Introduction:
Intensive care unit (ICU) survivors are at risk of emergency hospital readmissions. A risk prediction tool may help identify high-risk patients in need of preventative interventions after discharge. Scottish Patients at Risk of Readmission and Admission (SPARRA) predicts 1-year risk of emergency hospital admission in the general Scottish population. The aim of this study was to externally validate SPARRA in ICU survivors. We also aimed to compare the performance of the two SPARRA scoring systems: automated scores (imported from national database) and manual scores (generated by entry of predictors into online risk calculator).

Methods:
Retrospective study of 264 patients discharged from a single ICU from 2015-2018. Scores were matched to time of hospital discharge: automated scores were obtained for all 264 participants; 60 patients were also scored manually. Observed rates of emergency admission in the year from hospital discharge were recorded. Discrimination was assessed by area under the ROC curve (AUC); calibration plots were drawn and the mean absolute error (MAE) between predicted and observed readmission rates was calculated.

Results:
160 patients (60.6%) had ≥1 emergency admission in the follow-up year. Manual scores had poor discrimination: AUC 0.59 (95% CI 0.44-0.74); automated SPARRA scores had moderate discrimination: AUC 0.73 (95% CI 0.65-0.81). The ROC curves are shown in Figure 1. Both scoring systems were poorly calibrated with underestimation of admission rates across all risk strata. The MAE was 16.5% (95% CI 10.2-22.8) in automated scores and 20.9% (95% CI 13.8-28.0) in manual scores.

Conclusion:
Emergency hospital readmissions are common in the year after hospital discharge following an intensive care admission. Automated SPARRA scores performed better than manual SPARRA scores in parameters of discrimination and calibration. However, neither method reliably predicted emergency readmission in this cohort. A new risk prediction model should be developed for use in ICU survivors.
Figure 1: Receiver operating characteristic (ROC) curves for automated SPARRA scores (n=264) and manual SPARRA scores (n=60)