Impact of Variation on Healthcare Budgets

Key Messages:

- The cumulative effect of random variation is NOT the average

- Variation in budgets are NOT necessarily due to poor management

- Variation is set by the smallest common units NOT by the total size

- The current method of costing and pricing (the HRG tariff) accentuates variation

A typical large CCG contract with an acute Trust may be for over 40,000 admissions. Based on simple Poisson randomness a standard deviation of +/- 200 (or +/- 0.5%) could therefore be assumed to apply. However, the biggest unit of activity in even the largest of such contracts is around 1,000 admissions. This means 1,000 patients from a similar group in terms of cost, i.e. the same procedure, price or HRG group. Thus even though the total contract may be for over 40,000 admissions the variation exhibited by the contract is driven by the sum of the groups within the contract, i.e. the variation associated with groups less than 1,000 admissions.

In this case the minimum possible variation will be that associated with demand of 1,000 which is +/- 32 (or +/- 3.2%). Remember that the maximum possible variation (due to the impact of the external environment – weather, air quality, infectious outbreaks, etc) is 3-times the standard deviation, i.e. up to +/- 10%.

The normal variation associated with the sub-groups within the total demand imply that we are no longer operating in a region of stable financial outcomes.

Let us explore the possible outcomes from contracts. Imagine 'Any Trust' who have to deal with an expected demand of 1,000 admissions each year for the next ten years. The cost per patient is £1 and so over ten years they should be expected to treat 10,000 patients at a cost of £10,000. However over the ten years demand will fluctuate around 1,000. At the end of ten years we can expect the following:

Total cost over ten years	Comment
Greater than £10,410, i.e. >4% over budget	Will occur with a probability of 10%, i.e. 1 in 10 Trusts or 1 in 10 years
Greater than £10,220, i.e. >2.2% over budget	Will occur with a probability of 25%, i.e. 1 in 4 Trusts or 1 in 4 years

If we also assume that in addition to the natural variation in demand the cost per patient can vary with a standard deviation of 10p per patient (i.e. equivalent to a 10% variation in length of stay), then after ten years we can expect the following:

Total cost over ten years	Comment
Greater than £10,600, i.e. >6% over budget	Will occur with a probability of 10%, i.e. 1 in 10 Trusts
Greater than £10,320, i.e. >3.2% over budget	Will occur with a probability of 25%, i.e. 1 in 4 Trusts
Within +/- 1% of budget	Will occur only with a probability of 17%, i.e. less than 1 in 5 Trusts

It must be categorically stated that the cumulative effect of random variation is NOT the average.

Deviation from budget may not necessarily be the result of 'poor' management but is largely driven by the normal level of variation associated with demand.

The statement 'managing demand' is misleading since a reduction in demand is more likely to have occurred due to random fluctuation than to management intervention.

Consider the current method of costing and pricing. Activity from the previous year (often a six month sample) is used to price the following year. Should we be in a period when demand is below the average our prices in the following year will be higher simply because the total quantum of cost is divided by a smaller 'quantum' of activity, etc, etc. The likelihood of even larger financial deviation (for Purchaser or Provider) in the next year is therefore magnified.

The 'correct' method for the costing of HRG is the average case mix over a number of years adjusted for ongoing shifts in overnight to daycase. The activity for next year is likewise estimated from trends in demand. Financial variation is thus minimised but not eliminated.

We therefore see that the fundamental basis for Capitation-based funding and indeed HRG's is subject to inevitable confounding due to the relatively small size of even the largest hospital or CCG. Such concepts only 'work' for the national data set due to its large size.

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