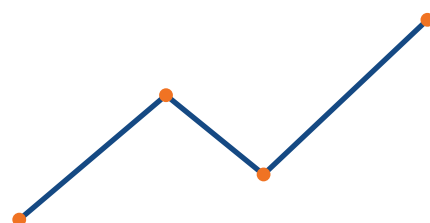


2022 PHARMA TRENDS REPORT



2022

RESHAPING INTEGRATED
CARE WITH AI&ML



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INTRODUCTION

The global pharmaceutical industry found itself right at the centre of the unprecedented changes that COVID-19 brought about. Two years since, pharma companies continue to aggressively work towards innovative solutions that can help fight the pandemic, while pivoting to strategies helping build resilience against supply chain disruptions and demand fluctuations. Research efforts scaled, drug manufacturing and marketing accelerated, and investments in digital technologies saw an uptick.

2021 saw pharma companies revamp their supply chains to drive growth and manage costs. Digitalizing the supply chain helped ensure greater transparency and therefore visibility. Routine re-assessments helped prepare for further vulnerabilities and finally, expanding networks of suppliers helped reduce the dependency on existing sources for critical raw materials.

COVID-19 also fast-forwarded digital transformation for the pharma industry by more than five years.¹ This transformation was already well underway last year, with a visible increase in the use of AI, ML, and big data in pharma. From drug discovery and clinical trials to patient management and pharmacovigilance, the power of digital technologies enhanced decision-making and optimized processes across functions.

As the revenue of the worldwide pharmaceutical market grew threefold – from \$390 billion in 2001 to an impressive \$1.3 trillion in 2020² – it was clear that this was the right time for investments in R&D. Returns in R&D investments saw an increase for the first time in six years after the pandemic hit, and rightfully so, as pharma companies around the world accelerated their efforts to develop and produce vaccinations.³



¹<https://www.pharmaceutical-technology.com/news/covid-19-accelerated-digital-transformation-of-the-pharma-industry-by-five-years-poll/>

²<https://www.statista.com/statistics/263102/pharmaceutical-market-worldwide-revenue-since-2001/>

³<https://www.thepharmaletter.com/article/r-d-return-on-pharma-investment-picks-up-for-the-first-time-in-six-years-despite-pandemic>



As the pandemic steps into its third year in 2022, pharma companies have learnt, unlearnt, and built resilience in the face of continued uncertainty. COVID-19 aside, the global population is ageing; the number of people aged 65 and above is expected to double to more than 1.5 billion by 2050.⁴ This demographic shift, coupled with a rise in chronic diseases,⁵ has seen global demand for innovative healthcare solutions surge.

This year will continue to witness a rise in digital health. Digital technologies will improve patient care, enable greater transparency, improve drug development and production, and provide cost-effective solutions to treatments.



 ⁴https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/undesa_pd-2020_world_population_ageing_highlights.pdf

 ⁵https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/undesa_pd-2020_world_population_ageing_highlights.pdf



THE RISE OF DIGITAL HEALTH

The potential of AI, ML, and big data to transform the value chain

Advanced digital technologies and increased patient expectations have already impacted health care worldwide. In 2022, the pharma industry is all set to embrace digital health to deliver more seamless, integrated care experiences to patients. Digital transformation will continue to accelerate, improving production, drug development and discovery, and building supply chains that are resilient to further disruptions.





TREND 1: DIGITAL TECHNOLOGY IN DRUG DISCOVERY AND DEVELOPMENT

According to ABI Research, AI spending in the healthcare and pharmaceutical industries is expected to increase from \$463 million in 2019 to over \$2 billion by 2025.⁶ Surveying pharma companies on this front, Pharmaceutical Technology reports that over 70% of the respondents anticipate drug development to be the area most impacted by smart technology implementation.⁷

Thousands of diseases exist today without a therapy. The health data for these diseases lies spread across various data types such as image, text, speech, and numerical data, which can be leveraged using multimodal AI. Multiple intelligence processing algorithms here can help discover disease pathways as well as personalize treatment and prognosis for patients.

Technologies such as big data and predictive analysis can be used to anticipate how drug molecules will behave – one of the most significant challenges to drug development. Predictive models can consider historical information on how certain targets behaved while interacting with other proteins. Using this information, researchers can now explore multiple drug molecule combinations using mathematical simulations and narrow down on combinations that deliver the most accurate results.

Predictive analytics will also promote collaborative efforts between drug research and drug development teams. Drug development teams can collect and store information on millions of compounds for possible candidate molecules, while drug researchers can cross-reference this information with their own research to predict the behaviour of newly discovered compounds and easily find the formulas of new drugs that will succeed in the market.

This year will also see the rapid implementation of AI-enabled tools. Case in point, a leading pharmaceutical firm⁸ is working on an AI platform for medical imaging, where digital applications will be made available to support radiologists. Using pattern recognition, powered by deep learning, the algorithm helps detect chronic thromboembolic pulmonary hypertension (CTEPH) on CT scans. This helps drive early diagnosis and treatment, improving outcomes for patients afflicted by this severe disease.

⁶<https://www.abiresearch.com/press/covid-19-pandemic-impact-global-rd-spend-ai-healthcare-and-pharmaceuticals-will-increase-us15-billion-2025/>

⁷<https://www.pharmaceutical-technology.com/news/covid-19-accelerated-digital-transformation-of-the-pharma-industry-by-five-years-poll/>

⁸<https://www.bayer.com/en/investors/pharmaceutical-industry-megatrends>



EVOLUTION OF DYNAMIC CLINICAL TRIALS

Dynamic trial designs rooted in technology to meet the changing lifestyles of patients

With the advent of the pandemic, a growing number of inpatient healthcare services are now delivered more effectively at home or in outpatient ambulatory facilities. Considering these changes, clinical roles need to be optimized and businesses will need to embrace the use of advanced technologies to deliver more integrated care to patients.

TREND 2: HYBRID MODELS OF TRIAL EXECUTION GAIN TRACTION

The year 2020 halted clinical trials as lockdowns were implemented worldwide. 2021 witnessed a sharp increase in digital solutions to promote remote patient monitoring (RPM) and enhance digital clinical trial models. 2022 is all set to take these developments further by merging both physical and digital models to make clinical trials more patient-centric, enabling patients to choose the mode of participation as per their comfort.

From oximeters, emails, and tablets to eDiaries and continuous glucose monitoring, decentralized components are quickly becoming mainstays for clinical trials. A growing interest in decentralized clinical trials (DCTs) is expected to see more momentum in the coming year with more than 35 specific decentralisation and/or virtualisation elements in clinical registry protocols of trials involving a drug intervention.⁹

Pharma companies across the world are merging these decentralized components with traditional clinical trials to arrive at hybrid models. Participation options have extended from clinics to homes, local pharmacies, and local doctors, keeping patient convenience at the heart of it all. To this end, AI-enabled tools will help clinicians streamline participant screening for trials as well as ensure access to historical and real-time data to make meaningful predictions on trial outcomes, regardless of the patient's physical location.



⁹<https://www.clinicaltrialsarena.com/analysis/2022-forecast-decentralised-trials-to-reach-new-heights-with-28-jump/>



Telehealth to monitor patients remotely will continue to see great adoption both among doctors and patients. A survey conducted by Pharmaceutical Technology revealed that 83% of the respondents considered telehealth services to be effective, while 78% believed their health concerns were proactively addressed.¹⁰ However, businesses must explore ways to make telehealth more accessible to patients over the age of 65, who often face difficulties in using digital services.

Integrating AI in telehealth will help healthcare providers work more efficiently. Real-time data obtained can help HCPs input patient notes, write prescriptions, and add related data that pharmacists can readily access at their own locations.

Further advancements are expected to be seen in RPM, with the global RPM systems market projected to hit over \$1.7 billion by 2027.¹¹ AI-powered dashboards to monitor drug impact, measured through wearables, have seen an increase in adoption. Patients are now required to wear medical devices that will measure critical health data such as heart rate, blood pressure, and temperature, to then provide prompts such as reminders to take medication. This level of monitoring can help patients with chronic diseases manage their own health and be better prepared for any fluctuations in their condition.

Cloud computing will also prove to be a cost-effective way to analyze the complex data associated with clinical trials. Many pharma companies today have embraced cloud computing and AI in drug research, development, and production processes to eventually reduce the time required to advance drug candidates to clinical studies and develop treatments.¹²



 ¹⁰<https://www.clinicaltrialsarena.com/analysis/2022-forecast-decentralised-trials-to-reach-new-heights-with-28-jump/>

 ¹¹<https://www.pharmaceutical-technology.com/comment/digital-pharma-trends-artificial-intelligence-2/>

 ¹²<https://www.insiderintelligence.com/insights/remote-patient-monitoring-industry-explained/>



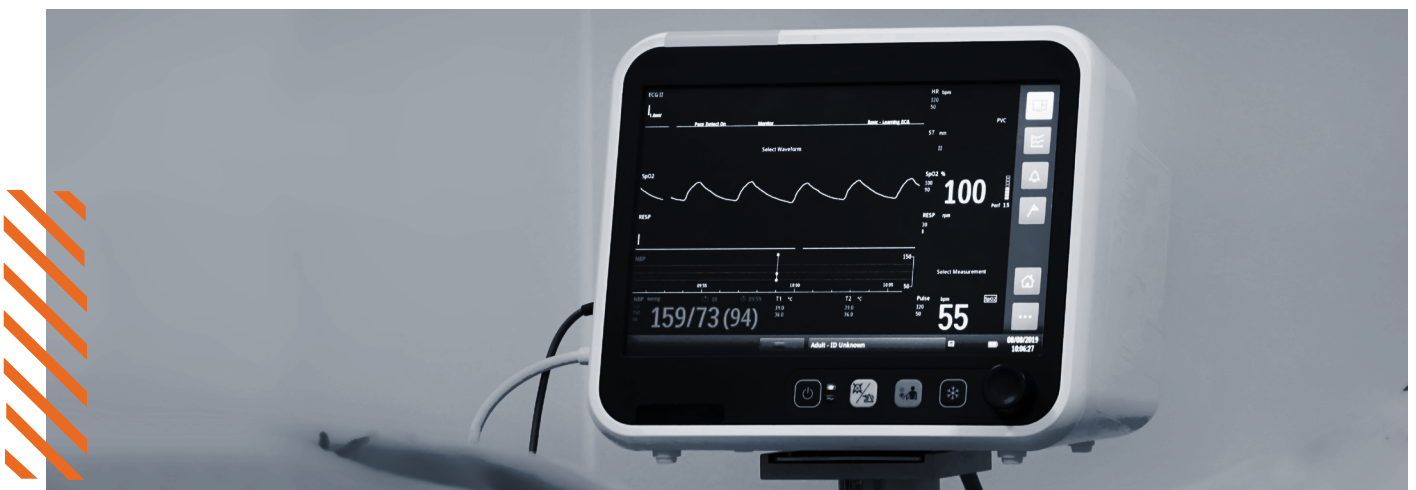
TREND 3: BLOCKCHAIN TECHNOLOGY TO FINE-TUNE TRIAL OPERATIONS

The advent of blockchain technology in pharma was a natural course of action. The key pillars it promises – transparency, reliability, scalability, and security – are the need of the hour for the industry. Whilst it has seen great adoption in transforming supply chains, it has also helped bring about much-needed visibility into clinical trials.

Adopting blockchain across R&D can help bring transparency to clinical trials by ensuring that data is secure and tamper-free. All clinical data can be made available for all to see, along with real-time data on progress. This solution helps meet the requirement that all clinical trials should be recorded and published on a publicly accessible database,¹³ while preventing data manipulation practices that could undermine the integrity of published research.

Such transparency will also help tackle the problem of counterfeit medicines and prevent sub-standard medicines from reaching patients. With a trusted record of all data, companies will be able to accurately identify its source, further fueling patient trust. An important blockchain feature, smart contracts, when combined with IoT, can automate execution agreements so that all participants can be certain of the engagement, without any intermediary's involvement or time loss. This can help reduce transaction times and secure trial data.

Blockchain can also be leveraged to decentralize data. In terms of clinical trials, multi-center trials can be connected seamlessly to enable participants and investigators to report remotely – while remaining within the overall structure of scientific and regulatory controls.



¹³<https://www.federalregister.gov/documents/2016/09/21/2016-22129/clinical-trials-registration-and-results-information-submission>



CONTINUED FOCUS ON PERSONALIZED THERAPY

Understanding genetic makeup and tailoring formulations of drugs

Health care is in the midst of a shift in approach from diagnosis and treatment to prevention and wellbeing. Consumers are increasingly becoming active participants in their own health care, fueled by the ready availability of digital health tools. Digital medicine takes this a notch higher to gather data, understand genetic makeup, and personalize treatment.

TREND 4: PRECISION MEDICINE

Tailoring the formulation of drugs to a specific diagnosis is no longer in the distant future. The market for precision medicine is expected to increase from \$39 billion in 2015 to reach \$87.7 billion by 2023.¹⁴ Biomarkers are already being used to identify tumors and develop drugs specific to exact diagnoses with the highest level of effectiveness. However, interpreting genomic data requires painstakingly curating knowledge from vast biomedical literature. Natural language processing (NLP) can play a key role here in interpreting big data for precision medicine. It can be used to review unstructured electronic health record data and pinpoint the characteristics that can better identify disease variants.

To put it simply, while precision medicine can identify the phenotypes of patients with unique healthcare needs, AI can leverage sophisticated computation to generate insights and empower clinician decision-making through augmented intelligence. A paper published in the NCBI outlines the development and training of a support vector machine using patients' gene expression data to predict their response to chemotherapy. Their data shows encouraging outcomes across multiple drugs, paving the way for precision medicine to reach new heights.¹⁵



¹⁴<https://www.prnewswire.com/news-releases/precision-medicine-market-size-to-exceed-87-billion-by-2023-global-market-insights-inc-599454691.html>

¹⁵<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7877825/>



KEY TAKEAWAYS

1. HYBRID PATIENT CARE MODELS ARE HERE TO STAY

Decentralized components in clinical trials will encourage wider participation and extend direct care that is location agnostic. Capitalizing on the increasing popularity of wearables across therapeutic areas will help deep phenotyping, detect and interpret adverse events, and enhance clinical trial participant recruitment. Offering patients the option of choosing their clinic sites will further help pharma companies deliver a seamless experience powered by digital medicine.

2. INVESTMENT IN DIGITAL TECHNOLOGIES

The year will continue to witness accelerated digital transformation and increased investments in AI/ML and big data. NLP and supercomputing, specifically, are likely to unlock profound insights into disease progression and clinical trial outcomes, which will then inform a comprehensive drug lifecycle.

3. R&D INVESTMENTS SET TO SHOW SIGNIFICANT RETURNS

Returns on R&D investments rose for the first time in years in 2021. Continuous investment in research will help meet the immediate demand for effective vaccinations against COVID-19. From a long-term perspective, the rapid growth of personalized medicine backed by AI-enabled tools will yield fruitful results to match evolving patient expectations.





CONCLUSION

Digitization has positively impacted the pharma industry and has helped the start of a greater, more consistent level of patient care. Advanced technologies are now providing benefits to patients that go beyond diagnosis: augmenting conventional healthcare approaches to enable more holistic care. People can now gain greater access to their health data, enjoy a greater level of confidence in treatment options, and determine actionable insights, enabled by digital applications.





TRANSFORM THE VALUE CHAIN WITH AI, SCALE WITH THE GROWING MARKET



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