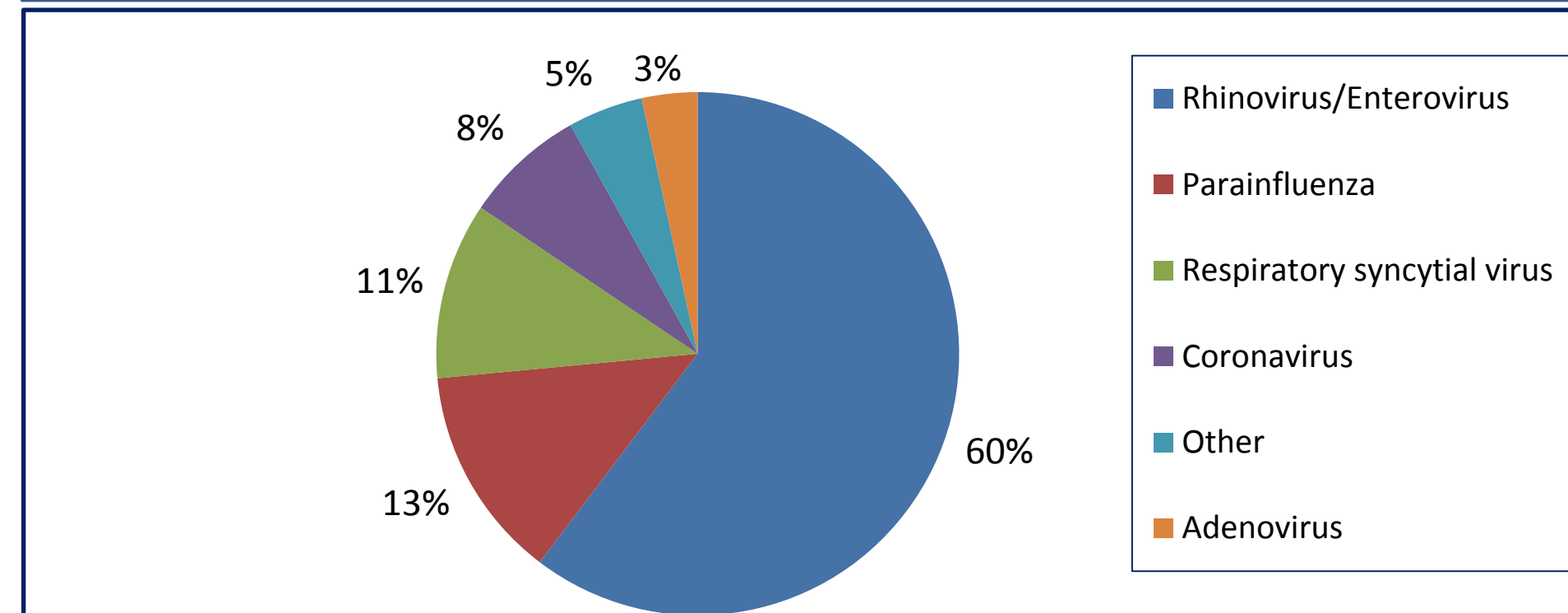
¹ Abbreviations: GT=gastric tube, JT=jejunal tube, GJ=gastric jejunal tube.

Figure 1: Infection Incidence and Rate by Type and Site



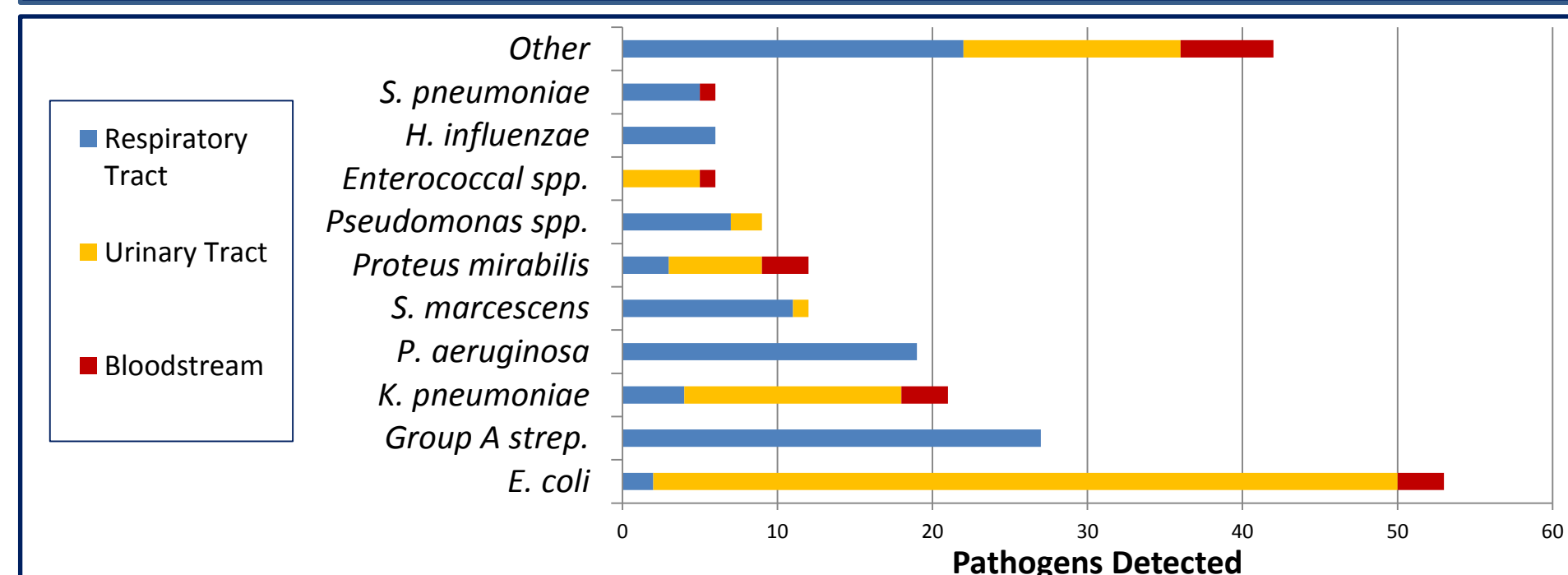
Abbreviations: RTIs=respiratory tract infections, HEENT= head/ears/eyes/throat, SSTI = skin and soft tissue, UTI=urinary tract infections, GIT=gastrointestinal infections, and BSI =bloodstream infections

Figure 2: Respiratory Viral Pathogen Profile (n=669)



Other contains: human metapneumovirus (2%), Influenza A (2%), Influenza B (1%), and coxsackie virus (0.01%).

Figure 3: Distribution of Bacterial Pathogens (n=213)



Other: Group G strep.(n=5), Moraxella catarrhalis (n=5), Staphylococcus aureus (n=4), Coagulase neg. staph. (n=3), Enterobacter spp. (n=3), Acinetobacter baumannii (n=3), Candida albicans (n=2), Citrobacter spp. (n=3), Group B Streptococci (n=2), Mycoplasma pneumoniae (n=2), Providencia stuartii (n=2), and 1 each of Acinetobacter Iwoffii, Morganella morganii, and Stenotrophomonas maltophilia.

Table 2: Respiratory Tract Infections Risk Factors

Variable	RTI Incidence per 1000 resident-days (n=number of residents with ≥ 1 RTI for each variable)	Bivariate IRR ¹ (CI ₉₅)	Bivariate P-Value	Multivariable IRR ¹ (CI ₉₅)	
-Sex	Female				
	3.17 (n=210)	3.43 (n=203)	0.98 (0.81, 1.18)	0.86	--
-Respiratory Condition	Present				
	3.43 (n=231)	3.11 (n=182)	1.43	0.0003	--
-Device Use	Present				
	0.97 (n=8)	3.35 (n=405)	0.46 (0.21, 1.02)	0.06	--
Baclofen pump					
Central venous catheter	4.89 (n=25)	3.23 (n=388)	1.41 (0.93, 2.15)	0.11	--
Feeding tubes (GT/GJ/IJ) ¹	3.59 (n=310)	2.29 (n=103)	1.46 (1.17, 1.82)	0.0008	1.34 (1.03, 1.64)
Nasogastric tube	4.59 (n=40)	3.23 (n=373)	1.26 (0.90, 1.77)	0.18	--
Tracheostomy	3.83 (n=174)	2.92 (n=239)	1.50 (1.25, 1.80)	<0.0001	1.40 (1.17, 1.69)
Ventilator	5.26 (n=40)	3.14 (n=373)	2.18 (1.61, 2.95)	<0.0001	--
- Age at enrollment ²	--	--	1.05 (1.04, 1.06)	<0.0001	1.05 (1.03, 1.06)
- Number of chronic comorbid conditions ³	--	--	1.16 (1.10, 1.23)	<0.0001	1.12 (1.06, 1.19)

¹ Abbreviations: GT=gastric tube, JT=jejunal tube, GJ=gastric jejunal tube, IRR=Incidence Rate Ratio
² Measured in years, modeled decreasing age; ³ Per CCC

Limitations

- Lack of generalizability of study sites.
- Demographic and clinical characteristics were collected at enrollment.
- Lack of case definitions for infections in pediatric LTC populations.
- Detected pathogens may represent bacterial colonization or viral shedding causing an over-estimate of infections.

Conclusions

- The pediatric LTC population requires an intense level of care due to numerous, co-existing chronic conditions.
- Residents experience a large burden of infections; 2052 infections were diagnosed of which 63% were RTIs.
- None of the patient level risk factors (young age, increased number chronic conditions, feeding tubes and tracheostomies) are likely to be modifiable in this population.
- Future work should focus on developing case definitions for infections and evidence-based infection prevention and control strategies to reduce infections, particularly RTIs, in this unique population.

References

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