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TITLE: Reduced NICU Length of Stay Using Heart Rate Characteristics Monitoring

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AUTHORS (FIRST NAME, LAST NAME): Jonathan R. Swanson[4], William King[2], Waldemar Carlo[7], Robert A. Sinkin[5], Robert Schelonka[8], Peter J. Porcelli[6], Christina Navarrete[9], Eduardo Bancalari[3], Judy L. Aschner[1], Jose Perez[10], Charles Palmer[11], O'Shea Micheal[12], Whit Walker[13]

INSTITUTIONS (ALL):

1. Pediatrics, Albert Einstein College of Medicine/ Children's Hospital at Montefiore, Bronx, NY, United States.
2. MPSC, Charlottesville, VA, United States.
3. Pediatrics, University of Miami, Miami, FL, United States.
4. Pediatrics, University of Virginia, Charlottesville, VA, United States.
5. Pediatrics, University of Virginia Children's Hospital, Charlottesville, VA, VA, United States.
6. Pediatrics, Wake Forest University, Winston-Salem, NC, United States.
7. University of Alabama, Birmingham, AL, United States.
8. Oregon Health Sciences University, Portland, OR, United States.
9. University of Miami, Miami, FL, United States.
10. Winnie Palmer Children's Hospital, Orlando, FL, United States.
11. Pennsylvania State University, Hershey, PA, United States.
12. University of North Carolina, Chapel Hill, NC, United States.
13. Greenville Hospital System, Greenville, SC, United States.

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Background: Late onset sepsis among very low birth weight (VLBW) remains an important cause of mortality, morbidity and increases hospital costs. Estimates of the increase in length of stay (LOS) associated with sepsis range from 5-19 days.

In a recent multi-center randomized-controlled trial, heart rate characteristics (HRC) monitoring decreased mortality by 22%. Among infants who developed late onset sepsis, there was a 40% reduction in mortality for infants randomized to HRC monitoring. However, there was no significant difference in LOS between monitored and unmonitored groups. Because LOS is a competing outcome with mortality, we conducted a secondary analysis to compensate for the confounding effect of increased survival.

Objective: To examine the effect of HRC monitoring on LOS among VLBW infants.

Design/Methods: A retrospective analysis of the original 3003 VLBW patient HeRO trial evaluating metrics of LOS among all patients, all survivors, and survivors with at least one positive blood or urine culture was performed.
LOS was calculated as the date of discharge from NICU minus the date of birth. A second calculation of LOS was performed where non-survivors were assigned a LOS of 120 days (original study endpoint). Postmenstrual age (PMA) at discharge was calculated as the gestational age at birth plus the LOS. Median LOS and PMA were assessed using normal approximation to the binomial. Arithmetic means were used to compare average gestational age using a Student T-test and were reported in days to be consistent with PMA and LOS. The significance of the difference in proportions was assessed by calculating the z ratio. Finally, chi-square tests were used to assess the differences in categorical proportions. All tests were one-tailed, with $p < 0.025$ demonstrating significance.

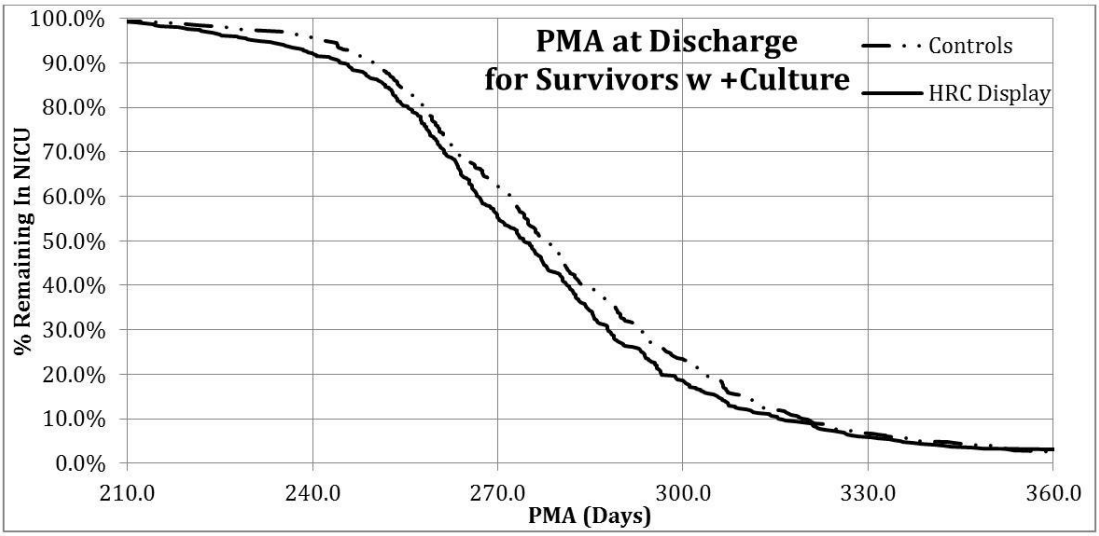
Results: Among all patients, infants randomized to the HRC monitoring group were more likely to be discharged alive and prior to day 120 (83.6% versus 80.1%, p=0.007). (Table) The PMA at discharge for blood or urine culture positive infants who survived was 3.2 days lower among infants randomized to receive HRC monitoring when compared with controls (p=0.013). (Figure)

Conclusion(s): VLBW infants who survive infection and receive HRC monitoring are discharged at an earlier PMA compared to infants without HRC monitoring. With previous studies demonstrating improved survival with HRC monitoring, this finding may have financial implications for NICUs by providing a cost-savings with a shorter length of stay.

TABLE:

Patients	Measure	Control	HRC-Display	P-value
All Patients	N	1489	1500	.
.	Gestational Age (mean; days (weeks))	195.4 days (27.9 wks)	195.9 days (28.0 wks)	0.281
.	Birth Weight (median; grams)	983	993	0.781
.	Male (%)	765 (51.5%)	786 (52.7%)	0.261
.	Race	.	.	0.299
.	Non-Hispanic white (%)	725 (48.8%)	779 (52.2%)	.
.	Non-Hispanic black (%)	561 (37.8%)	531 (35.6%)	.
.	Hispanic (%)	154 (10.4%)	144 (9.7%)	.
.	Other or unknown (%)	45 (3.0%)	38 (2.5%)	.
.	Length of Stay (median; days)	57.8	57.9	0.521
.	Length of Stay (median; days; deaths counted as 120 days)	67.7	65.3	0.044
.	Discharged before 120 days (%)	1340 (90.2%)	1374 (92.1%)	0.037
.	**Discharged Alive before 120 days (%)**	**1190 (80.1%)**	**1247 (83.6%)**	**0.007**
.	Postmenstrual Age at Discharge (median; days)	257.7	258.1	0.811

Survivors	**N (% of All Patients)**	**1327 (89.1%)**	**1369 (91.3%)**	**0.024**
.	Gestational Age (mean; days (weeks))	197.5 days (28.2 wks)	197.3 days (28.2 wks)	0.348
.	Discharged before 120 days (%)	1184 (89.4%)	1247 (91.6%)	0.026
.	Length of Stay (median; days)	62.0	61.0	0.285
.	Postmenstrual Age at Discharge (median; days)	259.6	259.5	0.468
Survivors with Positive Blood or Urine Culture	N (% of All Patients)	449 (30.2%)	467 (31.1%)	0.281
.	Gestational Age (mean; days (weeks))	186.6 days (26.7 wks)	185.9 days (26.6 wks)	0.260
.	Discharged before 120 days (%)	341 (76.3%)	376 (81.0%)	0.040
.	Length of Stay (median; days)	92.2	90.4	0.114
.	**Postmenstrual Age at Discharge (median; days)**	**277.4**	**274.2**	**0.013**
All significance tests are one-tailed. Bold font indicates a significant result, p<0.025				



Postmenstrual Age at Discharge for Survivors with Positive Blood or Urine Culture(s). The x-axis represents the PMA at discharge; the y-axis represents the percent of patients remaining in the NICU to that point in age.

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