Enhancing Our Understanding of Long-Term Value: Insurance Value   July 25, 2019

RESEARCH QUESTION

How can the concept of insurance value help us understand the value of therapies to the broader population?

KEY TAKEAWAYS

- Insurance value has been suggested as one of several elements to improve and enhance conventional cost-effectiveness analysis

- Insurance value measures the value that medical technologies provide to healthy individuals by reducing the physical risks of possible illness

- Accounting for insurance value may offer important insights into the broader value of new treatments for both treated patients and healthy individuals, who may be at risk of needing such treatments in the future

- Such insights can help decision makers to better prioritize investment in disease areas that provide the greatest value to broader society, especially when considering rare and severe illnesses

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QUANTIFYING VALUE

New health technologies can bring changes in both patient outcomes and health care costs. In a world of rising overall health care spending and constrained resources, as is currently the case in the United States, this often requires difficult decisions about where to invest in new technologies. To make the decisions that ultimately best serve patients, it is important to consider the value of new technologies compared to one another and to established standards of care.

Estimating the value of health technologies – in other words, examining costs relative to benefits for a specified population – is not a new practice. Arguably, the most established approach is cost-effectiveness analysis (CEA). In CEA, two or more treatments are compared to the standard of care in terms of incremental changes in costs relative to incremental changes in health benefits, generally measured in terms of quality-adjusted life years (QALYs).

Typically, CEA is based on the expected health care costs and health impacts for individuals who get treated, but there are increasingly calls for augmented approaches to value assessment that take into account the patient perspective and greater societal benefits of health. For example, the ISPOR Special Task Force on Value Assessment Frameworks recently recommended that CEA studies consistently incorporate "novel" components of value, such as insurance value.[1,2]

INSURANCE VALUE

Conventional value assessment (e.g., CEA) is based on estimating the health benefits of an intervention for a person who is already sick. This focus on current patients may be appropriate if real-world consumers do not care about risk, but the very presence of health insurance suggests this might not be true. For a healthy individual at risk of getting sick in the future, a new therapy functions a bit like an insurance policy against illness. For example, a homeowner's insurance policy provides peace of mind by promising protection in the event of a future fire. In the same way, a new, more effective treatment for a disease promises protection to a healthy individual in the event of a future diagnosis. Insurance policies are thus valuable to risk-averse homeowners, even those who never experience fires. In the same way, new therapeutic advances are valuable to risk-averse but healthy people who might become sick in the future.

Traditional CEA implies that a QALY is just as valuable when gained by patients with mild disease as with severe disease. This seems at odds with empirical evidence suggesting that most people think it more valuable to treat more severe disease.[3] Insurance value helps us make sense of this apparent anomaly. Insurance policies are more valuable when they protect against bigger risks – fire insurance for your house is more valuable than an extended warranty on your microwave. In the same way, insurance value for medical technologies is relatively more important for severe illnesses than mild ones. Indeed, insurance value approaches zero for diseases that are extremely mild. E.g., insurance value is a tiny fraction of total value when treating peptic ulcers, but it could be 90% of the value of treating seizures.[4]

All these implications have been rigorously proven using a relatively standard economic model of risk-averse behavior. The same model can be used to quantify insurance value and thus estimate the total value of a new therapy. These estimates rely on the typical ingredients of a cost-effectiveness analysis, along with an additional parameter – consumers' degree of risk-aversion – which is well-estimated in the economic literature on risk preferences.[5]

The typical CEA relies on an estimate of health improvements generated by the new technology, along with incremental costs. Health improvements are often estimated as quality-adjusted life-years (QALYs) gained. Traditionally, QALYs are estimated first by enumerating the set of possible health states that patients may find themselves in. Different states correspond to different levels of disease severity. Next, studies are performed to calculate individuals' preferences for each state. For instance, a study of this kind might conclude that patients find one year in a severely ill state to be worth just as much as three months in a perfectly healthy state. Such a finding would imply that one year in the severely ill state is worth 0.25 QALYs, or one-quarter of a perfectly healthy life-year.

Traditional CEA also relies on monetary values for QALYs. If one QALY is estimated to be worth $150,000, then 0.25 QALYs are worth $150,000/4 = $37,500, and so on. Assigning a monetary value to a year of life in perfect health is a common practice in health economics and cost-effectiveness analysis. It allows researchers to calculate the value of a therapy's expected impact on quality of life with a given disease. In conventional cost-effectiveness, the results are often reported in terms of the cost to gain a quality-adjusted life year (QALY), but the same results may also be reported in terms of net monetary benefit (NMB), or the total monetary value of benefits minus the total value of costs.[a]

To illustrate, imagine a hypothetical illness that reduces quality of life from 90% of a year in perfect health to 50%. If a year in perfect health is valued at $150,000, this illness imposes a cost of $60,000 per year ((90%-50%) x $150,000) in the absence of an effective treatment. Next, imagine a new therapy is introduced that costs $10,000 and improves quality of life with this disease from 50% to 70%. This improvement in quality of life is worth $30,000 annually; after accounting for the $10,000 cost of the therapy, the NMB of the therapy for someone being treated is $20,000.

This new therapy also provides value to healthy individuals at risk of developing the hypothetical illness in the future. Prior to the therapy's introduction, healthy individuals faced the risk of a reduction in quality of life valued at $60,000 per year. The new therapy reduces that risk by half, and though the risk of having to pay for therapy increases, the overall reduction in risk generates positive value. The exact value of this reduction in risk – the insurance value – depends on the probability of developing the illness and the degree of risk-aversion, or the individual's distaste for bearing risks. A relatively intuitive way to measure risk-aversion is to ask how much an individual will give up when he is healthy in exchange for an extra $1 of coverage when he is ill. Economists refer to this as the "marginal rate of substitution" between illness and health. As a short-hand, we will call it the "MRS."

The concept of insurance value is relatively new, and few examples of its application are currently available.[6] In this exploratory analysis, we endeavor to highlight the potential incorporation of insurance value by exploring the question: how does incorporating insurance value affect the relative value of therapy sequences in the treatment of rheumatoid arthritis (RA)?

ILLUSTRATION USING THE IVI-RA MODEL

Using the IVI-RA model, we illustrate the potential impact of including insurance value in a CEA.[b] Rheumatoid Arthritis (RA) provides an excellent context for the illustration of insurance value because treatment for RA focuses on reducing impacts on quality of life, rather than addressing mortality concerns (unlike, say, oncology). Because treatment for RA often continues for many years over a patient's lifetime, switching of therapies is common. As a result, there is value in having multiple therapeutic options, rather than just one.

Calculating Insurance Value for Individuals

We first simulated expected costs and outcomes for two possible treatment sequences.[c] In Sequence 1, patients are treated using conventional disease-modifying anti-rheumatic drugs (cDMARDs) such as methotrexate. In Sequence 2, patients are treated sequentially with a common series of newer biologic drugs (bDMARDs).[d] Corresponding lifetime QALYs and total healthcare costs (both discounted at 3%) for these two treatment sequences are preseented in Table 1.

TABLE 1. Expected Lifetime Outcomes for the Two Alternative Treatment Strategies, per Patient

	Sequence 1 (cDMARDs)	Sequence 2 (bDMARDs)
Life years (undiscounted), n (CrI)	16.5 (14.5-18.7)	19.7 (17.3-22.5)
QALYs (discounted), n (CrI)	5.27 (4.77-5.79)	8.45 (7.36-9.60)
Costs (discounted), n (CrI)	$36,080 ($26,260-$51,723)	$339,576 ($304,732-$375,514)

Note: QALYs: quality-adjusted life years. CrI: credible interval. Costs include direct and indirect health system costs.

To estimate the insurance value of these two sequences, we then convert the outcomes in Table 1 to annualized costs and benefits, based on the number of years of treatment patients undergo in the simulation,[e] and calculate the NMB (Table 2). By assuming a value of $150,000 per QALY, we calculate the annualized value of health benefits, which allows us to calculate the annualized NMB (value of benefits less costs).

TABLE 2. Annualized Outcomes for the Two Alternative Treatment Strategies, per Patient

	Sequence 1 (cDMARDs)	Sequence 2 (bDMARDs)
Number of QALYs, *n (Crl)*	0.214 (0.193-0.234)	0.342 (0.298-0.389)
Value of QALYs, *n (Crl)*	$32,030 ($28,990-$35,145)	$51,336 ($44,695-$58,319)
Health System Costs, *n (Crl)*	$1,461 ($1,063-$2,094)	$13,747 ($12,337-$15,202)
Net Monetary Benefit (NMB), *n (Crl)*	**$30,570 ($27,466-$33,708)**	**$37,589 ($31,608-$43,812)**

Note: QALYs: quality-adjusted life years. Crl: credible interval. Costs include direct and indirect health system costs.

Knowing the annualized NMB per treated patient, we are then able to calculate the value of the sequences to an individual that does not have RA. By multiplying the NMB by the probability of developing RA in the next year, we are able to estimate that we can call the *conventional value* to the healthy, which reflects the expected value of a treatment for a totally risk-neutral individual (Table 3 and Figure 1). For this illustration, we assume a 0.06% chance of developing RA.[7]

To capture the *insurance value*, which additionally captures the value of reducing the risk associated with developing RA, we then multiply the conventional value by the MRS. A MRS of 1.5, which we use in this illustration, would imply that a healthy individual is concerned about the risks of illness and willing to give up $1.50 today in order to ensure a $1.00 payment when ill. By multiplying the conventional value by the MRS, then, we obtain the current value of a therapy to a healthy individual in terms of potential benefits, costs, and the value of reduced risk in the event they develop RA. This insurance value calculation assumes, however, that the individual does not have health insurance and would bear the full financial cost of treatment. Health insurance reduces the financial risk of illness, which affects overall insurance value. In Figure 1, we present insurance value for both an uninsured individual and an individual with health insurance that covers 80% of costs.

## TABLE 3. Annualized Net Monetary Benefit for Healthy Population, per Healthy Individual

	Sequence 1 (cDMARDs)	Sequence 2 (bDMARDs)
Conventional Value (no insurance value), *n (Crl)*	$18.3 ($16.5-$20.2)	$22.6 ($19.0-$26.3)
Insurance Value without Health Insurance, *n (Crl)*	$27.5 ($24.7-$30.3)	$33.8 ($28.4-$39.4)
Insurance Value with Health Insurance, *n (Crl)*	$27.9 ($25.1-$30.7)	$37.1 ($31.6-$42.9)

Note: Crl: credible interval.

d Specifically, sequence two is: adalimumab + methotrexate -> etanercept + methotrexate -> abatacept SC + methotrexate -> tocilizumab + methotrexate -> tofacitinib citrate + methotrexate -> rituximab + methotrexate

e This is calculated as the difference between age upon starting treatment in the model and age at death (or 100 years old, which is the maximum age allowed in the model).

FIGURE 1. Annualized Value to Healthy Individuals (NMB)
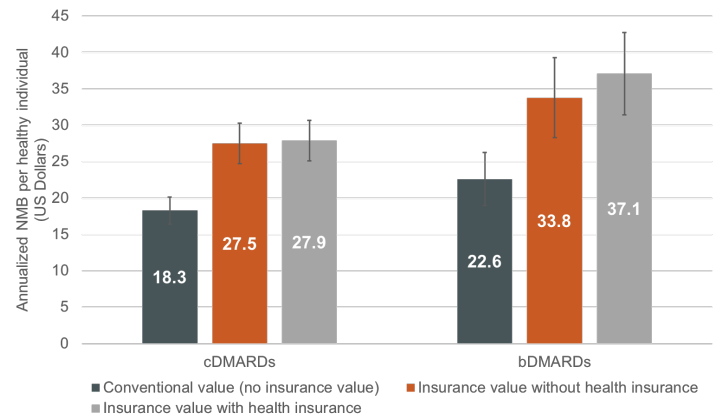
Note: DMARD: Disease-modifying anti-rheumatic drugs; NMB: Net monetary benefit. Error bars represent credible interval (Crl).

Informing Population-Level Decisions

Insurance value becomes relevant to decision-making when incorporated into population-level estimates of value. As an illustration, consider a hypothetical health plan covering a population of 1,000,000 individuals that mirrors the general population in terms of demographics, disease prevalence, and risk preference. Of the 1,000,000 covered lives, 5,000 (or 0.5%) have RA.[8] The plan is assessing the value of allocating budget to conventional therapy for RA versus treatment with a sequence of bDMARDs it commonly sees prescribed.

Using the annualized costs and benefits for its RA patients, the total NMBs of the RA therapies (per-patient NMB for each sequence times the number of patients (5000)) are $153 million and $188 million for cDMARDs and bDMARDs, respectively (Figure 2). Plan leadership know, however, that its 995,000 additional enrollees are also at risk of developing RA. In keeping with our earlier calculations, plan enrollees pay approximately 20% of the financial cost of treatment and have a 0.06% chance of developing RA in the next year. Assuming a MRS of 1.5, the total aggregated NMBs for this insured population without RA (per-healthy enrollee NMB for each sequence times the number of enrollees (995,000)) are $28 million and $37 million for cDMARDs and bDMARDs, respectively. By combining the annual total NMB for both groups, the plan finds that the overall annual NMB for cDMARDs and bDMARDs are approximately $181 million and $225 million, respectively. By accounting for insurance value, the plan now has a more

FIGURE 2. Aggregate Annual NMB for RA Patients and Healthy Enrollees in Hypothetical Health Plan
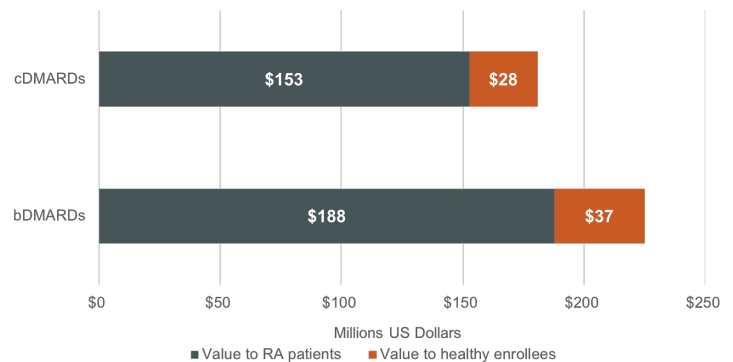
Note: DMARD: Disease-modifying anti-rheumatic drugs; NMB: Net monetary benefit; RA: rheumatoid arthritis.

complete picture of the two sequences' potential value to their covered population. While this additional insight may be helpful within a disease area like RA, it may become particularly valuable when comparing across disease areas, as the impact of insurance value on overall value estimates varies with disease prevalence, incidence, severity, and other factors.[2] By better understanding the value of therapies to the entire covered population, decision makers such as our hypothetical health plan can better prioritize spending to maximize value for the population.

IMPLICATIONS FOR VALUE ASSESSMENT

Insurance value provides important insight into the relative value of therapies from a broader societal perspective, by clarifying their value to those who may need them in the future. This information may help U.S. decision makers to improve the allocation of resources in healthcare by better capturing the priorities of the general population. Insurance value also better reflects the value commonly placed on treatments for rare or particularly severe diseases.

Accounting for the value a given intervention generates for an entire population – for example, all enrollees in a health plan – rather than solely for those receiving treatment can provide decision makers with a more complete picture of the relative value of interventions. Importantly, the concept of insurance value has the potential to address a unique aspect of value not well accounted for in conventional value assessment: the value of therapies for relatively rare diseases. For example, the aggregated NMB for a therapy that provides substantial health benefits for a very small population may be relatively low when compared to treatments for more common diseases, but accounting for the insurance value to the population without the disease in question – which is much larger for the rare disease – provides a more complete picture of the therapy's value for the overall population. Recalling that insurance value is especially relevant for highly severe illness, it has special significance for rare diseases, which often suffer from unusually high unmet medical need.[2]

As value assessment increasingly guides decision making in U.S. healthcare, it becomes ever more critical that the methods used in these analyses capture all relevant dimensions of value. In this context, novel concepts such as insurance value can open the door to important advances in value measurement. Moving from a promising theory to use in practice takes time, however, and methods for measuring insurance value are still nascent. Further research is needed to establish accepted methods, as is dialogue within the health economics and value assessment communities about how to incorporate such metrics into analysis and decision making in the U.S.

CONCLUSION

Insurance value is a relatively new concept in health economics that describes an important component of value: the value provided by medical treatments to healthy individuals who may need treatment in the future. Understanding the insurance value of new therapies can provide important information to guide decision making around healthcare resources, with particularly important implications for how we understand the value of treatments for rare or severe diseases. Our illustration of insurance value using the open-source IVI-RA model highlights the potential importance of the concept in understanding the value of health technologies from a broader population perspective. The field of value assessment is evolving as innovative concepts and methods – insurance value being just one example – continue to be developed, and ongoing research must be accompanied by real-world testing and debate for these advances to ultimately deliver greater value to patients both today and in the future.

ABOUT THE INNOVATION AND VALUE INITIATIVE

IVI is a nonprofit research organization committed to advancing the science and improving the practice of value assessment in healthcare through collaboration among thought leaders in academia, patient organizations, payers, life science firms, providers, delivery systems and other organizations.

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