

Concept article

The temporality of economic decisions applied to clinical reasoning

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ABSTRACT | INTRODUCTION: Medical thinking lacks economic thinking although temporality plays a crucial role in shared clinical decision-making. Present benefits, such as symptom relief, at times, should not be underestimated in the economic evaluation of medical interventions; and immediate effects in present benefit scenarios allow for valuable feedback, aiding in the assessment of the appropriateness of the chosen intervention. Ultimately, we underscore the need for a nuanced understanding of the interplay between time, costs, and benefits in clinical decision-making.

KEYWORDS: Clinical Decision-Making. Cost-Benefit Analysis. Economics, Medical.

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What return do we expect from an investment? A player who trains expects a sports victory. A young student expects a high grade on an exam. An investor expects financial returns. A patient who “invests” in medical treatment may have different types of returns to consider, such as life expectancy and quality of life. The human body, quality of life and social impacts are also “resources” that in a microeconomic mindset applied to clinical reasoning should be also considered to spare people from unnecessary improbable benefits with probable costs attached (physical and/or social).

Regarding that, the temporal aspect is essential for measuring the cost and return of clinical investment. In economics, the present has more value than the future. Firstly, because the present is happening (now), while the future is a (remote) probability. Secondly, the value of what will happen in the future depends on the future context, which is uncertain.

In today’s context, buying a car can dramatically benefit oneself. However, the value of purchasing a car through a consortium to obtain it in the future is uncertain because the context may have changed: one may be living in a city with excellent public transportation or may not have enough health to drive the car. Taking depreciation off the equation, the future value of a product is less than the present value. Therefore, economists discount the present value to obtain the future value.¹

Medical thinking is essentially a microeconomic process. The ideal timing for such decisions depends on the benefits and costs that exist in the present and the future. Conditions that require careful consideration of economic value are those with present costs and future benefits. There are also situations where both costs and benefits are either in the present or in the future. In addition to the known present context, events in the present tend to have a higher probability than events in the future. Therefore, we can represent the advantage of the present with the equation: Probability x Context.

For that matter, economic conditions can be categorized into three main time-dependent situations: favorable, potentially favorable, and highly uncertain (see Table 1). Favorable economic conditions occur when the benefits are immediate, and the costs are deferred to the future. Usually in this situation, costs may surpass benefits, but as previously explained, timing is important for its implementation, because the future has less value than the present.

Now considering potentially favorable economic conditions, both costs and benefits occur simultaneously. To justify intervention, the immediate benefits must outweigh the immediate costs, making it a sensible investment in the present for immediate gains.

However, in highly uncertain economic conditions the benefit is expected in the future, while the costs are incurred in the present. To warrant a decision in such cases, the future benefits must significantly outweigh the present costs, ensuring that the potential gains make enduring the immediate costs worthwhile.

Table 1. Benefits vs cost in different timing-dependent economic conditions

Economic condition	Benefits	Cost	Implementation criteria
Favorable	Present	Future	Benefits < cost
Potentially favorable	Present	Present	Benefits > cost
Highly uncertain	Future	Present	Benefits >>> cost

Source: the authors (2024).

1. Prognostic Treatments

Adjuvant chemotherapy for the surgical resection of localized cancers is an example of a present cost/future benefit situation². We base this approach on causing a different result that could improve the likelihood of treatment to succeed or more prolonged survival. Regardless of demonstrated efficacy, the clinical cost is almost guaranteed during treatment (present): stigma, hair loss, undesired side effects, or adverse events related to chemotherapy. On the other hand, the return will occur in a future context. It will be limited to patients "scheduled" to have a cancer recurrence after resection AND those in whom chemotherapy can prevent this recurrence.

This probability of future benefit is calculated by the multiplicative rule, resulting in a final probability smaller than the components of the equation:

$$P(\mathbf{A \text{ and } B}) = P(\mathbf{A}) * P(\mathbf{B|A}) = P(\text{cancer recurrence}) \times P(\text{preventing recurrence in those who would recur})$$

On the other hand, consequences in the present do not have the first component to be multiplied by the exposure effect. Moreover, when there is more than one possibility of undesirable events, they follow an additive rule.

$$P(\mathbf{A \text{ or } B \text{ or } C}) = P(\mathbf{A}) + P(\mathbf{B}) + P(\mathbf{C}) = P(\text{stigma}) + P(\text{hair loss}) + P(\text{discomfort}) + P(\text{event})$$

Comparing these two equations, it becomes evident why future efficacy has a probability (0 - 1) closer to 0 and a number needed to treat closer to 1. In contrast, some present costs have a probability close to 1 (almost deterministic).

Figure 1. Probabilistic spectrum of future vs. present benefits



Source: the authors (2024).

From an economic point of view, adjuvant therapy falls into the category of potentially uneconomical risk, and one should only indicate it after careful consideration that suggests the benefits outweigh the costs. We do not suggest avoiding this therapy, but the process must be deeply reflected upon.

The cancer screening paradigm aims to diagnose disease in asymptomatic individuals, making for another typical example of future benefit/present cost.^{3,4} The patient gains a diagnosis and a cascade of subsequent procedures (cost). This early cost would be justified by two premises to be multiplied: the "cancer" will progress to compromise the patient's life, and the treatment in the subclinical (early) phase will have more prognostic benefit than treatment in the clinical stage of the disease. For many indolent cancers, the first probability is low. The second probability is of marginal benefit (earlier treatment versus less early treatment), different from the central benefit observed in treatment versus no treatment. For this reason, many cancer screenings do not follow an economic rationale.

The surgeon performs a myocardial revascularization surgery on an asymptomatic patient who, due to screening, was diagnosed with extensive coronary disease. The premise behind the treatment is that the surgery will prevent a future event rather than just controlling symptoms.⁵ Again, a multiplicative probability rule. However, the price paid by the patient is on the day of the surgery, in the here and now, with its discomforts and potential complications.

Situations that carry risks imply the need for the physician to understand the dialectic between action and thought. In this debate, the recommendation of surgery over clinical management will never be deterministic, despite the high level of comparative evidence of effectiveness. The recommendation should be based on the individual perception that the quantitative and qualitative magnitude of the benefit far outweighs the cost so that the type of benefit compensates for the disadvantages of temporal context and multiplicative probabilities.

At the other end of the economic spectrum are the situations of present benefit and future cost. Let us look at purely didactic examples.

2. Present Benefits

Let's analyze the controversial indication of hormone replacement therapy for men and women for aesthetic purposes. The idea that aesthetics is not important in medicine may seem trivial. However, it is possible to argue that the "aesthetic outcome" encompasses factors such as self-esteem, functionality, vitality, sexuality, and overall well-being. This perspective allows us to view decisions related to aesthetics as part of the medical decision-making process.

Considering a hormone therapy prescription done appropriately, the therapeutic effect occurs in the present, does not rely on any multiplicative rule, and is almost entirely predictable.

As for the cost of hormone therapy, it concerns potential adverse effects regarding cancer or cardiovascular disease. Adverse effects are events distal to the intervention (indirect), conditioned to some predisposition to the disease, with a much lower probability than the initial purpose of the conduct. Actually, it is so low that large clinical trials are not able to show a significant increase in those events⁶.

Therefore, this type of hormonal treatment falls into the category of a better economic profile (present benefit/future cost). Although in this category, this hormonal indication should not be a rule since the benefit strongly depends on the patient's preference. It is not one of those things that almost everyone prefers (like living longer or without pain); there is

more significant natural variability, which justifies the need for individual consideration.

3. Symptoms Treatment

In the economic category of present benefit/future cost, the strongest indication is in symptom control, and this is because suffering individuals are most likely seeking relief from their symptoms.

What is more impactful: omeprazole for ulcer treatment or beta-blockers for heart failure treatment? Although ulcers do not cause as many deaths as heart failure, the former is a deterministic benefit (NNT = 10)⁷ and present, while the latter is probabilistic (NNT = 17)⁸ and future.

Ritalin for people with attention deficit is another high economic performance treatment that is not recognized. When well indicated, it can improve a person's life.⁹ There may be side effects, but the return on "investment" is vital to the decision. Some parents may be hesitant to allow their children to use this substance, preferring that they try to overcome it on their own. However, it is essential to note that the benefits can be immediate and highly likely if the medication is prescribed correctly. Therefore, if no benefits or side effects outweigh the benefits, the drug can be stopped immediately without irreversible consequences. Of course, there is the issue of overdiagnosis, which may be a problem in this field.¹⁰

The lack of this economic mental model causes a common cognitive bias: although they have a greater probabilistic and temporal impact, symptom treatments are considered less relevant than prognostic treatments. However, they can be more impactful.

Symptoms are seen as a second-class benefit due to the lack of microeconomics in medical thinking. Cardiologists often say, "Furosemide only controls symptoms of heart failure but does not reduce mortality". However, they do not realize that in severe heart failure, no equipoise allows for a placebo-controlled clinical trial to test the efficacy of furosemide. It is an indispensable drug for symptom control and reduction of mortality from acute pulmonary edema.

4. The Feedback of Present Effect

Conditions of present benefit have another significant advantage over future benefits: the evidence of feedback. When using a treatment with an immediate effect, we can observe the results during the treatment and determine whether the decision was appropriate or if the intervention is not meeting expectations. Using this clinical evidence from the patient, we will know if we are correct or should stop the intervention.

5. Shared Decision-Making

The economy of decision-making processes does not have the shape of a scale, where one side is the cost, and the other is the benefit. It is more complex than weighing the cost versus the benefit. Clinical cost and clinical benefit are incomparable directly because they represent different outcomes. Instead of using the scale, we should use sequential analysis, where after accessing the benefit, we evaluate "willingness to pay". First, focus on the benefit in terms of quality, probability, and temporality. After the patient understands the dimensions of this benefit, assess their willingness to pay for it. Present the investment's price after building with the patient's perception of the benefit and willingness to pay.

Figure 2. Shared decision diagram regarding cost vs. benefits



Source: the authors (2024).

There are different types of patients: those with an aversion to the risk of treatment with less willingness to pay; and those with an aversion to the risk of disease who develop tolerance to the risk of treatment. At one extreme, a patient who signals before surgery to "remove whatever is necessary" is highly willing to pay for tumor resolution. Another who says "I prefer to die rather than undergo surgery" has little willingness to pay.

There is a benefit to adjuvant chemotherapy. The decision to undergo it requires considering whether the patient is willing to invest in potential future benefits despite the present costs. There is a benefit from hormonal therapy for aesthetic purposes. The question is about the value of this benefit in the patient's quality of life and the willingness to pay in terms of future adverse event probability. Obviously, this discussion does not cover inappropriate prescriptions and conducts in chemotherapy or hormone therapy.

6. Conclusion

We move away from the patient's perspective when defending or attacking conduct with proven therapeutic effects. The defense should be professional in understanding the nuances and complexities of the economic decision-making process. Ultimately, medicine is all about taking calculated risks. Our profession is challenging and requires us to think deeply.

Authors contributions

Correia LC was responsible for the theoretical aspect of the discussion. Correia LC and Santos JV equally contributed to discussing the contents and message of the article, writing and revising the final version of the manuscript.

Conflicts of interest

No financial, legal, or political conflicts involving third parties (government, private companies, and foundations, etc.) were declared for any aspect of the submitted work (including but not limited to grants and funding, advisory board participation, study design, manuscript preparation, statistical analysis, etc.).

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