

## WHITE PAPER

# Clinical Research - Future Landscapes, Trends and Opportunities

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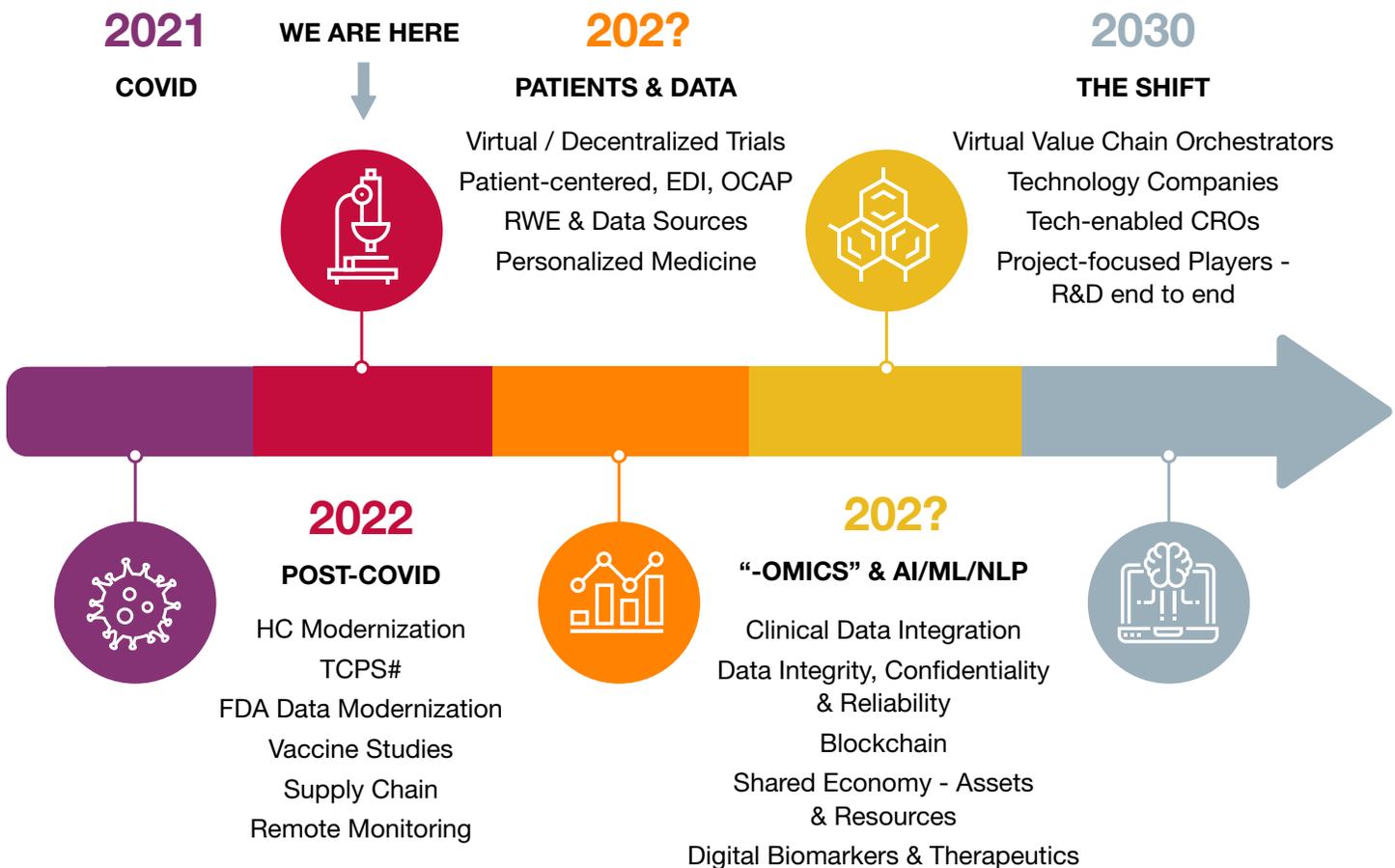
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The COVID-19 pandemic has reinforced the importance of clinical health research in generating evidence of safe therapies, involving participant equity and inclusivity, as well as requiring diverse multi-national trials. COVID-19 had profound effects on regulatory bodies to prioritize submissions, develop ad hoc review committees, and adjust processes to approve newly-developed COVID-19 studies while ensuring proper oversight and regulatory compliance. Research sites in the early months of the pandemic were prohibited from onsite participant visits, confronted with shortages of staff deployed to clinical care of COVID-19 patients, as well as tasked with finding secure remote ways of accessing data from common drives and patient records. Research ethics boards received a deluge of protocol amendments as sponsors, research sites, and participants faced challenges following the strict study visit schedules while also keeping study staff and participants safe from COVID-19 exposure. Overall, it has shown the fragility of the clinical health research enterprise.

**There were also a lot of positive outcomes.** The pandemic highlighted the importance of hygiene, the utility of population data and analytics to understand disease spread, the immense pressure endured by health care systems and need for preventative measures. Scientists and companies from different parts of the world pivoted and collaborated on research studies, and to solve emerging problems such as testing, personal protective equipment (PPE), secure messaging, and virtual visits. It further supported regulatory bodies consulting and collaborating to enable timely launching and monitoring of studies and continuing need to align regulations. There was strong support for standardization of review and approval processes, study forms, and secure data transfer to enable quicker approvals and assessments without compromising participant safety, privacy, nor data integrity. Participants reported the convenience of remote participation, particularly for individuals who were not close to the research centres or urban facilities. Research sites and clinical care centres were forced to adopt more digital management of studies and data collection, altering how onsite monitoring and auditing is conducted.

While countries are still managing the pandemic, Alberta Innovates is looking ahead to explore future trends in clinical health research (Figure 1). The Alberta Clinical Research Consortium (ACRC) is an Alberta Innovates-led initiative with the vision of high-quality, integrated, and efficient clinical health research. The ACRC is keenly interested in the evolution of clinical health research and brings together academia, government, public, and private stakeholders to drive innovation in the province. In less than a decade, clinical health research is expected to undergo substantial transformation with 2030 being viewed as a time of change. The 2030 target, aligns with other major global transformations with the United Nations and 193 world leaders' commitment to the 17 Sustainable Development Goals (Global Goals), including to end extreme poverty and hunger, good health and well-being, fight inequality and injustice, and tackle climate change. The exact timeline for realizing innovation milestones heading to 2030 is not yet defined for clinical health research as it is anticipated there will be a gradual shift.

**FIGURE 1**  
**Clinical Health Research Trends**



## **COVID-19 (2020-2021)**

The global pandemic highlighted the gaps and opportunities to re-think clinical research. Leading up to 2020, the International Council for Harmonisation (ICH), marking their 30th year is directing attention to harmonizing beyond the founding regions. Health Canada and the United States Food and Drug Association (FDA) have been undertaking joint public consultations over the past several years. In spring 2021, Health Canada invited stakeholder input on modernizing the clinical trial framework for drugs, devices and natural health products, which introduced proportional risk-based oversight, single authorization of a trial, agile lifecycle across product lines, decentralized trials and registration and public disclosure of results. The proposed changes will have significant impact on sponsors and research sites who will need training and revision of their processes.

## **2022 (Post-COVID-19)**

Countries are moving focus from a pandemic to endemic as vaccine studies will continue to grow in search of more effective preventative measures and treatment against new variants. In spring 2022, the Panel on Research Ethics and the Secretariat on Responsible Conduct of Research released TCPS 2: CORE-2022, which focused on all research involving human participants, regardless of discipline or methodology. In clinical research, following public health recommendations, many clinical sites are still practising physical distancing and reducing unnecessary clinic visits. Thus, sponsors are embracing technology and seeing cost-effectiveness in continuing remote participation and monitoring of trials, which requires electronic data including secure access to electronic medical record systems. This has focused attention on what are the needed data infrastructures for proper handling and storage of data, levels of access, privacy, confidentiality, security, and cybersecurity that will also support research data reliability and integrity. Early signals indicate that regulatory agencies will be incorporating some COVID-19 interim measures into regulations. As an example, the pandemic accelerated the shift to new ways of participating in trials, such as the release of the FDA's guidance document on digital health technologies for remote data acquisition and guidance on decentralized trials. These patient-centric trials offer additional access and convenience over traditional site-based trials and will change how we recruit and interact with participants.

## **202? (Patients & Data)**

Patients will increasingly continue to be at the center of studies, as researchers and regulatory agencies ensure studies consider equity, diversity, and inclusion of participants. Additionally, groups, such as the First Nations Principles of OCAP (Ownership, Control, Access, and Possession), are articulating their rights, jurisdiction on information and research, and how they would like to be informed and involved in clinical research. While a gold standard, traditional, randomized controlled trials lack early clinical information on the usage and potential benefits or risks of an interventional product that real world trials can provide. Thus, participant-generated data comes to the forefront to supplement other real-world data such as electronic health records claims and billings. There is also growing recognition that clinical health only accounts for 10-30 percent of an individual's health status. The other social determinants of health are influenced by health-related behaviors, socioeconomic and environment factors affecting variation in health status. Thus, part of this period will identify the data elements, source, standards, and accessibility and quality of data that contribute to health status. Topics to be addressed included consenting to the use of data for purposes other than the original intent who can have access, and how the data is to be used, managed, and stored.

## **202? (“omics” & Artificial Intelligence / Machine Learning / Natural Language Processing)**

Technological advances will continue to make more readily available biological omics data - genomics, transcriptomics, proteomics, epigenomics, and metabolomics - for computational analysis. A combination of these high-throughput molecular profiles can be integrated and analyzed - a multi-omics perspective - to provide further insights into the mechanism of disease etiology, diagnosis, and treatment. Linking omics data with clinical, patient-generated data and digital biomarkers from wearables and apps through artificial intelligence, machine learning, natural language processing and computational analysis, will accelerate the identification of precise patient populations likely to benefit from small molecule and biologic drugs. Additionally, omics-based drug development will enable analysis of patient sub-groups who are likely to experience toxicities that can expand or narrow label claims. Continued consumerism and growth of digital- and web-based health technologies technologies will spur changes in patient behaviour, including prevention and management of conditions. Taken together, as more data becomes available through digital transformation, identification of drug targets, and development of precise biologic or therapeutic interventions will further enable true personalized medicine.

This also requires interoperability, the standardization and incorporation of data principles - such as Findability, Accessibility, Interoperability, and Reuse (FAIR) of digital assets - in order to access and process data from multiple sources without losing meaning. These data can then be prepared for mapping, visualization and other representational analysis that does not compromise integrity, confidentiality, and reliability. Other data-driven technology, such as blockchain, can further expand data connections as it creates one reliable and traceable versions of all trial-related data, while also protecting patient privacy and ensuring data quality by linking data cryptographically. Not only can blockchain assist with tracing consent, identifying potential research participants, clinical and participant data management/analysis, and payment portals, but also with research and development (R&D) and supply chain management, ultimately boosting the credibility of studies.

Integrating all these pieces will require a shared economy – where the creation, production, distribution, trade and consumption of goods and services in R&D for product development, liability and accountability are shared. It also refers to areas where physical assets become services. Thus, growing consumer awareness in a shared economy, patients will increasingly designate who has access to their real-world data, which will require the development of legal frameworks to enable privacy and control.

## **2030 (The Shift)**

This period is aptly named ‘The Shift’, as clinical trials will look remarkably different. Enter Virtual Value Chain Orchestrators, who create and capture value by structuring, coordinating, and integrating the activities of previously disparate markets to creates novel markets. These individuals assemble the expertise involved in clinical trials discovery, artificial intelligence, data infrastructure, analytics, patient-centricity, and more, with the required skillsets to know who and when to engage and form strategic alliances. Additionally, there will be a need for disciplined, project-focused players to coordinate and manage the individual components in a complex, growing health care environment. As the public embraces e-commerce, health care organizations need to shift to a more consumer-centric model by improving the consumer value chain currently split across platforms and institutions. Growing numbers of consumers are expecting the same B2B experience set by Google, Microsoft and Apple, whereby patients and participants expect functionality, ease of use, aesthetic design and optionality in choosing their care and providers. The shift brings in technology companies not seen a decade ago, as consumerism and digital transformation will mark the decade. Only companies who companies maintain a flexible approach while embracing technology and continue to evolve will succeed.

## **SUMMARY**

The path to a more robust, efficient, technological, and valued clinical health research ecosystem holds countless opportunities for innovation. In supporting the path forward, the ACRC has released Phase III of its Strategic Plan as a compass to orient provincial efforts and be a champion for change. The priorities of this plan include streamlining research, data-driven innovation, cultivating a highly-qualified workforce, integrating research into care, and establishing economically viable pathways to technology commercialization. Systems-level transformation cannot be accomplished in isolation and will require coordinated efforts and collaboration amongst the clinical health research ecosystem.

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