Background

Emergency department (ED) crowding is a significant problem in emergency care. The most widely known tools to measure crowding are EDWIN and NEDOCS; these are validated scores. A newer tool, the International Crowding Measure in EDs (ICMED), seeks to measure crowding and determine its cause but has not yet been validated internationally. In New Brunswick, there are three tools used in local EDs, the ED Saturation Calculators; these have not been validated. The goal of this study is to determine which of these six tools, as well as five readily available single variables, is the best measure of ED crowding in our local department, as compared to physician rating via Visual Analogue Scale (VAS). A secondary goal will be to determine which tool best predicts ED crowding up to four hours before being recognized on VAS.

Methods

We conducted observations in crowding capturing all times of day, over two weeks, and compared resultant crowding scores to clinician rating, the standard of face validity in ED crowding, based on previous research for EDWIN, NEDOCS and ICMED. Five single variables were also analyzed (See Table 1). In this study, physician rating is the outcome measure, based on 10cm VAS. All predictor variables were calculated using data collected at 2-hour intervals. At each observation, ED Charge Physician and Charge RN were asked their clinical perception of crowding and safety using VAS. A representative sample of times was obtained to maximize validity of results.

Results

We recorded 143 events. Physician VAS showed the ED to be crowded 60.8% of time during the study period, using a binary cut point with VAS > 5 being crowded. The “if patients waiting” had the highest predictive value for crowding at time 0, with a sensitivity of 61% and a specificity of 64%. For formal tools at time 0, the DEC Score had the best predictive value (sensitivity=76.2%, specificity=64.3%). The DEC Score also had highest predictive value for crowding in 2 hours (sensitivity=89.5%, specificity=60.0%). For predictions of current safety, the NEDOCS score was most predictive (sensitivity=80%, specificity=80%), and the three NB Scores reported similarly. For prediction of safety in 2 hours, NEDOCS score was most predictive (sensitivity=82.7%, specificity=89.5%). No variable could accurately predict crowding or safety in 4 hours. For the binary crowding VAS, Cohen’s kappa for 2 raters showed κ=0.424. For the binary safety VAS, Cohen’s kappa showed κ=0.345.

Conclusion

In this study, we examined 11 predictor variables used in the measurement of ED crowding, including previously validated crowding tools and local ED Saturation Records. In addition we examined five single variables that are easily obtained within the ED. As no benchmarks exist for the accuracy of crowding, we determined which variable(s) were best at predicting current and future crowding and safety in our local centre, when compared against our clinicians’ own sense of crowding and safety within the department. No one score or variable performed best as a measure or predictor of current or future crowding and safety. For current ED crowding and safety, we found single variables to be as sensitive and specific as formal crowding scores. In determination of crowding and safety 2 hours in the future, the validated NEDOCS Score showed greatest sensitivity and specificity.