GRESHAM COLLEGE

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WHAT IS VALUE IN HEALTHCARE?

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"Money could buy you comfort and luxury, but it couldn't buy you the only thing in the world of real value, which was health. It couldn't buy you a cure"

Peter James, 2013[1]

Introduction

If an individual has severe arthritis of a hip causing pain and restricted movement, it is obvious that it would be of enormous value to them if that pain could be eliminated and movement restored. We know that we can achieve this in most people by joint replacement. If the person was of working age, they could get back to work, and/or continue to support their family. Later in life, society benefits by keeping someone active and thus more likely to stay healthy, and by avoiding costs associated with delayed treatment, including increased risk and greater complexity. Prompt and appropriate joint replacement is a good idea.

Young couples are often keen to start a family, and most do so naturally. Some couples are less fortunate, and despite being desperate for children, find they cannot conceive. Some are suitable for IVF treatment, of which they may need several cycles in the hope of success. The value to them of children is self-evident.

Someone diagnosed with a malignant cancer who has been given a terminal prognosis potentially may benefit from a new drug which has been shown to prolong life in a percentage of patients. That life-extension may be immensely valuable to them; to spend more time with their family, put affairs in order or to complete a bucket list. It may also offer that ephemeral concept of hope.

The value to the patients in all these examples is, I hope, clear. In each of these though, you will be aware from the media that limited resources have led the universal application of these treatments to be questioned. The wider value to society of their liberal use has been called into question as those buying care struggle to decide how to divvy up their money.

In this lecture, I want to consider the following;

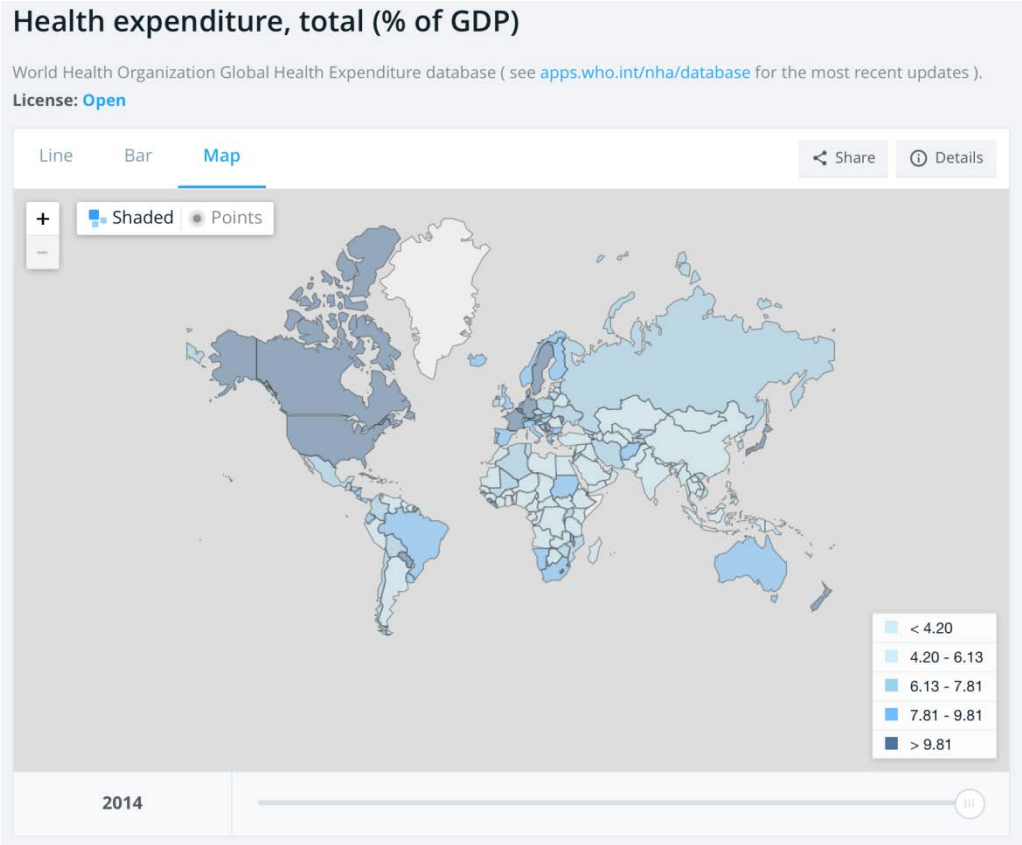
- The range of health expenditure around the world
- Whether that expenditure produces value for money
- How we choose which treatments to employ
- How we can measure value to a patient or society
- How we can estimate cost
- And what we will need to do to get maintain value for money

But I must first emphasise the crucial importance of Government Policy in the allocation of resources to health services and how government chooses emphasis within that financial envelope.

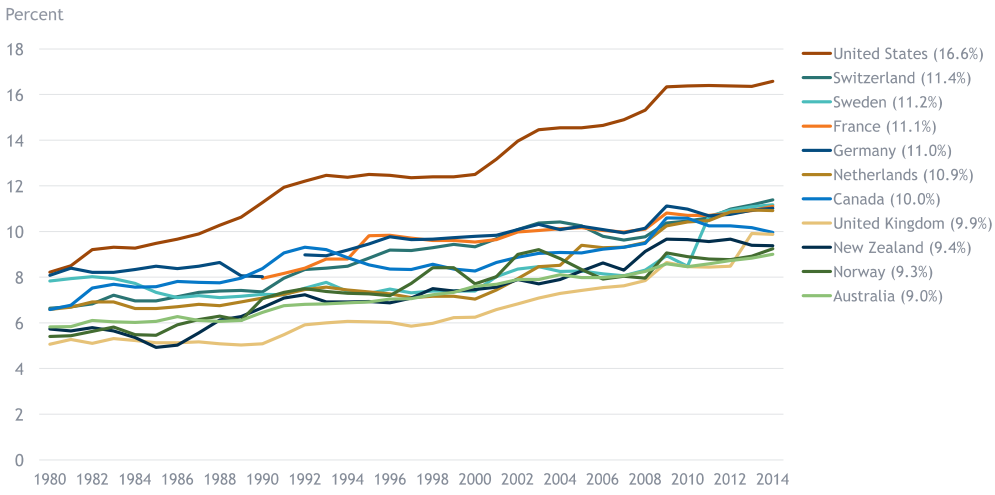
International Health Expenditure

The amount of money governments choose to spend on health (usually expressed as a proportion of Gross Domestic Product[2]) varies widely from country to country as demonstrated by the 2017 Commonwealth Fund Report [3] and in data from 2014 shown on the map below from the World Bank (http://data.worldbank.org/indicator/SH.XPD.TOTL.ZS/?view=map).

It is salutary to see what an enormous proportion of the world's population lives in regions with very low health expenditure.



But even in the 'developed' world, there are stark contrasts. The 2017 Commonwealth Fund Report[3] includes a graph (Exhibit 1), which I reproduce here;

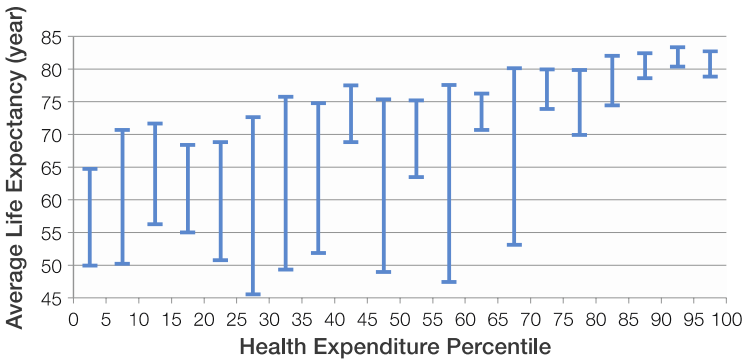


ealth care providers.

Over the last 25 years, all the countries listed above have increased expenditure on health as a percentage of GDP, with the USA now spending roughly twice as much as the others (an even greater proportion when expressed *per capita*; $8,508 in the US v. $3,182 in the remaining countries). But are Americans twice as healthy, or do they live twice as long? The answer to both questions is "No". In fact, the USA has the highest infant mortality rate, the highest percentage of adults with at least two of five common chronic conditions, the highest mortality in conditions amenable to healthcare and the shortest life expectancy amongst this group of countries for people aged 60y[3]. The huge expenditure simply cannot represent good value for money for the whole society.

Such **poor value for money** is also evident in data presented by the World Economic Forum[4] which show big variations in health outcomes (expressed in terms of life expectancy) amongst countries with similar health spending per capita.

Figure 1: Big variations in health outcomes among countries with similar health spending per capita



In England, policy decisions related to austerity have resulted in Government demands for £22 billion of savings from the NHS. This huge ask leads us directly to question the value of what we do. As Chris Ham put it in his foreword to a 2015 Kings Fund Report[5], action is required at all levels of the NHS "*to maximise the value of every pound spent on patient care*". He concluded that there should be 'particular emphasis' on clinical practice.
A 2017 OECD report[6] helpfully defines **Wasteful Clinical Care**. This occurs when patients receive health services that fail to maximise health outcomes for avoidable reasons. **Low-value Care** occurs when the benefit of an intervention is deemed too low in relation to either the cost or inherent risk, and may thus be *ineffective, inappropriate or poorly cost-effective*. There is huge variation across countries in all these domains[7]. Across the OECD countries, over 30% of babies are delivered by Caesarean section, when medical indications suggest a proper rate would be less than 15%. There is a huge discrepancy in the use of cheaper generic drugs (compared with their more expensive branded products) ranging from 10 to 80% across the OECD countries. The OECD estimates that around 20% of health expenditure makes no effective contribution to health outcome [estimates for the USA suggest this may be up to 50%]. This is waste. We could and should do better.

Evidence-Based Medicine

I was always taught to base my medical decisions on the best available evidence. This concept was formalized in the term *evidence-based medicine* (EBM) in a paper from the American Medical Association in 1992[8]. It is a very attractive concept, but inherent in it is the idea that clinicians (a) have access to the best evidence, (b) can determine the veracity of that evidence, (c) can work with their team to implement that evidence and (d) are allowed, by their employers, to utilise the treatment identified by best evidence.

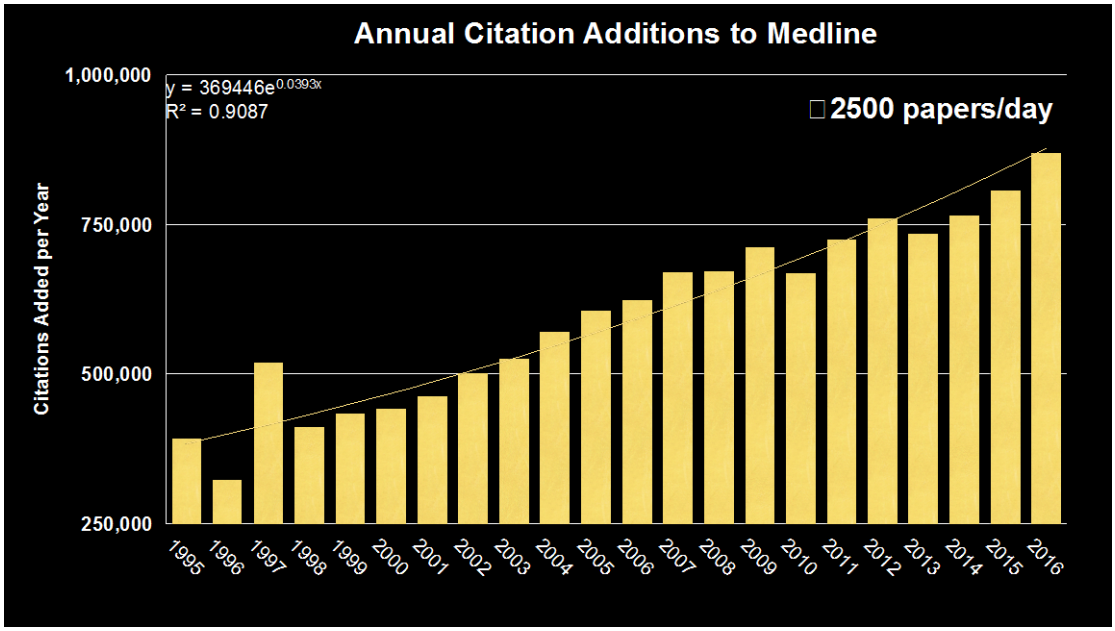
To help get to grips with the massive amount of data out there, evidence has been classified[9] into a series of levels, with Level 1 being the 'strongest' evidence.

Hierarchical Levels of Evidence[9]

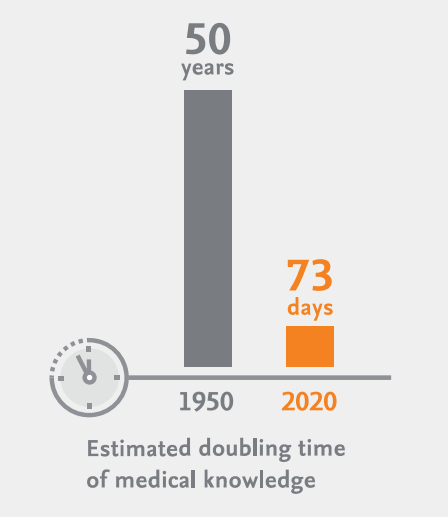
Level of Evidence	Interventional Study
Level I*	**Randomised clinical trial with low (<0.05) Type 1 error [chance of accepting a false positive outcome] and a low (≤20%) type 2 error [chance of accepting a false negative outcome]**
Level II	**Randomised clinical trial with a high (>0.05) type 1 error and/or a high (>20%) type 2 error**
Level III	**Uncontrolled, unrandomised clinical trial (treatment group compared to no treatment group without randomisation)**
Level IV	**Intervention on a series of patients with no comparison group**
Level V	**Interventional case report**

* *A meta-analysis combines two or more clinical trials that may be under-powered to determine effect. As such a meta-analysis can convert Level II evidence into Level I evidence.*

Sadly, searching for the evidence is not straightforward. It has become incredibly difficult to keep up to date with the medical literature, simply because of the sheer volume produced. Over the last 20 years, there has been a steady and accelerating rise in the number of papers indexed by Medline, the main indexing system for medical publications (https://www.nlm.nih.gov/bsd/medline_cit_counts_yr_pub.html) .



In 2016, almost 900,000 papers were indexed on Medline, roughly 2,500 per day. It is impossible to read all that, let alone review it in detail for quality or relevance. It has been estimated that the sum-total of available medical information doubles every 3.5 years. It is anticipated that this will fall to 73 days by 2020[10]!



Obviously, each specialty has its 'niche' publications and its own professional meetings, and this narrows down what one must read or watch, but it is frankly impossible for most busy doctors to keep as up to date as they would like. Various tools are available to help us navigate the literature (see Pain, 2016[11]) and there are organisations such as the Cochrane library (http://www.cochranelibrary.com) which specialize in identifying and publishing best evidence as systematic reviews. Their resources are also limited and thus not everything is reviewed. Despite these constraints, EBM is now established as the best way of choosing how to manage our patients; relying on fact rather than fancy.

Value-Based Medicine

There is an old Jewish teaching that if one were to put a single life on one scale and the rest of the world on the other, the scales would be equally balanced[12]. Hardly utilitarian, and not of much practical use, but it does reflect the innate human respect for an *individual* human life. To provide comparison between treatments or to judge the effectiveness of organisational change in health care, we need more objective measures of outcome than philosophical balance.

The effectiveness of any medical intervention as judged by EBM alone is usually seen through the lens of the clinician or her colleagues, in terms of numbers of some kind (*objective measures*) such as change in blood pressure, % ejection fraction or glomerular filtration rate. But if we consider the *value* of a treatment, might it not be better also to judge the effectiveness by *patient-perceived* value? We may be able effectively and objectively to treat your condition, but if, in doing so, we make your life worse causing unpleasant side effects of the drugs we use, might that not lower the value of treatment? The treatment has had the medically desired goal, but has decreased the quality of life. There are 'trades-off' which have to be made.

This leads us to the concept of ***value-based medicine*** **(VBM[13]),** which is becoming a key component of the design of many health systems. VBM theoretically uses the best evidence-based data combined with the *patient-perceived quality of life* conferred by a treatment, and relates those to the resources used for, and as a consequence of, that treatment[13]. Another way of describing this is in the form of an equation;

Value (to the patient) = Outcome (following the intervention)/Cost (of the intervention)

This is a **cost/utility analysis**; the so-called **value equation**, which should provide an objective comparator suitable for use in all fields of medicine[14]. Such analyses form the basis of the work done by NICE, The National Institute for Health and Care Excellence (https://www.nice.org.uk) a UK organisation which is devoted to identifying best practice in terms of both outcome and cost, and which is both the envy of health systems around the world and a source of advice to many. The value equation has also been proposed by many workers, notably Professor Michael Porter of the Harvard Business School, as a basis for complete revision of the payment or commissioning system for healthcare[15], and many of their ideas have found their way into policy changes in US Health Care.

It sounds so simple, doesn't it? And obviously appropriate, but it is far from straightforward in practice. It can be surprisingly hard to measure the outcome of treatments and may be equally difficult to quantify all the relevant costs. As Brown et al point out[13], "*there are few industries in which purchasers are unable to measure the value of what they purchase; historically, healthcare has been the major one*".

A great place to start in delivering value to patients is to concentrate on ensuring that your system, hospital and personal practice are devoted to delivering high-quality care. If you provide high quality care the patient experience is also likely to be good. Complications and delay are expensive, and equate to poor service to the patient. Further, one in ten patients in OECD countries is unnecessarily harmed at the point of care and 10% of hospital expenditure is spent correcting such errors. This is waste. We could and should do better.

The Institute of Medicine (IoM) defines **high quality medical care** as having six attributes[16]:

1. **Safety** (patients should not be harmed by the care that is intended to help them)
2. **Patient-Centred** (care should be based on individual needs)
3. **Timely** (waits and delays should be minimised)
4. **Effective** (care should be evidence-based)
5. **Efficient** (waste should be reduced to a minimum)
6. **Equitable** (care should be equal for all people)

I have heard it said that "**health care is not truly great until the patient thinks it is**". Most of the complaints I had to deal with as a medical manager related to poor communication between people, poor organisation of processes and occasionally a lack of compassion Get the quality of care delivery right, the argument goes, and that care is likely to be cheaper, especially if you can eliminate unnecessary variation.

The Value Equation has thus been 'refined over recent years to take *quality of care* into account in addition to objective outcomes. Costs have been split into *direct and indirect* costs, thus:

Value (to the patient) = Quality ÷ Cost
= (Outcomes + Experience*) ÷ (Direct + Indirect Costs)

*****Experience relates to the patient's experience during and after the treatment intervention; sometimes called the quality of care.

Simply looking at the IoM's list of six attributes of high quality care (above) gives an insight into how difficult resolving the value equation will be.

How do you measure safety in a uniform manner? Perhaps infection rates, or 'returned to operating theatre' rates, bleeding rates or unplanned readmissions.

What does patient-centred care really mean? And how would you capture any meaningful information to make a comparison?

Delays and access issues might well be reportable, but when should the clock start ticking? In the GP surgery or after referral to the hospital? And what if the system of referral differs so much from one place to another to be incomparable? These problems are all potentially solvable, but require a great deal of work on methodology as well as extensive developments in data collection and analysis. Just to define some aspects of quality.

The measurement of effectiveness in the form of *objective* clinical outcomes is better understood, but the introduction of patient 'satisfaction' to the assessment sometimes challenges clinicians' concepts of success. For example, the outcome of cancer treatment is often expressed in terms of patient survival. Thus, a treatment may be judged to be a success if it extends life for a significant proportion of those patients receiving the treatment when compared with a control group of similar patients who did not receive the treatment. But what if a patient does not value life extension if it involves the use of very toxic chemotherapy and so chooses to have an earlier,

but drug free, death. Is that a **failure of the treatment or a success of care**? Clinicians and hospitals are often judged internationally by the survival data, and so the wishes of the patient may bring their respective goals into conflict.

Quality of Life

Such debates have led to a search for ways to 'quantify' measures describing quality of life. It is not completely straightforward, and remains, in 2017, a topic of active research[*]. Measures of quality of life have come to be called *instruments* for some reason. They can be divided into the following categories.[13].

- *Function-based Instruments* primarily measure the patient's functional capability associated with a health state or disease. They include measures of the ability to function cognitively, vocationally, physically, socially and psychologically.
- *Preference-based Instruments* require that the patient decides regarding his or her preference (desirability or undesirability) for a particular 'health state'.
- *Generic Instruments* measure the quality of life across all specialties of medicine.

The **function-based instruments** are mostly specialty-specific, i.e. relating to cardiology, rheumatology, psychiatry or eye disease, etc. As a result, there are many such tools available, far too many to review here (if you are interested a fairly easy to read listing of them is available in Brown, Brown and Sharma[13]). The instruments may be relatively simple classifications such as the example for rheumatoid arthritis given below, or extend to pages of questionnaires which themselves require significant training to deliver.

The American College of Rheumatology Classification of Global Functional Status in Rheumatoid Arthritis

Class	Description
Class I	Completely able to perform usual activities of daily living (self-care, work, school and recreational or leisure activities) age and sex appropriate and patient-desired
Class II	As above but with limited recreational or leisure activities
Class III	As above but also limited ability to work or go to school
Class IV	Limited in all aspects of life

There are several generic functional instruments, for example the 36-Item Short-Form Health Survey (**SF-36**)[17] and a 12-item version the **SF-12**[18, 19]. All these instruments can be self-administered, but yield different results when administered by trained individuals. This constrains their use, particularly in cost-utility analyses which I describe later.

Preference-Based Quality of Life Instruments are designed to elicit how a patient **feels** about a given health state or disease; what they find desirable or undesirable. They are all generic, and can be applied across all specialties. There are three main types of preference based instruments;

- Utility Analyses
- Rating scales
- Multi-attribute utility analyses

[*] https://www.nice.org.uk/news/article/nice-to-work-with-partners-on-developing-new-ways-to-measure-quality-of-life-across-health-and-social-care

Utility[20] Analyses

There are three main types of utility† analysis; *standard gamble. Willingness to pay and time trade-off.* They are all designed to get to what the patient prefers. There is a convention that ranks a utility value along a scale from 0.0 (a state of death) to 1.0 (a state of perfect health)

Standard Gamble

In standard gamble utility analysis[20] [see diagram below], the subject must first choose between remaining in the same health state and selecting a 'gamble' with two possible outcomes, e.g. perfect health (conventionally 1.0) or death (0.0). Put another way, if you are offered a 70% chance of having perfect health if you choose the gamble, with a 30% risk of death, would you take the chance or stay in the health state you have now? Forms of words have been established to help put these questions to patients[13], and the diagnosis, severity and inclusion or otherwise of any co-morbidities must be strictly defined.

Standard-Gamble Utility analysis has the advantages of being applicable to all health states, being reproducible and being fairly easy to administer. However, it does not deal well with mild health states and an understandable risk aversion to death tends to bias results to higher values (greater utility). It is thus not surprising that some patients find it hard to comprehend.

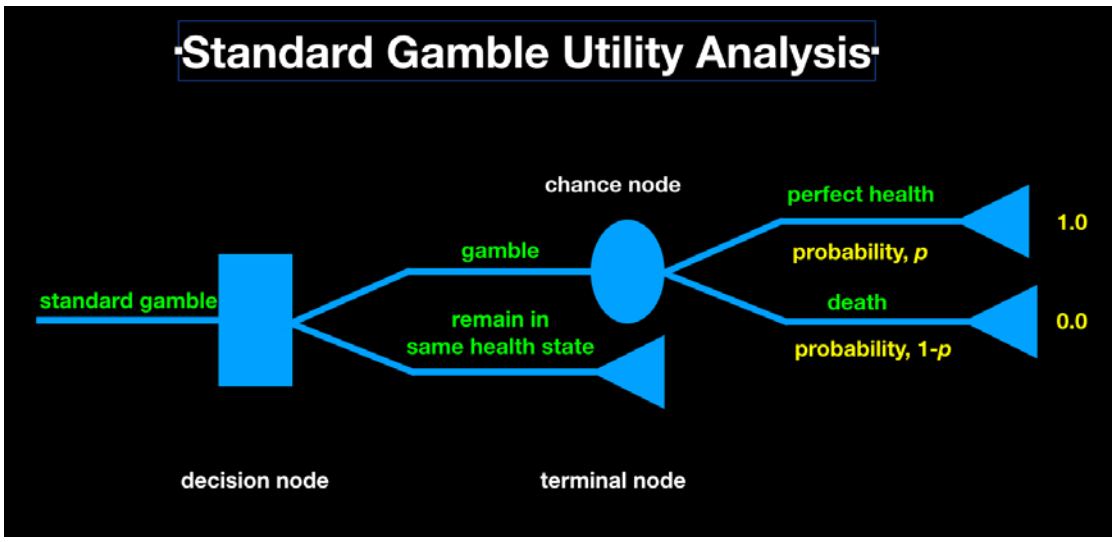


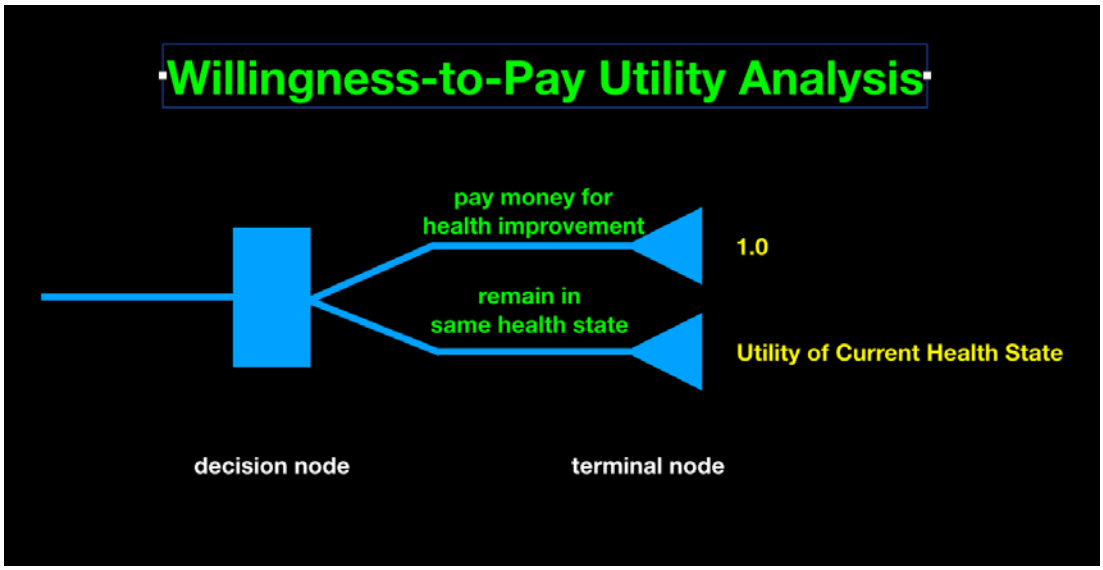
Diagram modified from Brown et al (2005)[13]

Willingness to Pay Utility analysis

This method was first suggested by Schelling in 1966[21]. The core principle relies on the idea of paying money for an improvement of health state or a return to normal health. The choice one has to make is to remain in the same health state or pay money (for example, as a single sum, a percentage of monthly income, or a percentage of total wealth) to return to a normal health state. The question may be asked in this way: "*Please imagine that by permanently paying a percentage of your monthly income you could permanently eradicate your diabetes. What is the maximum percentage of your monthly income – if any - that you would be willing to pay to get rid of your diabetes?*" If someone was willing to pay 20% of their income to get rid of diabetes this would equate to a utility value of 1.0 - 0.2 = 0.8, where 1.0 is the perfect health state.

This approach is also easy to administer and easier to understand for most, but has poor reproducibility and is affected by overall wealth and earnings; a serious drawback across populations.

† Utility in this context is based on the theory of rational decision making put forward by von Neumann and Morgenstern. Their first axiom states that a person can quantify a probability (p) of a difference between two outcomes; a sure outcome (e.g. the same heath state) and a gamble between two additional possible outcomes (e.g perfect health or death)

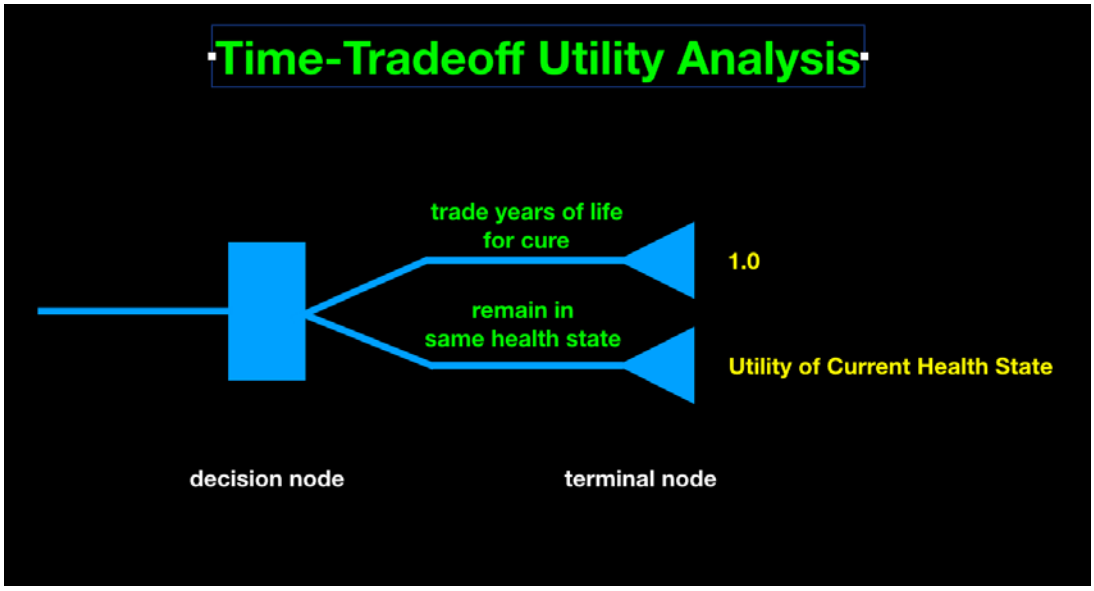


Time-Trade off Utility Analysis

This was proposed by Torrance et al in 1972[22]. This is easiest to understand by describing the question asked of the patient. Using the diabetes example again; "*(1) How many more years do you to expect to live? (2) Suppose there was a treatment which would get rid of diabetes for the rest of your life. The treatment works, but will shorten your life. Your quality of life will be better, but you will live for less time. What is the maximum number of years of life – if any – you would be willing to give up to have the treatment and have no diabetes for the remaining years?*"

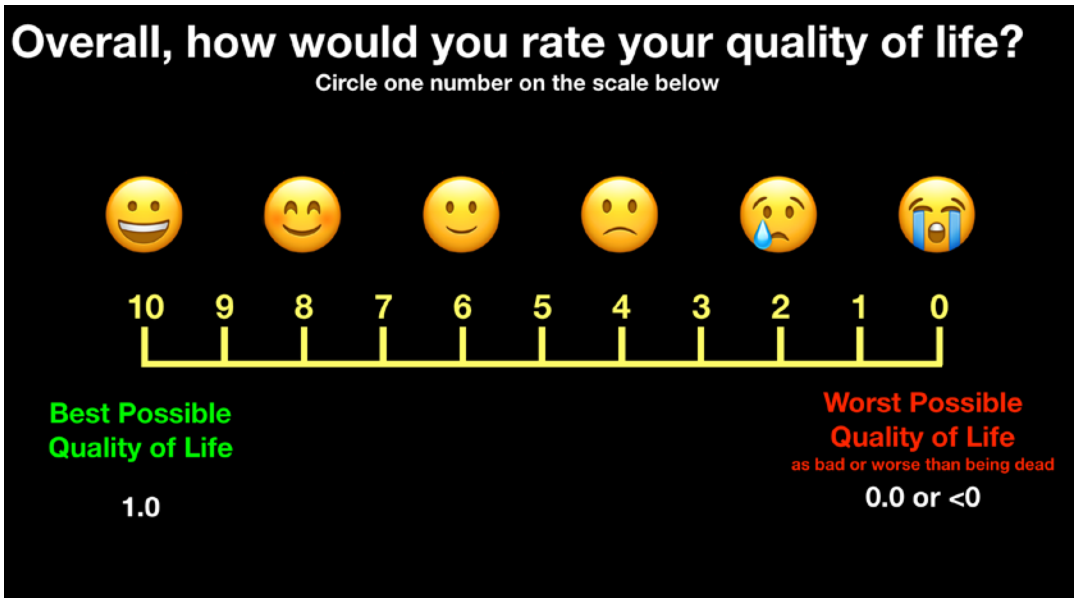
Let us assume that the patient believes she will live for another 20 years, and is willing to trade three of those years to be free of diabetes. The calculated utility value is 1.0 – (3/20) = 0.85. If she were to trade off 7 years, the utility would be 0.65.

Time trade-off is relatively easy to administer and has good reproducibility.



Rating Scales

Rating scales are probably the easiest to grasp since the format is widely used in customer satisfaction surveys. The subject is asked to estimate their quality of life anywhere on a continuous scale from perfect health or best imaginable health (1.0) to death (0.0). Sometimes emoticons are added to help the subject imagine better where they might mark along the scale. This makes the concept easier to grasp, but also militates against careful thought about the choices made. The results obtained are not as reproducible as other methods.



Multi-Attribute Instruments

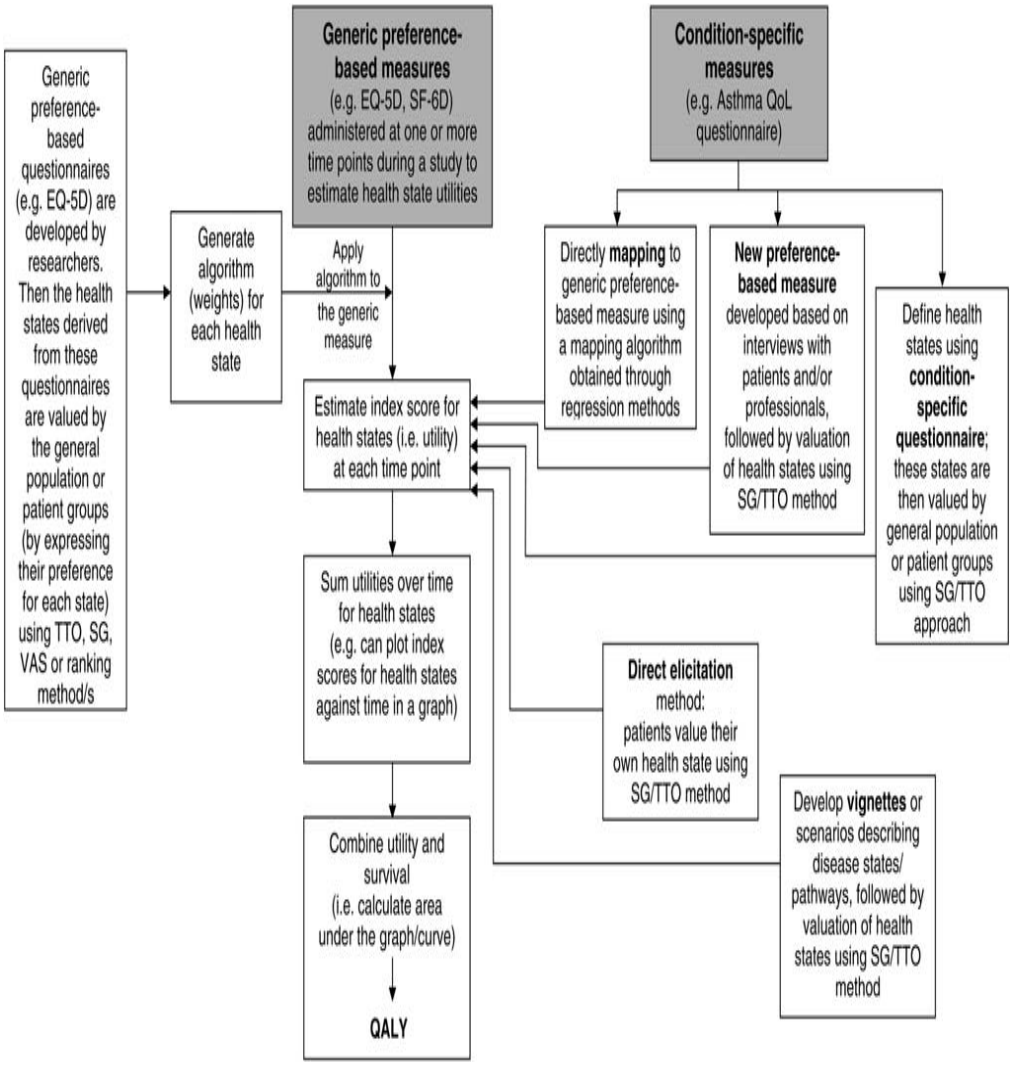
These are generic instruments which are applicable across all diseases and specialties. Rather than ask patients about just one utility value they attach to their health state, they are asked 5 or more questions about several dimensions of their heath state. Each combination of scores is weighted based on underlying utility theory and from community based utility surveys[13]. Examples of such an instruments are the EuroQol 5-D[23] and the Health Utilities Index[14].

The 5 Dimensions of the EuroQol 5-D

Dimension	Degree of Difficulty		
1. Mobility	No Problem	Some Problems	Confined to Bed
2. Self-Care	No Problem	Some Problems	Unable to Wash or Dress
3. Usual activity	No Problem	Some Problems	Unable to Perform
4. Pain/Discomfort	None	Moderate	Severe
5. Anxiety/Depression	None	Moderate	Severe

Scoring of the EuroQol works like this. If a person is 'Normal" for each of the 5 dimensions, the utility value is 1.0. However, if a person has, say, moderate pain this represents -0.15 in utility value (based on the community surveys). If the person also has difficulty walking this counts as -0.12 in utility value. Thus, the resultant score is 1.0 – 0.27 = 0.73. It is possible to end up with a score less than 0 (worse than death) in severe health states.

These various utilities, however complex, go some way to make it possible to describe an individual's quality of life and thus permit comparison across different areas of health care and between treatments. The impact of a treatment on the length of patient's life can be incorporated and a measure called the QALY has been developed to do just this.



The QALY‡

QALY stands for Quality Adjusted Life Year. It is one of the most commonly used means of quantifying the effect of a healthcare intervention and thus to guide allocation of healthcare resources. It is used by NICE to enable a standardized approach comparing economic evaluations across different health care areas, providing equity.

The QALY is calculated using the formula below which assumes a utility value (quality of life) between 0 (dead) and 1 (perfect health). The utility is obtained using the techniques described above, and is designed to reflect the desirability of that health state to the individual concerned[25]. The various methods of obtaining health utilities and how they are involved in the calculation of a QALY are shown in the diagram above from Whitehead and Ali[24]. It is not straightforward.

YEARS OF LIFE x UTILITY VALUE = #QALYs

To explain further:

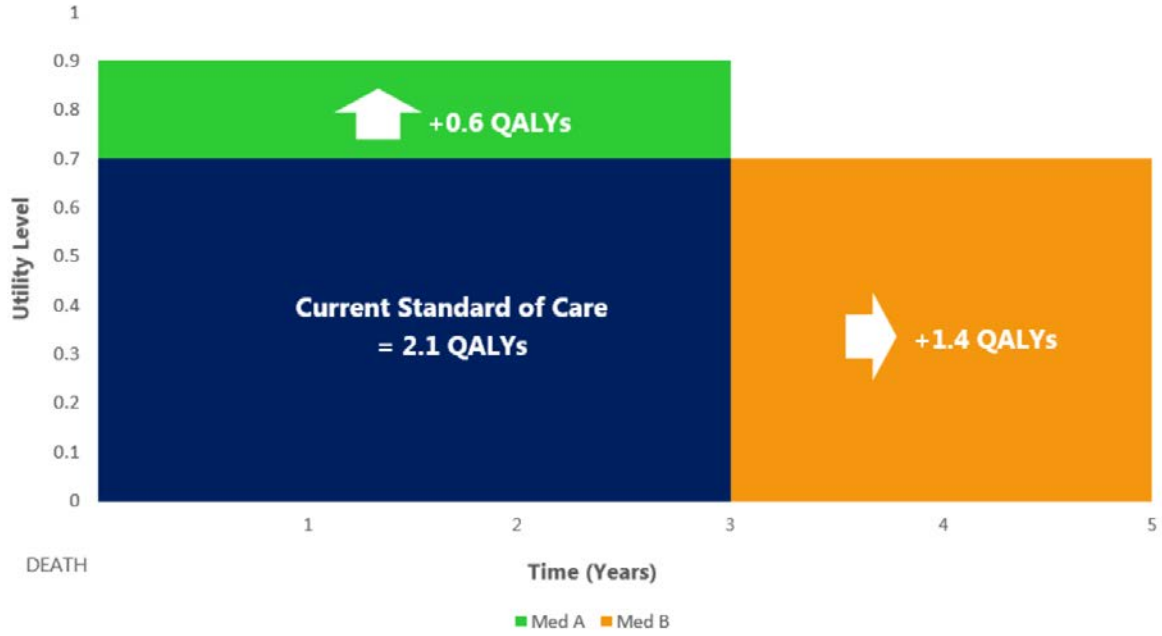
- If a person lives **for one year in perfect health**, that person will have 1 QALY. (1 year of life x 1 utility value = **1 QALY**)
- If a person lives for **only 0.5 year but in perfect health**, that person will have 0.5 QALYs (0.5 years of life x 1 utility value = **0.5 QALYs**)
- If a person lives **for 1 year, but in only 0.5 perfect health (0.5 utility)**, that person will also have 0.5 QALYs (1 year of life x 0.5 utility value = **0.5 QALYS**)

In either cost-effectiveness studies or health economic evaluations QALYs are used to quantify the effectiveness of, for example, a new treatment versus and older one.

Here is a simple example, courtesy of Prof Lieven Annemans (http://www.celforpharma.com/insight/do-you-know-what-qaly-and-how-calculate-it)

- If a person lives for 3 years with a disease and the current standard of care for that disease means he/she lives with a utility value (quality of life) of 0.7, that person will have 2.1 QALYs. **(3 years of life x 0.7 utility value = 2.1 QALYs**)
- If that person takes new medicine A and his/her utility level increases to 0.9, that person will now have 2.7 QALYs. Thus the benefit of medicine A can be said to be 0.6 QALYs. **(3 years of life x 0.2 *additional* utility level = 0.6 QALYs)**
- If another medicine (Medicine B) is tried and prolongs life by 2 years, but with no change in quality of life (utility value 0.7), medicine B will provide that person with an additional 1.4 QALYs. **(2 years of *additional* life x 0.7 utility value= 1.4 QALYs)**

‡ For a wider review of QALYs and their usefulness see references;**24.** Whitehead S, Ali S. Health outcomes in economic evaluation; the QALY and utilities. *British Medical Bulletin.* 2010;96:5-21. And **25.** Weinstein M, Torrance G, McGuire A. QALYs: The Basics. *Value in Health.* 2009;12 (Suppl 1):S5-S9.



Medicine A (Green) is giving you more quality but no longer life;
Medicine B (Orange) is giving you more quantity of life but no gain in quality.

Conventionally, the aim of any economic analysis of a healthcare intervention is to produce the greatest number of QALYs for the available resources, giving healthcare-related value for money. Because of the impact of social factors such as poverty and deprivation, there is the potential for important variables to be unmeasured or distributional effects of healthcare may be underestimated[26]. Decision makers thus may have to consider giving greater weight to equity than efficiency (equity weighting) to ensure appropriate care reaches the poorest in society.

There are alternatives to the QALY.

The **disability-adjusted life year (DALY)**[27] has been used to reflect the degree to which health is reduced by a disease condition whereas the QALY reflects the preferences of an individual for certain health states. DALYs incorporate age-weighting, giving greater weight to a year lived by a young adult compared with a child or old person. They are mainly used for international comparisons of disease burden.

The **Healthy Year Equivalent (HYE)** has also been proposed[28] as being a better theoretical model, but it is not considered to be implementable for practical reasons.

Although there remains debate about the appropriateness of using QALYs from ethical, theoretical and methodological points of view, they remain the cornerstone of cost-utility analysis in healthcare. The approach is being improved rather than rejected in favour of other methods[24].

Cost

I have discussed the top line of the value equation, namely how we estimate both outcome and quality. I will now turn to the quantification of cost. Before I became interested in the efficiency of health care delivery, I thought that measuring cost would be easy. Cost was cost, wasn't it? It turns out I could not have been farther from the truth. It is a complex subject, with a language of its own, open to academic analysis[29]. The methods chosen are, however, important and they can have major health policy implications.

I discussed earlier the importance of perspective; from whose perspective is costing being done?

The **patient** can incur costs from loss of income, time, opportunity and from the expenses associated with receiving healthcare. Having a National Health Service keeps these relatively low but cost may still come into decision-making for the self-employed or those with responsibilities to dependents. However, it is much worse when private systems predominate as in the USA or China, where what you can afford may well determine what health care you can obtain. We have all heard stories of the sacrifices some patients must make to get treatment, and the consequences if they cannot raise the money.

The **provider** (e.g. a hospital) incurs costs associated with staffing, equipment, facilities and drugs etc. Many of those costs are driven by the physicians caring for the patients. Financial considerations have become increasingly important for all health providers.

Society incurs costs associated with the overall delivery of health care and will have to make policy judgements about what health care to buy. These policy decisions involve how health care is organised and which treatments to pay for.

As Chapman and Kern point out[30], hospital costing has been a major concern of governments since the formation of the NHS in 1948. A variety of methods have been tried over the years, but they were mostly driven by the need for central budgetary control. The output of these costing models was in a form that could not easily be used by front-line staff to improve performance or improve value for money. Clinicians have largely felt excluded over the years, not least because the costing models used were complicated and were not clearly linked to clinically relevant categories. It was effectively impossible to gain an understanding of the cause and effect relationships between clinical decisions, resource consumption and outcome.

Front-line staff, and especially consultants and senior nurses, can have a huge influence over costs by the choices they make and decisions they take, but they are not the only cost-drivers. Staff costs in general make up over 60% of NHS costs; drug prices are set by industry; technology is not cheap and needs to be maintained or replaced in pace with the rest of society; processes can be wasteful (or efficient) and complications are hugely expensive. And then there are costs associated with education, facilities and plant, scale, waste and so on.
The complexity of health care requires specific costing methods. This is not the place for a detailed review, so I will confine myself to a few important principles and issues. For those wanting to read about this (in relation to the UK) in more depth, I suggest the review by Mogyorosy and Smith[29], the NICE website (https://www.nice.org.uk) , the detailed NHS costing manual (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/216427/dh_132398.pdf) and the interesting article by Chapman and Kern[30].

You must first decide what you want to cost. You might want to cost a particular **event** (e.g. a GP visit, gastroscopy or prostate procedure); or a **treatment episode or group of similar episodes**[§] (e.g. treating an episode of flu or cancer care). Once a decision has been made about what *needs* to be costed and over what time period, all costing methods follow three basic steps[29];-

a. Identification of the resources needed to deliver the service
b. Measurement of the actual utilisation of resources
c. Attaching monetary value to this resource use

Followed of course by validation processes and statistical analysis.

For most of my time in the NHS, costing was done centrally by the finance department or remotely by the Department of Health. Budgeting was an annual process and, like Oliver, we turned up at committees (especially in March) to ask for more or to get a hand out of unused resources before the next budget cycle.

§ These groupings are **Diagnosis Related Groups (DRGs)** largely used in the US, and **Healthcare Related Groupings (HRGs)** in the UK. They are statistical systems of classifying inpatient or outpatient episodes of care into groups with similar levels of resource consumption for the purposes of payment

The introduction of the so-called internal market and the purchaser-provide split by the Thatcher government demanded a new level of detail. And a raft of approaches to costing have developed. These include whole hospital, departmental costs, and specialty costing, management budgets and resource management. There were innovations such as the grouping together of patients into **Health Resource Groups (HRGs)** which reflect diagnoses or treatments which use similar resources, and **Payment by Results (PbR)**, which didn't really pay for outcomes but rather for activity related to such groupings as HRGs. These costing tools were mostly driven by the need for central control[30], and end up creating '**reference costs**' which represent the *average* cost of an HRG episode of care. At ward level, you seem to have little control over these.

This centrally driven, top down, approach effectively excluded most of those who were actually spending the money, and who were indeed *cost-drivers* in their own right; the clinicians. The calculations of costs using these methods was complicated, drawing data from the general ledger and allocating overheads to HRGs, methods which did not seem to have any clinical relevance to those on the shop floor. These central approaches produce data which reveal little to the clinician about cause and effect relationship between their decisions, resource consumption and clinical results. Without such transparency, it is very difficult to motivate the very people who can save the system money, and who have the crucial responsibility to maintain clinical quality.

To improve this situation, two modes of costing are spreading through health care. These are **Patient-Level Information and Costing Systems (PLICS) and Service Line Reporting (SLR).** PLICS is supposed to identify the costs associated with the care of a single patient, aggregating to identify costs of groups. SLR reports revenue and costs of clinical activities at the unit or service level[30]. I love these approaches, but they are very dependent on the degree to which the organisation has developed its digital services. Are the IT systems good enough? For example, are consumables bar coded and can they be mapped to an individual patient and thence to a specific unit? Are there systems available locally to allow clinicians to choose a cheaper option when they need it (rather than at an annual procurement meeting)? Are finance data and clinical data linked so that outcome/cost relationships can be calculated and monitored?

The development of an adequate IT infrastructure is critical, and hospitals are very far apart in terms of how far along this path they have walked. Where such development has taken place, there is the opportunity to apply yet another costing approach, **activity-based costing (ABC).** Rather than try and identify every little detail of cost (that is expensive in time and labour), ABC generates cost pools from the data in the hospital reflecting different clinical activities, at the same time making the full costs both transparent and manageable. The combination of PLICS, SLR and ABC offers some hope of accuracy, but in the end, those who spend the money must be able to see what they are spending and be made aware of what purchase choices they have if they are to be able to drive down costs[30]. Simply red-lining a budget in a finance department or a remote ministry will not work.

Concluding Remarks

It is clearly right that we consider the value of what we do in healthcare. But that value is all about perspective; patient, family, provider, payer and society may all have a different view. The decisions we make about the allocation and use of resources, and the decisions that affect individuals have ethical as well as economic dimensions[31]. As Professor Matthew Cripps (the National RightCare Director) puts it; "*Rarely does the letter 's' make such a difference to meaning as in the difference in 'value' and 'values.'*

The patient and his or her family may have a different concept of value, for example if they observe great suffering as part of the treatment. Their own hope may be trumped by the pain they see their loved one experiencing to extend their life. The wonders of the NHS mean that almost all treatment is free, and a cost:utility analysis is not something which individuals or families have to deal with, unless they have chosen to be cared for privately. If a patient had to trade in their house, their savings, accept money from friends or family or go in to debt to get treatment, such analyses become personal and very direct. In the USA or China, these are real problems for real people, as the debates over Obamacare have demonstrated. As Whitehead and Ali point out[24], whilst the patient has a really clear perception for what is important to them, they may also overestimate (and overvalue) the benefits of a new treatment with the knowledge that they will be a direct

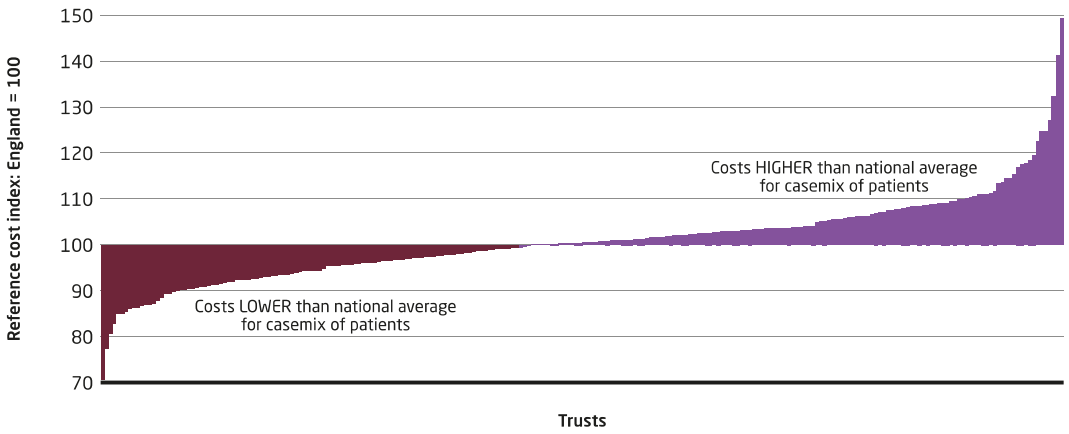
beneficiary if it works. Or they may adapt to a chronically poor health state and assign higher scores to its utility and thus value a newer treatment less.

Governments and health systems must take a more objective view. Apart from having direct control over the size of the State, they also control (directly or indirectly) both resources and service provision available for health care. As resources diminish (as in austerity) or costs rise (through, for example, increasing demand or innovations) then cost: utility analyses become crucial tools to guide policy. As I indicated earlier, NICE has become a world leader in this field, and has forged a path through the complex ethical undergrowth to balance the needs of individuals with the wider needs of society. The involvement of both providers and users of the service in assessing the value of treatment supports equity of distribution, and the transparency of their work is to be praised. Such public valuation has the theoretical advantage of minimising vested commercial interests[24]. NICE's reports are freely available and can be read by anyone. Members of that public and manufacturers alike can (and do) put pressure on government to release more funds if they disagree with published decisions.

In a societal sense, we should clearly use resources only on *effective* interventions and ensure that we meet need *equitably*. However, there is very wide variation in treatment availability and cost across the NHS, and thus *value for money* is not uniform. The NHS regularly publishes an Atlas of Variation (http://fingertips.phe.org.uk/profile/atlas-of-variation) which helps visualise many of the wide discrepancies in access to evidence-based services. These atlases are useful in that they focus policy makers' minds on the core functions of a National Health Service. I recommend you look at these maps; they are in many ways frightening, as the degree of variation is considerable. For example, the percentage of patients with Type 1 or Type2 diabetes who receive care according to NICE guidelines in 2012-13 ranged from 40% in the lowest performing areas to 76% in the best. This simply cannot be regarded as equitable, and NHS England has a number of programs in place to try and correct such anomalies. Public exposure and discussion of the findings is a great place to start.

There is not only variation in access to appropriate treatment, but also in the core costs of service delivery. These have been highlighted in Lord Patrick Carter's 2016 review (Operational productivity and performance in English NHS acute hospitals: Unwarranted variations[32]), as well as in the Kings Fund 2015 Better value report[5] from which the figure below is taken.

Figure 3 Reference cost index: English hospitals, 2013/14



Source: Department of Health 2014

Lord Carter's report identified a potential £5 billion (of £55.6 billion overall budget) in efficiency savings by eliminating variation, and he made 15 core recommendations to achieve such efficiencies. He found, for example, that the most expensive hospital trusts spent 1.3 times more on clinical staff than the least expensive. That there was a 1.6 x difference in sickness rates, a 1.5 x difference in nursing costs, a 1.6 x difference in medical staff costs and a 2.0 x difference in spending on allied health professionals. There is not space here to go into his report in detail, but is both easy and salutary to read, and can be found on line;

(https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/499229/Operational_productivity_A.pdf) .

The variation in actual treatment delivered (rather than the access or hospital wide issues) is also considerable. This is highlighted by the work of the orthopaedic surgeon Professor Tim Briggs and the GIRFT programme (Get It Right First Time)[33]. Briggs demonstrated enormous variation in orthopaedic practice in terms of adherence to recognised best practice, volume of procedures per surgeon, the use of appropriate prostheses, outcomes and the price paid for medical equipment. The King's Fund reviewed this work in 2017[31] concluding that the methodology of the GIRFT programme had considerable potential, especially since it was clinically led (in a similar way to the reviews of paediatric cardiac services after Bristol (http://bit.ly/29JOpDw). It has now been extended (http://gettingitrightfirsttime.co.uk) to many other specialties, including general surgery (http://gettingitrightfirsttime.co.uk/wp-content/uploads/2017/08/GIRFT-GeneralSurgeryExecSummary-Aug17v1.pdf) in which specialty variation in activity, decision-making, outcomes, productivity and cost were just as variable. It is immediately evident from this work that value can be increased in terms of outcomes **and** cost and that value can be delivered to all relevant parties. I look forward to seeing follow up to these programmes and hope the NHS has the governance in place to deliver it. If they work, they will be excellent examples to health systems everywhere.

It seems to me morally right that we should deliver high quality care at the lowest possible cost. We all want to be in good health, even if our individual definitions of what good looks like may differ. If we need treatment to restore us to that good state, then it also seems morally right that we have access to the best available evidence based care. I understand that some treatments are so expensive they require some sort of National judgement about whether or not society can afford them. We are lucky that NICE exists to provide as much equity of access to such care as possible. The government of the day still has the duty decide how much of its budget goes to healthcare, but after that it is up to the health system to be cost effective and deliver good to its patients.

I see no rational excuse for excessive variation, failure to abide by well worked out guidelines or performing useless operations. Unwarranted variation reveals two possible problems, as the NHS RightCare programme states:

- Underuse of high value interventions, which may be compounded by underuse by certain social groups, leading to inequity
- Overuse, or high rates of lower value activity which always wastes resources and which will also result in harm for some people.

Evidence should be followed or if it is absent, be obtained. We need much improved and better integrated data systems to know our results, manage our health care and identify efficient care.

Much political capital has been made criticising management costs in the NHS. But without management there would be no effective organisation. It is often argued that health systems function best with clinical rather than administrative leadership, and to a point I agree with that. Clinicians have largely been trained in the mechanics of care, not in the process of its delivery or, for example, cost control. Medical care should be provided by organisations which put patient safety and the quality of care first. Clinicians do this naturally. As I said earlier in this essay, it is much better (and cheaper) to get it right first time; complications are expensive. However, our training brings with it a risk of inflexibility, adherence to old guild-based organisational structures (specialties) and a concept of 'professional' which makes devolution of tasks to less expensive workers difficult. Process and efficiency improvements may be frowned on as 'management interference' and implementation of good ideas may thus be delayed. For example, many hospitals struggle to manage leave for consultants. Rotas may be on scraps of paper, leave booked late, swaps not communicated and leave dates in school holiday periods over-subscribed. This creates a mismatch between supply and demand. As a result, operating lists and clinics get cancelled at short notice at huge cost to both patient and hospital. Putting this right needs good IT systems, good management and good discipline. It doesn't matter if this is done by a clinician or an administrator; but it is necessary management.

I believe passionately that we can reduce the cost of care significantly if we can demonstrate the cost of activity to the staff at shop floor level. We need to see the data and be allowed to make choices on the basis what they reveal. We must also expend a great deal of effort in minimising complications caused by care itself. Predictable care can be made more efficient; complications are expensive and best avoided. It is our job as clinicians to sort that out.

Data are also key to our understanding of outcomes. As Michael Porter has pointed out[15], the value of care to a patient, and the costs associated with it, extend not just to the end of an admission or a few months after a procedure, but throughout the remainder of the patient's life. We must build systems which collect and integrate patient data, direct and indirect costs over the course of their life and throughout the NHS, not just within hospitals. Currently, data from primary care are not meshed with hospital data. Whilst we must obviously guard such data with great care, we should also encourage the population to recognise the value of pooling such information. Describing quality and duration of life depends entirely on obtaining such data; a task which should not only be possible in a true **national** health service but which is also essential to define the best care for our population.

I hope I have demonstrated that, whilst the value equation is a very sensible way of describing the benefit or otherwise of what we do, resolving it is no simple matter. However, with accurate, integrated outcome and cost data, together with improved process controls, we will have the tools to increase value both to the patient and to wider society. As Churchill said[**], "*give us the tools, and we will finish the job".*

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[**] https://www.winstonchurchill.org/resources/speeches/1941-1945-war-leader/give-us-the-tools

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