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The NHS England review of urgent and emergency care

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In the wake of the A&E crisis NHS England (2013a), formerly the NHS Commissioning Board, has commissioned a review of unscheduled care. Those who have read the accompanying material to this review may not have noticed that there is no reference whatsoever to the contribution from high hospital bed occupancy to this problem.

Those of you with even the slightest acquaintance to queuing theory will know that it is mathematically impossible to run any service (such as inpatient beds) at very high average occupancy without creating huge queues (Bain et al 2010, Marjot 1987). Indeed the mathematics is confirmed by real life experience and this may explain why queuing theory is so widely used across multiple industries but strangely ignored especially in the NHS in England.

A figure of 85% has been widely claimed as the 'optimum' occupancy for hospitals. Alas this claim arises from the total misrepresentation and misunderstanding of a study conducted by Bagust et al (1999). The figure of 85% only applies to a bed pool with 200 beds, i.e. a medical bed pool with 200 beds and under conditions of minimal seasonality (Jones 2002, 2009, 2010, 2012). Any bed pool containing fewer than 200 beds, such as Paediatrics or Gynaecology will therefore need to work at lower than 85% average occupancy and only in the very largest hospitals should we find bed pools operating above 85%. In fact the optimum average occupancy for the whole of a hospital (from a patient access and operational efficiency viewpoint) with 1,000 beds should be somewhere around 75% to 80% (Jones 2011a). Indeed for these very reasons occupancy in maternity units with fewer than 1,000 beds should always be lower than 75% (Jones 2012).

If you think this figure is unrealistically low a recent study into the adverse effects of high occupancy has demonstrated that in a large acute teaching hospital with 650 beds the probability of severe adverse events, i.e. an in-hospital fall resulting in a fracture or an overdose of medication requiring treatment or a longer stay to rectify, increased significantly above 75% occupancy. Half of all falls resulting in a fracture occurred above 99% occupancy and half of medication events occurred above 98% occupancy. Occupancy was measured on a daily basis

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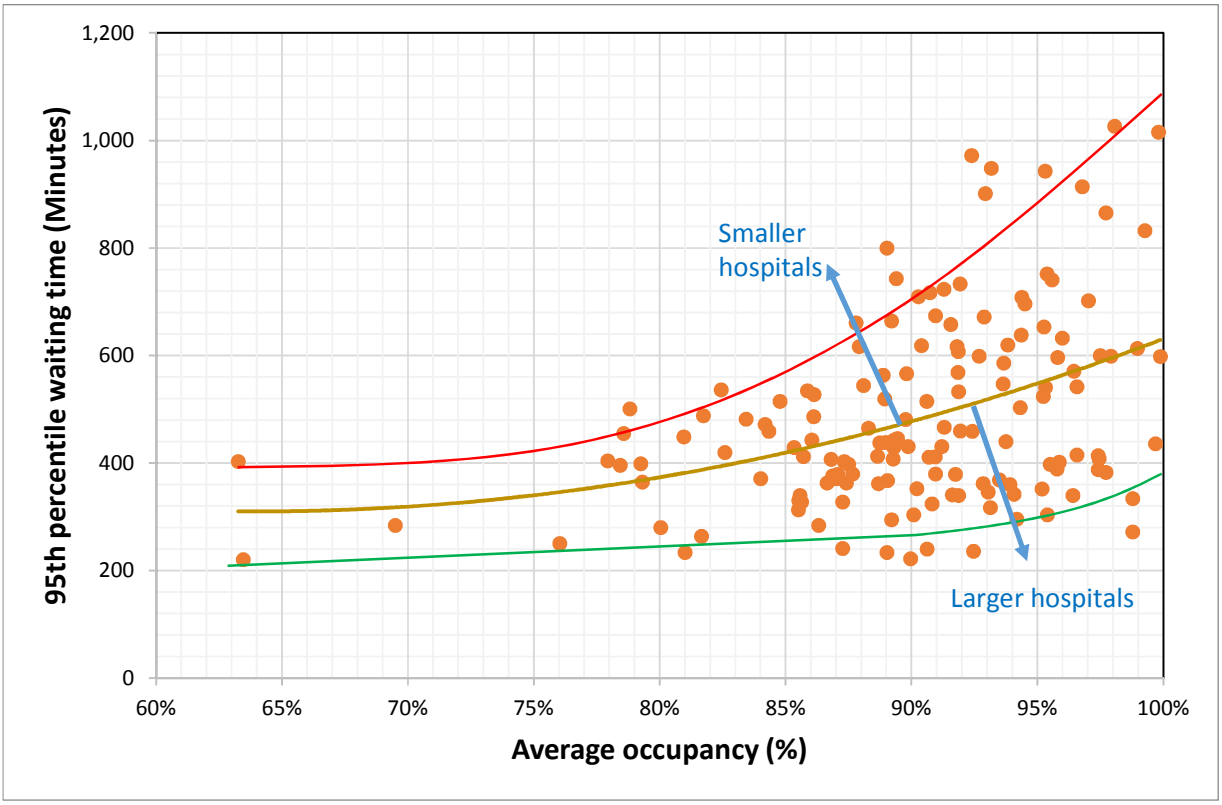
rather than an annual average. At this hospital the probability of at least one severe event per day was 15%, 20% and 28% at 80%, 90% and 100% occupancy respectively (Boyle et al 2013). So where does all this leave the NHS in England? Figure 1 which plots the 95th percentile for the time waited to be admitted from A&E against average occupancy in the 4th quarter of 2012/13 gives a clue to the enormity of the problem.

Figure 1: Waiting time to be admitted and average occupancy in English hospitals



Footnote: Data covering the 95th percentile of waiting time for admission from A&E into a bed in the month of January 2013 is from the Health and Social Care Information Centre (2013) and this is matched against average occupancy figures for the general and acute bed pool in English hospitals between January to March of 2013 (NHS England 2013b).

As can be seen there are now very few hospitals in England operating anywhere near to 85% average occupancy. The amber line on this chart is the average while the green and red lines show minimum and maximum trends. Average occupancy on this occasion is over a three month period and will appear artificially lower than day-to-day reality because it is a midnight occupancy and includes lower occupancy over the weekends. Work day reality will be close to 100% occupancy with hidden queues to admission.

Note that the four hour target is 240 minutes. In this respect the cluster of data points at the lower edge of the data around 240 minutes probably represent cases of 'admission' into a non-existent bed such as a trolley in a corridor, etc and represents mathematically impossible

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performance, i.e. these represent data massaging to be seen to be achieving the target rather than the reality of patient experience.

Hence if the A&E problem is ever going to be solved we either have to stop patients being admitted and/or we need to expand the bed pool – I am not suggesting expanding the number of staff, see Jones (2011b). Given the complexity and time required to prevent admissions may I suggest that the best short term solution is to expand the bed pool.

Surely this is the exact opposite of good financial management. Alas the reality is that as average occupancy rises a hospital loses many of its opportunities to operate at high clinical efficiency (lower length of stay) and operational efficiency (fewer cancelled operations). One study by Xu et al (2011) demonstrated that medical patients who were outliers in non-medical beds had double the length of stay and double the re-admission rate. My own studies into the NHS reference costs show that (after adjusting for economy and diseconomy of scale) there is no difference in the average cost per hospital for hospitals operating over 75% average occupancy, i.e. the higher capital utilization of beds gives no financial benefit since it is outweighed by the rising costs of inefficiency, 'never' events and hospital acquired infection (a far wider issue than just MRSA and C. diff) as occupancy rises.

Hence in my own consultancy work I endeavor to demonstrate to senior management that expanding the medical bed pool in a manner that is sensitive to seasonal trends actually reduces average length of stay and reduces costs. Increasing the number of beds paradoxically leads to reducing the number of occupied bed days. It's all about efficient patient flow. What is the likelihood of the NHS England review of reaching this politically incorrect conclusion?

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