ABSTRACT TITLE: Does a multi-parameter early warning scoring system predict clinical deterioration?

Cynthia Perez, MS, RN, CNS, CCRN, Ellie Olson, MS, RN, CCRN, Jill Williams, RN, BSN, James Kelly, RN, CCRN. perezc@ohsu.edu

Problem: There are approximately 210,000 in-house cardiac arrests (IHCA) each year in the US, with a survival rate of only 23-24% (American Heart Association, 2013).

Previous studies have shown that a large proportion of patient decompensation goes unnoticed, despite clear signs of clinical deterioration eight or more hours ahead of time. Adverse events have been attributed to a lack of observation, lack of documentation of observations, and lack of communication between healthcare providers (Mapp, Davis, & Krowchuck, 2013).

The American Heart Association has recommended that greater emphasis be placed on early detection of deterioration. Timely identification of deterioration and appropriate intervention might prevent IHCA or ensure that patients receive the right level of care in the right setting (Morrison et al., 2013).

Background/Evidence: Unfortunately, identifying patients early, before overt clinical deterioration and decompensation occurs, is often difficult. Early Warning Scoring Systems (EWSS) generate a score using patient's vital signs, and typically some other discrete data points readily accessible in the electronic health record (EHR), to estimate/predict a patient's risk for adverse event/clinical decompensation/code/cardiac arrest. The score is linked with an intervention, such as stepped up monitoring or notification of providers, to ensure the most effective patient care. Several EWSS have been developed, and are well described in literature, validated across a wide range of hospitalized patients, that are designed to identify patients who are deteriorating before an emergency arises. However, there are differences in the vital signs required and the way each tool weighs specific vital signs to generate the score.

Aim/Objectives: The aim is to compare the effectiveness of three scoring systems, the eCART, Vital Sign Alert, and the NEWS (National Early Warning System). The objective is to evaluate if a systematic, formalized, and universally applied method for identifying at-risk patients through predictive data analysis and targeting surveillance and clinical support activities, performed at regular intervals, will decrease the incidence of IHCA on acute care units.

Methods/Strategy: This is a chart review study, applying three of the most validated early warning scoring systems validated from literature, to identify high risk patients in acute care settings. This has been accomplished by completing retrospective chart reviews on all code blue events in 2014 and 2015 to determine whether implementation of an electronically supported EWSS might have predicted clinical deterioration in advance of overt decompensation, as in either emergent transfer to a higher level of care or cardiopulmonary arrest.

Results: The 2014 reviews revealed that 22/37 Code Blue events scored as "high alert" using any of the 3 tools at hours prior to event. In particular, the combined 2014-2015 data showed the CART was least sensitive to deteriorating patients for the time interval selected (24/90 charts presented with a high

score in the 12 hours prior). Our results reveal a combined sensitivity for predicting Code Blue events between 30.9 and 74.5% for all 3 tools; lower than the documented sensitivity of any of these tools reported in respective studies. Although, importantly, our data is limited in that it only considered those cases where an event occurred. The NEWS had a higher predictive value compared to the eCART and VSA with 74.5% scoring moderately. The results suggested that 74.5% of patients would have had stepped up surveillance before the code blue event.

Recommendations: For better statistical representation and more informative data, the nurse investigators need to complete the planned scoring review of a given population over time, so as to determine how many patients also scored as "high alert", but may have had alternate outcomes, such as ICU transfer, or a change in Advanced Directive.