The Digital World of Clinical Research

Established in 1996, SQN Clinical entered the clinical research industry and quickly became an established leader in biometrics. The last two decades have seen significant changes in clinical trial processes as technology has come to the forefront, driving processes in every sector. However we are still seeing numerous active trials following the same processes as were followed in the 90s – mountains of paper and multiple transcriptions of data adding human error to the mix.[1] Pharmaceutical and biotech companies are under immense pressure to continue to develop life-changing treatments, whilst reducing cost and time to market to increase the margin for return on investment. If we continue to compare the pharmaceutical industry with other sectors, we see that there is still a long way to go. For example, finance, which is as heavily regulated as the health sector, has made incredible steps towards a digital world, from emerging online-only banks to contactless and digital payments. So how can we harness this technology revolution in healthcare? Regulators such as the FDA and EMA continue to publish extensively in preparation for a digital world[2] and as we begin to see pharma companies exploring a more cost-effective decentralised approach to clinical research,[3] technology will surely take centre stage to make this a reality.

At SQN we have driven and innovated the change in trend from paper to electronic data capture (EDC) solutions and from assessing the tools in the marketplace we quickly established that for a large amount of therapeutic areas, these were not flexible enough to fulfil the evolving needs of clinical research and so we created SQN Health – our ecosystem of tools and solutions to facilitate the shift to a digital world in healthcare.

Electronic Data Capture, the First Step Towards Change

A more accurate and efficient way to collect study data was required, which was met by evolving technologies, paving the way for electronic data capture. As a result of EDC, since 2000 the volume of data in clinical trials has risen by more than 50%, with more companies able to conduct trials more effectively. However, EDC has also added to the complexities of running a trial, not only increasing costs, but also adding to the time managed by site staff.[4] Many EDC systems still suffer from slow deployment time, ongoing maintenance and lack of flexibility. We found a number of oncology and rare disease trials are impacted quite severely due to the complexity of trial designs. SQN changed the EDC market with its own innovative technology, previously known as Syneclin, now a part of our clinical ecosystem, SQN Health.

Our system was designed around the needs and feedback from our clients and system users, which translated into an intuitive system with simple yet sophisticated electronic case report forms (eCRF). Built from a validated library, these eCRFs deliver standardisation and efficiency, reducing study setup time considerably. Real-time field and form-based validation enhances the quality of data directly at the point of collection and as a result reduces both clinical monitor and data management intervention. SQN Health is fully integrated with our suite of advanced analytics, ePRO data collection and multi-version MedDRA and WHODrug coding dictionaries. SQN Health's flexibility in study design has been a deciding factor for a number of pharmaceutical companies to deviate from their usual preferred systems for late-phase oncology and post-marketing studies.

Technology is the gateway to reduce costs by speeding up clinical research. Although adopting a digital approach into clinical research has at times been slow and complex, the industry has a need and desire to accelerate this. This would mean that current EDC systems would need to extend their capabilities to eliminate time-consuming, manual paper-based processes. Though some of the issues lie with the sites embracing such technologies to their full capacity, there has also been quite a significant change in perspective. With 30 billion internet searches a day relating to healthcare,[5] patients seem more interested in their health than ever before. An expectation set by the regulators has now meant the industry must adopt a more patient-centric approach to clinical research, as real-world data not only gives better insight, but the patients' engagement would impact the trial in a huge way.

Putting Health Back into the Hands of Patients

Unprecedented amounts of information are available in today's world, and so patients have a greater understanding of their health and any condition they have. Patient-reported outcomes (PRO) is a bridge which helps clinicians to better understand a disease from an individual level.[6] Patient self-assessment has had a positive influence in clinical decision-making as important symptoms and quality of life aspects are better discussed.[7] It is not surprising that because of this, the number of drug approvals with PRO elements was at almost 77% between 2011 and 2015, with a number of oncology-related treatments being the most prominent therapeutic area to adopt such patient-centric methods.[8] The benefits of PRO instruments however have been limited by the traditional use of paper-based questionnaires. In this technological era, PROs can now be reported electronically, similarly to EDC. Around 2.1 billion people worldwide own a smartphone device, with this number expected to grow significantly by 2020.[9] With this in mind, we are able to take ePRO as a concept from clinical sites to integration into a patient's life. Generally, missing information and data entry errors can be reduced and avoided, and patients are encouraged to participate through pop-up alerts or gamification, increasing compliance. Real-time tracking of the patient captured means it is instantly accessible by the clinical team, supporting data patient safety.

SQN Health ePRO was built with the progressive nature of the population of smartphone users in mind, utilising all features of a mobile device to better involve patients in a trial as well as providing valuable data to the clinical team and sponsor. We have taken the traditional idea to capture questionnaire-based data such as EQ-5D or SF-36 etc, as well as diary data specific to the study design, and incorporated graphical assessments using diagrams, image and video upload where appropriate, plus a dedicated "Wellness" section of the application which allows patients to freely report on a number of health categories which may be important to them. Our capabilities don't stop there; we are bridging the gap between clinician and patient to allow direct communication, allowing patients to have a full grasp of their health through advanced in-app analytics. With all functionalities available, both online and offline data capture opportunities are never missed.

1 – SQN Health data eco-system

Excitingly, the FDA have recently approved an electro-cardiogram monitor on the new Apple Watch, with a long list of other components within Apple products pending approval.[10] An average site visit costs anywhere between $3000 and 7000 per patient and as such virtualising a study through video, home tests and ePRO tools could reduce this cost to as little as $1000 per patient per visit.[11] As a result, a number of pharmaceutical companies are currently trialling a decentralised approach to clinical research as disruption to patients is minimised and site costs are dramatically reduced. With technology such as the Apple Watch and other wearable devices gaining approval, this paves the way for a decentralised approach becoming more commonplace over the next few years. During our development stage, we built SQN Health with this progressive movement in mind, harnessing the ability to connect such devices and hardware to synchronise with our ePRO application. PRO and biomarker tool assessments provide a wealth of rich information directly from patients suffering from a particular condition; however, due to the vast amount of data collected, aggregating this has always been a challenge.[12]

Current and emerging technology is also enabling electronic patient consent (eConsent), eliminating the current extensive paper-based processes. This approach is already built into our SQN Health ecosystem and ready for deployment.

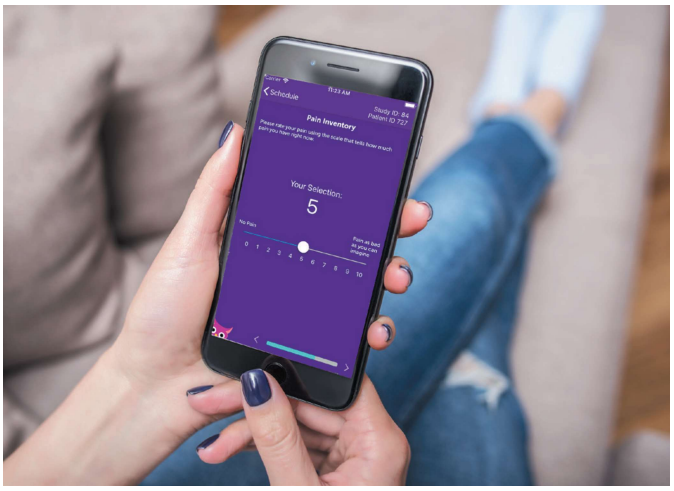
2 – eCRF forms adapted from paper to digital

Advancing Analytics in an Era of So Much Data

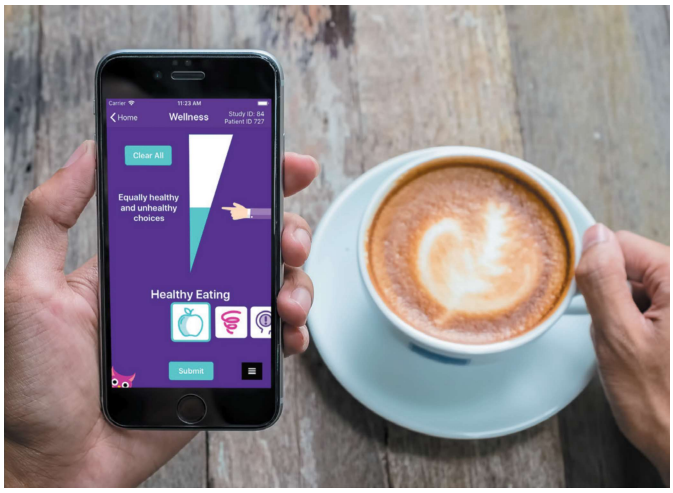
We have become accustomed to running clinical trials using an array of different data capture methods, from paper to electronic, however these disconnected methods result in disparate data which cannot be cross-compared in an effective manner, making in-trial decisions increasingly difficult. Clinicians require a holistic view of trends, issues and overall trial performance to assist with the efficiency of a trial. There is a critical need for real-time access, analysis and oversight of study data in order to make important decisions while uncovering detrimental in-trial issues as they arise. To achieve this, investment in a robust study data ecosystem is required. This ecosystem must collect data from multiple sources, and merge these focal points into one central dashboard for effective and comprehensive study oversight.

As part of SQN Health, we have built a robust, advanced data analytics suite which supports project management and clinical oversight in a trial. Our dashboards and drill-down reports are designed to provide real-time access to multiple data sources in a centralised location, enhancing safety oversight and early triggers of site performance issues, enabling action for escalation processes. As standard, the suite encapsulates a set of dynamic data visualisations displaying key study metrics. However, our flexible in-house analytics platform enables the build of bespoke data visualisation options tailored to each sponsor and study requirement. Our analytics suite structures and displays complex information in an intuitive and effective way. Unlike other data visualisation platforms, we designed ours with clinicians in mind. Users are able to explore study data ranging from broad data aggregations to specific data points giving a comprehensive view of how the trial is running in real time rather than waiting for formal statistical analysis post trial completion.

3 – Digital allows for graphical eCRF collection



4 – ePRO questions are a more efficient way to collect patient reported outcomes



5 – Wellness allows for patients to freely report on their health

How far can we go with analytics? With the vast amount of data available to us, we are able to experiment further with the capabilities advanced analytics could have in clinical research. Clinical site monitoring has previously relied heavily on source data verification (SDV). However, evidence has shown that SDV is far less useful that we previously thought.[13] Mounting analysis has recently found that centralised monitoring activities could have identified 95% of the findings of on-site monitoring visits.[14] This has led to the adoption of a risk-based monitoring (RBM) approach, which combines centralised and off-site review of study parameters with an adaptive on-site monitoring approach that places greater emphasis on risk mitigation activities.[15] Computer-based techniques incorporated into advanced analytics can be much more reliable and efficient as a detection tool using this approach. Additionally, we hear a huge amount about the development of artificial intelligence and machine learning. With the right algorithm in place, clinicians could identify and predict trends, mitigating risk before it arises. The team here at SQN continue to evaluate certain aspects of this with a view to including it into our advanced analytics suite in a future release.

Conclusion

The tools and services encapsulated under SQN Health provide the clinical trial market with the ability to adapt to a changing environment. With an abundance of enabling technology and a generation with more electronic devices to hand than ever before, a more patient-centred, cost-effective, decentralised approach is possible whilst giving clinicians better oversight of a

6 – Advanced analytics give complete trial oversight

7 – Drill down from high level to more detailed eCRF pages for a better understanding of the trial as it progresses

trial and bringing drugs to market in a more timely and efficient manner.

For more information on SQN Health please visit our website www.synequanon.com or contact us on +44 (0)1379 644449.

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