Comparing the use of inhalation anaesthetics

By Ray Fitzpatrick and Ron Pate

Abstract

Aim
To examine the use of isoflurane, sevoflurane and desflurane across hospitals in England and explore whether the data can be compared for benchmarking purposes.

Design
Data were sourced from IMS Health's database.

Results
Analysis of raw data for three individual inhalation anaesthetics showed no particular trends. When use of the short acting sevoflurane and desflurane were combined there was an 8.8-fold variation in their use across hospitals. However, when the combined sevoflurane and desflurane use was expressed as a proportion of total anaesthetic use, the variation was reduced to 3.5-fold.

Conclusion
Comparing the use of short acting inhalation anaesthetics as a proportion of total inhalational anaesthetic used could be of value in benchmarking exercises. However, before truly meaningful comparison can take place, differences in hospital day case activity need to be factored in.

There are four inhalational anaesthetics available in the UK — halothane, isoflurane, sevoflurane and desflurane — all with different clinical characteristics. Halothane is the oldest, but its use is limited due to adverse effects on the liver. Isoflurane is the most commonly used and least expensive agent. Sevoflurane and desflurane are faster acting and have quicker recovery times than isoflurane, but are more expensive: £123/250ml, £58/240ml and £147/250ml respectively. Desflurane is faster acting than isoflurane with faster emergence and recovery, but is less potent.1 Sevoflurane is more expensive than desflurane but is more potent, is rapidly acting and also has faster emergence and recovery.1 Therefore, while more expensive than isoflurane, sevoflurane and desflurane are suited to short procedures and have played a central role in the increase in procedures undertaken as day cases. NHS hospitals in England spent over £14m on inhalational anaesthetics in 2006/07 (personal communication, NHS Information Centre) and so it is important that hospitals use the most cost effective choice of anaesthetic agent for the procedure. Furthermore, the introduction of payment by results (PBR), a system by which hospitals are paid a standard price for interventions and procedures,5 means hospitals are critically reviewing the cost base for treatment. Similarly, as commissioners of medicines management provision in secondary care, pharmaceutical advisers will be looking for assurances that medicines use is appropriate and cost effective when compared with other providers.

As part of the NHS financial management system, individual hospital costs for particular procedures or episodes of care (HRGs) are collected by the Department of Health for comparison. These costs are termed reference costs, and are often benchmarked by the NHS to perform manage and benchmark their services.6 Furthermore, with the advent of PBR and as hospitals move towards foundation trust status, the costs associated with procedures and treatments are being compared with the income through the national tariff. This is service line reporting since it measures the contribution to a trust's financial position by each of its service lines.

Therefore, it is important for clinicians and managers to understand the components contributing to these costs, including medicines.

Detailed information on medicines use has been available within most hospitals for a number of years, and is used to help promote safe rational and cost effective prescribing through feedback to clinicians and managers.7 However, unlike primary care, there is no routine system of comparing hospital medicines use, since until recently there has been no nationally available dataset of hospital prescribing information. Even if such a dataset were available, we have previously argued that robust comparison of hospital medicines use is confounded by varying size, different levels of activity and case mix between hospitals.8 In addition to these differences hospital pharmacy departments use different computer systems to capture cost and usage information at the point of issue to wards, departments and individual patients, which further confounds useful comparison.9

A dataset of hospitals medicines usage is collated by IMS Health, a commercial information company, and this dataset covers approximately 95 per cent of hospitals in England.

The purpose of this study was to examine the use of inhalational anaesthetics in hospitals across England using the IMS dataset, to explore whether usage data could be compared for benchmarking purposes.

Methods
Usage data for isoflurane, sevoflurane, and desflurane was provided by the NHS Information Centre, Leeds, sourced from the IMS Health database for the year 2005/06, for each of the former 28 strategic health authorities (SHAs) in England.

Using these data, two analyses were undertaken:

- A comparison by volume of the annual usage of short acting inhalational anaesthetics expressed as a proportion of total anaesthetic usage by former SHAs

Halothane was excluded from the analysis since its use was negligible. Analysis of expenditure on inhalational anaesthetics was not undertaken since the cost varies across the country due to different regional contracts being in place. Although isoflurane is supplied in 100ml as well as 250ml bottles, usage was converted into units of 250ml for the purposes of comparison.

Unfortunately the confidentiality agreement between the NHS Information Centre and IMS did not permit release of data down to hospital level.

Results
When we looked at the usage of all three inhalational anaesthetics by former SHAs, no particular trends or patterns emerged. When we combined the usage of the two short acting anaesthetics sevoflurane and desflurane there was a similarly wide variation, with an 8.8-fold difference from the lowest user (1,378 units) to the highest user (12,095 units). The average consumption of short-acting anaesthetic per former SHA was 5,694 units per year. The distribution of use of short acting anaesthetics, as shown in Figure 1, is skewed towards the lower users, demonstrating a non-normal distribution. However, the median value is only slightly lower than the average at 5,502 units per year.

In order to take out hospital activity as a confounding variable between health authorities the combined usage of short acting

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different picture emerged where the difference between the lowest and highest user was only 3.5 fold.

The distribution pattern of short-acting inhalational anaesthetics when expressed as raw usage data was skewed towards the lower end (Figure 1), but when expressed as a proportion of all inhalational anaesthetic use the distribution pattern changed and was skewed towards the higher end (Figure 2). These findings would suggest that analysis of usage data tends to underestimate the real usage pattern of short-acting inhalational anaesthetic agents, since it does not take into account hospital activity, which is a major variable in all medicines use.

One particular SHA provided a good example of how the usage pattern changed using the different analyses. The SHA did not use much for short acting inhalational anaesthetics, being only slightly above the national average. However, when use is expressed as a percentage of total inhalational anaesthetic use, the same SHA showed the highest proportional use of short acting inhalational anaesthetics nationally.

This study demonstrates that expressing the use of specific medicines in a group as a proportion of total use removes the variables of hospital size and activity because absolute quantities are not involved. By removing these variables a different pattern of use is seen (in this case inhalational anaesthetics) as a proportion of all medicines use.

The nearly nine-fold difference between the lowest and the highest use is not remarkable, since there is a wide variation in hospital size and activity across all the former SHAs. However, a large difference in use is surprising because analysis by SHA would be expected to smooth out differences between individual hospitals, indicating that analysis by individual hospital would probably show an even wider variation. When analysis of usage was expressed as a proportion of combined short-acting inhalational anaesthetics and noflurane a

**Figure 1: Distribution of use of short-acting anaesthetics**

**Figure 2: Distribution of use of short-acting anaesthetics expressed as a proportion of all anaesthetics**

References

5. Fitzpatrick RW, Pate RG. Hospital prescribing: a taste of each other’s medicine. Health Services Journal 2008;113 Nov:28–9.