

Debate on the cost of innovation in healthcare: is it too costly?

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INTRODUCTION

This paper summarises a structured panel session regarding the cost of innovation in healthcare. The debate took place during the 2016 Simnovate Conference at McGill University. The audience, panel members and venue largely included members from academia as well as representatives from industry and organised medicine. The goal of the debate was to consider a balanced argument regarding the views of healthcare innovation and the associated costs.

GROUNDING THE DEBATE

VJD

Demand and cost

The demand for healthcare is rising. The burden of disease is increasing. The population is ageing. We face the threat of emerging infectious diseases. We are struggling with health disparities.¹ At the same time, all nations are facing the challenges in providing access, cost and quality healthcare.² We are here today to talk about cost and to debate the various ways in which innovation may lead to an increase or a reduction of cost. Indeed, healthcare costs are extremely high and there is much concern about whether recent trends are sustainable. For instance, healthcare spending accounts for 19% of gross domestic product (GDP) in the USA and it is expected to grow another 4% this coming year. This is the basis for our debate.

Drugs, medical devices and hospital care

A *JAMA* study in November 2013 noted that 91% of increased healthcare costs between 2000 and 2011 were because of the increase in the price of drugs, medical devices and hospital care.³ It is argued by industry that to develop novel breakthrough therapies, they must invest in innovation which is risky and costly. By charging for these new therapies, industry can recover the losses related to high-risk research and development. In essence, industry needs to be incentivised and reimbursed for the dollars they put in the innovation, which often includes patents and other costs to protect the innovation.

Consider exciting developments on the horizon, such as precision medicine, innovative medicines and tissue engineering, how will the products of these innovations affect the cost of care? In the USA, there are no rules or regulations governing the prices industry can charge.

For example, there are the hepatitis C drugs which now cost about \$84 000 per year. These drugs no doubt will drive healthcare costs in the short term, but this is only one part of the story.

Modelling suggests that these drugs will actually drive down overall spending on this disease within a decade. Long-term savings for treatment of chronic conditions, liver transplants and lost productivity may ultimately offset the cost of these drugs and more.

How do you assess the real long-term cost-benefits in a system that measures and incentivises short-term results? For example, drug companies and insurance payers are less likely to benefit from developing or reimbursing a costly new drug or therapy that would save a billion dollars in 10 years because they cannot realise any gain right away. In contrast, the current system does incentivise the development of predictive tests that may yield significant savings over long term.⁴

Finally, while it is a fact that most innovations have resulted in diagnostics and therapies that have driven up the cost of care, one can also imagine that innovation can produce products that are cheaper and more cost-effective. For example, precision diagnostics and medicine may result in less trial and error, yield cost-savings and better outcomes. As you can see, the relationship between innovation and healthcare costs is not always straightforward. Furthermore, some cost-saving innovations are not always broadly implemented in clinical practice. With this background, I have set the stage for our debate on whether innovation is too costly.

INNOVATION IS TOO COSTLY

DAA

Defining cost and innovation

Innovation is the process of creating value from new ideas. We get incredible benefits from innovation. We just pay too much for the process. Healthcare innovation is too costly not because it does not bring benefit, but because it could bring the same or more benefit faster or less expensively if we adopted some processes found in other industries.

The cost of research and development

The National Institutes of Health annual budget is about \$32 billion.⁵ As large as that figure may appear on its face, it represents only about \$100 per US citizen. That seems like too little. The right amount of government spending is hard to determine in absolute terms but relative comparisons reveal that nations vary considerably in how much they put into research. South Korea invests 4.3% of its GDP in research and development (R&D); Japan 3.6%; the USA 2.4%; the European Union 1.9%; Canada 1.6% and Russia 1.2%. Given the



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downstream benefits of research investments many countries might be advantaged by putting far more into R&D. As Mary Lasker said, “If you think research is expensive, try disease.”

But at the same time I think that I can argue strongly for the pro position. So here is the old joke: I tell my wife I walked home to save bus fare and she says, “You could have saved a lot more by not taking a taxi.” So much of the way we think about cost reflects what we compare it to. Healthcare innovation is too costly not because it does not provide value. It does provide value. Healthcare innovation is too costly because we could get the same or better value for much less money and that is the point I want to make.

Some ways we get it wrong

All sorts of avoidable errors add cost to our innovation process. One of them is going in the wrong direction with a seemingly promising approach and scaling up well before we know the approach will actually work.⁶ Premature scaling is expensive. Worse is never finding out that what we were doing in the first place was wrong. That is an argument for starting small and yet we do not do that enough in healthcare innovation.⁷

Another problem is overgeneralising a variety of risks. Healthcare can be dangerous, and so can healthcare innovation. As a result, both operate in a highly regulated environment to protect human beings. And yet we overgeneralise the protections required for large risks to the settings in which we face small risks. Here is a case in point: in the USA, it is not so easy to introduce texting or video chats into clinical practice. Someone is sure to worry that these channels are not secure or to invoke the possibility of a Health Insurance Portability and Accountability Act of 1996 violation—a suggestion that seems to stop innovation in its tracks. Telephoning patients seems to be fine, perhaps because we have years of convention supporting that practice.⁸ And yet texts and video chats remain sources of concern despite the fact that they travel over the same wired or wireless channels as telephone calls. That is a concern, because the stereotypical 20-year-old does not use the telephone, open postal mail or respond to email. In my own experience, I have to text my children to respond to my email—and that is even when they are in the house. We need protections of human beings, but not the same protections for communicating with a patient about their hypertension that we need when delivering experimental chemotherapy to a patient with cancer. That burden is expensive and it is slowing us down.

It is not just that its costly, it is too costly

It is easy to point to the high costs of innovation but it is more constructive to think about ways to lower that cost. It is the opportunity to lower cost that allows us to argue that healthcare innovation is *too* costly. And it is that ability that offers the most promise going forward. Some of those opportunities can come from the judicious application of techniques from other industries.

We can learn from innovation in retail marketing. Google AdWords has taught us how to design better products and services to deliver to customers by delivering a less expensive way to observe decisions people make in real contexts.⁹ At the same time, these approaches from retailing show us both the importance of using real contexts for learning and also that our approaches to research safety are inconsistent across health and other settings. We need new approaches to human beings protection.

The National Academy of Medicine has worked hard on developing a framework for a learning healthcare environment and new approaches to thinking about human beings protection

in a minimal risk setting in the context of clinical service. There are so many ways we can borrow from the innovation of other industries to move faster and less expensively towards the value we need. So much of the innovation we need in healthcare is service transformation. We should not burden that process with regulatory systems principally designed to protect human beings from the risks of potentially harmful chemotherapeutic agents used in cancer drug trials. In healthcare, what we really need is innovation in innovation.

INNOVATION IS NOT TOO COSTLY

BH

The complexity of defining cost

To fully consider the cost of a healthcare-related technology, there are third-party payers, subsidies, taxes and employer contributions. There are moral issues about whether somebody should be denied care because they cannot afford it and so forth. These are very complex factors in measuring cost. So I will start with an overly abstract argument which is, at least in the USA, we have a free market with many, many companies competing, and when you have a free market things cost the right amount. Nobody argues literally that healthcare is a free market. It is highly distorted by regulatory and the previously listed factors, but given those two previous facts, innovation costs the right amount because there are lots of players in the innovation space.

Is cost equal to the sticker price?

However, the overall cost of a medical technology is not the sticker price. If you have to buy an MRI machine for two million dollars or a DaVinci surgical robot for a million dollars, that does not mean there are no benefits and the benefits are harder to scrape out from the existing data thanks to the sticker price. Some critiques do not add the benefits into the plus column. Examples would be how long the patient's recovery takes. Do they get out of the hospital in fewer days? There are economic studies in some detail that show a correlation between higher costs and higher R&D spending. Presumably the R&D spending then correlates to innovation. Of course the correlation is not a causality. We do not know which direction that arrow goes.

Can innovation reduce costs?

Ultimately we are seeking ways in which innovation reduces costs. How does that happen? A great example is Moore's Law. A significant set of technologies are not just improving, but exponentially improving, and lowering costs. Examples include telecom, semiconductors information technology (cloud and mobile), rocketry and genome sequencing.

What do the exponentially improving technologies have in common? They all have a single number metric with which you can measure quality. How many base pairs did you get for \$1 000 000 or \$1000? How many bits per second are you getting over a wire? What's your CPU computing rate? How high can the rocket go? Those are all numbers that characterise how good that technology is and everybody can use that metric to do better. It is unlikely that healthcare will ever have that single metric as it has been pointed out that multifactorial metrics are required. But multifactorial metrics of healthcare could be improved indirectly by taking better advantage of these technologies. If we can couple exponential technology innovation curves into healthcare, we should be able to see large benefits.

Examples might include: IT positively impacting healthcare costs. Smartphone diagnostics a single smartphone today could run the computer science department of Massachusetts Institute of Technology (MIT) in the 1980's. Big data and precision medicine: these are things that everybody is optimistic about. What about the low-cost genome and personalised medicine?

These and similar technology areas really hold the potential for coupling very disruptive and exponential style technology curves into the necessarily slower and appropriately risk averse, field of medicine. Risk aversion is a very counteracting force to innovation but we can leverage these very dynamic technologies to reduce costs.

The alternative to innovation

Finally, consider the alternative to innovation. We do not have to bite on a wooden stick and be strapped to the operating table anymore. There used to be a thing called exploratory surgery. We have to be very careful to recognise that the benefits sometimes are hard to put it in dollars on the opposite account of the sticker price of technologies. The technologies will get cheaper and the savings will grow as innovations sustainably show benefits.

GROUNDING THE DEBATE

CMP summary

Costly mistakes versus downstream value

Panellist 1's argument reminds us that ideas are inexpensive. It is the process that is costly and expensive. We make a number of costly mistakes by scaling prematurely. On the other hand, panellist 2 reminds us that it is really about how we measure costs. We tend to look at the sticker price of the technology but we forget to look at the value that is brought downstream. So it is not the immediate return on the investment, but the investment in the future that we should be looking at when we assess the cost of innovation in healthcare.

AUDIENCE DISCUSSION

CMP summary

The role of cost and value in rising healthcare costs

A question that needs to be addressed is whether innovation uniformly has to contribute to rising healthcare costs while coupled to the value it generates or are rising healthcare costs due to the misuse of innovation. There is a difference between cost and value. Cost is a price point that gets set. If the market is not willing to pay for a specific innovation, then that innovation is going to fail. Value is greatly determined by perception. The skill of the innovator is to appeal to a market that will perceive their product to be of value. The more we can lower the cost of creating tangible benefits, the more value that we create.

In addition, a huge amount of money is spent on one-off innovations. If something is built for one hospital, the next hospital wants it completely modified before they will accept it. This extra expense is a very poor application of innovation. Finally, something that looks like value can get misapplied. For example, a patient with two forms of advanced cancer had a cardiac arrest in his recliner at home which is where he wanted to die. However, he was rushed to the hospital, received three, innovative drug-eluting cardiac stents, and he lived for two more months and died of cancer. This is an indictment of the things that we do that look like value to some people but not others.

Research funding and innovation

It has been argued that the way we fund research does not support, reward or inspire innovation. Should we be doing something different? For example, the National Institutes of Health (NIH) has been criticised for being too incremental in a world that cannot wait; however, that criticism is not entirely fair. There are processes of stewardship that are designed to vet projects and investigators and ensure that we are using national resources wisely. Those processes are extremely important to maintaining trust in a system that is publicly financed.

Made in America?

So the USA, Canada and UK are funding a lot of innovation which requires some risk-taking. Some things are going to work, some things are not. Maybe it is the responsibility and duty of those countries to take that on so that countries with fewer resources can benefit in the long run. In contrast, much of the technologies and innovations created in emerging markets in the developing world could never be done in America because the rules and regulations are so tough. So it seems there is also a benefit to bring more reverse innovation in to reduce our costs. It does not all have to be made in America.

FINAL REBUTTAL COMMENTS

DAA

I think healthcare innovation is way too costly not because it does not provide value, but because we can be much cleverer about how we do it and thereby increase the value that healthcare innovation can provide. By that standard we are operating in a way that is way too costly. We could make it cheaper and just as good, or frankly, even better.

BH

I would just sum up by pointing out that it is not particular to medicine that a technology, when first introduced, is very expensive and one of two things happens then. Either it is eventually dropped because it is not cost-effective or it is adopted and made cheaper through competition. Greater adoption and higher volumes means lower manufacturing costs. If you take a 2016 Honda Civic, if somebody had to manufacture those in the same volumes as a DaVinci surgical robot today with all the systems in it, all the regulatory compliance, that car would cost the same as a surgical robot. It is all about volume to drive down costs.

VJD

The issue at the end of the day really is what the market can bear. Other questions relating to value and cost are: To whom? Who is paying for it? Is it the patient? Or the government? Or employers? There is a moral hazard here. Ultimately, if an individual is responsible for paying the majority or the entire cost, they may decide they do not want to pay that much and choose to forego the treatment. So the challenge of a free market approach is sometimes the lack of transparency of who is ultimately responsible for the costs. The other question relates to whether the innovation is being used properly, that is, cost-effectively and how different countries decide to spend money for drugs and technologies based on differences in their values.

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REFERENCES

- 1 Michener JL, Yaggy S, Lyn M, *et al*. Improving the health of the community: Duke's experience with community engagement. *Acad Med* 2008;83:408–13.
- 2 Ackerly DC, Udayakumar K, Taber R, *et al*. Perspective: global medicine: opportunities and challenges for academic health science systems. *Acad Med* 2011;86:1093–9.
- 3 Moses H, Matheson DHM, Dorsey ER, *et al*. The anatomy of health care in the United States. *JAMA* 2013;310:1947–63.
- 4 Dzau VJ, Ginsburg GS, Van Nuys K, *et al*. Aligning incentives to fulfil the promise of personalised medicine. *Lancet* 2015;385:2118–19.
- 5 Ellner AL, Stout S, Sullivan EE, *et al*. Health systems innovation at academic health centers: leading in a new era of health care delivery. *Acad Med* 2015;90:872–80.
- 6 Asch DA, Terwiesch C, Mahoney KB, *et al*. Insourcing health care innovation. *N Engl J Med* 2014;370:1775–7.
- 7 Asch DA, Rosin R. Innovation as discipline, not Fad. *N Engl J Med* 2015;373:592–4.
- 8 Asch DA, Weinstein DF. Innovation in medical education. *N Engl J Med* 2014;371:794–5.
- 9 Hallman M. How to test demand for your new product using Google AdWords. <http://evergreendm.com/test-demand-new-product-using-google-adwords/> (accessed 29 Sep 2016).