Healthcare Analysis & Forecasting

Supporting your commitment to excellence

E-Plus for Beds

A methodology for determining the correct number of hospital beds and/or average occupancy

While there are several examples of the application of the Erlang equation in determing the number of hospital beds and the associated occupancy level to avoid averse turn-away of patients only E-Plus for Beds has been tried and tested over a number of years in the real world of acute, paediatric and maternity bed provision.

HCAF began the development of E-Plus for Beds in 1998 while investigating improved methods for predicting the correct size of acute hospitals. The method has wider applications in mental health, maternity, intensive care, special care baby units, etc. The rationale behind the methodology and why it gives superior results over the currently accepted methods (i.e. forecast future admissions x forecast future average length of stay x forecast future average occupancy) was presented at a conference on Bed Management held in the UK in 2001.

The E-Plus for Beds methodology recognises that the surgical and medical bed pools behave in very different ways (see statement of principles) and that a different approach is needed to optimise the mix and management of beds.

The methodology clearly shows that the central issue behind operational management is not necessarily beds *per se* (assuming that there are sufficient in the first place) but how staffs are flexibly deployed in the face of highly volatile medical bed demand.

Most hospitals are confused about the level of average occupancy needed for the proper functioning of A&E and medical care in general. For example, why do the paediatric and maternity bed pools operate at such low average occupancy? E-Plus for Beds allows the direct calculation of the appropriate occupancy level for each different bed pool (see Fig. 3).

For more information regarding E-Plus for Beds contact HCAF.

Dr Rod Jones (ACMA)

Healthcare Analysis & Forecasting, Camberley, Surrey, UK

hcaf_rod@yahoo.co.uk or www.hcaf.biz

+44 (0)1276 21061 or 07890 640399

Statement of Principles

A surgical mindset cannot be applied to the medical bed pool.

In the surgical bed pool length of stay efficiency and percentage day case surgery are key drivers for the size of the bed pool. However, as the size of the surgical pool shrinks it reaches a size where the lower average occupancy associated with a smaller bed pool limits the opportunity for further reductions in bed numbers. This limit is reached at about 100 beds.

A large part of this is to do with the specialist nature of the Trauma & Orthopaedic bed pool, i.e. it is a closed bed pool. The beds required in the Trauma part of this bed pool is set by long-, medium- and short-term cycles in bed demand. Bed demand peaks every third year and occasionally for two years running.

The remaining surgical pool which is usually around 100 beds (or smaller) therefore reaches the 100 bed barrier and as such increased efficiency can be assumed to match increasing demand via demographic changes in the population. This bed pool therefore remains virtually static in size provided there are adequate beds in the first place.

The medical bed pool is dominated by a different set of forces (see Fig. 1 & 2). Daily occupancy is subject to huge fluctuation as patterns of weather, temperature, sunlight, viruses, etc lead to periods of average occupancy which then shift to a new average occupancy ad infinitum. This pattern is unique to each year.

In such an environment the peaks in occupancy are set by the external environment and not by efficiency per se. Efficiency is seen by a lower average length of stay, fewer patients staying longer than the upper length of stay trim point and a resulting positive contribution to any Trust financial surplus. These are matters of financial efficiency which are not related to the size of the medical bed pool.

Efficiency becomes an issue when a Trust attempts to run with far fewer beds than are needed. In this case medical outliers lead to a starved surgical pool which uses whatever beds are left to maintain throughput, however, in an environment of high cancellation rates.

The remaining key is that of adequate dedicated surgical day surgery facilities. Day surgery has a different operational mindset, a different mix of nursing intensity and skills and different theatre scheduling. See Healthcare Commission Day surgery report (2005). As such mixed implementation with short stay wards, etc does not perform as well as it should.

E-Plus for Beds is applied within this operational framework to provide an optimum mix of medical, surgical and day case beds.

Figure 1: Daily medical bed occupancy at a very large acute hospital after adjusting for delayed discharges.

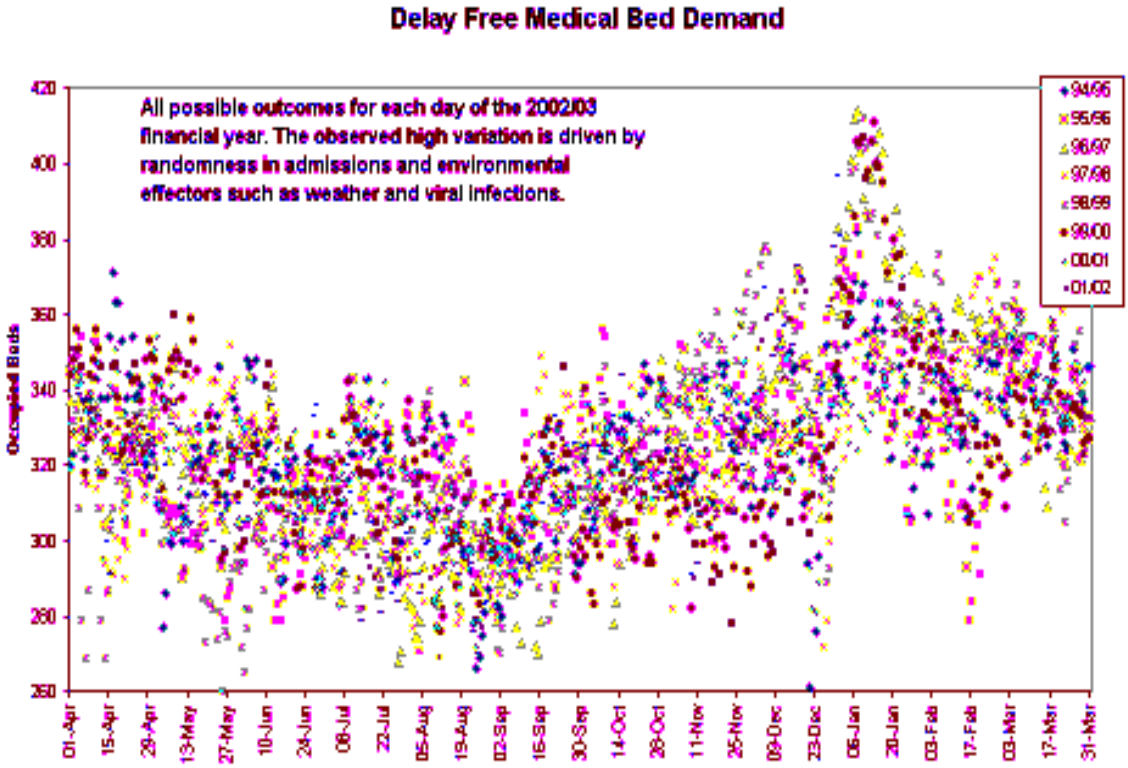


Figure 2: Monthly weekday medical bed occupancy at a medium sized hospital (after adjusting for weekend occupancy).

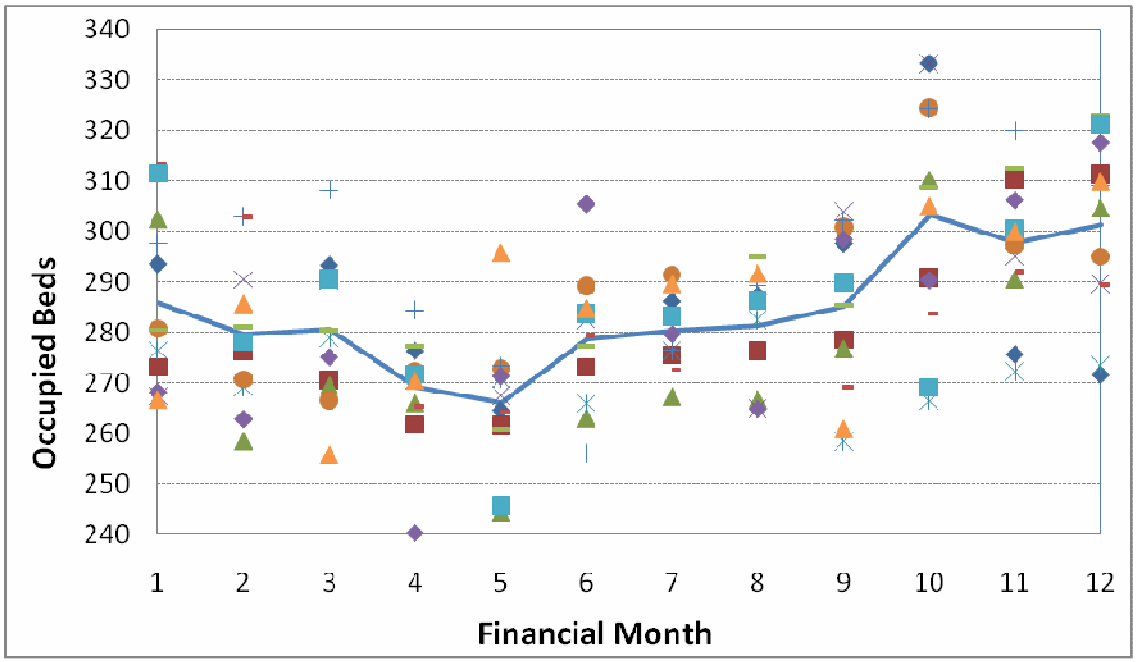
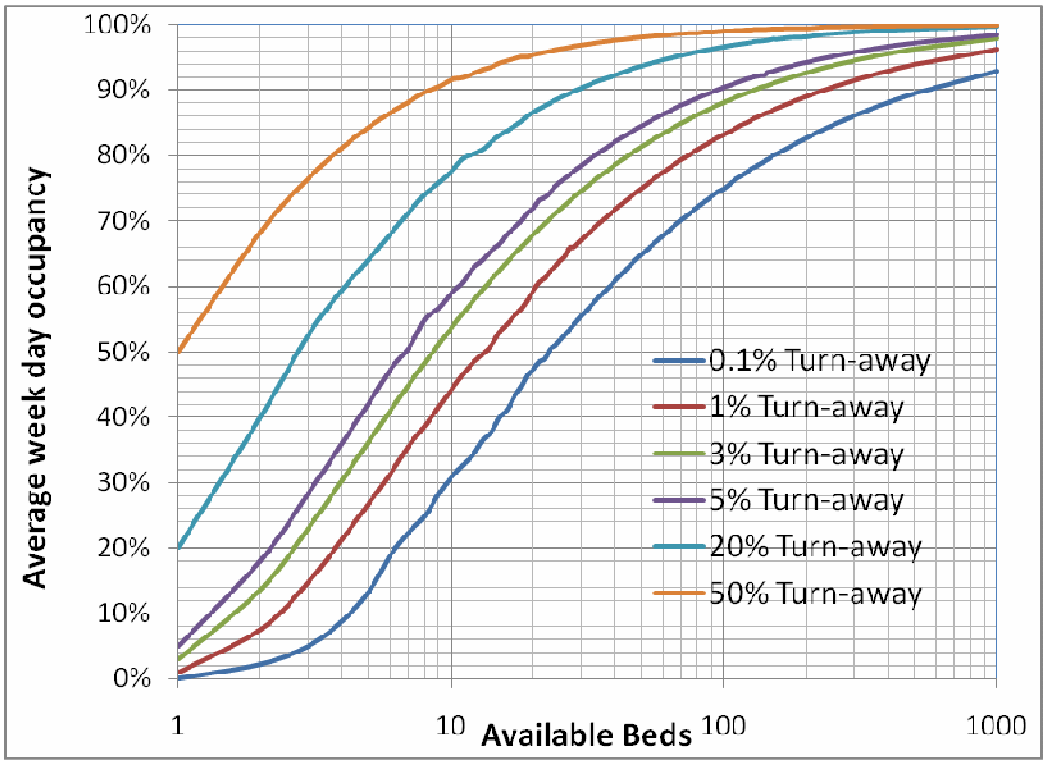


Figure 3: Performance measures for different sized bed pools



Notes:

1. Maternity bed pools must operate in the interval 0.1% to 1% turn-away
2. Interpret turn-away as the level of operational chaos
3. Between 100 and 1,000 beds the incremental change in performance is modest
4. Below 100 beds the incremental change is large – hence the comments about the surgical bed pool