Rapid Assessment and Discharge, optimizing emergency department bed space allocation: an interrupted time-series analysis

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Initiatives to combat overcrowding in the Emergency Department (ED) are numerous and varied. It remains unclear that any are effective [1]. With the exception of minor injuries, a majority of patients are assessed and treated in a bed space or trolley. There remains scope to scrutinize the unnecessary utilization of ED beds [2].

In November 2017 we introduced a streaming intervention we termed “Rapid Assessment and Discharge” (RAD). Patients aged 75 and over were automatically prioritized to a bed space and assessed directly by the team there. Adult, ambulatory patients under 75 were assessed by the RAD team in the pre-existing assessment rooms adjacent to the waiting area. This assessment included examination, investigation and treatment. If the patient needed to be supine for any reason, a bed space was requested. Prior to the intervention period, patients had a rapid assessment in the same area. The majority then progressed to a bed space unless they could be immediately discharged. We conducted an interrupted time-series analysis.

We aimed to assess the reduction in bed space occupancy (defined as the number of patients that progressed from the waiting room area to a bed space cubicles in the main department). We also studied the number of admissions, discharges and waiting times (WT) to see a doctor in the RAD and bed space groups.

The locations of all patients were recorded on the patient flow management system (*Cerner Millennium®*). Data collected were from 12 months prior to and 12 months after the introduction of RAD on 6thNovember 2017. An autoregressive integrated moving-average (ARIMA) model with exogenous covariates (also known as ARMAX model) was used to assess the effect of intervention of the RAD system for a range of outcome variables such as

bed occupancy while taking into account temporal autocorrelation. Outcome variables were also transformed into logarithm scale. 95% confidence interval (CI) are reported.

During the first 12 months prior to the intervention there were 154,771 total ED attendances. Of these, 45,701 were seen in a bed space, a mean of 125 per day (29.5%). In the 12 months after the intervention there were 156,483 attendances. Of these 38,049 (mean of 104 per day) were seen in a bed space (24.3%). Despite an increase in global attendances, a total of 7,652 fewer patients were seen in a bed space; a daily mean reduction of 21 patients (the model adjusted reduction is 12 patients, 95% CI [6.19, 16.92]). See Figure 1. The mean number of ambulatory adult patients discharged without using a bed space increased from 28 to 53 (6.5% and 12.3% of total attendances respectively) after the introduction of RAD (adjusted increase in discharge is 8.3, 95% CI [-24.07, 40.72]). There was a mean reduction in discharges from the bed spaces of 87 to 66 (adjusted reduction 10 patients, 95% CI [4.51, 15.83]). The waiting time to see a doctor in the ambulatory RAD group was significantly reduced from 50 to 45 minutes (adjusted difference 10 minutes, 95% CI [7.16, 12.58]). The reduction in the bed space group was 61 to 56 minutes (adjusted difference 7.8 minutes, 95% CI [5.54, 10.01])

This streaming intervention is novel in that it is primarily based on age stratification. As reflected by the reduction in discharges from bed spaces, it has been shown to distinguish patients that are likely to be admitted from those destined for discharge. Further research into the optimization of bed space usage is needed. This is of particular relevance to the design of new departments. This model suggests more assessment rooms may make better use of the available space within the ED footprint.

References

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Figure 1. Bed space total daily attendances and RAD discharges