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Assessing the "Cost Versus Benefit" of Radiology

All nations aspire to obtaining the best value for money for their population, achieving the maximum heath gain for the money spent. Although a predominantly State-funded system like the NHS in the UK can look at these issues more readily than those with a mixed economy of healthcare, private insurers are also interested in value for money and are increasingly evaluating the evidence of benefit of treatments before funding them. All licensed drugs have trial evidence that they work within their licensed indications, otherwise they would not have been granted a marketing authorisation by bodies such as the European Medicines Agency. Nevertheless they do not necessarily have to work particularly well or sufficiently well to justify their cost compared with other available treatments.

As the provision of healthcare has become more complex and expensive, health economics has emerged as an increasingly important discipline. There are three main ways in which the value for money of a health intervention can be assessed, as outlined here.

Cost effectiveness analysis. This looks at the costs of achieving a defined benefit. Examples might be cost per life saved, life year gained, hospital admission avoided, 5mm drop in systolic blood pressure, or 1% drop in HbA1c etc. Here the outcome itself is known to be of benefit either in health or societal terms, or associated with a monetary value.

Cost utility analysis. This uses a universal measure of 'wellness' or 'illness' on a scale of 0-1, where 1 is perfect health and 0 is death. Everyone will be somewhere on that scale and can be described in terms of their 'utility' (interestingly, it is possible to be in a state less than 0 i.e. considered to be in a health state worse than death). Utility declines with age and illness. A cost utility analysis looks at the average gain in utility against the cost of a treatment, allowing the success of any treatment for any condition to be judged using the same units. This is refined by the length of time for which the intervention works, to give a calculation of total health benefit gained as a result of the treatment. The unit is a quality adjusted life year (QAlY) which is a year of perfect health. When the cost of the treatment is known, a cost per QAlY can be calculated. This represents what would have to be spent on that intervention to 'buy' the equivalent of a rise of 1 in the utility scale, lasting for one year in the treated population. This is looked at in relative terms i.e. in comparison with treatments already available. So in essence, an intervention which gives a big rise in utility and lasts a long time compared with alternative treatments will generate many QAlYs in the treated population and may be a good investment even if it is relatively expensive.

***Cost Minimisation Analysis*. This is simpler, and can be used when two treatments are equally beneficial. It evaluates which is the cheaper, taking all costs related to the treatment into account. These calculations can only be made on the basis of excellent evidence on the effectiveness of treatments, and the costs involved. Complex economic models are constructed to map the course of the disease in relation to the treatment(s) used, in order to calculate the value for money provided. This methodology is particularly widely used in the NHS in the UK by the National Institute for Health and Clinical Excellence (NICE) before being funded for use in the NHS.**

Assessing the 'Value' of Radiology

These same principles can be applied to radiology. There are however several examples in relation to health screening, notably population screening for breast cancer, where similar analyses provided evidence that mammographic breast screening was a good investment in terms of cost versus benefit for the population in the selected age group.

Interventional procedures are also amenable to health economic evaluation, particularly comparing image guided intervention with open surgical techniques. It is is perhaps surprising, and probably not to radiology's benefit, that these analyses have not been widely undertaken because the generally lower cost of interventional radiology might well work to its advantage in several areas of practice. It can be done; for example NICE evaluated the use of ultrasound guided central venous line insertion compared with 'blind' placement. The analysis found ultrasound guidance to be cost effective in cost per QAlY terms on the basis of the number of complications avoided and the medical time saved by fewer attempts being required.

Evaluation of the health benefits of diagnostic radiology outside population screening is more problematic because here there is a more indirect relationship between the diagnostic test and the utility gain of the patient. It would however be perfectly possible in theory to calculate for example the cost per QAlY of using MRI to diagnose acoustic neuroma. Equally, in the case where two different imaging methods could be used to make the same diagnosis, it would be possible to evaluate which provides the better value for money based on their sensitivity, specificity and cost. In circumstances where a second test is used to confirm the finding of a first, a calculation of the additional information/ benefit gained relative to the cost of another investigation would give a measure of the incremental cost benefit of carrying out the second test.

The Future

As an expensive service, radiology will not be immune from scrutiny forever. In some cases, investigations are done for reassurance, for medico-legal reasons or to compensate for clinical uncertainty and might not be a good use of scarce resources. Cost effectiveness evidence for the appropriate and effective use of radiology resources may not be a bad thing.

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