



Effect of RVP results on length of stay for neonatal fever patients with negative sepsis evaluations

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Introduction

Fever $\geq 38^{\circ}$ C is a common presenting complaint for infants <90 days old. Although most will prove to have a viral illness, ~8.5% of these infants will have a serious bacterial infection (SBI), including urinary tract infections, bacteremia, and meningitis.

Given the potentially severe consequences of a missed SBI past guidelines have recommended hospital admission with a full sepsis evaluation and antibiotic treatment pending negative culture results at 48 hours for all febrile infants less than two months of age. However, the need for a full 48-hour inpatient stay has been increasingly called into question. Pediatric blood cultures have a high negative predictive value after just 24 hours of incubation. Meanwhile, with the rise in availability of rapid viral testing it has been shown that a confirmed viral infection significantly decreases a patient's chance of having a concurrent SBI.

Physicians in our facility frequently order a respiratory viral panel (RVP) to search for a fever source in febrile neonates, looking for evidence that a patient may be safely discharged prior to the 48-hour mark. The purpose of this study is to determine whether a positive RVP does in fact lead to a shorter length of stay for neonatal fever patients with negative sepsis evaluations in our facility.

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Materials and methods

- Identified all patients aged ≤ 28 days admitted between 6/1/13 and 9/30/14 with diagnosis of fever
- Excluded all patients with the following:

Acute pyelonephritis 590.10	Group B strep infection 041.02	Pneumonia organism 486
Arm cellulitis 682.3	Group D strep infection 041.04	Pseudomonas infection 041.7
Bacteremia 790.7	H. influenza infection NOS 041.5	Pyelonephritis NOS 590.80
Bacterial infection NEC 0418.9	Herpes simplex meningoencephalitis 054.3	Renal/perirenal abscess 590.2
Bacterial meningitis NOS 041.9	Inflammatory breast disease 611.0	RSV bronchiolitis 466.11
Bacterial pneumonia NOS482.9	Influenza bronchiolitis 487.1	S. aureus infection 041.11
Bacterial UTI 599.0	Influenza with pneumonia 487.0	Salmonella meningitis 003.21
Bronchiolitis 466.19	Klebsiella pneumonia infection 041.3	Salmonella septicemia 003.1
Buttock cellulitis 682.5	Leg cellulitis 682.6	Sepsis 995.91
Cellulitis NEC 682.8	Lung abscess 513.0	Severe sepsis 995.92
Congenital adrenal hypoplasia 255.2	Meningitis NOS 322.9	Septic shock 785.52
Congenital pneumonia 770.0	MRSA 041.12	Shock without trauma NEC 785.59
Escherichia coli bacteremia 790.7	MRSA septicemia 038.12	Streptococcal infection NEC 041.00
Escherichia coli infection 041.4	Newborn bacteremia 771.83	Streptococcal meningitis 320.2
Escherichia coli UTI 599.0	Newborn infective mastitis 771.5	Trunk cellulitis 682.2
Encephalitis/myelitis/EM NOS 323.9	Newborn omphalitis 771.4	Urinary tract infection NOS 599.0
Eyelid abscess 373.13	Newborn septicemia 771.81	Viral meningitis NEC 047.8
Face cellulitis 682.0	Newborn urinary tract infect 771.82	Viral meningitis NOS 047.9
Gram-negative meningitis 320.82	Orbital cellulitis 376.01	
Gram-negative bacterial infection NEC 041.85	Other bacterial meningitis 320.89	
	Other staph infection 041.19	

- Also excluded patients with positive cultures not identified by the above ICD-9 codes, those with cultures done at an outside facility, and those for whom a CSF culture could not be obtained
- Performed chart review to determine:
 - Length of stay (LOS) for each patient, measured as time in hours between blood culture being drawn and the time of discharge
 - RVP results if available
 - Presence or absence of URI symptoms, defined as cough, congestion, and/or rhinorrhea documented in the admission H&P

Used Welch's t-test (unpaired, assumes unequal variance) to compare the LOS of:

- Patients with positive vs negative RVP results
- Patients with URI symptoms vs no URI symptoms who had no RVP sent

Conclusions

In our facility neonatal fever patients ≤ 28 days of age with negative sepsis evaluations and confirmed viral infection on RVP are discharged ~5 hours earlier on average than those with a negative RVP result.

However, they are not discharged any sooner than those patients who present with URI symptoms who do not have an RVP sent.

This suggests that an RVP and its attendant cost (\$135.67 at our facility) should be avoided in neonatal fever cases where the diagnosis of a URI can be made clinically at the time of admission. However, it can be a useful tool to promote earlier discharge in those patients who present without URI symptoms.

Results

A total of 167 patients ≤ 28 days of age were admitted for neonatal fever and found to have negative sepsis evaluations during the study period. An RVP was sent for 86 of these patients (52%). The average LOS for all patients was 46.24 hours.

Patients with a confirmed viral infection on RVP were discharged significantly earlier than those with a negative RVP (44.55 hours vs. 49.20 hours, $p=0.03$, see Table 1).

However, among those patients who did not have an RVP sent those with URI symptoms at presentation were likewise discharged significantly earlier than those without URI symptoms (43.68 hours vs. 46.79 hours, $p=0.022$, see Table 2).

There was no difference in length of stay for patients with confirmed viral infection on RVP compared to those with URI symptoms at admission who did not have an RVP sent (44.55 hours vs. 43.68 hours, $p=0.649$, see Table 3).

Of note, 84% of patients with a positive RVP had URI symptoms at admission.

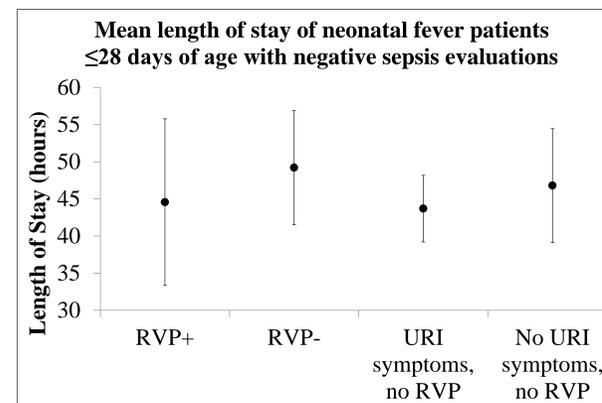


Table 1. Average length of stay (LOS) for neonatal fever patients with RVP

Positive RVP (n=45)		Negative RVP (n=36)		
Mean LOS (hours)	SD	Mean LOS (hours)	SD	p-value
44.55	11.22	49.20	7.69	0.030

Table 2. Average length of stay (LOS) for neonatal fever patients without RVP

URI symptoms present (n=25)		No URI symptoms (n=61)		
Mean LOS (hours)	SD	Mean LOS (hours)	SD	p-value
43.68	4.49	46.79	7.67	0.022

Table 3. Comparison of length of stay (LOS) for neonatal fever patients with positive RVP results versus URI symptoms only

Positive RVP (n=45)		URI symptoms present, no RVP (n=25)		
Mean LOS (hours)	SD	Mean LOS (hours)	SD	p-value
44.55	11.22	43.68	4.49	0.649

References

- Byington CL, Enriquez FR, Hoff C, et al. Serious bacterial infections in febrile infants 1 to 90 days old with and without viral infections. *Pediatrics*. 2004;113:1662-1666
- Dagan R, Powell KR, Hall CB, Menegus MA. Identification of infants unlikely to have serious bacterial infection although hospitalized for suspected sepsis. *J Pediatr*. 1985;107(6):855-860
- Jain S, Cheng J, Alpern ER, et al. Management of febrile neonates in US pediatric emergency departments. *Pediatrics*. 2014;133:187-195
- Krief WI, Levine DA, Platt SL, et al. Influenza virus and the risk of serious bacterial infections in young febrile infants. *Pediatrics*. 2009;124:30-39
- Kumar Y, Qunibi M, Neal TJ, Yoxall CW. Time to positivity of neonatal blood cultures. *Arch Dis Child Fetal Neonatal Ed*. 2001;85:F182-F186
- Levine DA, Platt SL, Dayan PS, et al. Risk of serious bacterial infection in young febrile infants with respiratory syncytial virus infections. *Pediatrics*. 2004;113:1728-1734.
- McGowan KL, Foster JA, Coffin SE. Outpatient pediatric blood cultures: time to positivity. *Pediatrics*. 2000;106:251-255 2000
- Pantell RH. Febrile Infants: Aligning science, guidelines, and cost reduction with quality of individualized care. *Pediatrics*. 2012;130:e199-e200
- Roberts KB. Young, febrile infants: a 30-year odyssey ends where it started. *JAMA*. 2004;291(10):1261-1262