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Crafting efficient bed pools

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This is the final part in a series investigating the role of a capacity margin appropriate to delivering timely and efficient healthcare The process of streaming implies grouping patients with similar needs so that they can receive dedicated input of clinical care. It is best known for its application in achieving efficiency in accident & emergency departments (Cooke et al 2002). While there are many ways of streaming patients into groups on this occasion we will use trends in diagnoses as defined by the 148 summary groups in the International Classification of Diseases (ICD) to illustrate some of the issues. The ICD summary groups are a useful high level aggregation and while primary diagnosis is not without some limitations the various diagnoses can be ranked according to complexity to allow focus on those diagnoses most likely to contribute to blockages in patient flows (Jones 2005) In the UK all hospital admissions receive an ICD diagnosis code. The wider issues of bed planning and length of stay efficiency have been previously discussed (Jones 2009c,d).

Table 1: Top 15 diagnostic groups for growth in occupied beds.

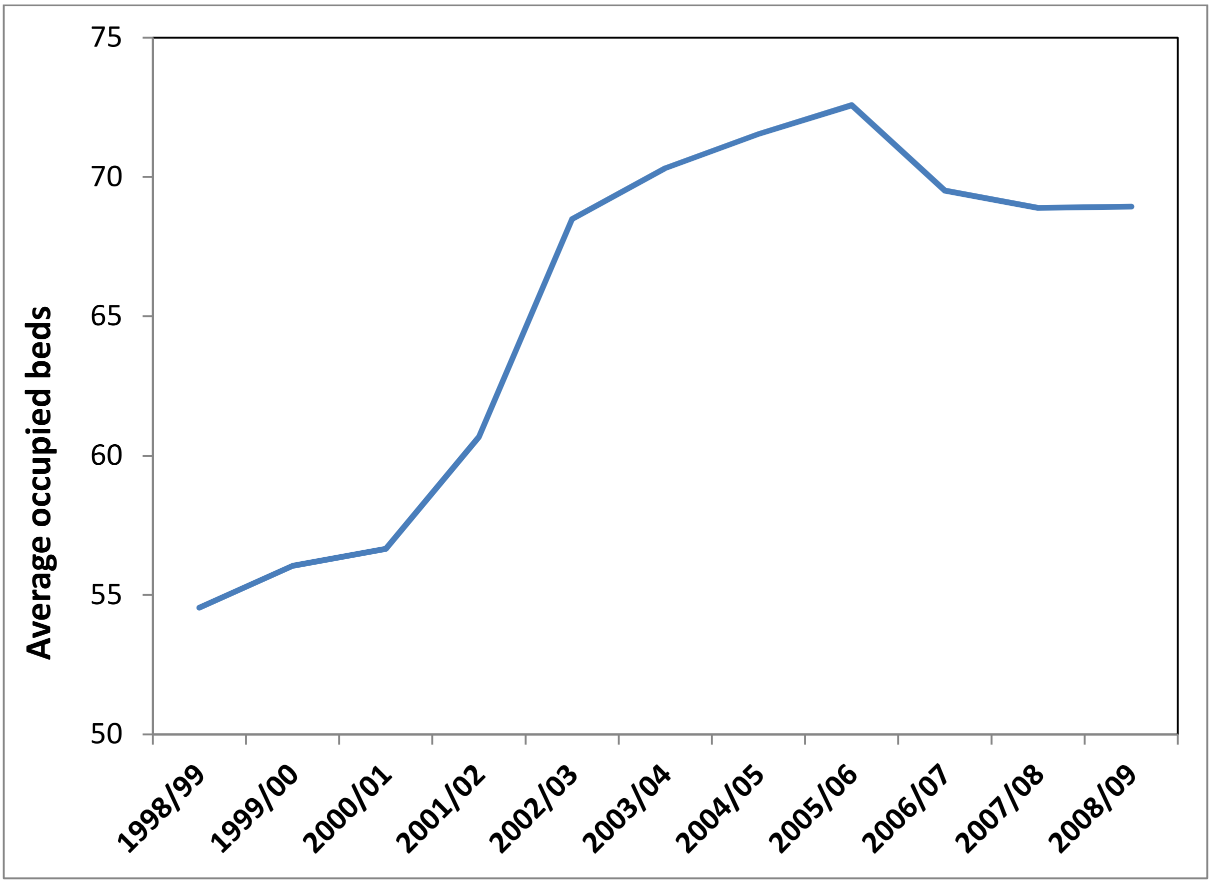
ICD Codes	Description	1998/99	2008/09	% Change	Extra Beds
A00-A09	Intestinal infectious diseases	2.1	5.2	149%	3.1
A20-A49	Certain bacterial diseases	3.5	6.4	85%	2.9
E15-E90	Endocrine nutritional and metabolic diseases	5.0	8.6	74%	3.7
J10-J18	Influenza & pneumonia	17.2	29.8	73%	12.6
J60-J70	Lung diseases due to external agents	0.8	3.7	367%	2.9
J80-J99	Other diseases of the respiratory system	6.5	9.4	44%	2.9
K50-K52	Non-infective enteritis & colitis	6.9	8.9	30%	2.1
K55-K63	Other diseases of intestines	14.1	16.1	14%	2.0
K80-K87	Disorders of gall bladder, biliary tract & pancreas	10.5	12.9	24%	2.5
L00-L14	Other infections and disorders of the skin	13.9	16.0	15%	2.1
N17-N19	Renal failure	5.2	8.1	56%	2.9
N30-N39	Other diseases of the urinary system	12.4	24.1	95%	11.7
P05-P96	Other conditions starting in the perinatal period	18.2	21.1	16%	2.9
R69	Unknown & unspecified causes of morbidity	46.0	67.6	47%	21.5
T80-T88	Complications of surgical & medical care	14.0	18.4	32%	4.4

Data as per Fig. 1. Growth is over the decade to 2008/09. Extra beds are for a typical large acute hospital (assuming 150 large hospitals in England). Extra beds at a medium sized site will be around half this figure, however, the percentage increase will remain the same. Excludes mental health and injuries (see Fig 1).

Table One investigates the top 15 diagnoses showing highest growth in bed demand over the past decade. There is a clear message about the growth in infections. The high growth in urinary tract conditions has already been identified as a very long standing growth trend (Jones 2009a) – perhaps ripe for some primary care intervention (which may be as simple as ensuring adequate fluid intake in the elderly). However, on average the top 15 diagnoses will have the greatest impact on the medical bed pool and it is at this point that the overlap with all manner of admission avoidance schemes from within primary care should be obvious.

Figure 1 presents the trend in bed demand for the ICD diagnoses relating to injuries (as a possible stream). This is very apposite given the recently reported effect of vitamin D supplementation on a 20% reduction in falls and fractures in the elderly (Bischoff-Ferrari et al 2009). Also note the highly non-linear trend over time, i.e. considerable flexibility and re-evaluation are required in the application of resources into potential streams. On this occasion the expression of bed demand appears to be the result of very long, medium and short term cycles in demand which can be understood using wavelet analysis. To put this in layman's language – there is far more complexity to the trends behind bed pressures than is often appreciated.

Figure 1: Trend in bed demand for injuries



Footnote: Data is from Hospital Episode Statistics (HES) (http://www.hesonline.nhs.uk/Ease/servlet/ContentServer?siteID=1937&categoryID=202) and uses 148 summary level groupings of ICD primary diagnoses. Change is over the period 1998/99 to 2008/09. Overnight stay elective and emergency has been combined. National data has been divided by 365x150 to approximate a large hospital. Injuries comprise ICD codes S00 to S99 and T00 to T14.

The final comment is around the occurrence of R69 (unknown and unspecified causes of morbidity). This is a complex issue. The accepted view is that chapter R signs & symptoms are an outcome of poor clinical coding. Clinical coding is supposed to have shown huge improvements over the decade. If so, why are beds occupied by various R codes showing growth in bed demand? It has recently been suggested that although R codes may partly be a product of a poor coding process they may also be a marker for the recently identified long term cycle in medical admissions and this can be seen in the trends for R50-68, R69, etc (Jones 2009b). The possibility exists that this is an expression of an as yet unknown/uncharacterised disease and hence chapter R codes are entirely appropriate. The patients are ill but we do not quite know why, i.e. as yet we have no diagnostic framework to characterise these patients. This is somewhat analogous to the position prior to late 1980 when AIDS was first characterised as a distinct clinical condition. However R69 can also be regarded as a symptom of a 'distressed' organisation where high bed occupancy and general chaos have led to a breakdown in the process of diagnosis and the subsequent recording of the diagnostic information. We may therefore assume that the level of 'distress' among hospitals has increased over time as bed occupancy has risen – an example of the negative consequences of too small a capacity margin.

However, while we may be able to discern such high level trends at national level what happens when we make the transition down to each hospital, especially those which are small. It is at this point that it must be pointed out that there are seasonal cycles behind admissions for some of these groups, i.e. the bed demand is seasonal within the context that some seasons are worse than others (Jones 2009). If we then add the daily volatility in admissions into the equation we can understand why it may be difficult to craft dedicated bed pools for every condition and we have to resort to clinical pathways applied to patients who may be dispersed across different wards.

We need to return to the central theme of this series, namely, the capacity margin is set by the volatility in demand and not by efficiency per se. Attempts to increase bed occupancy lead to the inefficient distribution of patients. The statistics behind volatility in demand are exceedingly cruel to those who are small (Jones 2006). Hence if we have too few beds we loose the ability to create distinct bed pools and are forced to assume that all nursing staffs are competent to apply a wide range of clinical pathways to ensure an optimum outcome. Such an assumption is somewhat optimistic and so we can see why the process of running an acute hospital (especially if it is small) is a product of many compromises impinged upon by financial and other pressures. At the end of the day there are no short cuts to high efficiency where skilled and dedicated input of care will always deliver the best outcome for the patient and will (as a by-product) also deliver associated efficiency measures such as lower length of stay. Hopefully the use of primary diagnosis illustrated here will prompt some innovative thinking in this challenging but central area in operational efficiency (Nataraja et al 2009). If we are to reduce the size of the acute sector then the primary care must deliver their side of the bargain. After all, if simple Vitamin D supplementation can make a 20% reduction in injuries (Fig 1) then 10 to 15 beds in every hospital is waiting for primary care to do its part.

Hence to conclude this series an adequate occupancy (capacity) margin is essential for two reasons. Firstly it allows patients to be aggregated into streams which facilitate reduction in length of stay and secondly there are as yet unexplained surges in bed demand (as per Fig1) which demand a prudent occupancy margin to avoid being caught out by such unexpected increases in demand.

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