

SPER NEWSLETTER

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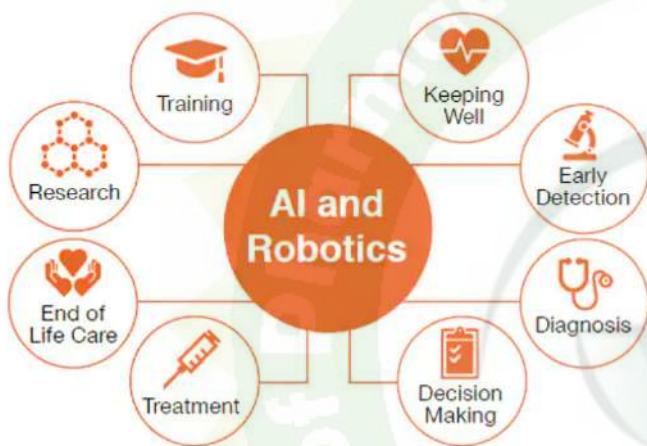
ARTIFICIAL INTELLIGENCE (AI) & ROBOTICS IN HEALTHCARE SYSTEM

Simulated intelligence is getting progressively refined at what humans can do, yet more effectively, more rapidly, and at a lower cost. The potential for both AI and mechanical technology (robotics) in medical care is huge. Very much like in our consistently lives, AI and advanced mechanics are progressively a piece of our medical services eco-framework.



The idea of robots in improving healthcare is not new – as early as 1985 there was a plan to transform industrial robots into precision machines for surgery and beyond.

The appearance and improvement of the DaVinci robot in the early 2000s approve how far technological development has come.



The use of Artificial Intelligence ("AI") innovation in the healthcare industry has without a doubt altered clinical practice. There is incredible hopefulness that the AI application can give considerable enhancements in every aspect of medical services from robotizing day-by-day drudgery and routine clinical assignments to performing diagnostics and treating functions. The upsurge in the utilization of AI and clinical robots in medical services settings has even incited particular organizations to devise explicit standards and rules to oversee the innovation.

In any case, regardless of how great, advanced mechanics like robots in medical services is as yet a framework constrained by people. The genuine enchantment of the 21st-century robot-specialist will come from computerized reasoning frameworks that can adapt such a lot that it will outflank the best specialists by consolidating all the accessible information in every clinical storehouse.



Artificial intelligence eliminates the manual wellbeing framework into programmed, in which people lead the standard work or tasks in medical practice to the administration of patients and clinical assets. The specialized difficulties of digitizing wellbeing administrations present new issues when designers make computerized reasoning frameworks to complete the assignment.

Artificial intelligence offers the potential for an enormous improvement in understanding consideration and a decrease in medical care costs. The expanding populace is relied upon to have the option to support the interest for wellbeing administrations. The wellbeing administration area needs imaginative answers to discover how to be more viable and productive without inordinate consumption.



This is the place where innovation comes in for the arrangements. Quick advancements in innovation, particularly in the fields of AI and mechanical technology, can help supplement the medical care industry.



Computer-based intelligence and advanced mechanics in medical services utilizing man-made consciousness grow rapidly, particularly for early identification and symptomatic application.

Computer-based intelligence is turning out to be all the more remarkable simultaneously. It empowers them to do what people perform – frequently more proficiently, effectively, and at a decreased expense.

SCOPE OF ARTIFICIAL INTELLIGENCE

In 2011, a report by IBM estimated that there is approximately 161 billion GB of data related to healthcare available on the internet. With that significant quantity of data available online, AI is destined to become a game-changer in improving healthcare and restrict the current trend of unsustainable spending on healthcare.

Artificial Intelligence can offer guidance on drug therapy monitoring, drug interactions, and drug formulary selection. Artificial intelligence can change our focus from the dispensing of medications towards providing a wider range of patient-care services, Pharmacists can use AI to help patients get the best therapeutic benefit from their medicines and also offers them complete information regarding side effects along with figures from the ADR database.



ARTIFICIAL INTELLIGENCE IN NEW DRUG DEVELOPMENT

- Artificial Intelligence in pharma is emerging and gaining much importance to save more lives than ever before.
- Pharma businesses are constantly demanding the involvement of AI to increase the success rates of potential drug candidates and to reduce the cost of production as well.
- Recently, a study was published by the Massachusetts Institute of Technology (MIT) which stated that only 18.8% of drugs successfully pass the phase of clinical trials.
- Additionally, it may cost between \$ 161 million to \$ 2 billion to complete the entire clinical trial process and get FDA approval.

AI in Virtual Screening: Funding by application

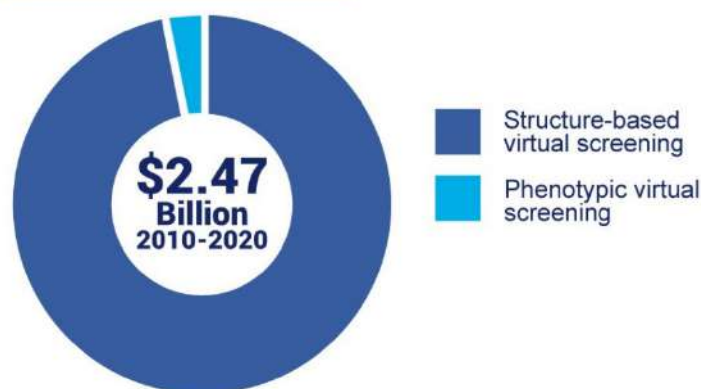


Image Source: 'Structure-Based Virtual Screening Heating up AI in Drug Discovery Market' ;IDTechEX; June 2021

HOW IS AI APPLIED IN DRUG DISCOVERY?

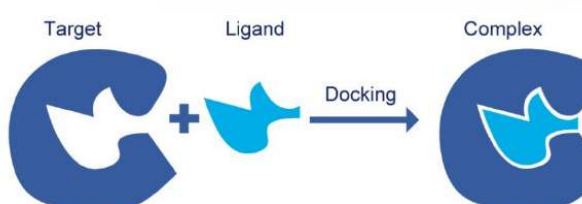
As per the recent reports published in IDTechEx, basically, areas of virtual screening and *De Novo* drug discovery involve two main aspects of drug discovery in which significant activity is occurring. Specific applications such as structure-based virtual screening are receiving significant attention, but it is not yet fully clear which aspect of AI in drug discovery will have the most impact in the future.

While structure-based virtual screening is enabled by the ready availability of structural data on which to apply AI algorithms, the complexity of biological systems means that structure and fit of compounds do not indicate a compound's safety and efficacy as a drug. Technologies such as phenotypic virtual screening and *de novo* drug discovery may hold more promise for first-in-class and even multi-target drugs, and all aspects will be supported by the application of AI in the prediction and optimization of a compound's properties.

This report covers four aspects of the drug discovery process:

- Virtual screening, including structure-based virtual screening, ligand-based virtual screening, and phenotypic virtual screening
- *De novo* drug design
- Lead optimization (predicting and optimizing compound properties)
- Chemical synthesis planning

Structure-based Virtual Screening



VARIOUS PHARMACEUTICAL AND BIOTECHNOLOGY COMPANIES INVOLVING AI FOR DRUG DEVELOPMENT



Image Source: 'Artificial Intelligence in Drug Discovery and Development; Nexocode; June 2021



• CEO of Novartis, Vas Narasimhan is one of the forward-looking digital leaders in healthcare who is constantly advocating the role of AI, predictive analytics, and big data in pharma.

• Novartis is now embracing advancements in AI Technology to create improved and advanced treatments for fatal diseases. Currently, Novartis uses machine learning to distinguish digital cell images by treating each cell with various experimental compounds.

• Machine learning algorithms help in speeding up the collection and grouping of similar compounds together, before passing on the clinical data to researchers.



• Bayer and Merck & Co uses AI algorithms to identify pulmonary hypertension and were granted the Breakthrough Device Designation from FDA for artificial intelligence software that aims to support clinical decision making of chronic thromboembolic pulmonary hypertension (CTEPH).

• This form of pulmonary hypertension affects nearly 5 people per million. Per year around the world.

• The software aims to detect certain patterns faster and AI analyzes image findings from cardiac, lung perfusion, and pulmonary vessels in combination with patient's history and then pass the insights to radiologist leveraging this technology.



• Verge Genomics involves automated data collection and analysis in their drug discovery process. This automation helps to create solution to some of the most complex diseases known today, including ALS and Alzheimer's.

• Verge Genomics also map out hundreds of genes responsible for causing disease and then finding drugs that target them all at once.

• Their platform is specifically designed for predicting novel treatment for neurological disorders and also aids in reducing cost of drug development.





UPCOMING PHARMACEUTICAL COMPANIES & HEALTHCARE SECTORS TAPPING IPO MARKET

Mounting on high investor interest in the pharma/healthcare sector, five big pharma giants are tapping the initial public offering (IPO) market over the next couple of weeks in August 2021 to raise a sum over Rs 8,000 crore. This list comprises of -

1) Emcure pharma which is India's 14th largest pharma company in sales, produces mainly tablets, capsules, and various other common injectables) issued Rs 4,000-crore.

The Emcure pharma is backed by Bain Capital, one of the world's largest leading private multi-asset investment firms since 2013.



2) Krsnaa Diagnostics raised Rs 1,200 crores. Started in 2010, one of the fastest-growing diagnostic chains in India. With over 1080 diagnostic centers in India, it shows consistent and good financial performance. Total revenue was more than 6600 crores in the year 2021.



3) Vijaya Diagnostic Centre operates a large chain of 80 diagnostic centers along with 11 reference laboratories across 13 cities in South India. In the financial year 2020-21, the company had achieved a profit of Rs 85 crores, 23 crores more than the previous year.



VIJAYA DIAGNOSTIC CENTRE

4) The smallest amount of 400 crores raised by pharma formulations developer and manufacturer (CDMO) Windlass Biotech'. Windlass biotech started in 2001, produces pharmaceutical developments and formulations. The IPO of this company opened on 4 August 21 and later closed on 6 Aug 21.



5) The bulk drugs manufacturer from Mumbai, Supriya Lifescience raised a sum of Rs 1,200 crore. The Supriya Lifescience Limited is a Public incorporated on 26 March 2008. Supriya Lifesciences is a principal manufacturer and supplier of various active pharma ingredients (APIs) in India that too with a strong focus on research and development, this company is also a pivotal pharma company in specific niche segments. As per the information from March 2021, Supriya Lifesciences had niche offerings of 39 APIs directed on various therapeutic sections.



IMPACT ON PHARMA SECTOR AFTER COVID-19

- After March 2020, India witnessed a bull run. The Bombay stock exchange Sensex has grown by more than 60% and nifty from 7700 to over 16500.
- The Nifty pharma index and the BSE healthcare index have grown over 75% in a year. Lots of pharma giants such as Divis lab, Aurobindo pharma, Sun pharma have doubled and almost tripled the returns in some cases.
- They have grown up by a significant margin after the covid outbreak, specifically after March-April 21. Along with these mentioned companies, the stocks of Abbott India, Ajanta Pharma, Sanofi, Cipla, Dr. Lal path labs have also performed quite well.

AFTER OPENING UP PRIVATE MARKET

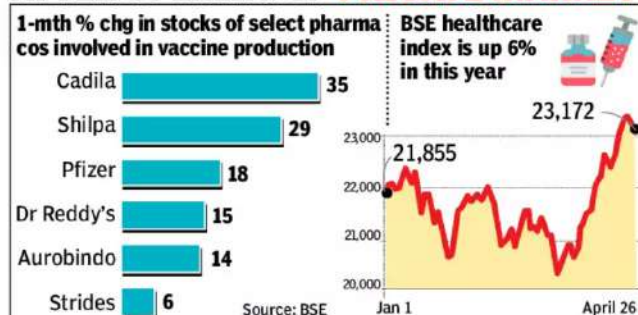


Image Source: 'Stocks of pharma companies linked to vaccines rally'; Times of India; April 2021

Investment bankers predict financial year 21-22 as IPO year for India. Healthcare and Pharma companies are aiming for an even better future in India. This fiscal year, 12 firms have raised Rs 27,000 cr just from IPOs, and other issues worth 70,000-crore are in the pipeline.

The entire FY21 saw only 30 IPOs raising Rs 31,277 crore.



Cadila, Cipla, Dr. Reddy are primary beneficiaries of Covid vaccines. According to a report of Price Waterhouse Coopers, the global market size was 1230.2 billion in 2019 which will increase to 2151 billion by the year 2027. The covid-19 pandemic was also responsible for this increase to some extent.



Image Source: 'Top 15 Pharma Companies in India'; Market Research Reports; 2019

Also, there has been a huge surge in healthcare spending for the last ten years because of the huge burden of several lifestyle and chronic diseases, because of which there are huge chances that pharma/healthcare stocks will perform well in upcoming years.

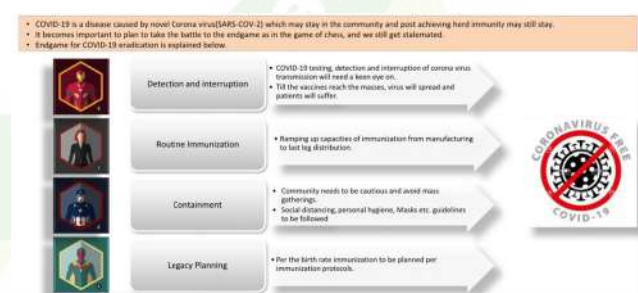


COVID-19: PHARMA SUPPLY CHAIN SECURITY, VISIBILITY & ROBUSTNESS IN VACCINE DISTRIBUTION



Vaccine supply chains are exponentially more complex than many other supply chains. It cannot be left unattended for a longer duration of time. The supply chain involves not only manufacturing the vaccine contents but storage and packaging components, cold-chain transit, domestic and global shipping, distribution strategies, and storage.

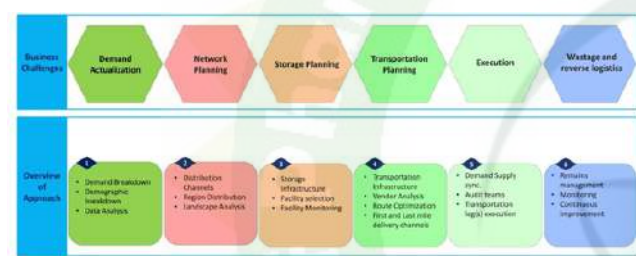
Another major capacity issue involves refrigeration. Health officials believe that a vaccine that will eventually come to the market will likely be maintained at 2 - 8 degrees Celsius throughout the shipping process. Some new and advanced technologies could be required with slight modifications in the freezers that can keep the vaccines at a frigid minus 80 degrees Celsius.



Ultimately, countries will need broader access to Covid-19 shots to halt the virus that has devastated everything. Manufacturing deals are being extended, and facilities are getting re-established to produce the still-experimental shots at the risk they fail in the clinic. Though the science underscoring the inoculations is still unproven, and mass production remains a daunting task, top pharmaceutical executives speculate that distribution will pose the greatest challenge of all.



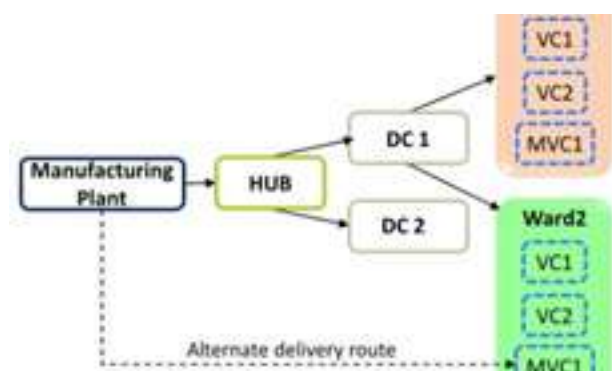
Successful immunization programs are built due to functional, end-to-end supply chain and logistics systems. The role of the supply chain is to manage effective vaccine storage, handling, and management of stocks, variable temperature control in cold chain; and maintenance of sufficient logistics management information. The final aim is to build continuous availability of quality vaccines from manufacturer to service-delivery state. This can be achieved by the six rights of the supply-chain management system.



CHALLENGES & APPROACHES:

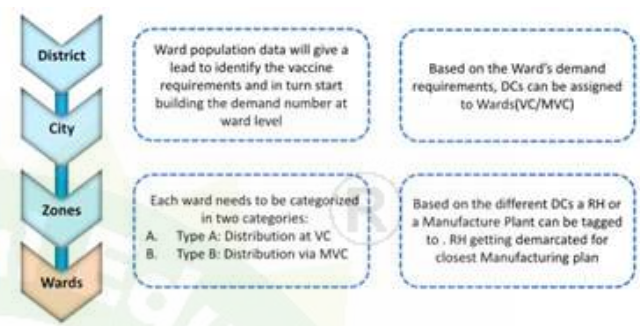
1. DEMAND ACTUALIZATION:

In order to cater to a population of 1.3 billion, there is a need to start small with a focused yet aggregated approach and build progressively. What do we need? Data of people residing in the community, with addresses, communication means, and demographics of the sample.



2. NETWORK PLANNING:

A robust vaccine cold chain and logistics system is the cornerstone of this immunization strategy. Rigorous supply & planning based on accurate data is necessary for the right vaccines in the right place, at the right time, in the right quantities, in the right condition.



3. STORAGE PLANNING:

Once manufactured, the vaccines need to be stored and handled based on protocols approved by ICMR. Storage planning will not only come for vaccines just manufactured but also for the first mile, hub, spoke storage, final distribution centers, mobile vaccine plans, and also for backhaul planning.



4. TRANSPORTATION PLANNING:

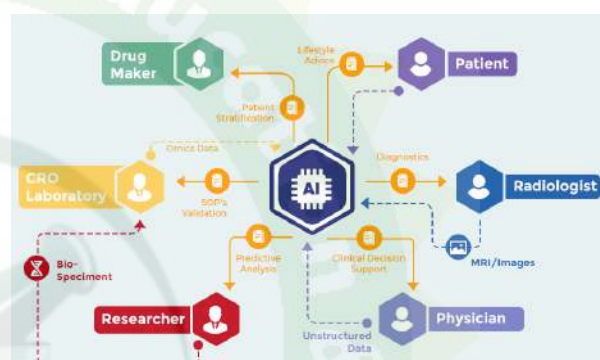
This caters to the planning of vaccine deliveries from DCs to Vaccine centers but also relationships between Manufacturing Plants to DCs. Transportation needs to be an efficient, safe, and cost-saving factor in the entire supply chain by optimizing the leg runs in each trip.

Key Issues for COVID Vaccine Distribution

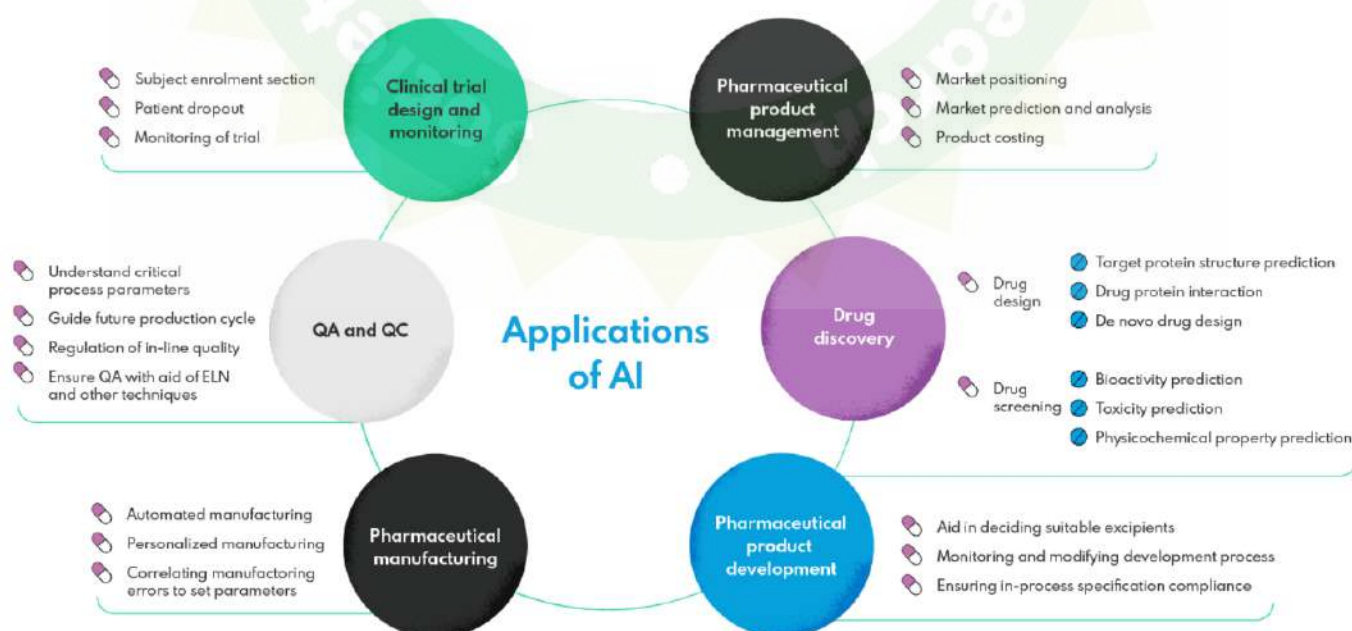


Current medical and technological advancements that have helped development in healthcare sector:

- The overall evolution of computers, resulting in faster data collection and data processing.
- Increasing accessibility of health-related data and more precise knowledge of disease from healthcare records.
- Advancement in pharmacogenomics and genetic databases.
- Expansion and normalization of electronic health records.



APPLICATIONS OF AI





AI-DRIVEN FUTURE OF PHARMACY

Innovations in medical sciences and new technologies are constantly increasing at a fast rate. Patients are now more focused on their well-being, and are demanding better health care access, customized products and convenience.

In this new ecosystem, interesting opportunities arise for pharmacists to develop and extend their job because of Artificial Intelligence. Clinical and technological inventions are happening at a record rate, because of the revolutionary power of artificial intelligence (AI) and robotics

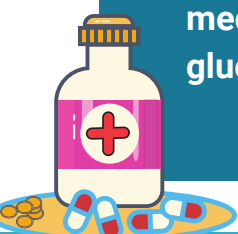
Various innovations are happening across the life sciences:

- Scientists are developing smart mirrors that will employ advanced cameras to detect the alterations in our overall health.
- Various companies are experimenting and working on home health care bots that can conduct basic care services.
- Smartphones are evolving to become home health diagnostic tools for conditions such as urinary tract infections, diabetic and eye disease.
- Laboratories are producing an edible origami robot that can be consumed and controlled to patch an internal wound.
- Corporations are working on the gut microbiome to produce a food-as-medicine approach to regulate glucose levels in human body.



When all these innovations are linked with the emerging influence of patients focused on their healthy lives, the coming days for pharmacy will be entirely different.

These changing dynamics generate compelling pressure on the pharmacy companies & pharmacists as they debate on today's market-winning strategies while devising, adjusting, and investing for the coming future.



SPER HIGHLIGHTS!



Society of Pharmaceutical Education & Research (SPER)

Ganpat University Faculty of Pharmacy
25th Anniversary

(In Collaboration with)
Ganpat University, Mehsana

Virtual Conference

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Theme
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Integrating academia
and industry

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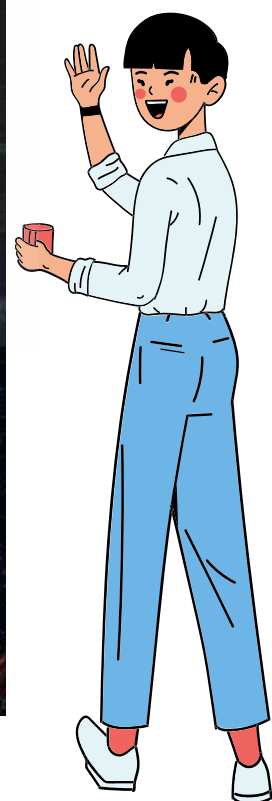
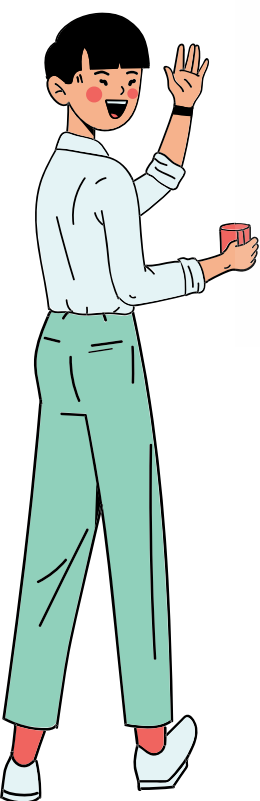


SPER Market Research

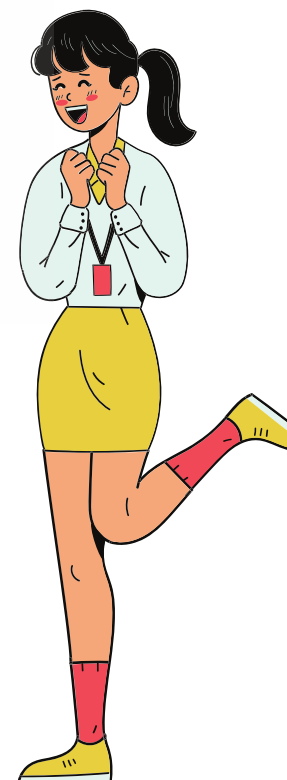
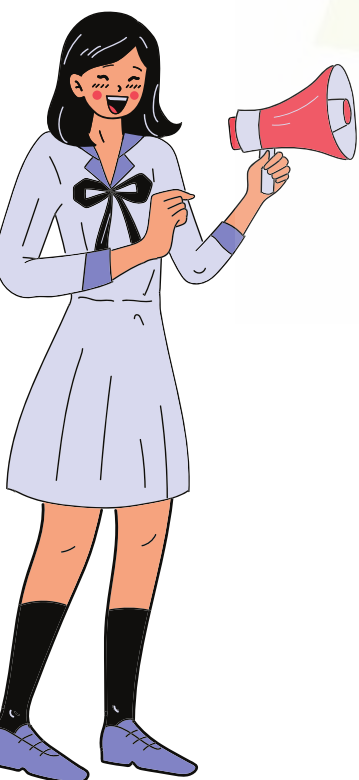
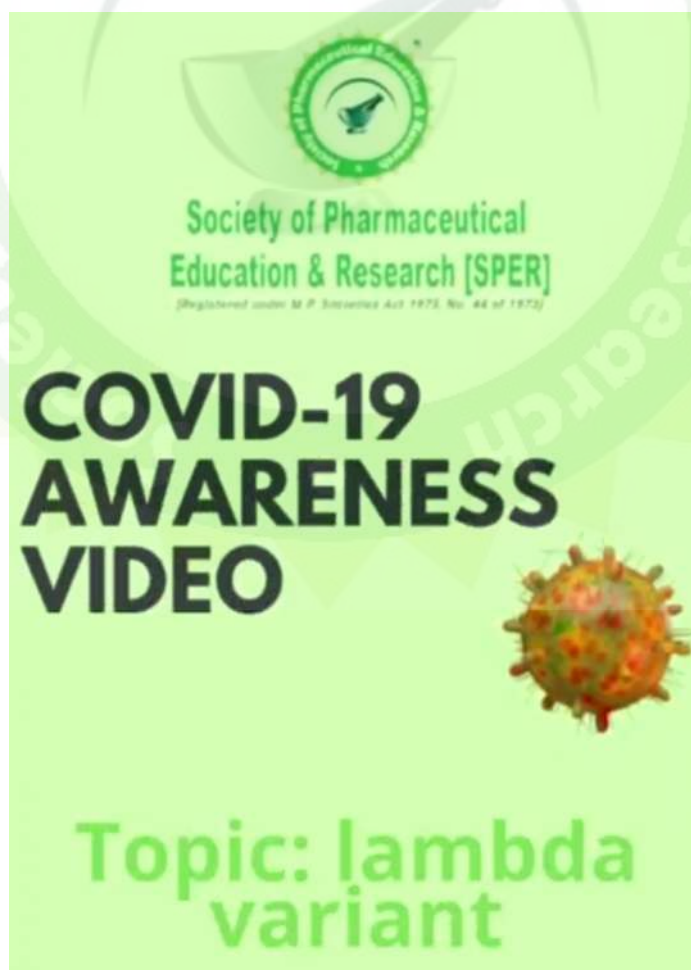
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SPER HIGHLIGHTS!



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