How Should We Value Disease Eradication?

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KEY POINTS . . .

In evaluating the real cost of a new breakthrough drug, we need to consider its long-term value to society, not its initial price tag.

When major treatment advances are measured in terms of increased quality-adjusted life years for patients, innovators typically receive a financial return of only 5% of the actual value of a new drug.

The treat-all strategy for HCV would result in a projected £9 billion worth of health benefits measured in quality-adjusted life years over the next 50 years, at a cost of only £12,000 per life year.

Pricing of breakthrough treatments is often controversial. The media has extensively covered the debate over the cost of the new hepatitis C combination pill, which is priced at $100,000 or more per patient for the three-month therapy. Similar controversies have surrounded new drugs to combat HIV, cancer, and other diseases.

The public, unsurprisingly, wants immediate and unfettered access to groundbreaking therapeutic advances. Yet any price above the marginal cost is going to limit that access. For society in the long run, however, it's essential to encourage new innovation. In the world of pharmaceutical research and development, financial incentives such as patents, market exclusivity, and research subsidies have been designed to reward the high risk involved in developing new drugs. Thus, the balance between cost and access remains a fundamental policy question (see Figure 1).

This dilemma played out dramatically in the mid-1990s with the advent of highly active anti-retroviral therapy (HAART) for HIV, one of the most devastating conditions globally and one that predominately affects young people. HAART revolutionized HIV care, leading to a dramatic improvement in survival rates. But its high cost led to protests, with patients and their advocates equating patent enforcement with death.

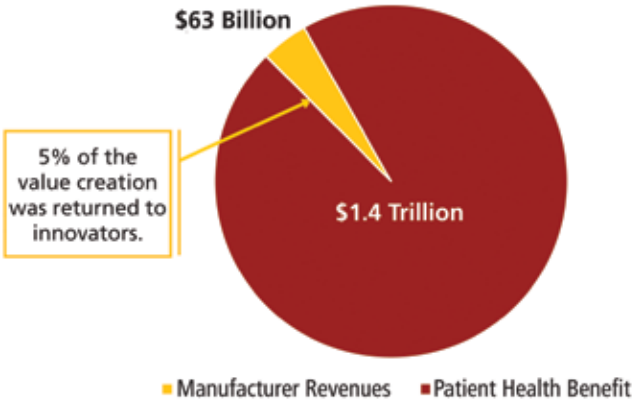
Shifting the survival curve upward is, of course, the goal of medical science. By 1994, we had made some progress–perhaps because of the availability of AZT. But what is really remarkable is the increase in life expectancy over the subsequent decade. In 1984 when someone was diagnosed with HIV, the best estimate for survival was about 19 years. By 2000 that had increased by 15 years. So the introduction of HAART really expanded survival and turned what had been a terminal diagnosis into a chronic but manageable condition.

By aggregating an additional 15 years of life over all of the patients who have benefited from the introduction of HAART, you find that some $1.4 trillion in health benefits flowed to patients at the cost of $63 billion in revenues. That means only 5% of the value of HAART was returned to the innovators (see Figure 2).

The point is that we tend to lose focus when examining prices in health care. We tend to look at the price of the inputs rather than outputs and so, in the case of HAART, people saw this $63 billion cost-

Figure 1: The Innovation-Access Dilemma

Figure 2: Most of the benefits of HAART flowed to patients



Source: Philipson T and Jena AB. Who Benefits from New Medical Technologies? Estimates of Consumer and Producer Surpluses. *Forum for Health Economics and Policy.* 2006 ; 9(2).

of-treatment number and said, "Hey, look at the cost of this. This is really expensive."

On the other hand, if you consider the price of health, HAART actually appears quite inexpensive. We need to look at the right price — not the launch price of new breakthroughs, but rather the long-term financial benefit to patients and society of the advance in treatment.

A similar story is now playing out with the hepatitis C virus (HCV) around the world. HCV has several routes of transmission. It can be contracted through a blood transfusion, inadequate sterilization of medical equipment, sexual intercourse, unsafe injections such as intravenous drug use, or even sharing a toothbrush with someone who has the disease.

HCV has a delayed impact. It may take 10 to 15 years after infection to develop the consequences of the disease, which involve scarring in the liver that, ultimately, can lead to liver cancer and the need for a liver transplant. HCV is the leading cause of liver cancer.

Because of the latency of the disease, the high health care costs for treating HCV are incurred long after transmission of the disease. Thus, prevalence is in the rearview mirror while the costs of care are–to continue the metaphor–through the windshield.

In the United States, most of the infections occurred in the late 1990s. While the prevalence of HCV infection is declining from its peak, the incidence of advanced liver disease and the economic burden continues to rise. Yet as a society, we tend to focus on infection, not health care costs.

Compare the U.S. experience with HCV to that in England, where the disease is the second leading cause of liver transplants. In the U.S., most of those infected with HCV contracted the disease through health care exposure, while in England, intravenous-drug use accounts for 90% of the cases, with those infected unwittingly transmitting the disease to others. At the USC Schaeffer Center for Health Policy & Economics, we conducted cost-effectiveness analysis of treating the disease in England at various points in its progression and with different available regimens.

Table 1: Hepatitis Treatments – Regimen Efficacy and Cost

		Therapy			
		Old Agents (pegIFN/ribavirin)		New Agents (e.g. sofosbuvir/ledipasvir)	
	Virus Variant	Cure Rate[1]	Regimen Cost[2]	Cure Rate[3]	Regimen Cost[4]
90% of cases in England	Genotype 1	33-41%	$35,000	94-99%	$100,000
	Genotype 2	66-79%	$17,000	91-97%	$100,000
	Genotype 3	66-79%	$17,000	92-94%	$200,000

The older, interferon-based therapeutic agents had cure rates ranging from 33% to 79%, at a cost of between $17,000 and $35,000. These old regimens were extremely toxic and difficult for patients to complete. With the recent introduction of products such as sofosbuvir and Harvoni–the new combination pill–we see cure rates that are much higher, above 90%, depending on the genotype of the virus, but with a regimen cost of $100,000 to $200,000 (see Table 1). The regimen duration–between 8 to 24 weeks–also varies by HCV genotype as well as the patient's health status (e.g., whether or not the individual has cirrhosis).

With such a high cure rate, the policy question becomes whether or not we want to treat the disease early. We started our modeling with a baseline therapy using older therapeutic agents and treating people with advanced disease. In that scenario, our model predicted no real reduction in the prevalence of HCV over the next 15 years. Our modeling also showed that treating the same population as the baseline, but with the new regimens now available, would only reduce prevalence by 3% and new infections by 4% over the same 15-year period.

The point to consider is not whether a breakthrough is expensive but if it has value; sometimes innovations that are expensive are quite valuable.

We also modeled what would happen if we expanded the patient pool under different scenarios. Treating everyone who is infected would reduce the prevalence of HCV in England by 87% and the rate of new infections by 72% over the next 15 years. Although treating all who have HCV is quite effective, it is also quite expensive, raises questions about system capacity, and requires an aggressive screening program. So we modeled a phased-in alternative in which 18% of those at various stages of HCV-related disease would be treated. This scenario more closely matches current treatment capacity and showed a 41% decline in prevalence and a 17% reduction in new infections over the next 15 years (see Graphs 1 & 2).

The health benefits are dramatic. By treating the disease, patients are being cured and are not infecting others. Whether treating those with advanced disease or treating 18% of patients at various >

disease stages, the new regimens are clearly saving lives in the short term. But treating advanced disease will have minimal impact on prevalence or incidence. And it turns out that this transmissivity effect–not infecting others–is an important component of value, particularly in England. By giving people an incentive to come in for care, England has an opportunity to simultaneously address not only its HCV problem but also its intravenous-drug-use problem.

So the question becomes: Are we deciding on policy for the short term or the long term?

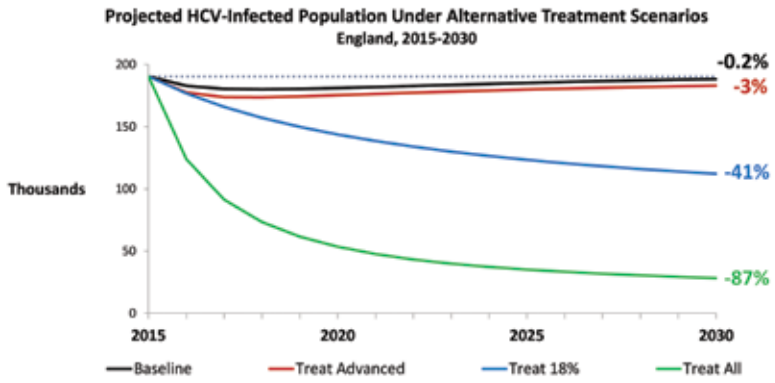
By modeling the various scenarios, it is clear that the potential savings of broader treatment strategies at both the patient and population level are significant when considering the long-term picture.

The treat-all strategy for HCV would result in a projected £9 billion worth of health benefits measured in quality-adjusted life years over the next 50 years, at a cost of only £12,000 per life year (see Graph 3). The cost-effectiveness is rather remarkable. At the same time, you could actually eliminate the disease in England, or come close to it.

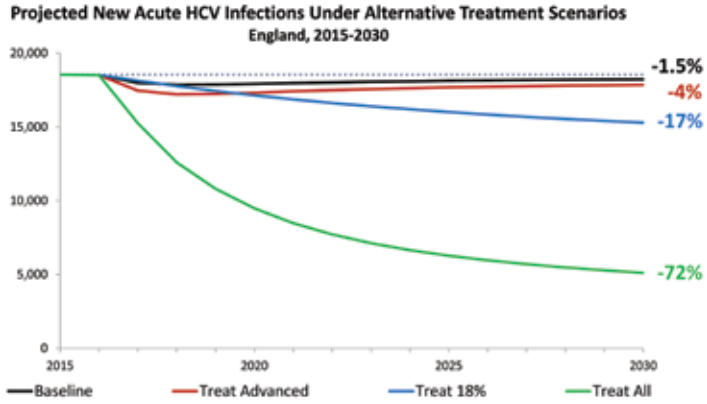
The point to consider is not whether a breakthrough is expensive but if it has value; sometimes innovations that are expensive are quite valuable. When you think about the price per pill for the latest HCV treatment with its high cure rate, compared with a $500,000 liver transplant, the value is clear. The manufacturers have developed products that will put themselves out of business, so there is potential for an outcomes-based contract with pharmaceutical companies in this type of scenario. When a breakthrough drug can not only cure the disease for individual patients but also eliminate the disease from the population, it is something in which society should invest. ■

Additional information:
The preceding article was based on an Issue Panel entitled, "Can We Afford Medical Breakthroughs for Large Prevalence Diseases? Lessons from Hepatitis C," at the ISPOR 20th Annual International Meeting, given on May 18, 2015, Philadelphia, PA, USA.

Graph 1: Prevance in England could be reduced by 40% or more by 2030 in some scenarios



Graph 2: New infections



Graph 3: Discounted costs and benefits of alternative treatment strategies