Children's Mercy Kansas City
SHARE @ Children's Mercy

Research Days | GME Research Days 2023

May 11th, 12:00 PM - 12:15 PM

Association Between Remote Monitoring and Interstage Morbidity and Mortality in Single Ventricle Patients Across Socioeconomic Groups

Bianca Cherestal
Children's Mercy Kansas City

Let us know how access to this publication benefits you

Follow this and additional works at: https://scholarlyexchange.childrensmercy.org/researchdays

 Part of the Cardiology Commons, Cardiovascular Diseases Commons, Higher Education and Teaching Commons, Medical Education Commons, Pediatrics Commons, and the Science and Mathematics Education Commons

Cherestal, Bianca, "Association Between Remote Monitoring and Interstage Morbidity and Mortality in Single Ventricle Patients Across Socioeconomic Groups" (2023). *Research Days*. 8.
https://scholarlyexchange.childrensmercy.org/researchdays/GME_Research_Days_2023/ResearchDay4/8

This Oral Presentation is brought to you for free and open access by the Conferences and Events at SHARE @ Children's Mercy. It has been accepted for inclusion in Research Days by an authorized administrator of SHARE @ Children's Mercy. For more information, please contact hlsteel@cmh.edu.

The Association Between Remote Monitoring and Interstage Morbidity and Mortality in Single Ventricle Patients Across Socioeconomic Groups

Bianca Cherestal, MD

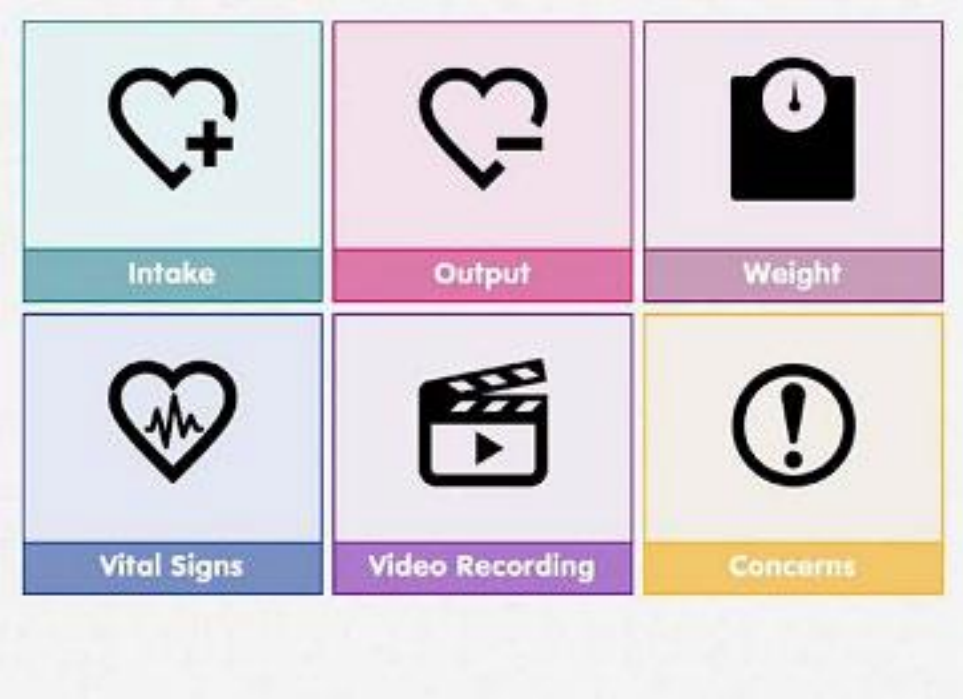
BEST CHILDREN'S HOSPITALS U.S.News RANKED IN 10 SPECIALTIES 2022-23
MAGNET RECOGNIZED AMERICAN NURSES CREDENTIALING CENTER
UMKC School of Medicine
KU SCHOOL OF MEDICINE The University of Kansas
Children's Mercy KANSAS CITY

Background

- Despite improving outcomes, morbidity and mortality for single ventricle (SV) infants remains high.
- Infants of low socioeconomic status (SES) are known to be particularly vulnerable following stage 1 palliation.
- Interventional strategies to target this population are lacking.

Background

- CHAMP® (Cardiac High Acuity Monitoring Program)
  - Enrollees download the CHAMP® app or are provided a device.
  - Parents obtain daily weight, heart rate and oxygen saturation.
  - Data input into the app is transferred via cloud-based web service.
  - Process allows for near instantaneous transfer of data to the care team.



Background

- **Aim:** To investigate whether use of a novel remote monitoring program, CHAMP ® (Cardiac High Acuity Monitoring Program), mitigates the known disparate outcomes for lower SES SV infants during the interstage period (ISP) by providing more direct access to the care team

- **Hypothesis:** Among a large cohort of CHAMP ® participants, there will be no difference in outcomes by SES.

Methods

- Data Source: CHAMP®
  - CHAMP® enrollment has expanded from CMH to 12 sites across the U.S.
- Inclusion criteria:
  - Functionally univentricular patients discharged home during the IS period.
  - Consented to research.
- Exclusion criteria:
  - Currently using/returned device.
  - Underwent biventricular repair.
  - Missing/incomplete data.
  - Not Glenn or transplant candidate.
  - Transferred care to another center.

Methods: Predictor Variable

Neighborhood Socioeconomic Status
Log of median household income
Log of Median value of housing units
Percentage of households with interest, dividend, or rental income
Percentage of adult residents who completed high school
Percentage of adult residents who completed college
Percentage of employed residents with executive, managerial, or professional occupations

Methods

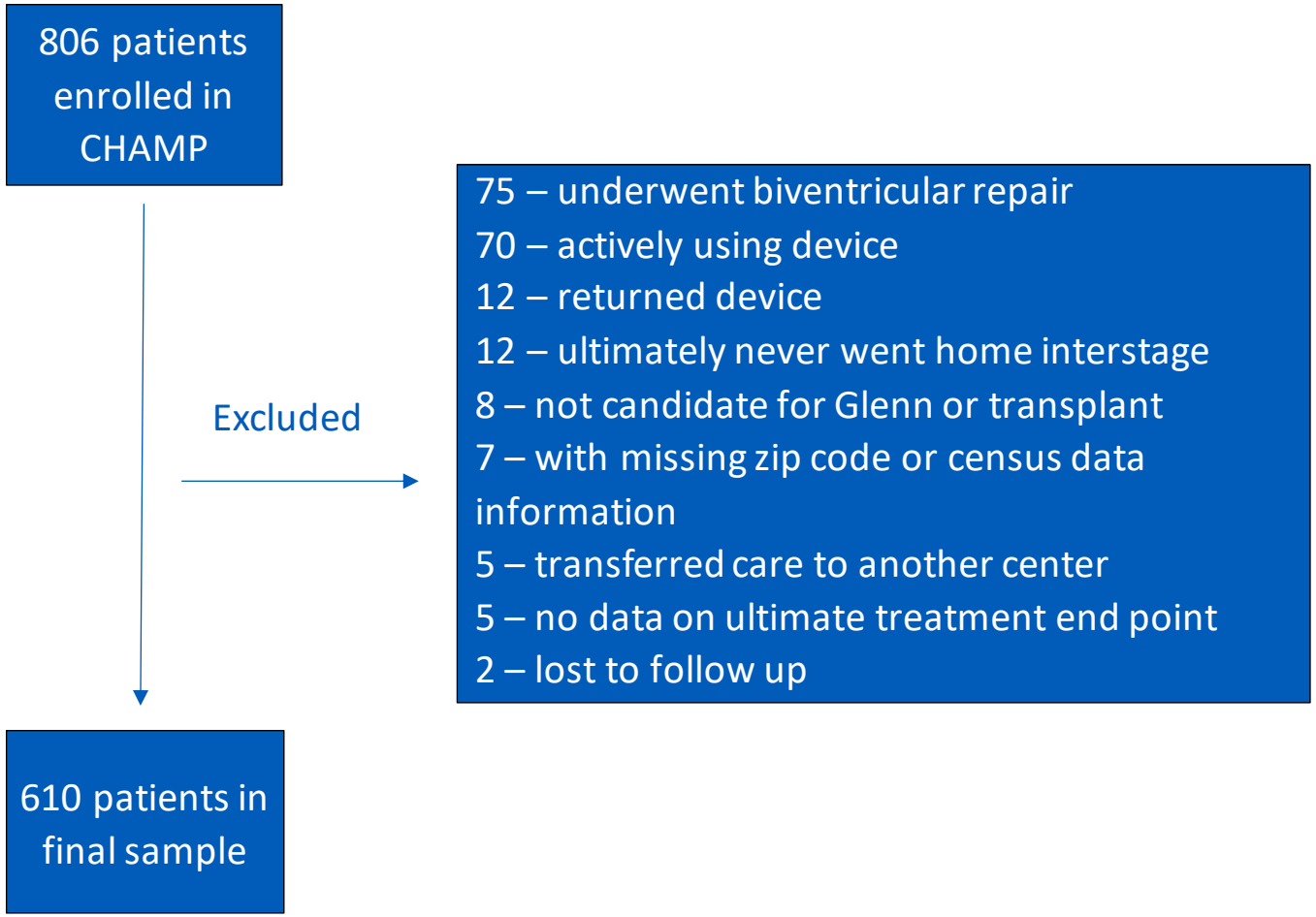
- Outcome Variable: Death or transplant listing during the interstage period.
- Covariates:
  - Sex
  - Race/Ethnicity
  - Prenatal diagnosis
  - Hypoplastic Left Heart Syndrome
  - Gestational Age
  - Birth Weight
  - Genetic Syndrome
  - Presence of AV-valve regurgitation prior to discharge
  - Ventricular dysfunction prior to discharge
  - Adherence with CHAMP ® app

Methods: Statistical Analysis

- Comparison of baseline characteristics by SES tertile:
  - Kruskal-Wallis tests for continuous variables and $\chi 2$ or Fisher's exact tests for categorical variables.
- Comparing characteristics of patients reaching the primary outcome vs. those who did not:
  - Wilcoxon rank-sum tests for continuous variables and $\chi 2$ or Fisher's exact tests for categorical variables.
- Multivariable hierarchical logistic regression to adjust for potential confounding variables.

Results

Study Population

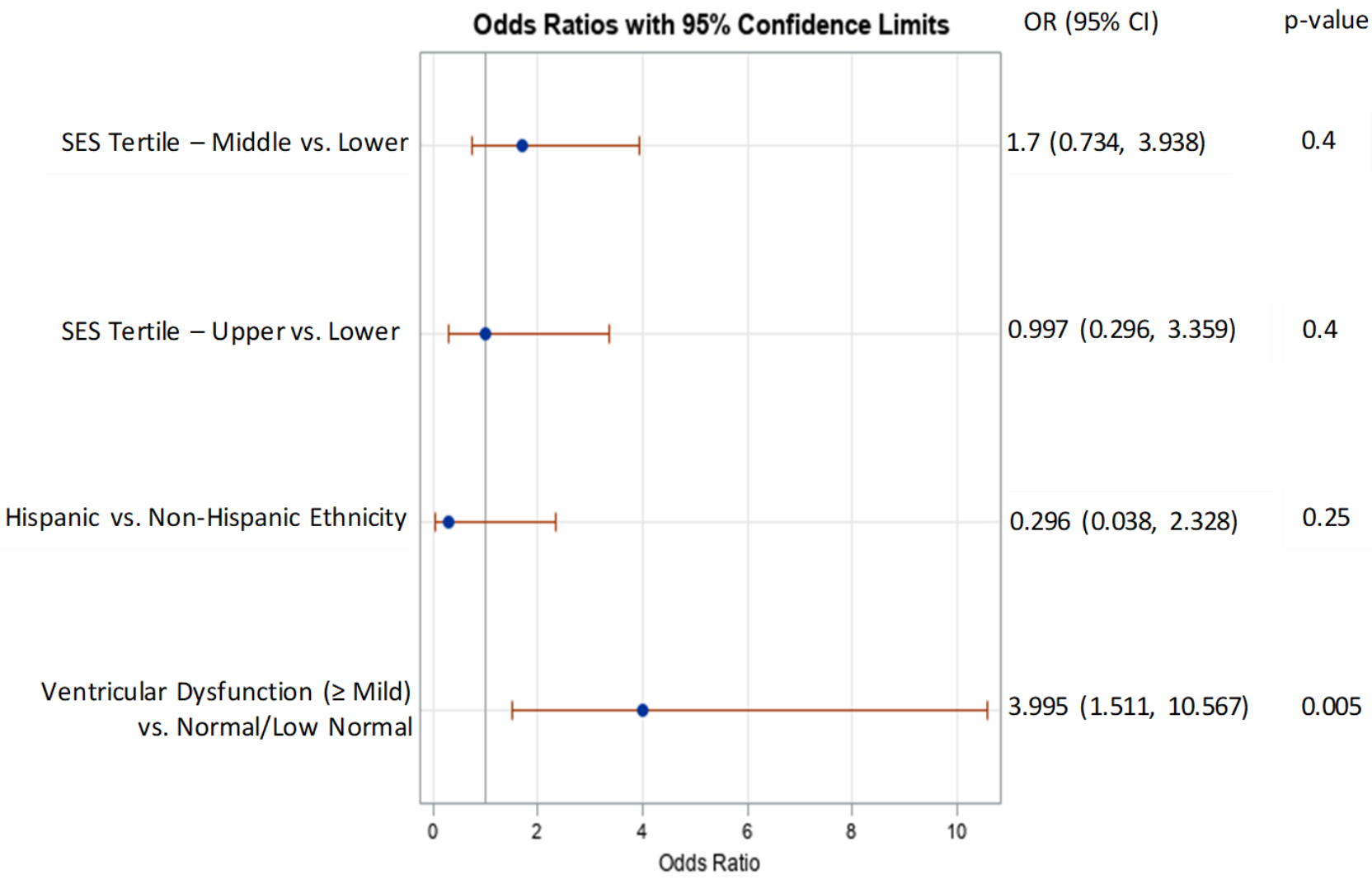


	Lower Tertile N = 200	Middle Tertile N = 211	Upper Tertile N = 199	P value
Demographic characteristics				
Female, n (%)	73 (36.7)	76 (36)	72 (36.2)	0.99
Non-White Race, n (%)	39 (19.5)	39 (18.5)	39 (19.6)	0.95
Hispanic/Latino, n (%)	41 (21)	26 (12.6)	24 (12.2)	0.023
Age at Discharge (days), mean ± SD	45.5±35.5	42.3±29.9	40.4±31.3	0.32
Educational Attainment*, n (%)	74 (48.4)	104 (68.9)	79 (74.5)	<0.001
Surgical Center Distance*, n (%)	98 (49)	81 (38.8)	60 (30.8)	<0.001
Private Insurance, n (%)	54 (27.8)	95 (47.3)	112 (57.4)	<0.001
Neighborhood Summary Score (range)	-10.84 to -1.56	-1.55 to + 1.21	1.23 to 13.54	0.61
Birth characteristics				
Prenatal diagnosis, n (%)	164 (82)	173 (82.8)	172 (86.4)	0.44
Gestational age (weeks), mean ± SD	38.1±1.7	38.2±1.7	38.1±1.5	0.29
Birthweight (kg), mean ± SD	3.2±0.57	3.1±0.55	3.2±0.5	0.53
Clinical Characteristics				
Anatomy – HLHS, n (%)	65 (32.7)	81 (38.6)	78 (39.2)	0.33
Genetic Syndrome, n (%)	162 (81)	170 (80.6)	159 (79.9)	0.96
Other Anomalies, n (%)	174 (87)	184 (87.2)	175 (87.9)	0.96
Bypass Time (min), mean ± SD	145.7±60.4	150.1±55.4	144±51.4	0.85
Cross Clamp Time (min), mean ± SD	66.7±40.5	69.2±38.1	74.2±41.5	0.25
Pre-Discharge AVVR*, n (%)	93 (46.5)	96 (45.5)	106 (53.5)	0.64
Pre-Discharge Function* – normal, n (%)	186 (93.5)	196 (93.3)	183 (92)	0.94
Interstage Period (days), mean ± SD	165.7±80.3	155.6±56.9	146.7±57.7	0.12
Adherence (%)*, mean ± SD	55±30	65±29	62±29	0.003
Outcomes				
Glenn, n (%)	191 (95.5)	193 (91.6)	187 (93.9)	0.07
Death, n (%)	7 (3.5)	15 (7.1)	5 (2.5)	
Transplant Listing, n (%)	2 (1)	3 (1.4)	7 (3.5)	

Adherence = (# days weight, oxygen saturation & heart rate entered in app)/(total # IS days – hospitalization days).

Children's Mercy KANSAS CITY

	Death/Transplant Listing N=39	Glenn N=571	p-value
Female, n (%)	19 (5)	202 (35.4)	0.07
Non-White Race, n (%)	7 (17.9)	110 (19.3)	0.84
Hispanic/Latino, n (%)	2 (5.1)	89 (15.9)	0.07
Educational Attainment*, n (%)	11 (52.4)	229 (58.8)	0.83
Surgical Center Distance*, n (%)	15 (38.5)	224 (39.6)	0.65
Private Insurance, n (%)	15 (40.5)	246 (44.5)	0.79
Prenatal Diagnosis, n (%)	31 (79.5)	478 (84)	0.46
Anatomy – HLHS, n (%)	15 (38.5)	209 (36.7)	0.83
Genetic Syndrome, n (%)	27 (69.2)	464 (81.3)	0.07
Pre-Discharge weight (kg), mean± SD	4.0±1.02	3.7±0.72	0.03
Pre-Discharge AVVR*, m (%)	27 (66.6)	250 (43.8)	<0.001
Pre-Discharge Function*, n (%)	7 (17.9)	33 (5.8)	0.02
Oral Feeding at Discharge, n (%)	10 (25.6)	231 (40.9)	0.02
Adherence, mean (%)	60±31	60±29	0.58
Lower Tertile, n (%)	9 (23.1)	191 (33.5)	0.24
Middle Tertile, n (%)	18 (46.2)	193 (33.8)	
Upper Tertile, n (%)	12 (30.8)	187 (32.7)	



Study findings align with our hypothesis: there is no significant difference in outcomes by socioeconomic status.

Children's Mercy KANSAS CITY

Limitations

- Sample size.
- Low event rate limited ability to adjust for potential confounders in multivariable analysis.
- No comparison group.

Conclusion

- In this large cohort of SV infants enrolled in a digital remote monitoring program during the ISP, we found no difference in outcomes based upon SES.

- These findings differ from prior studies showing worse outcomes for SV patients of lower SES.

- Our study suggests this novel technology could help mitigate differences in outcomes for this fragile population of patients.

Acknowledgements

- Lori A. Erickson, PhD, RN, MSN, CPNP-PC
- Janelle R. Noel-MacDonnell, PhD
- Girish Shirali, MBBS
- Hayley S. Graue Hancock, MD, FAAP
- Doaa Aly, MBBCH
- Natalie Jayaram, MD, MSB

Questions?

Thank you!

Children's Mercy
KANSAS CITY