Characterization of Microbiology And Associated Antibiotic Usage In The Neonatal Intensive Care Unit

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Characterization of microbiology and associated antibiotic usage in the neonatal intensive care unit

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BACKGROUND

- Antibiotics are the most commonly administered medications in the neonatal intensive care unit (NICU).[1]
- Antibiotic usage in neonatal patients may be associated with significant adverse effects.[2]
- A sepsis calculator was implemented on April 1, 2019 to evaluate infection risk in infants 36 weeks gestation or older with goal to reduce unnecessary empiric antibiotic treatment.
- Surveillance cultures are collected to detect colonization and limit the transmission of methicillin-resistant *Staphylococcus aureus* (MRSA).[3]
- Goal of this research project was to evaluate culture results, surveillance cultures and antibiotic use in the NICU at Lehigh Valley Reilly Children's Hospital (LVRCH)

METHODS

Primary Objective

- Characterize empiric antimicrobial therapy based on postmenstrual age.

Secondary Objectives

- Calculate percentage of documented infections and characterize infecting organisms
- Calculate percentage of patients colonized based on surveillance cultures

A retrospective chart review was performed for neonates admitted to the NICU within LVRCH who received at least one dose of antibiotics between April 1, 2018 and March 31, 2020.

The study sample was summarized using descriptive statistics.

RESULTS

Table 1. Patient demographics

	Total N=664	4/1/2018 – 3/31/2019 N=379	4/1/2019 – 3/31/2020 N=285
Gestational Age, n (%)			
20 weeks 1 day to 23 weeks 6 days	10 (2)	5 (1)	5 (1)
24 weeks 0 days to 27 weeks 6 days	56 (8)	21 (6)	35 (12)
28 weeks 0 days to 31 weeks 6 days	79 (12)	40 (12)	39 (14)
32 weeks 0 days to 36 weeks 6 days	174 (26)	89 (23)	85 (30)
37 weeks 0 days and older	345 (52)	224 (59)	121 (43)
Male gender, n (%)	382 (58)	209 (55)	173 (61)
Birth Weight (kg), median (IQR)	2.82 (0.45-1.77)	3.08	2.51

Figure 1. Empiric Antibiotic Usage with Respect to Postmenstrual Age

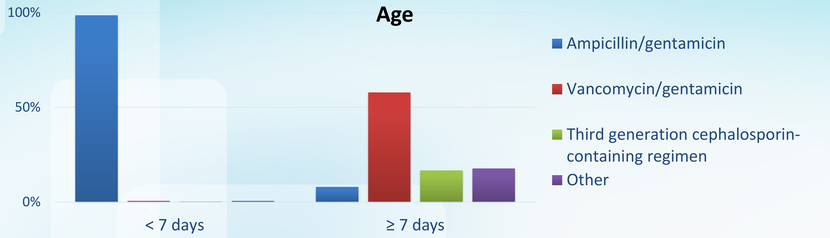

Table 2. Microbiology of documented infections and surveillance cultures

	4/1/2018 – 3/31/2019	4/1/2019 – 3/31/2020
Documented infections (n=23), n (%)	11 (1.7)*	12 (1.6)*
Blood	8 (72.7)	9 (75)
Sputum/trach	1 (9.1)	2 (16.7)
Urine	1 (9.1)	1 (8.3)
Wound	1 (9.1)	0
Microbiology (all sources), n (%)	N=17	N=17
Gram-negative	8 (47.1)	10 (58.8)
Escherichia coli	2 (11.8)	5 (29.4)
Haemophilus influenzae	1 (5.9)	1 (5.9)
Klebsiella spp.	1 (5.9)	2 (11.8)
Pseudomonas aeruginosa	4^ (23.5)	0
Other	0	2 (11.8)
Gram-positive	9 (52.9)	7 (41.2)
Enterococcus spp.	3 (17.6)	2 (11.8)
MRSA	0	1 (5.9)
MSSA	1 (5.9)	1 (5.9)
Staphylococcus epidermidis	5 (29.4)	1 (5.9)
Streptococcus agalactiae	0	1 (5.9)
Streptococcus spp.	0	1 (5.9)
Surveillance cultures	N=171	N=169
Organism identified, n(%)	37 (22)	38 (22)

*Percentage of documented infections calculated as number of infections divided by number of admissions for each year
^All *Pseudomonas aeruginosa* isolated from single patient

Figure 2. Positive surveillance cultures with respect to day of life

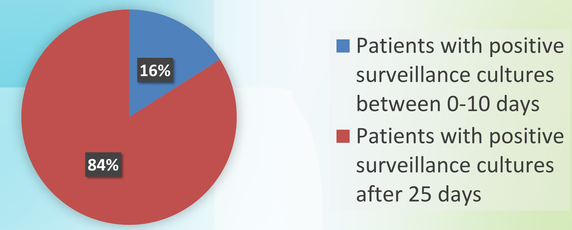

Figure 3. NICU Days of Therapy per 1000 Patient Days

CONCLUSIONS

- Ampicillin/gentamicin was the most frequently prescribed empiric antimicrobial regimen in the first week of life, whereas vancomycin/gentamicin was encountered more frequently in infants beyond 7 days of life.
- Documented infection rate for the NICU at LVRCH was similar across the two time periods and remains low based on size and level of care. Gram-negative and gram-positive organisms were encountered similarly during the two timeframes.
- Less than 25% of patients were colonized during their NICU hospitalization. Majority of patients were colonized after a three week hospital stay. MSSA represented more than two-thirds of positive surveillance cultures.
- Antimicrobial days of therapy have steadily declined over the study period. This could be attributed to implementation of the sepsis calculator and less empiric use of antimicrobials.

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