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The quantum era of AI-fueled drug discovery: Implications for pricing and market access strategy

The commercialization of quantum computing, particularly when integrated with the promises of artificial intelligence (AI), may fuel pharmaceutical companies' ability to quickly and accurately model complex chemical interactions, potentially initiating a "golden age" of drug discovery. Over the past three years, the Food and Drug Administration has approved approximately 50 drugs per year, which comprise a mix of novel assets and "me-too" products. Computational drug discovery aims to expand our knowledge of biology and assess new chemical structures for potential development.

A substantial increase in the number and quality of novel drugs that enter the drug evaluation funnel is likely to have an impact in multiple significant ways. First there will be a reduction in research and development (R&D) costs due to a decrease in clinical trial failures. Quantum-fueled computational computing is likely to better predict how drugs will interact with biological systems, ultimately rejecting drugs before they make it to the clinic. This will decrease the percentage of failures and ultimately the expected R&D cost per new drug. Second, we would expect to see an increase in the clinical value (e.g., efficacy and safety) of drugs that come to market. Similar to the reduction in R&D failures, those drugs that are brought into the clinic should be better targeted to specific biologic pathways, enabling superior clinical effect. Finally, quantum-fueled computational computing will expand the number of novel drugs that come to market each year.

With clinical-stage companies looking to leverage this new technological breakthrough, we would expect to see a variety of "hard" pharmaceutical problems solved in relatively short order. Manufacturers should consider how this bounty of high-value assets could impact stakeholders' valuation of new medication and develop pricing and market access strategies accordingly.

What is quantum computing?

Quantum computers currently resemble elaborate chandeliers that must be cooled to near absolute zero to stabilize the electrons inside. They leverage highly advanced technology, novel materials, and the principles of quantum mechanics to tackle specific problems swiftly. Some of these problems would take so long to solve using today's traditional computers that the universe would likely end first. Unlike traditional bits, quantum bits (or "Qubits") can exist as both 0 and 1 simultaneously due to a quantum principle called superposition. For tasks like factoring large numbers or modeling molecular interactions, quantum computers calculate solutions exponentially faster than traditional ones. Companies worldwide are racing to create a commercially viable quantum computer.

What is computational drug discovery?

Computational drug discovery involves predicting how new chemicals will interact at the atomic level within biological systems. This prediction helps researchers screen virtual molecule libraries or design new molecules for specific functions. Significant progress has been made with traditional computers, which have helped to act as a proving group for how quantum computing technology could be effective in designing novel medications. Despite the advances in drug discovery that have been enabled by traditional computers, experts still predict that quantum computing will vastly outperform even the fastest classical super computers in molecular modeling. Problems that would take traditional systems longer than the life span of the Sun to solve could be completed by quantum computers in minutes.

Why is quantum computing and AI relevant to drug pricing and market access strategy?

Take the leap of imagination with us into a "golden age of drug discovery," where molecular interactions are almost perfectly understood. In this world of tomorrow, R&D costs per product are lower because failures in the clinic are infrequent and the quality of assets is significantly differentiated from even today's blockbusters. This fantasyland sounds magical, but it has a darker side. Somebody is going to have to pay for all this innovation, and if we use the metrics of today to evaluate tomorrow's medications, they could come with a steep price tag.

The US healthcare system is already struggling to adequately care for America's citizens. It's plagued by high costs, with healthcare spending projected at $4.9 trillion in 2024[1] and the price of new medications rising sharply; since the introduction of the Inflation Reduction Act, launch prices are up by 35%.[2] Savings that were expected as a result of biosimilars have not been realized; 86% of branded biologics eligible for biosimilar competition do not have a biosimilar competitor in

1 https://www.healthsystemtracker.org/brief/policy-issues-and-trends-2024/

2 https://energycommerce.house.gov/posts/chair-rodgers-the-biden-harris-price-setting-scheme-raises-costs-on-seniors

development.[3] Further, while many are hopeful that glucagon-like peptide-1 (GLP-1) agonists will decrease long-term healthcare costs, two-year results suggest an increase of 46% in medical costs for GLP-1 patients.[4]

A significant increase in drug spending, in an already overburdened healthcare system, is going to be a challenge for employers and payors to manage. As such, this golden age may also need to come with adaptations in how market access stakeholders manage products, and how manufacturers pursue pricing and market access strategies. Manufacturers should prepare for several potential future scenarios:

Scenario 1—Status quo

No change; despite the already burdened healthcare system, the drug pricing and access paradigm continues to absorb increased budgets. This could continue to increase healthcare premiums, which patients and employers would continue to absorb. Ideally, these products would ultimately provide cost offsets as their heightened efficacy and improved safety diminish the need for future medical care.

Scenario 2—Increased utilization management to control costs

Whether the product has improved efficacy or not, market access stakeholders could double down on utilization management tactics. A variety of these tactics are already in use today in the form of electronic step edits, step edits as part of a prior authorization, or increasingly strict prior authorization criteria. In this scenario, prices would follow similar trends as they do currently. However, with many additional products, payors would focus on limiting the use of new therapies to specific patient segments or to patients who have tried all other options first.

Physicians and patients have been pushing back against step therapy, which they have dubbed “fail first” for quite some time. A variety of step-therapy reform efforts are under way in the US at the state and federal levels. This may ultimately limit the effectiveness of insurers’ ability to expand step therapy as a management tool. Instead, payors may need to rely on simply excluding new medications from their formularies. Exclusion lists have been a cornerstone of management for pharmacy benefit managers (PBMs) since 2012 and today include approximately 600 unique products at each PBM.[5] Excluded products can sometimes be accessed via a medical exception process, but the extra effort required to navigate that process may limit prescriber willingness to engage with these new medications.

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3 https://www.specialtypharmacycontinuum.com/Online-First/Article/11-24/Biosimilars-Generics-445-Billion-Savings/75360

4 https://www.reuters.com/business/healthcare-pharmaceuticals/weight-loss-drugs-didnt-curb-health-costs-within-two-years-data-show-2024-10-24/

5 https://www.drugchannels.net/2025/01/the-big-three-pbms-2025-formulary.html

Scenario 3—Reduction in pharmaceutical pricing

Heightened competition within categories may lead to lower launch prices. While the golden age of computational computing may lead to a surplus of improved drugs, there's nothing stopping multiple manufacturers from using this technology to develop multiple assets in the same therapeutic space. With crowded therapeutic categories, manufacturers would naturally compete, much like today, but with substantially better products and potentially much more often. We could see more categories, even in rare diseases, with list or net prices being substantially reduced.

It is entirely possible that some combination of the above scenarios could occur, with some drug categories seeing vastly more development—and subsequently more utilization management—and other categories maintaining their current approach to pricing and access. As pharma manufacturers develop their strategic planning and assess opportunities for assets that may still be many years out, they need to consider how a potential influx of new assets will impact the pricing and access landscape.

If you would like to discuss how quantum computing may affect your drug pipeline and see how CRA can advise you on an effective pricing and market access strategy, please contact Matthew Majewski, VP at CRA's Life Sciences Practice.

About CRA's Life Sciences Practice

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