Clinical Trials in 3D – Decentralised, Data Science, and Digital Transformation

The pandemic has forced much of the world to pivot to remote working practices over the last year, and clinical trials are no exception – site-based trials have many limitations, several of which can be addressed by implementing technology to support a new, patient-centric model for healthcare

Temitope Keyes at Cmed Technology

A new era of clinical research has begun where the old ways of recruiting, conducting studies, and analysing data are simply no longer viable. As sponsors evaluate new clinical technologies and assess their existing systems, the emphasis must now be on those solutions that optimise clinical trial data workflows by bringing the tech to data. Specifically, the new world needs to easily handle disparate and unstructured data, reduce the burden on site staff, and provide a holistic view of the trial data with immediate visibility to give total control from Phase I to IV.

Halt and Catch Fire

2020 was likely the most challenging year our industry has ever faced. After an enforced pause, we have begun to realise that now is the time to address the many challenges plaguing clinical trial data, including the pain around aggregating and integrating disparate data in complex trials, the perpetual data lag from capture to analysis, canned two-dimensional and poor-quality visualisations, the inability of study teams to act in a timely manner, to gain deeper insights, and operationalise the data.

With the right technologies in place, sponsors can realise their goals of running flexible, dynamic decentralised clinical trials (DCTs), embrace the power of data science and concepts such as Big Data, artificial intelligence (AI)/machine learning (ML), and natural language processing. Radically shifting their organisations from staid clinical development through a digital transformation has long been a vision in the minds of clinical trial leaders.

To realise clinical trials in 3D, nimble and agile technology is crucial to be able to manage, explore, visualise, and analyse clinical data effectively, so we can move trials forward in a new reality. It is not about loosely linked point solutions or so-called 'unified' solutions. It is now vital to have a data strategy built around a single technology platform that can support the current and future health innovation of sponsors.

It Is Time to Bring the Technology to the Data

During the COVID-19 pandemic, the whole industry – sponsors, regulators, and investigators – rallied to quickly respond to and overcome the new barriers against trial continuity. There has been a crucial shift towards greater digitalisation, adoption of new patient- and site-centric technologies and procedures that provide for continuing patient safety. Even with these changes, over 1,000 clinical trials were affected in 2020.

In many of these cases, the innovations were just stitched onto already underperforming legacy systems. It is not news to anyone in the industry that we have long had a history of suturing different bits and pieces from different systems to give functionalities for different trial needs (see **Figure 1**).

This intricate patchwork of systems was never designed as a functional and cohesive whole. Each system has its own databases, processes, and configurations

but, more importantly, most teams may not appreciate the effects of their own actions to groups up and downstream from themselves.

As such, trial data and information are, unsurprisingly, not always properly integrated, or are unavailable holistically. Add to this cascading data from sources such as real-world evidence (RWE) and wearables, imaging, biomarker labs, and electronic patient reported outcomes (ePROs)/electronic clinical outcome assessments (eCOAs), and it falls to clinical operations and data management staff to connect the dots, often separately. Consequently, clinical teams compensate by creating 'workarounds', the most common of these being pulling extracts into Excel. In an era of increased data volumes and complexities, this hinders immediate data availability and ultimately delays critical trial decisions. Sponsors' various teams are prevented from getting the benefit of a 'single source of truth', limiting true patient centricity, and eroding investments in upstream analysis tools (e.g., SAS®) by hindering reporting and visualisation.

In addition, we need to consider that a lot of the individual systems used today are no longer fit for purpose. An obvious example of this are standalone electronic data collection (EDC) platforms. These can be seen as rigid and limited as they were never designed for the agility we need today and do not always even allow real-time access to, or the querying of, fully integrated data.

New risk-based approaches and the supporting technologies are commonly accepted by regulators, but some in the industry seem slow to embrace them. Using analytics is rarely supported or considered, limiting programming options and keeping the process cumbersome and ineffective. New systems must provide effective and user-friendly visualisation of trends across patients, sites, and trials. They must support multi-modal monitoring of trial performance against key indicators – even in the most complex trials. Ultimately, the objective is still to increase data quality, patient safety, and efficacy.

The End of Distinct Data Management and Clinical Roles

Thought leaders in the industry have, for some years now, speculated about the future of a standalone data manager role as technology advances and more modern technology environments bring less need for skilled programming. Today's technology, with a focus on centralised and holistic data, introduces new opportunities to the data management and clinical world.

We agree with the industry organisation Society of Clinical Data Management that internal teams, such as data managers, are evolving towards data science, providing remote monitoring of trial data in real time, working in partnership with the clinical research associate, who is at site ensuring trial safety and efficacy, enabled by tools that use readily available phone and tablet devices to capture images, videos, and documents. This central position

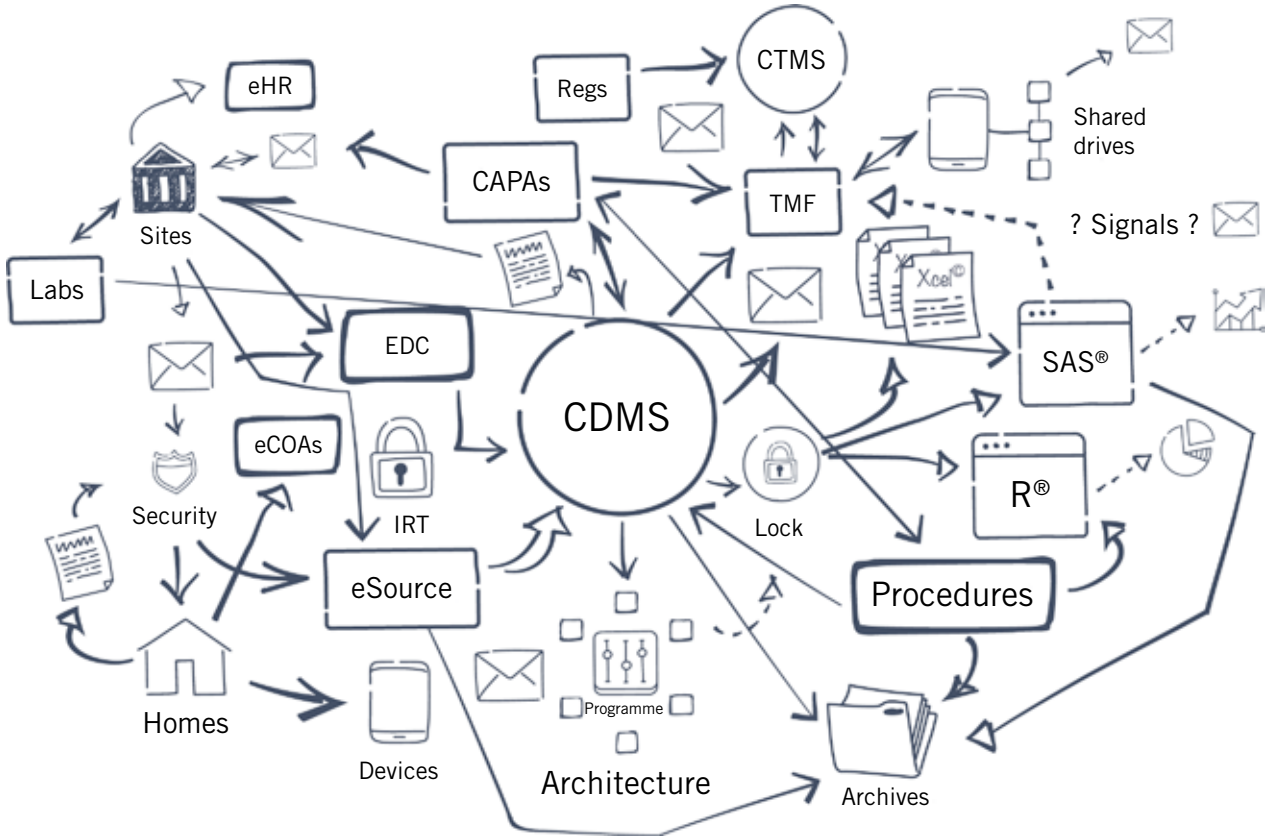

Figure 1: A patchwork of clinical trial systems. CAPA: corrective and preventive action; CDMS: clinical data management system; CTMS: clinical trial management system; eHR: electronic health records; IRT: interactive response technology; TMF: trial master file

provides for a more holistic data review allowing a more considered focus on the key essentials to a trial. With greater domain knowledge and supported by sophisticated analytical software, they create a new paradigm in trial efficiency and effectiveness.

When we consider the opportunities for increased efficiency, improved data quality, greater patient safety, and oversight, together with new levels of job satisfaction and career choices, what is holding some of us back?

#NoGoingBack – A Reimagined Trial Systems Ecosystem

The pandemic has been a much-needed catalyst to spark change in the industry and driven the increased focus on running virtual trials. The terms 'direct data capture', 'remote monitoring', and 'remote trial management' are now becoming frequently discussed options.

When conducting clinical trials of the future, sponsors will look to transform their trials through use of a single cohesive platform to collect, review, analyse, and visualise all their disparate trial data. With the volume and variety of data sources increasing (e.g., eHRs/electronic medical records, RWE, EDC, ePRO/eCOA, wearables, genomics, biomarkers, and lab and CTMS, to name but a few), it is critical to have a defined data strategy to improve efficiency.

The choice of technology must be purposeful, with a primary aim of removing complexity, streamlining processes, accessing adaptable functionality, and preparing for the knock-on benefits that come from immediate visibility of all the currently disparate data.

Clinical trials in 3D requires, at its core, a revolutionary platform to give sponsors the ability to monitor data quality and integrity in real time, and provide actionable visualisations and analytical power to track study progress and site performance across all the integrated data.

Of course, such an end-to-end platform must support integrations to other systems, robust processes, and the ability for cross-functional interaction. The power and capability that comes from using a truly advanced technology brings the conduct of decentralised or virtual clinical trials within easy reach. With the maximal use of analytics and AI/ML, the trials of tomorrow will increase job satisfaction and study quality, as well as improve efficiency, further supporting speed to market and allowing clinical research teams to join the digital revolution so many other sectors have already realised.

How Sponsors Can Revolutionise Their Trials

It will undoubtedly take time to arrive where sponsors say that they currently are, indeed, conducting clinical trials of the future. The journey can start by committing to five steps:

- **Transform the clinical technology ecosystem**
  Reduce the number of systems and replace old legacy systems. Sponsors should shift to more modern and innovative platforms that would eliminate the need for workarounds.

- **Choose technologies that mimic consumer systems**
  Prioritise the user experience already championed by consumer-orientated systems elsewhere, and strive for ease of use. Consumer systems are interactive and engaging – especially important with systems designed to be used for home visits or patient engagement.

- **Reconsider data utilisation**
  Update data monitoring processes to make use of today's technology. Be more critical of data flows within clinical trials to remove bottlenecks or choke points, with an acknowledgement of acceptable risks. From that review, new skill sets will become evident – perhaps today's data managers become tomorrow's central data monitors or data scientists?

- **Support sites to allow the conduct of DCT/virtual trials**
  Sites need the opportunity to update their procedures, including more effective/efficient systems that allows trial virtualisation and central data monitoring. eSource is a straightforward switch, which can save a huge amount of time and effort at site. Data visualisations would increase clinical awareness and improve patient safety and oversight.

- **Engage all stakeholders including sites, regulators, and patients**
  Secure support from senior executives and make sure to ask for feedback from participants.

Conclusion

The costs associated with these new technologies are not small, but with thoughtful choices of application together with updated processes that take advantage of the technical options, we can increase profitability, throughput, and data quality, offsetting any initial implementation costs.

Certainly, there are substantial costs involved in continuing to work with the current patchwork of systems and their associated processes. With the need to manage more discrepant and complex data, in greater volumes than ever before, costs will only increase, creating ever more friction with study teams. We say the time to act is now.

Temitope (Tope) Keyes has 22 years of clinical R&D experience, which began on the sponsor side, with the majority of that primarily in the eClinical solutions space. She has a passion for technology and its ability to advance vital clinical research and successful trial execution. Her experience includes pre-clinical purchasing and clinical outsourcing roles at AstraZeneca and Sanofi, followed by almost 15 years in business development with the likes of ERT, Synteract, Datatrak, and Axiom Real-Time Metrics. Tope joined **Cmed Technology** in 2020, where she drives the sales and marketing for the encapsia clinical technology platform.