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ORIGINAL ARTICLE

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Predicting unplanned readmissions to a pediatric cardiac intensive care unit using predischarge Pediatric Early Warning Scores

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Abstract

Objective: Unplanned readmission to the pediatric cardiac intensive care unit (CICU) is associated with significant morbidity and mortality. The Pediatric Early Warning Score (PEWS) predicts ward patients at risk for decompensation but has not been previously reported to identify at-risk patients with cardiac disease prior to ward transfer. This study aimed to determine whether PEWS prior to transfer may serve as a predictor of unplanned readmission to the CICU.

Design: All patients discharged from a tertiary children's hospital CICU from September 2012 through August 2015 were included for analysis. PEWS assessment was performed following transfer to the cardiac ward, and starting in January 2014, PEWS scores were also assigned by bedside CICU nurse prior to transfer from the CICU. Scores exceeding a predetermined threshold prompted further stability assessment by provider team prior to transfer.

Results: Among 1320 discharges of 1082 patients during the study period, there were 130 unplanned readmissions during their hospitalization. Following implementation of pretransfer PEWS scoring, there was no significant reduction in unplanned readmission frequency (10.2% vs 9.2%, $P = .39$). A secondary analysis of PEWS scores revealed cardiac scoring as a strong discriminator of those likely to experience an unplanned readmission, independent of other significant clinical predictors of readmission (OR 1.78, 95% CI 1.17–2.71, $P = .007$). The resultant multivariate model was a good predictor of unplanned readmission (AUC 0.77, 95% CI 0.71-0.83, $P < .001$).

Conclusion: While implementation of a pretransfer PEWS assessment did not reduce the frequency of unplanned readmissions in this small single-center cohort, a multivariate model including pretransfer elements of an early warning scoring system, along with other patient characteristics serves as a good discriminator of patients likely to experience an unplanned readmission following CICU discharge. Further prospective investigation is needed to define objective measures of pretransfer discharge readiness to potentially reduce the likelihood of unplanned readmissions.

KEYWORDS
congenital heart disease, pediatric cardiac ICU, PEWS, readmission

1 | INTRODUCTION

Pediatric patients with cardiovascular disease who require an unplanned readmission to a cardiac intensive care unit (CICU) before hospital discharge experience significant morbidity and mortality.[1,2] Hospitalized pediatric patients with cardiac disease have higher rates of cardiopulmonary arrest than other hospitalized children.[3] Various scoring systems have been created to help identify patients at risk for decompensation on the acute care floor,[4–7] and studies suggest that early recognition and intervention on the acute care floor can prevent

	0	1	2	3
Neurocognitive	Awake/alert/at baseline	Sleeping/easily aroused or fussy but consolable	Difficult to arouse/irritable, inconsolable, aggressive	Lethargic/confused, agitated or combative, decreased response to pain
Cardiac	Cap refill 1-2 sec	Cap refill 3 sec	Cap refill 4 sec HR increase/decrease >20 from last assessment	Cap refill >5 sec, HR increase >30 or SBP <20 from baseline
Respiratory Rate				
0-3 mo	30-40	41-50	51-60	>60 or <20
3-12 mo	20-30	31-40	41-50	>50 or <20
1-3 yr	18-26	27-34	35-39	>40 or <18
4-5 yr	16-24	25-30	31-35	>36 or <16
6-12 yr	14-20	21-26	27-30	>31 or <14
>12 yr	12-18	19-23	24-27	>28 or <12
			OR increase in RR >10 since last assessment	OR increase in RR >20 since last assessment
Auscultation	Good aeration throughout	End expiratory wheeze or mild crackles/rales	Expiratory wheezes or coarse crackles/rales	Diminished breath sounds
Oxygen saturation	Within expected range on RA or baseline O2	Need for up to 1 LPM	Need for up to 2 LPM	On 3-4 LPM or unable to maintain desired saturation
Respiratory Effort	None	Intercostal retractions	Intercostal and substernal, nasal flaring	Intercostal, substernal and supraclavicular or grunting

FIGURE 1 Vanderbilt Children's Hospital Pediatric Early Warning Score (VCH PEWS)

transfers to the intensive care unit and reduce the frequency of cardiopulmonary arrest.[8]

The Pediatric Early Warning Score (PEWS) is the first reported scoring system designed to identify pediatric patients at risk for decompensation.[5] This scoring tool is based on 5 domains: behavior, cardiac, respiratory, nebulizer use, and persistent postoperative vomiting. The scoring system was designed to be applicable to a general acute care population and easy for nurses to score with routine patient assessments. Studies have shown the PEWS identifies >80% of patients who require transfer to a pediatric ICU as early as 11.5 hours prior to the actual ICU transfer.[8] McClellan developed the Cardiac Children's Hospital Early Warning Score (C-CHEWS), specifically tailored for use in pediatric cardiac patients on the acute care floor.[4] The C-CHEWS was better able to identify patients who experienced cardiac arrest or unplanned transfer to the cardiac ICU as compared to the PEWS.[9]

One recent study has examined whether the PEWS at PICU discharge and acute floor admission predict readmission to the PICU.[10] Mandell reports that for every 1 point increase in PEWS, patients experienced a 60% increased risk of PICU readmission within 48 hours. However, this study excluded all patients discharged from the cardiac ICU. While prior studies have identified patient-specific factors that increase cardiac patients' risk of readmission,[1,2] there is a lack of clinical data that can be assessed at the time of transfer from the cardiac ICU that can assist clinicians in identifying which patients are at risk for readmission. Our study aims to identify whether institution of an early warning scoring system prior to patient transfer from the cardiac ICU will lead to a decreased rate of unplanned readmission. We hypothesized that implementation of a reproducible, objective measure of clinical stability performed prior to CICU discharge would facilitate an improved understanding of discharge readiness in a population of patients with cardiac disease.

2 | METHODS

This study is a single center, retrospective chart review of all patients discharged from the cardiac ICU from September 2012 through August 2015 at a tertiary care, free-standing children's hospital. Our center uses a PEWS that has been modified from the validated Brighton score (Figure 1). In addition to neurocognitive and cardiac domains, it expands the respiratory domain into 4 separate subscores: respiratory

rate, respiratory effort, oxygen requirement, and auscultation. An additional point is also given if the patient requires q2h nebulizers, was admitted/transferred or had a rapid response in the preceding 24 hours. A score from 0 to 21 is generated, with higher scores indicating patients at increased risk of clinical decompensation. Once the total score is calculated, a color is assigned to serve as a simple marker of risk of clinical decompensation. Total scores 0–4 are green, corresponding with the lowest risk patients. Scores 5–7 are yellow, 8–11 are orange, and ≥12 are red, with escalating scores indicating greater risk of decompensation. Any total score of ≥5 or a score of 3 in the neurocognitive or cardiac domain is considered a critical PEWS prompting further assessment from front line provider staff and therapy where clinically appropriate. A PEWS score is recorded by the ward nursing staff on arrival to the acute care floor, and documented accordingly within the electronic medical record (EMR). All discharges from the pediatric cardiac ICU to the cardiac acute care floor from September 2012 through August 2015 were included in the study. Beginning in January of 2014, once a patient was deemed ready for transfer from the cardiac ICU to the acute care floor, cardiac ICU nursing staff recorded this same PEWS score with vital sign assessments, occurring at least every 4 hours prior to ICU discharge.

Retrospective chart review was performed to identify CICU readmissions prior to hospital discharge. Each readmission was considered an independent event, so the analysis does include patients who experienced multiple readmissions within a single hospitalization. Readmissions where considered unplanned when unrelated to a planned surgical procedure. Indications for readmission were characterized as neurologic, cardiac, respiratory, infectious, procedural, or other. In addition to readmissions, data were also collected on patient demographics, admission indication, ICU and hospital length of stay, and cardiac anatomy. Any patient admitted for cardiac surgery was classified by the Society of Thoracic Surgeons-European Association of Cardiothoracic Surgery Mortality (STAT) Category.[11]

2.1 | Data analysis

Demographic and clinical data were compared using the Mann-Whitney *U* test or analysis of variance test for continuous variables and the chi-square test or Fisher's exact test, where appropriate, for categorical variables. Descriptive statistics are presented as medians with interquartile ranges (IQR) for continuous nonnormally distributed data and frequencies with percentages for categorical variables. Predictors of unplanned readmission were assessed through both univariate and multivariate logistic regression analyses. Covariates with a univariate significance threshold (determined a priori) of $P < .1$ were considered for inclusion within a conditional multivariate logistic regression model after assessing for multicollinearity. All multivariate models underwent assessment of fit with the Hosmer and Lemeshow goodness-of-fit test. Data from logistic regression analyses are reported as estimated odds ratios (ORs) and 95% confidence intervals (CIs). Statistical analysis was performed using SPSS statistical package, release 23.0 (SPSS, Inc, Chicago, Illinois). The authors had full access to and take full responsibility for the integrity of the data. All authors have read and agree to the manuscript as written.

TABLE 1 Baseline demographics (1082 patients, 1320 CICU admissions)

Variable	(n = 1082)
Age (days, at initial admit)	234 (67, 1541)
Weight (kg, at initial admit)	7.2 (4.2, 15.5)
Weight under 5 kg	333 (31%)
Male gender (%)	594 (55%)
Chromosomal anomaly	198 (18%)
Indication for CICU admission	
Surgical	900 (83%)
Medical	182 (17%)
Primary diagnosis (n = 1082)	
Hypoplastic left heart syndrome	133 (12%)
Tetralogy of Fallot	93 (8.6%)
Coarctation of the aorta	69 (6.4%)
Other single ventricle	63 (5.8%)
Ventricular septal defect	55 (5.1%)
Single ventricle physiology	280 (26%)
Night (5P-7A) transfer	
Nighttime transfer	307 (28%)
Daytime transfer	775 (72%)
STAT category	
STAT 1	194 (18%)
STAT 2	341 (32%)
STAT 3	100 (9.2%)
STAT 4	202 (19%)
STAT 5	42 (3.9%)
Surgical, not categorized	21 (1.9%)
Nonsurgical	182 (17%)
Unplanned readmission within 48 h CICU discharge	25 (1.9%)
Unplanned readmission during hospitalization	130 (9.8%)
Any readmission during hospitalization	238 (18%)
CICU LOS (initial admission)	3.2 (1.8, 7.0)
CICU LOS (all readmissions)	4.4 (2.6, 9.4)
Hospital LOS (days)	9.2 (5.2, 22.4)

Continuous variables are reported as median (25th, 75th percentile). Categorical variables are reported as frequency (%).

3 | RESULTS

Of the 1320 CICU to ward transfers identified during the entire study period, there were 130 unplanned readmissions to the CICU before hospital discharge. Patient demographics are summarized in Table 1. Our patients tended to be young, with a median age of 234 days and nearly one third weighed less than 5 kg on admission. Over 80% were admitted to the CICU for a surgical indication. Hypoplastic left heart syndrome was the most common primary diagnosis in our cohort (12%), and single ventricle physiology was present in 26% of patients.

TABLE 2 PEWS scores post-ICU transfer

Variable	n = 1320
Posttransfer total PEWS	3 (2, 4)
Posttransfer neuro score	0 (0, 0)
Posttransfer cardiac score	0 (0, 1)
Posttransfer respiratory rate score	1 (0, 2)
Posttransfer oxygen saturation score	0 (0, 0)
Posttransfer lung auscultation score	0 (0, 0)
Posttransfer respiratory effort score	0 (0, 0)
Posttransfer "green" score	1082 (82%)

Continuous variables are reported as median (25th, 75th percentile). Categorical variables are reported as frequency (%).

Chromosomal anomalies were reported in 18% of patients in our cohort.

Documentation of PEWS on the ward was standard practice throughout our data collection period. The median total score on arrival to the acute care floor was 3 (2, 4) which corresponds to the green zone in our color-coded scheme (Table 2). Respiratory rate was the only physiologic parameter with a median score greater than 0 on ward arrival. Over 80% of patients had total scores in the green range with their first PEWS assessment on the floor (Table 2). We began tracking PEWS prior to CICU discharge 15 months into our data collection window, resulting in a documentation of pretransfer and posttransfer PEWS in 737 patients. The median total PEWS score in the CICU prior to transfer was 2, with over 90% of patients scoring in the green PEWS zone prior to transfer.

Univariate comparisons revealed that patient weight, chromosomal anomaly, medical indication for admission, STAT 5 category, single ventricle physiology, and CICU length of stay before transfer were all associated with unplanned readmission (Table 3). Additionally, a high CICU census at time of transfer (defined as $\geq$85% capacity in our 18 bed unit) was associated with an increased frequency of readmission. There was no difference in readmission among patients transferred out of the CICU in the evening hours (5P-7A), relative to daytime hours (7A-5P). Indications for readmission within the entire discharge cohort are summarized in Table 4. The majority of readmissions were related to respiratory complications (51%), with cardiac being the next most common indication (25%). Surgical and catheterization procedures following readmission are also included in Table 4. A total of 41 interventions occurred as a result of the 130 unplanned readmissions.

A summary of PEWS scores for the cohort of patients that had scores documented before and after transfer are summarized in Table 5. Median time between CICU PEWS and acute care PEWS score was 3:59 (1:07, 7:51). The majority of patients had scores in the green zone at both CICU discharge and floor arrival, although fewer patients were in the green zone on arrival to the floor than when they left the CICU. A total of 53 patients (7.2%) left the CICU with a score outside the

TABLE 3 Readmission characteristics (all CICU admissions)

Variable	No unplanned RA (n = 1190)	Unplanned RA (n = 130)	*P* value
Age (days)	211 (65, 1354)	146 (61, 346)	0.003
Weight (kg)	6.7 (4, 14.4)	4.5 (3.4, 7.1)	<0.001
Weight under 5 kg	399 (34%)	68 (52%)	<0.001
Male gender (%)	656 (55%)	78 (60%)	0.29
Chromosomal anomaly	230 (19%)	42 (32%)	0.001
Surgical admission indication	998 (84%)	99 (76%)	0.03
STAT 1 category			<0.001
STAT 1	198 (17%)	2 (1.5%)	
STAT 2	363 (31%)	21 (16%)	
STAT 3	108 (9.1%)	6 (4.6%)	
STAT 4	234 (20%)	41 (32%)	
STAT 5	69 (5.8%)	26 (20%)	
Not categorized	26 (2.2%)	3 (2.3%)	
Nonoperative	192 (16%)	31 (24%)	
STAT 5 category	69 (5.8%)	26 (20%)	<0.001
Single ventricle physiology	353 (28%)	82 (63%)	<0.001
Off hours transfer (5P-7A)	341 (29%)	28 (22%)	0.086
ICU LOS prior to transfer	3 (1.7, 6.7)	7.1 (3, 13.1)	<0.001
CICU census at discharge	14 (12, 16)	15 (12, 16)	0.031
High CICU census at discharge (>16)	166 (14%)	30 (24%)	0.006

Continuous variables are reported as median (25th, 75th percentile). Categorical variables are reported as frequency (%).

TABLE 4 Unplanned readmission characteristics

Variable	(n = 130)
Indication	
Respiratory	69 (51%)
Cardiac	33 (25%)
Infection	12 (9.2%)
Neurologic	8 (6.1%)
Other	5 (7.7%)
Unplanned procedure	3 (2.3%)
Interventions following readmission	
Cardiac surgery	13 (10%)
Noncardiac surgery	14 (11%)
Cardiac catheterization	14 (11%)

TABLE 5 Pretransfer PEWS scores with respect to unplanned CICU readmission

Variable	No unplanned RA (n = 667)	Unplanned RA (n = 68)	*P* value
PEWS scoring prior to CICU discharge			
Total score	2 (1, 3)	2 (1, 3)	.07
Cardiac score			.001
0	476 (71%)	35 (51%)	
1	176 (26%)	25 (37%)	
2	14 (2%)	8 (12%)	
3	1 (0.1%)	0 (0%)	
Neurocognitive score			.91
0	590 (89%)	61 (90%)	
1	76 (11%)	7 (10%)	
2	1 (0.1%)	0 (0%)	
3	0 (0%)	0 (0%)	
Respiratory effort score			.66
0	547 (82%)	54 (79%)	
1	116 (17%)	13 (19%)	
2	4 (0.6%)	1 (1.5%)	
3	0 (0%)	0 (0%)	
Auscultation score			.85
0	586 (88%)	59 (87%)	
1	65 (9.7%)	8 (12%)	
2	5 (0.7%)	0 (0%)	
3	11 (1.6%)	1 (1.5%)	
O_2 saturation score			.69
0	476 (71%)	45 (66%)	
1	174 (26%)	22 (32%)	
2	16 (2.4%)	1 (1.5%)	
3	1 (0.1%)	0 (0%)	
Respiratory rate			.95
0	360 (54%)	38 (56%)	
1	214 (32%)	20 (29%)	
2	70 (11%)	7 (10%)	
3	23 (3.4%)	3 (4.4%)	

Continuous variables are reported as median (25th, 75th percentile). Categorical variables are reported as frequency (%). Additional 1 point added for q2h nebulizers, admission/transfer in last 24 h, and rapid response in last 24 h. See Figure 1 for explanation of scoring.

TABLE 6 Multivariate analysis of predictors for CICU readmission

Covariate	Adjusted odds ratio (95% CI)	*P* value
Single ventricle physiology	2.00 (1.09–3.64)	0.024
STAT 5 surgery	3.88 (1.80–8.34)	0.001
Medical indication for admission	2.05 (1.05–3.97)	0.034
Pretransfer cardiac PEWS score	1.78 (1.17–2.71)	0.007
ICU length of stay (days)	1.018 (1.005–1.031)	0.005

Abbreviation: PEWS, Pediatric Early Warning Score.
Other covariates considered for inclusion in forward conditional logistic regression model: Weight under 5 kg, chromosomal anomaly, and a high census (>16) at CICU discharge. There were 735 patients included in creation of this model. Hosmer and Lemeshow test $P = .31$.

green zone, and 115 patients (15.6%) arrived to the floor with a score outside the green zone. We compared agreement between the pretransfer and posttransfer total scores and subset scores. Agreement between a score in the green range at both time points was fair at best, with $\kappa = 0.154$. Oxygen saturation and lung auscultation had the highest agreement, but most subset scores had κ values less than 0.3.

Of the 737 patients discharged with pretransfer PEWS implementation, there was an unplanned readmission rate of 9.2%. This was not significantly different relative to the unplanned readmission rate prior to pretransfer PEWS implementation (10.2% vs 9.2%, $P = .39$). Univariate comparison of pretransfer PEWS did not demonstrate a significant difference in total PEWS or frequency of a "critical" value (PEWS total >5 or an individual cardiac or neurocognitive categorical score of 3). A secondary analysis of VCH PEWS components was then performed. While there were no significant differences identified among respiratory or neurocognitive components with respect to unplanned readmission, patients with unplanned readmissions had demonstrably greater cardiac PEWS prior to transfer from the CICU (Table 5). Using clinical predictors identified by univariate analysis, as well as the pretransfer cardiac PEWS score, a multivariate logistic regression model with unplanned CICU readmission as the primary outcome was constructed. As demonstrated in Table 6, among this series of patients, for every 1 point increase in pretransfer cardiac PEWS, there was a 70% increase in odds of unplanned readmission. A receiver operating characteristic curve describing the sensitivity and specificity of the associated multivariate model is depicted in Figure 2 (AUC 0.77, 95% CI 0.71–0.83, $P < .001$).

4 | DISCUSSION

This is the first study to examine the relationship between pretransfer PEWS and unplanned readmission in a pediatric cardiac ICU. Analysis of 1320 discharges from the CICU over a 36-month period revealed that 9.8% of discharges resulted in unplanned readmission prior to hospital discharge. While there was no difference in the raw rate of unplanned readmissions after implementation of pretransfer PEWS documentation in our pediatric cardiac population, we report several factors apparent at the time of transfer including the pretransfer

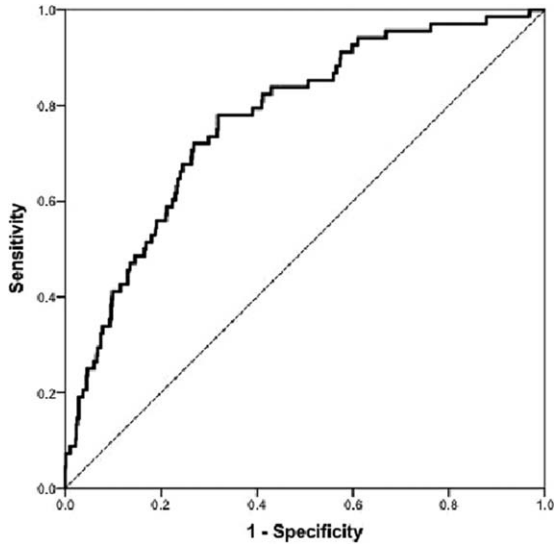

FIGURE 2 ROC curve generated by above model (AUC 0.77, 95% CI 0.71–0.83, $P < .001$)

PEWS cardiac score that are independent predictors of unplanned readmission.

To our knowledge, only 2 other single-center series have examined readmissions to the pediatric cardiac ICU.[1,2] A third study examined readmission rates of a medical and cardiac unit combined and found a readmission rate of 8%.[12] Our readmission rate of 9.8% was higher than those previously reported. Bastero-Minon et al reported a readmission rate of 2.4%; however, they limited their study to readmissions within 72 hours of ICU discharge. Their finding is similar to the 2.1% readmission rate that we observed when examining only those readmissions occurring within 48 hours of ICU discharge. Brunetti et al observed an unplanned readmission rate of 5.7%, inclusive of readmission at any time within the same hospitalization. Similar to Brunetti et al, we also found patients with a genetic anomaly, single ventricle physiology, higher STAT category, and longer ICU LOS to have higher risk of unplanned readmission. Unlike Brunetti et al however, we did find age, weight, and medical admission indication to be predictive of unplanned readmission in our univariate analysis.

In order to investigate the morbidity associated with unplanned readmissions, we examined the frequency of cardiac catheterizations and surgical procedures that occurred during readmission. Nearly one third of the readmissions were associated with an invasive intervention. Our rate of cardiac catheterization was lower than previously reported by Brunetti et al; however, rates of surgical intervention were similar.[2] Reasons for this difference are unclear, but it is certainly possible that the threshold for catheterization varies by institution. The difference may also be attributable to patient characteristics, as the indication for readmission varied between our study and other published reports. Regardless, the number of invasive interventions associated with readmission represents a significant morbidity risk for this patient population.

The most common reason for readmission to the CICU in our cohort was related to respiratory complications. Prior studies have found either respiratory or cardiac symptoms being the leading cause of readmission to the cardiac ICU.[1,2] Despite respiratory symptoms being the most common cause of readmission in our cohort, the data suggest that only the cardiac element PEWS score, reflecting heart rate, capillary refill, and blood pressure, is predictive of unplanned readmissions. This would seem to suggest that the expanded respiratory PEWS used at our institution may have less clinical utility in this cohort of patients with primary cardiac disease. In fact, it is possible that heavy emphasis on respiratory scoring is preventing the identification of at-risk cardiac patients prior to transfer. Furthermore, while the majority of readmissions were related to respiratory decompensation, there was no difference in any of the respiratory PEWS subscores, suggesting that respiratory symptoms may have actually been attributable to underlying cardiac dysfunction. The Cardiac Children's Hospital Early Warning Score a scoring system developed specifically for use in pediatric patients with heart disease, includes a single respiratory category (scored 0–3) that includes assessment of oxygen requirement, work of breathing, and nebulizer use.[4] The inclusion of the various respiratory components scored individually in the VCH PEWS into a single domain may allow the tool to better predict readmission before a patient transfers from the CICU. This would need to be evaluated in a prospective study to determine the tool's utility in predicting CICU readmission prior to transfer.

An interesting facet of our study was the ability to investigate the variability in PEWS scoring between the pretransfer and posttransfer time points. A prior study of the Monaghan PEWS tool showed excellent interrater reliability when scores were taken by separate RNs several minutes apart.[13] Since the median time between the 2 scores in our study was nearly 4 hours, we compared the color category between the 2 time points rather than the raw PEWS score as some variance in vital signs is to be expected. While most patients were in the low-risk green category at both time points, more than twice as many patients had a score outside of the green zone on floor arrival compared to CICU discharge (15.7% vs 6.0%, $P < .0001$). Several explanations for this observation are possible. First, it may be that CICU nurses are more comfortable with sicker patients and are assigning inappropriately low scores, particularly in the more subjective components of the score. It is also possible that patients are actually becoming sicker between the 2 measurements, although this would be an unexpected finding in a group of patients identified as ready for discharge. Perhaps most likely, the discrepancy in PEWS is identifying the subset of patients who have more labile physiology. To test this hypothesis, we examined the readmission rate of the cohort of patients with discordant PEWS color categories between CICU discharge and floor arrival. We found that this group had an unplanned readmission rate of 14.4%, higher than our overall readmission rate of 9.8%. Because this discrepancy cannot be known until a patient has already left the CICU, it cannot aid the intensivist in determining a patient's readiness for discharge. However, presence of a PEWS color discrepancy may serve as an important marker of patient risk to the provider team on the acute care floor.

There are several limitations with this study. Our data was limited to a retrospective study at a single center. While the PEWS tool did

not change over the study period, the score calculated at our institution is based on a nonvalidated modification of the Monaghan tool. Due to the low incidence of unplanned readmissions, we counted all readmissions prior to hospital discharge. However, it is plausible that the sensitivity of PEWS at CICU discharge to predict an unplanned readmission decreases as more time elapses between discharge and readmission. Perhaps limiting the analysis to unplanned readmissions within a predetermined time from ICU discharge in a larger cohort of patients would show the PEWS to more reliably predict unplanned readmission. Finally, we did not collect mortality data although multiple prior studies have shown increased mortality among children readmitted to an intensive care unit.[1,2,14]

This is the first study to examine whether pretransfer PEWS can predict unplanned readmission to a pediatric cardiac ICU. While the total score was not predictive of readmission, there was found to be a 70% increase in odds of unplanned readmission for every 1 point increase in pretransfer cardiac PEWS. Due to the morbidity and mortality associated with readmission, creation of a tool to help clinicians identify at-risk patients prior to transfer is highly desirable. We hope the results of this study contribute to the development and validation of a simple tool that can evaluate the stability of pediatric cardiac patients as they prepare to leave the ICU.

CONFLICT OF INTEREST

The authors have no potential conflicts of interest to disclose.

AUTHOR CONTRIBUTIONS

ARK performed drafting of manuscript and contributed to data interpretation and revision of article. JM performed data collection. AHS performed statistical analysis and contributed to writing and critical revision of article.

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