The Research & Development of Prescription Drugs: An Overview

Introduction

The research and development (R&D) that goes into the creation of a new drug is a complex process involving a variety of public and private entities. But as drug prices have rapidly risen in recent years—far outpacing inflation many times over and driven by not only record-high launch prices but also in price spikes for decades-old drugs[1]—and patients struggle to afford them, public interest in the role government funding plays in the creation of new medicines has grown. As a result, taxpayer support of the development of new treatments is frequently invoked as a justification for policy proposals requiring the federal government to step in and help lower prescription drug prices for families.[2]

To better understand this argument, as well as the pharmaceutical industry's pushback against it, it is first helpful to understand the general steps in developing a drug and the federal government's role in supporting that process. The following brief provides that overview before examining relevant, common claims made in both opposition and support of government protections against unaffordable drug prices, concluding with a brief discussion of the policy implications of government's investment in R&D.

OVERVIEW OF THE RESEARCH & DEVELOPMENT OF A PRESCRIPTION DRUG

It takes several years for a new drug to be developed and approved for marketing by the Food and Drug Administration (FDA), as well as hundreds of millions of dollars.[3] Broadly, the federal government is a strong supporter in early-stage "basic" research, while the pharmaceutical industry generally plays a stronger role in later stages of development once a potentially profitable medicine is identified.

Basic Research

At the start of the process, researchers work to understand a condition or disease and explore a variety of different "targets"—generally, proteins or genes—that could be affected by a drug in a way that would prevent or treat a disease. Once an appropriate target is identified, researchers will test many different molecular compounds to identify one that seems promising for further research as a potential drug.[4]

Funding

Government spending on basic research is higher than the pharmaceutical industry's own spending on basic research.[5] This government spending primarily takes the form of National Institutes of Health (NIH) grants awarded to academic researchers and other scientists.[6] In fact, one study found that federally funded research contributed either directly or indirectly to the development of every new drug approved by the FDA between 2010 and 2016.[7]

Preclinical Research

During this stage, the selected compound (potential drug) is put through a variety of testing to determine the drug's safety and effectiveness. Preclinical studies involve animals, but trials with humans are not yet allowed. These studies result in a pharmacological profile that provides detailed information on the drug—such as its dosage, toxicity, and interactions with other medicines—that will be used in further research and possible manufacturing. The profile is also a key part of submitting an Investigational New Drug (IND)

application with the FDA, which allows the FDA to ensure that future research involving humans is ethical and appropriate before the drug can be tested on humans.[8]

Funding

A funding gap (sometimes referred to as the "valley of death")[9] exists during this time period—both government and industry contribute to the financing of preclinical research, but not enough to fully meet need. Most drugs in the early stage have not yet proven themselves to be potentially profitable enough to attract industry attention, necessitating that the government focus its funding on this initial stage of development.

Recognizing this need, in recent years, U.S. foundations have significantly increased the amount of grants they award to industry to engage in preclinical-stage research for specific diseases of interest to the foundations.[10] The U.S. Department of Health and Human Services has also increased its focus on this type of research through financial assistance to small businesses attempting to bring early-stage research into being, NIH training programs, and FDA initiatives to foster private-public partnerships.[11]

Clinical Research

Clinical research—the first time a treatment will be tested in humans—has several phases that examine the safety and effectiveness of the drug being studied. The first phase focuses on studying the drug's safety to understand appropriate dosages and identifying potential side effects and interactions with other drugs. The second phase is focused on establishing what is known as a proof of concept (POC)—essentially, proof that the drug will work in the way intended. The third stage builds on that POC to show effectiveness in a large patient population. It is at the conclusion of the third stage that, if the results are successful, a New Drug Application (NDA) will be filed with the FDA for review. The final, fourth stage are trials conducted after approval for marketing purposes or for continuing monitoring of the drug's long-term effects.[12]

Funding

Once the POC is established, the pharmaceutical industry will evaluate the potential profitability of the drug and determine whether it is likely to be profitable enough to satisfy shareholders and investors. As a result, funding for the clinical studies once the POC is demonstrated is generally robust and largely driven by industry for drugs deemed promising.[13] During these final stages, while not typically directly funding the drug's development, government still plays a significant role through the tax breaks given to the pharmaceutical industry to complete the drug development process.[14]

PUBLIC AND INDUSTRY PERSPECTIVES

In sum, both taxpayers and industry financially support the development of drugs in different ways, with government focused on research and manufacturers focused on development.[15] While the pharmaceutical industry, however, is experiencing record breaking profits,[16] both government and patients are experiencing significant financial hardships because of the prices that industry sets for medicines.[17] As calls for the government to disrupt this imbalance grow, two major argument trends have emerged in support and opposition to reform.

Access

Despite heavy government investment in the development of drugs, Americans are increasingly finding the medicines their tax dollars helped produce out of reach. In fact, U.S. drug prices are the highest in the world.[18] The average cost of brand-name drugs has rapidly risen in recent years,[19] resulting in patients skipping dosages or foregoing treatment altogether.[20] Vital government programs, such as Medicare, are suffering as well. In 2017, Medicare spent more than $185 billion on drugs alone, which contributes to higher health care costs for seniors across the board.[21]

The impact of drug prices is felt, however, by those of every age. Some of the most expensive drugs, in fact, are for those that are designed to treat rare illnesses in children and are supported by dedicated grant programs within the NIH and FDA awarding money to academia and industry alike.[22] Despite this investment, these diseases often cost hundreds of thousands of dollars a year—one recent high-profile drug was set at 2.1 million dollars—putting treatment completely out of reach for many and putting others into crippling debt.[23]

To those suffering from these prices—including both patients and the health care system—the same "return on investment" that the pharmaceutical industry enjoys is nowhere to be found. And with spikes in prices continuing despite public condemnation, support for government to step in to bring down costs is at an all-time high.[24]

Innovation

In attempts to counter this argument, the pharmaceutical industry warns that cuts to drug prices will result in lowered profits that will lead to less investment in developing new treatments.[25] However, even putting aside that government is the primary funder of the early-stage research that indicates when new a cure may be within reach, data from the pharmaceutical industry itself contradicts their own argument.

One recent study examined the 2015 financial reports issued by the 15 companies responsible for manufacturing the top 20 best-selling drugs.[26] The researchers compared the revenue generated through the higher ("premium") prices charged in the U.S. to that generated through the lower prices charged in Canada and several European countries.[27] Annual revenue from just those select drugs was much larger than each company's total R&D budget for the same time period, with several companies covering their entire R&D budgets from revenues generated from U.S. premium price of just one drug.[28]

CONCLUSION: POLICY IMPLICATIONS

While it is clear that the federal government is significantly investing in prescription drug R&D, the practical policy implications of that investment are less obvious. What is recognized is the fact that this investment creates at least some type of ownership interest for the government in drugs developed with taxpayer support.[29]

As a result, there are currently policy levers available that could allow the government to intervene to demand lower prices when certain conditions have been met—the most well-known called "March-In Rights."[30] These rights, however, have never been tested and significant questions remain on how such intervention would operate.[31] Other policy proposals would go much farther. For example, Senator Warren authored a bill that would use the government's ownership rights in certain drugs to create a government-run drug manufacturer to produce medicines if the private sector charges unreasonably high costs for the treatment.[32]

Further exploration of these policy avenues is warranted. Future reforms, however, must be squarely grounded in an honest understanding of how "innovation" is truly being funded. Any policy that attempts to sidestep this question—or defers to drug manufacturers' claims about their own investments—will do little to ensure that life-saving medicines do not continue to become a luxury good.

ENDNOTES

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