Using Acuity to Predict Oncology Infusion Center Daily Nurse Staffing and Outcomes

Pamela F. Tobias, MS, RHIA, CHDA, Zachary Oliver, MA, Yue Huang, PhD, Christopher Bayne, MSN, RN, NE-BC, and Lisa Fidyk, MSN, MS, RN

BACKGROUND: Outpatient oncology infusion centers (OICs) use acuity to quantify the complexity and intensity of care to improve staffing levels and equitable patient assignments. OIC interviews revealed inconsistent measurement of acuity and a mixture of use cases. No publications measured objective operational benefits beyond surveyed nurse satisfaction or compared different models of acuity.

OBJECTIVES: This study assessed three acuity models across multiple centers to determine whether acuity was superior to patient volumes or patient hours in predicting the number of nurses needed to care for scheduled patients in an OIC, as well as the effect on objective metrics of missed nurse lunch breaks and patient wait times. A secondary end point was used to identify a superior model.

METHODS: Classification machine learning models were built to assess the predictive value of three acuity models compared to patient hours and patient visits.

FINDINGS: None of the tested acuity models were found to have statistically significant improvement to the prediction of needed OIC nurse staffing, patient wait times, or missed nurse lunch breaks.

OUTPATIENT ONCOLOGY INFUSION CENTERS (OICs) STRUGGLE to accurately predict nurse staffing needs to care for scheduled patients. Acuity has been a proposed solution to improve staffing predictions and satisfaction (DeLisle, 2009; Vortherms et al., 2015). Acuity aims to recognize that patients have varying care needs and can provide a more accurate quantification of the required nursing care in this setting. Literature reviews and background interviews revealed that OICs without acuity scores use available metrics of visit volumes or patient hours for staffing projections (Nevidjon, 2018). Previous publications have indicated that acuity is superior to more easily gathered metrics at accounting for the complexity of the care needed (DeLisle, 2009; Vortherms et al., 2015). Patient classification systems, such as acuity, have been used widely, albeit with more standardization in acute care settings (Fesler & Toms, 2020). Although OIC acuity has been used since the early 2000s, there is no universal scoring model, and acuity scores are used for different purposes. The most frequent applications include assigning patients, daily unit staffing, forecasting full-time equivalent budgets, and tracking patient care complexity over time. Current scoring approaches include patient classification, activity classification, and time/activity classification. A literature review and background interviews revealed a lack of standardization among infusion centers in scoring models, as well as a lack of validity and reliability (Swan & Griffin, 2005). During the current study's interviews, the majority of OICs stated that models were developed from a baseline reference, then modified for their center. The rationale was the perception that the patient population at a given OIC had unique characteristics unaccounted for in the model. However, the unique characteristics described were commonly found in any outpatient OIC. It is reasonable to hypothesize that the published models are missing key elements to infusion nursing acuity or there is a misperception of uniqueness, causing unnecessary modifications. Center-specific modifications to acuity models prevent the ability to conduct objective cross-institution model comparisons. The authors could not find published literature on any head-to-head comparisons of different acuity scoring models. The interviews confirmed that nurses working in OICs cite the need to quantify the difference in complexity of treatments and patients in their care.

Prior to study design, an extensive literature search was conducted to assess different acuity scoring models, applied uses of acuity scoring, and end point measurements used to assess effectiveness. In addition, 13 of