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Lowering bed occupancy: A life-saving intervention?

High levels of bed occupancy intuitively seem to be bad for patient care. Apart from the direct consequences of full wards and rapid turnover, the knock-on effects for the emergency department (ED) are likely to include exit block and consequent crowding, with associated threats to patient safety. Observational evidence suggests that high bed occupancy and ED crowding are associated with increased hospital mortality [1,2], but these data may be subject to confounding by case mix, since bed occupancy, ED crowding and mortality will all increase at times when the hospital has to manage sicker patients. What we really need to know is whether intervention to reduce bed occupancy leads to reduced ED crowding and mortality.

Boden et al [3] appear to have shown exactly that. After an intervention that successfully reduced mean bed occupancy from 93.7% to 90.2% they found that the 4-hour target was achieved in 51% of weeks, compared to 33% before intervention, while risk-adjusted mortality fell by 4.5%. These findings suggest that reducing bed occupancy improved ED performance and saved lives, but a few words of caution are required.

The authors have helpfully identified a number of potential confounding factors in their discussion, including the possibility that the intervention led to less seriously ill people being admitted. This may be evident in the raw data. The 2.6% fall in the number of deaths after intervention is less than the 4.5% fall in risk-adjusted mortality or 4.8% fall in crude mortality. This difference is explained by the 9.3% increase in the number of non-elective admissions. Mortality comparisons were risk-adjusted but the risk-adjustment methods used do not take illness severity into account. Maybe increased bed availability led to some less seriously ill people being admitted who would previously have been managed at home? Risk adjusted mortality scores such as the HSMR and SHMI are adjusted so that each year the baseline is reset at 100. Thus changes in score are relative and a reduction in a score for a particular hospital could be not because mortality has gone down but because comparator hospital mortality has gone up. It is reassuring to see the crude mortality has also gone down.

Before and after studies are analysed using an 'interrupted time series' model [4] and should take into account the fact that the error terms in a time series model are unlikely to be independent. This lack of independence should be accounted for or the inference will be wrong. Boden et al use this model but it is susceptible to a number of biases, some of which the authors enumerate. This includes a general reduction in hospital mortality and other changes being instigated over the period, such as staffing levels. Time series models are complex and simple models often do not describe time series very well. The figures show a number of unexplained features which are unlikely to be random noise. Allowing for high order autoregression in the model may not remove serial correlation adequately. There is also the fact that this is an observational study, and other unmeasured factors may account for the change.

Even if we are convinced of the benefits of reducing bed occupancy, the measures used (increasing bed and senior medical availability) cost money that might be better spent elsewhere. The UK NHS is usually prepared to spend £20-30,000 per quality-adjusted life year gained, so accurate estimates of the number of lives saved will be essential to build the case for more acute beds and doctors.

References

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