How Technological Innovations Are Creating And Resolving Clinical Trial Challenges

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The clinical trial industry is faced with both a deeply entrenched set of challenges and a fast-growing collection of technologies with the potential to address these problems. How sponsors, vendors, and other stakeholders manage this situation will go a long way to deciding the shape of clinical trials in the years to come.

On one level, the use of digital technologies in clinical trials is nothing new. The concept of digital health was first discussed in the 1920s[1]. Since then, researchers have frequently tried to build new tools into their workflows. In 1966, researchers were testing the use of "a small, general-purpose, high-speed digital computer" for patient questionnaires[2]. By the mid-1990s, a new generation of researchers was exploring the use of touch screens for such questionnaires, work that led to the discovery that patients are comfortable submitting data through such devices[3].

Yet, while these examples show digital-enabled clinical research has deep roots, there are reasons to believe the current wave of technological advances is more significant than those of the past. That "small" digital computer used for patient questionnaires in the 1960s took up eight square feet of floor space. Equally, while the 1990s research showed patients like using touch screens, it took until the introduction of the Apple iPhone in 2007 for such devices to go mainstream. By 2015, 72 percent of the United States population owned a smartphone, according to a survey by Pew Research Center[4].

The widespread adoption of smartphones has supported the development of other technologies that rely on wireless communication and miniaturized electronics. To date, wearable activity trackers have been the most visible example of this trend. The breadth of types of data that can be collected using such devices has expanded beyond step counts to include sleep metrics and heart rate readouts. In the years to come, wearables are expected to be just the first step on the path towards the 'Internet of Medical Things,' a network of biomedical sensors that track an individual's physiological status continually.

While this vision is yet to come to fruition, drug developers already face some of the challenges its realization will entail. The emergence of wearables means clinical trial sponsors already have access to the means to generate unprecedented amounts of data on the lives of subjects between site visits. This should be a boon for clinical trials, but it also creates new challenges.

Incorporating Innovations Into Clinical Trials

The new challenges faced by sponsors are unlike those the industry has dealt with in the past. Until recently, the worlds of drug development and consumer technology were unconnected. Innovation came from within pharma companies and specialist vendors. That changed with the emergence of wearable devices such as Fitbits, the ResearchKit mobile research framework from Apple, and smartphones capable of gathering data. Each of these events have contributed to sponsors coming to recognize the consumer technology sector as a source of innovations that can improve clinical trials.

However the use of such consumer technology creates some challenges which must be taken into consideration before implementing into clinical programs. While a Fitbit can generate sleep and activity data of interest to sponsors, it was never designed for use in clinical trials. As such, consumer wearables are not designed to generate the validated data sponsors need to support regulatory submissions for approval of drugs. This has limited the use of consumer devices to the generation of data for exploratory endpoints, those that are of interest to the sponsor but will not support a regulatory decision. When validated data are needed, sponsors use specialist clinical trial wearables such as ActiGraphs.

The trade-off between consumer and specialist wearables is indicative of how sponsors need to understand the capabilities and limitations of technologies and how they can be adapted for various purposes. Consumer devices are relatively cheap, easy to use, and simple to provision, but they cannot currently generate validated data. In contrast, specialist devices are more expensive and complex to provision, but they generate data that meet the demands of regulators. Knowing which technologies to bring into clinical trials and in what context is now an important skill.

Such knowledge will help sponsors convert technological advances into tangible improvements in clinical trials, specifically by enabling a shift from periodic to continual data collection, but the industry will need the support of regulators if it is to fully realize the potential of digital health. The FDA has decided against regulating "low-risk general wellness products," but it does take an interest in any device used to gather data against the primary endpoint of a trial. Creation of appropriate guidance on the regulatory-compliant integration of innovations into clinical trials would be helpful.

Encouraging Change In A Risk-Averse Industry

The importance of guidance is a consequence of the highly regulated environment sponsors operate in and the risk-averse mind-set this fosters. Faced with such an environment, drug developers have traditionally been wary of adopting new technologies and ways of working. This puts the onus on regulators to provide clarity and on advocates of innovation to show how new products can live up to the industry's demands.

To encourage change, promoters of innovations must understand what sponsors value. Technologies that improve data quality, shorten time to market, lower costs, or, ideally, achieve all three of these outcomes are always welcomed by drug developers. Simplicity is typically another prerequisite for widespread adoption, as is well-documented regulatory acceptance of the technology. Approaches that are burdensome to incorporate into trials are unlikely to be implemented at scale, while those that carry a risk of regulatory rejection are typically seen as too much of a gamble by sponsors.

"Sponsors recognize that consumer technology sector is a source of innovation that can improve clinical trials."

History suggests the digital health sector must comprehensively deal with these issues before devices become common in clinical trials. In the early years of electronic data capture (EDC) technology, many sponsors kept using paper because it was seen as the safe, more familiar option. Arguments in favor of the efficiency of EDC were insufficient. Sponsors also needed to see compelling evidence that the technology would have no detrimental effects on their data.

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When running expensive, multi-year trials, fear that data will be compromised acts as a brake on the uptake of innovation.

Regulatory support for EDC and the experiences of early adopters helped to tip the risk-benefit balance in favor of the technology. Digital health needs to engineer its own tipping point. This will entail encouraging regulators to support adoption of trial technologies while working to demonstrate to the industry that the tools are a low-risk way to improve clinical research.

Sharing Knowledge To Accelerate Innovation

The history of EDC is one of several examples of how, under the right circumstances, pharma companies are open to adopting new technologies and ways of working. Another notable example has emerged in the past few years. Drug developers have traditionally been wary of collaborating with their competitors. This is understandable given the importance of intellectual property and the intense competition that characterizes the industry.

Yet, in recent years, drug developers have engaged in more and more precompetitive collaborations and data sharing initiatives, a trend typified by big pharma consortium TransCelerate BioPharma. The trend stems from recognition that the industry has duplicated workloads and shared problems that are too big for any one company to address. In response, companies have teamed up to work on tasks such as qualifying trial sites, training investigators, and establishing a model approach for the anonymization of clinical trial data.

The anonymization initiative is potentially a key enabler of greater sharing of clinical trial data. As it stands, as lot of data are locked away inside drug developers, a situation that prevents third parties from analyzing and learning from the results. This is changing. In 2014, the European Parliament passed regulations necessitating the publication of clinical trial results. In parallel, many leading drug developers have begun voluntary data sharing initiatives, such as Johnson & Johnson's collaboration with Yale University. These initiatives necessitate anonymization of data.

By ensuring lessons learnt by one company spread more quickly through the research community, data sharing initiatives are tipped to accelerate the process of bringing innovative drugs to market. The industry is heading in this direction, but, as with adoption of digital health devices, advocates of the trend will need to continue demonstrating that sharing of the data is a price worth paying to facilitate the spread of knowledge.

Managing Tension Between Innovation And Security

The data sharing debate, like discussions regarding many areas of clinical research, is defined by a tension between the potential to derive benefits from a new approach and the security of the established way of working. How sponsors, vendors, regulators, and new entrants to the sector (such as consumer technology companies) manage this tension will dictate how quickly and effectively the industry adopts new tools and ways of working with the potential to reshape clinical trials.

While there are risks to making changes, inaction carries its own dangers. Companies that leverage new data collection technologies and ways of working will be rewarded with clinical trials capable of generating broader, more continual data sets while reducing the burden trial participation places on patients and investigators by lessening the need for site visits.

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