Innovation

The role of health economics in the evaluation of surgery and operative technologies

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Limited budgets and escalating costs demand prioritization of deployment of medical services. Health economics addresses the allocation of resources within a specific health economy[1-3] and can be envisioned as the study of choices and their consequences. From this perspective, it is insufficient for an operative treatment to display efficacy; to be considered for adoption, an intervention must also display good value for the money that is being spent. In short, a decision maker should be satisfied that, by spending additional resources on these new interventions, the benefits will outweigh the potential consequences of shifting funds away from other sources.

Many national-level decision-making bodies have been established to make such judgements. In England and Wales, the National Institute for Health and Care Excellence (NICE) provides guidance to the National Health Service (NHS) on the clinical effectiveness *and* cost-effectiveness of selected new and established technologies. Various bodies addressing national health technology assessment (HTA) operating in other countries include the Canadian Agency for Drugs and Technologies in Health in Canada, the Pharmaceutical Benefits Advisory Committee in Australia, and the Health Care Insurance Board in the Netherlands.

In the United States, decisions on the adoption of new technology are often decentralized, and individual hospitals or hospital groups frequently depend on internal value analysis committees to reconcile budgets, physician preferences, regulations, and other factors. These various national HTA groups aim to provide evidence to decision-makers regarding the medical, social, economic, and ethical implications a new intervention might have for patients and for the system as a whole.

Health systems and national processes of HTA decisions differ from region to region. For instance, some countries focus purely on clinical aspects using clinical or physician-driven outcomes, while others explicitly include economic considerations, such as cost, quality of life, and other patient-reported outcomes. Those using economic outcomes as a key factor in decision-making tend to be more explicit about the trade-offs that must be faced within systems with limited resources.

In such systems, it is vital to have methods to assess the relative health benefits associated with different interventions. For example, a new (expensive) technique for an operation might demonstrate improvements in long-term survival,

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while a new (also expensive) monitoring system might decrease the risk of perioperative complications. Health economics is about measuring and weighing the relative merits of these different types of trade-offs in order to inform decisions on health care resource allocation, including adoption of the technology.

MEASURING COSTS

Although an operative intervention may be demonstrated to be *effective*, it is essential to estimate the health care resources that would be required to provide that intervention, since these resources could potentially be used elsewhere in the system. The costs that are considered in health care decision-making are typically limited to those that fall on the health care provider or, in some countries, an insurer.

These costs may include staff time, surgical equipment, monitoring equipment, and drug costs, among others. The specific costs to be included in an economic evaluation differ depending on the viewpoint or "perspective" of the analysis. Many different perspectives can be taken, including that of society as a whole, the health care system, the individual institution, or even a specific patient.

Depending on which perspective is being taken, costs may be categorized as direct or indirect. Direct costs typically relate to those that are paid for by the health care provider.[2,3] To measure these costs, the quantity of health care resources used (eg, number of clinicians and duration of the operation) are multiplied by the individual unit costs or prices of those particular resources. Evaluations sometimes use the rates derived from health care resource groups, diagnosis-related groups, or hospital billings instead, which do not provide similar levels of detail.

Indirect costs refer to any costs borne *outside* the health care system. These may include factors such as the impact on productivity due to lost work time resulting from illness or other health care needs. In some cases, the inclusion of indirect costs can have a substantial impact on the results of an evaluation, although it is important to note that any technologies displaced by the use of a new intervention may also have had an impact on productivity and other indirect costs.

It is also important to consider the implications of including long-term costs. For instance, although an operative intervention is likely to have high short-term costs, there are likely to be substantial longer-term effects. These might be cost savings, wherein a successful intervention might avert future complications or add years of productive work and tax contributions. Alternatively, an operative intervention might lead to cost increases if a "successful" treatment increases a patient's life expectancy and, therefore, increases overall lifetime costs. The latter scenario can, of course, penalize particularly successful interventions. The duration of time over which health care costs could be modelled depends largely on the nature of the therapeutic area and the intervention under investigation. In some cases, it is clearly necessary to consider long-term costs, while in other cases, all consequences of a treatment may be expected to occur within a few weeks after the intervention. Providers of health care tend to prefer spending money in the future compared with spending the same money today; therefore, costs are routinely "discounted" to present values. The rate at which future costs are discounted varies among countries; in the United Kingdom, NICE guidelines recommend that costs should be discounted at 3.5% per year.[4]

MEASURING AND VALUING BENEFITS

To justify additional spending on a new intervention when funds are limited, it is vital to develop some measurement of the magnitude of benefit that each treatment will deliver. Common measures of benefit include survival, time to discharge, readmission rates, and event-free survival; however, keeping in mind that holders of the health care budget are often forced to allocate limited resources across a whole range of areas, decision-makers often face impossible trade-off decisions when different measures are used in each area. As a result, some countries have moved toward the use of measures that incorporate health-related quality of life (HRQoL) in addition to the "quantity" of life.

The use of the quality-adjusted life year (QALY) for measurement of health outcome has become standard practice in many countries because the measure takes into account the impact of the treatment on both the quantity and quality of life. The QALY is a measure that can be used in all disease areas, thus allowing decision-makers to readily compare the benefits of a diverse range of treatments within a system. QALYs are measured by multiplying HRQoL (or "utility") by the duration of time that a patient spends with that utility score. Utility is measured using a scale between 0 and 1, where 0 represents a health state equivalent to death, and 1 indicates perfect health. Thus, a patient who experiences 5 years in perfect