MEDICAL UNIVERSITY OF SOUTH CAROLINA
CENTER FOR EVIDENCE-BASED PRACTICE
Evidence-Based Practice Summary
Validity of the Cardiac Children’s Hospital Early Warning Score (C-CHEWS)

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ASK THE QUESTION

Question 1: Is the Cardiac Children’s Hospital Early Warning Score (C-CHEWS) a valid tool for use by nurses to identify inpatient pediatric cardiovascular patients at high risk of cardiopulmonary arrest?

SEARCH FOR EVIDENCE

Search strategies included research-based articles published in English

Databases included PubMed, Scopus, CINAHL, also looked at references and citing articles

Key words/terms (pediatrics[Mesh] OR children OR child) AND (cardiac OR cardiology[Mesh]) AND “early warning score”

CRITICALLY ANALYZE THE EVIDENCE

Question 1: Is the Cardiac Children’s Hospital Early Warning Score (C-CHEWS) a valid tool for use by nurses to identify inpatient pediatric cardiovascular patients at high risk of cardiopulmonary arrest?

Two primary research studies were found addressing this question. Both are observational studies. One is a pilot study of the Cardiac Children’s Hospital Early Warning Score (C-CHEWS) and the second is a validation study for the C-CHEWS.

McLellan and Conner (2013) described a series of three pilot studies used to modify the C-CHEWS and its corresponding Escalation of Care Algorithm. By the third adaptation (n=20), the C-CHEWS correlated with severity of clinical presentation for 100% of
pediatric cardiopulmonary patients. While the sample size was small, the favorability of the 3rd pilot study’s results were compelling, and the C-CHEWS was approved for use.

McLellan, Gauvreau & Conner (2014) used a retrospective chart review to validate the C-CHEWS against the existing Pediatric Early Warning Score (PEWS). The C-CHEWS had a higher sensitivity & negative predictive value than the PEWS at both score >3 (Yellow) and score >5 (Red) cut-points for C-CHEWs score, and significant increases in lead time (p<0.001) for activation of resources compared with the PEWS. Inter-rater reliability was favorable (kappa statistic, 0.50) on a convenience sample of 37 patients over 2 12-hr shifts. However, the scores agreed 100% of the time when C-CHEWS score >3 (kappa statistic, 1.00). These results favor the use of the C-CHEWS over the PEWS for identifying pediatric cardiopulmonary patients at risk of cardiopulmonary arrest or unplanned ICU transfer.
| Congenital Heart Disease | pediatric cardiac patients | (64 experiencing cardiopulmonary arrest or unplanned ICU transfer, 248 convenience sample controls) admitted to a med/surg unit in a quaternary academic hospital (2009-10) | Negative Predictive Value (NPV): score >3 (Yellow): sensitivity 95.3% (95% CI 86.9-99.0) for C-CHEWS vs 54.7% (95% CI 41.7-67.2) for PEWS; specificity 76.2% (95% CI 54.3-78.4) for C-CHEWS vs 86.3% (95% CI 81.4-90.3) for PEWS; PPV 50.8% (95% CI 41.6-60.1) for C-CHEWS vs 50.7% (95% CI 38.4-63.0) for PEWS; NPV 98.4% (95% CI 95.5-99.7) for C-CHEWS vs 88.1% (95% CI 83.3-91.9) for PEWS.

score >5 (Red): sensitivity 67.2% (95% CI 54.3-78.4) for C-CHEWS vs 23.4% (95% CI 13.8-35.7) for PEWS; specificity 93.6% (95% CI 89.7-96.3) for C-CHEWS vs 97.6% (95% CI 94.8-99.1) for PEWS; PPV 72.9% (95% CI 59.7-83.6) for C-CHEWS vs 71.4% (95% CI 47.8-88.7) for PEWS; NPV 91.7% (95% CI 87.6-94.8) for C-CHEWS vs 83.2% (95% CI 78.4-87.3) for PEWS.

There was a statistical difference in the overall scores for C-CHEWS and PEWS (p<0.001): C-CHEWS (AUROC =0.917) vs PEWS (AUROC =0.785).

Lead time for activation of resources increased significantly (p<0.001) with use of the C-CHEWS:

score >3 (Yellow): median 9.25hr (range 0-21) for C-CHEWS vs median 2.25 hours (range 0-20) for PEWS

score >5 (Red): median 2 hours | Studies (case-control, cohort, cross sectional, longitudinal, descriptive, epidemiologic, case study/series, QI, survey) |
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<tr>
<td>□ Insufficient sample size</td>
<td>□ Sample not representative of patients in the population as a whole</td>
<td>□ Variables (confounders, exposures, predictors) were not described</td>
<td>□ Outcome criteria not objective or were not applied in blind fashion</td>
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<td>□ Insufficient follow-up, if applicable</td>
<td>□ For prognostic study, sample not defined at common point in course of disease/condition</td>
<td>□ For diagnostic study, gold standard not applied to all patients</td>
<td>□ For diagnostic study, no independent, blind comparison between index test and gold standard</td>
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Level of evidence for studies as a whole:

- High
- Moderate
- Low
- Very Low

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Practice Recommendation/Conclusion: The Cardiac Children’s Hospital Early Warning Score (C-CHEWS) has been validated for use by nurses for assessing mobility and equipment needs in hospitalized patients. Future research using the C-CHEWS is needed to provide additional knowledge regarding its usefulness and validity in specific patient populations, and in other healthcare organizations. (Strong Recommendation, Low Quality Evidence)

REFERENCES