



Transforming Healthcare Delivery
Through Innovation and Technology

Bola Oyegunwa, PhD, MBA, MMB

labcorp

GO WOLFPACK!

Master's In Microbial Biotechnology; Ph.D., Microbiology & Immunology; MBA

**NC STATE
UNIVERSITY**

Professional Background

- Management Consultant
- Corporate Strategist (Head of Corporate Strategy & Assistant to the CEO)
- Emerging Technology, Clinical Product Management & Development
- VP, GM Software Solutions (Clinical Technologies & Investigator Solutions)
- CIO, Clinical Drug Development
- SVP, Enterprise Systems
 - ❖ Lab systems
 - ❖ Corporate & Billing systems
 - ❖ Robotics (ProteDyne)
 - ❖ Business Relationship Management
 - ❖ Divisional IT & Subsidiary IT (M&A Integrations)
 - ❖ Software Delivery Teams

LABCORP OVERVIEW

Labcorp is a leading life sciences company, improving patient health on a global scale

Our mission: Improve health and improve lives

Our objectives:

- Deliver world-class diagnostics
- Bring innovative medicines to patients faster
- Use technology to improve the delivery of care



50+ years' experience delivering healthcare solutions



Offers nearly 5,000 clinical laboratory tests with new tests added each year



Serves more than 3 million patients each week and has data on 50% of US population



Labcorp's strategic pillars is designed to accelerate enablement of our mission



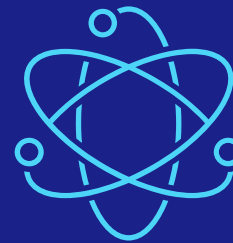
**Build on Our
Leadership in
Oncology**

and expand lessons
to **lead in other
specialty testing
categories**



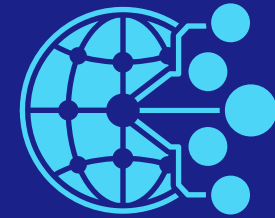
**Differentiate
Through Digital
and Data,**

seeking opportunities
to embed AI,
digitization, and
analytics throughout
the enterprise



**Drive Customer
Centricity**

and consistently
deliver valuable
solutions that help
them achieve their
goals



Expand Globally

leveraging our
lab network,
scientific capabilities,
vast health data and
insights, and results-
oriented culture

Healthcare Trends: It is important to understand healthcare trends prior to evaluating the role of emerging technologies in the future of healthcare



Evolving Reimbursement Models

Focus on quality of care, and improvements in population health to reduce healthcare costs



Proliferation of Data Reviewed for Diagnosis, Treatment and Monitoring

Increasing adoption of wearables and connected devices for clinical data collection and patient monitoring



Continuing consolidation among hospitals and health systems

Increasing administrative burden on physicians, opportunity to streamline inefficient processes



Increasing Cost Pressures in Healthcare

There is a focus on developing a sustainable cost healthcare cost model



National Physician Shortage

Physician burnout, 85M Americans without adequate primary care, expected physician shortfall of 50K – 100K in the next decade

Digital Solutions have the potential to improve care, reduce physician administrative burden, automate manual processes and improve efficiencies



POPULATIONS

Identify and monitor at-risk patients, support quality measures and coding, and target gaps in care



HEALTH SYSTEMS

Clinical decision support, Identify the right tests / treatment for the right patient at the right time, reducing costs while improving quality metrics



PROVIDERS

Physician co-pilot, AI solutions imbedded into the physician workflow to support diagnosis, patient monitoring, and treatment decisions allowing providers to focus on what matters most



PATIENTS

Improve patient monitoring and care

Digital Solutions that will be explored

AI

- Impact on streamlining processes, and improving accuracy of diagnosis

IoT

- Improve patient monitoring and preventative health

Digital
Twins


- Impact on reducing cost of drug development, and improving treatment plans


Robotic
Process
Automation

- Streamline and automate highly repetitive and manual processes

What is AI?


Shared Chat • Default (GPT-3.5)


 Explain AI in simple terms

 Artificial Intelligence (AI) is like a smart computer program that can learn from experiences, make decisions, and perform tasks that normally need human intelligence. It's designed to mimic human thinking to solve problems, recognize patterns, and adapt to new situations without explicit instructions for each scenario.

What is AI?

Shared Chat • Default (GPT-3.5)

 Similar to neural networks and machine learning, what are different types of AI

 AI encompasses various approaches, including:

1. **Symbolic or Classical AI:** This traditional approach uses symbolic reasoning and logic-based systems to represent knowledge and manipulate symbols to solve problems.
2. **Machine Learning:** It's a subset of AI that focuses on creating algorithms that enable systems to learn and improve from experience without being explicitly programmed. It includes techniques like neural networks, decision trees, and clustering.
3. **Neural Networks:** These are a specific type of machine learning modeled after the human brain's structure, composed of interconnected nodes (neurons) that process information and learn patterns.
4. **Natural Language Processing (NLP):** It involves enabling computers to understand, interpret, and generate human language, allowing interactions between computers and humans via language.
5. **Computer Vision:** This field concentrates on enabling computers to interpret and understand the visual world, processing images and videos.

These various types often intersect and complement each other in developing AI systems to perform diverse tasks and functions.

Is AI Perfect?



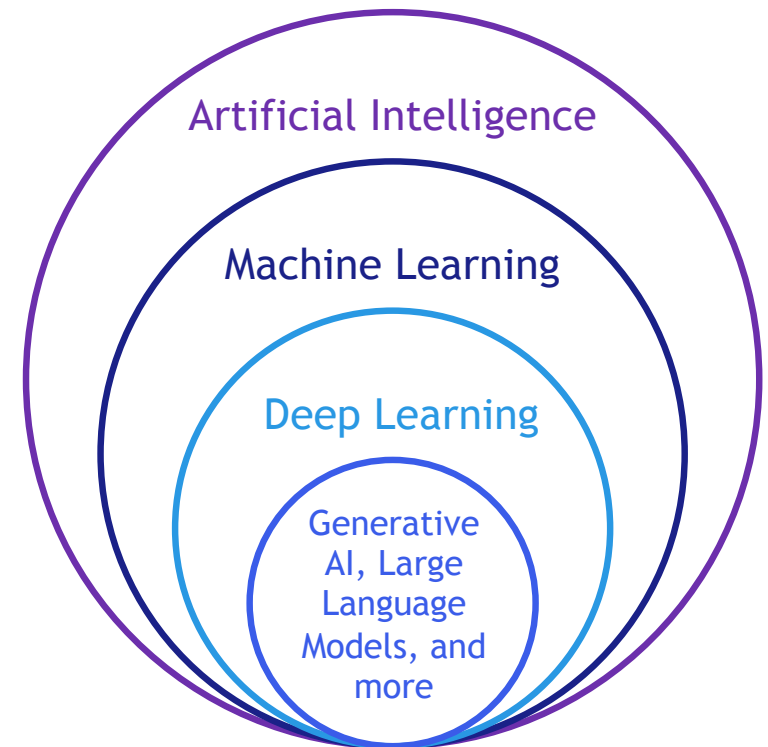
I agree with those. However, did you forget Generative AI?



You're absolutely right. Generative AI is a significant subset within artificial intelligence. It involves systems capable of creating new content, whether in the form of images, text, music, or other media. These systems can generate content that is original and not explicitly copied from existing data, often using techniques like Generative Adversarial Networks (GANs) or Variational Autoencoders (VAEs). Generative AI has applications in art generation, content creation, and even synthetic data generation for various purposes.

While there are many buzzwords around the artificial intelligence space, almost all techniques fall under some basic broad categories

- **Artificial Intelligence (AI):** overarching description of powerful computer systems that can mimic basic human cognition.
- **Machine Learning (ML):** models trained with data to perform a specific task, potentially without direction or guidance from humans
- **Deep Learning:** the ability for models to absorb and learn from non-traditional forms of data (text, images, video, audio, etc.).



[What is Deep Learning? - Deep Learning Explained - AWS \(amazon.com\)](#)
[MIT Bootcamp: How to identify business opportunities with AI \(youtube.com\)](#)
<http://azure.microsoft.com/en-us/resources/cloud-computing-dictionary/artificial-intelligence-vs-machine-learning#:~:text=How%20are%20AI%20and%20machine,computer%20system%20develops%20its%20intelligence>

AI Solutions can improve patient and provider outcomes by improving diagnosis accuracy, reduce administrative burden and increase efficiencies

Physician Digital Resident

- Aggregate patient history, test results, signs and symptoms for physician review
- Tuned to be a "digital resident" that allows physicians to practice at the top of their license
- Alert physician to areas of concerns that will facilitate physician decisions
- Support physician in determining the right tests/clinical procedures and creating a treatment plan

Reduce Administrative Burden

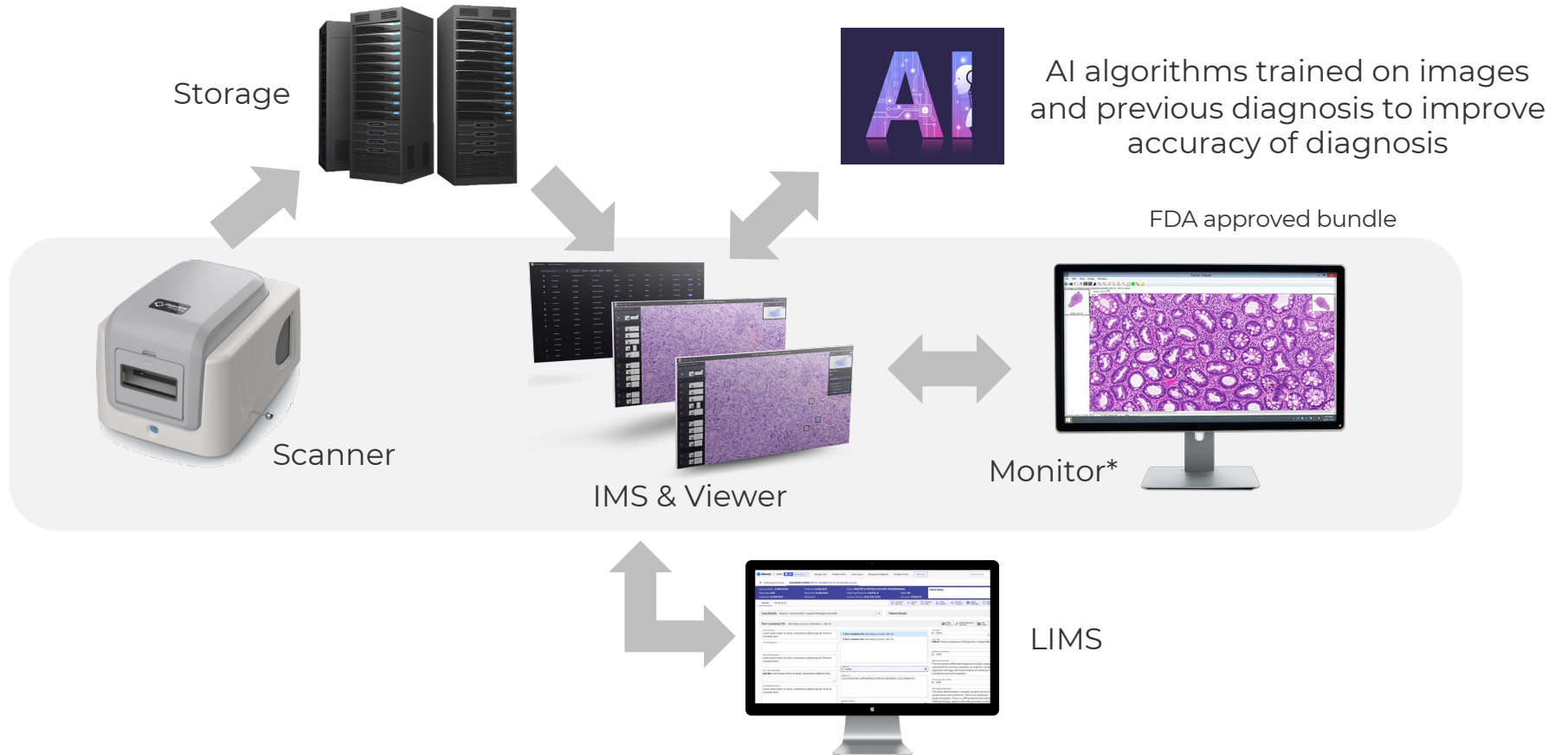
- Complete review of patient notes from previous visits
- Create summary of physician notes and treatment plan
- Rapidly access clinical and operational information



Clinician Decision Support

- Guide physician decisions during diagnosis and treatment cascades
- Generate clinical insights from review of clinical data, lab data, prescription data, images
- Improve diagnosis accuracy of images (Xrays, Pathology, MRIs, Digital Cytology)
- Seamlessly imbedded into clinician's workflow to prevent disruptions
- The physician remains the decision maker

AI Solutions can improve accuracy of cancer diagnosis



AI has the potential to rapidly improve patient outcomes

[nature](#) > [news](#) > article

NEWS | 12 January 2024

Google AI has better bedside manner than human doctors – and makes better diagnoses

Researchers say their artificial-intelligence system could help to democratize medicine.

By [Mariana Lenharo](#)



An [artificial intelligence \(AI\) system](#) trained to conduct medical interviews matched, or even surpassed, human doctors' performance at conversing with simulated patients and listing possible diagnoses on the basis of the patients' medical history¹.

Large scale adoption of AI requires improvement in data quality and adoption of common data models to ensure accuracy and reliability of AI models

- Healthcare data is frequently incomplete, inconsistent, and inaccurate. An inconsistent data set introduces biases and errors.
- This can have profound consequences for an AI model trained on such raw data. Biased and inaccurate data can perpetuate healthcare disparities and affect patient outcomes.
- Inconsistency of data formats and protocols hampers the ability to compare and exchange data across different healthcare providers limiting collaboration and insights derived from large-scale data analysis.
- A lack of data normalization poses a significant roadblock, hindering the integration of AI in healthcare.
- Without normalization, the accuracy and reliability of AI models may be compromised, leading to suboptimal performance and prediction errors.
- Organizations can mitigate these challenges with a data strategy. Initiatives such as the adoption of common data models, standardized vocabularies, and structured data formats can enhance data quality and facilitate the seamless exchange of information between systems.
- By fostering standardized data practices, the healthcare industry can unlock the true potential of AI. This will ensure the delivery of accurate, unbiased, and patient-centric care.

Robotic Process Automation uses software to automate repetitive and rule-based tasks such as data manipulation and integration across different systems

RPA can also be combined with artificial intelligence to create intelligent automation solutions that can handle more complex and unstructured data sets, such as natural language processing and optical character recognition. Collectively, this can enable healthcare organizations to leverage cognitive capabilities such as machine learning, computer vision and natural language generation to further enhance their automation potential.

RPA use cases can reduce cost, enhance quality and compliance, improve efficiency and patient outcomes

Streamline Administrative Processes

- Patient billing
- Appointment scheduling
- Claims processing
- Data entry
- Coding and billing: Apply appropriate codes and modifiers based on clinical documentation
- Improved compliance and revenue cycle management

Improve Clinical Documentation

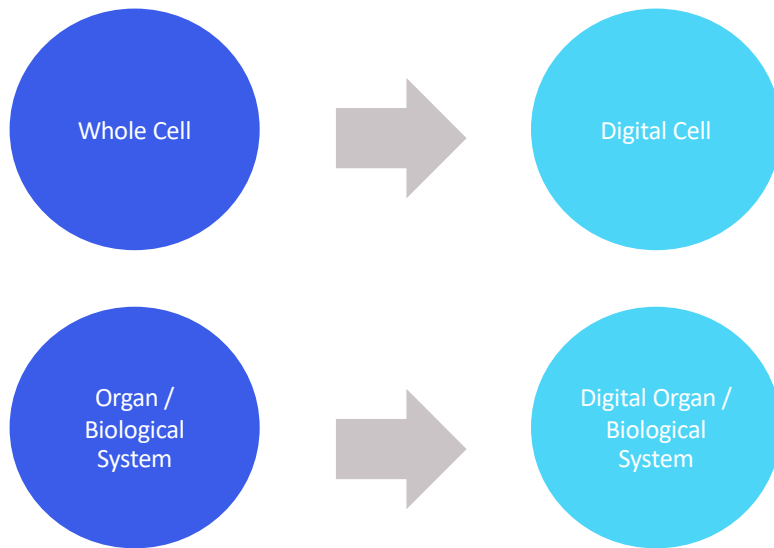
Assist clinicians with documenting patient encounters, diagnoses, treatments and outcomes by capturing data from EMR, voice recognition systems.

Enhance Patient Care

- Data review and entry for remote patient monitoring
- Tracking patient progress (alerts and notifications)
- Personalized patient communications
- Identify data from various sources and identify high-risk patients that need proactive intervention

Digital Twin Technology Has the Potential To Radically Disrupt Healthcare

Digital twin is a digital version, model or representation that is meant to replicate a real-world physical counterpart.



Reduce Time and Cost of Developing New Drugs and Therapeutics

- Digital twins can be used to mimic whole cells or systems
- Safety and efficacy of the drug / therapeutic can be tested
- Increase insights on whole cell behavior vs specific pathways

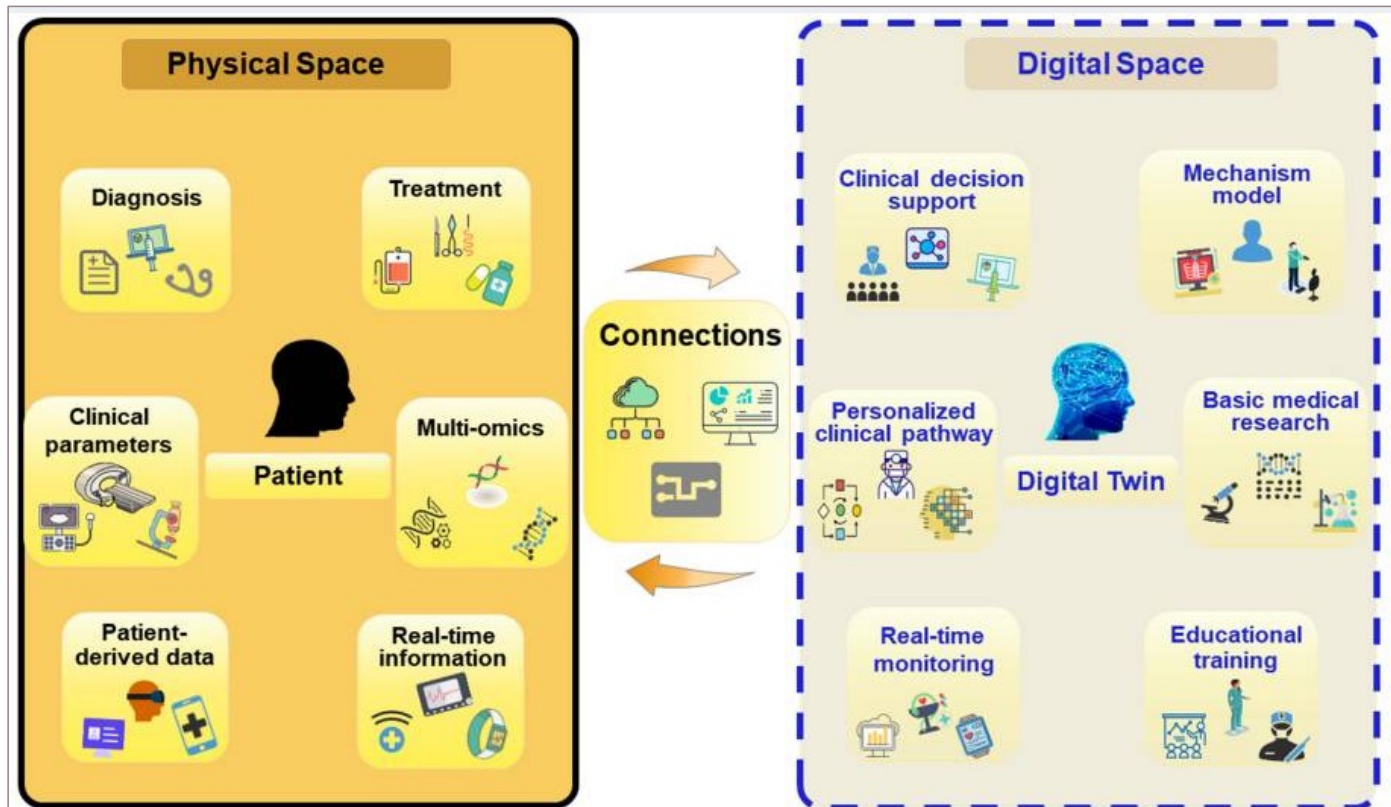
Discovery of New Biological Targets

- Rapidly develop specific disease models
- Generate insights on multiple pathways
- Integrate inference logic using multi-agent distributed AI to create specific domains personalized to patients

Model the Human Genome

- Generate insights on genetic diseases
- Near-real time understanding of therapeutic impact

DT can be divided into two categories, statistical model driven by data and a mechanical model that integrates multi-scale knowledge and data



DT shows promising results in reducing invasiveness and improving accuracy of diagnosis treatment plan and patient outcomes

Cardiovascular Models



- The application of the DT to the cardiovascular system includes the establishment of DT heart models and the precise treatment of cardiovascular disease.
- Models can be used to accurately determine the most valuable diagnostic basis and reliably infer biomarkers through non-invasive procedures.
- The key to DT-guided diagnosis is the personalized construction of the model.
- This approach has [been adopted for the computation of pressure drops in flow obstruction and has proved to be more accurate than following clinical guidelines](#)

Surgery



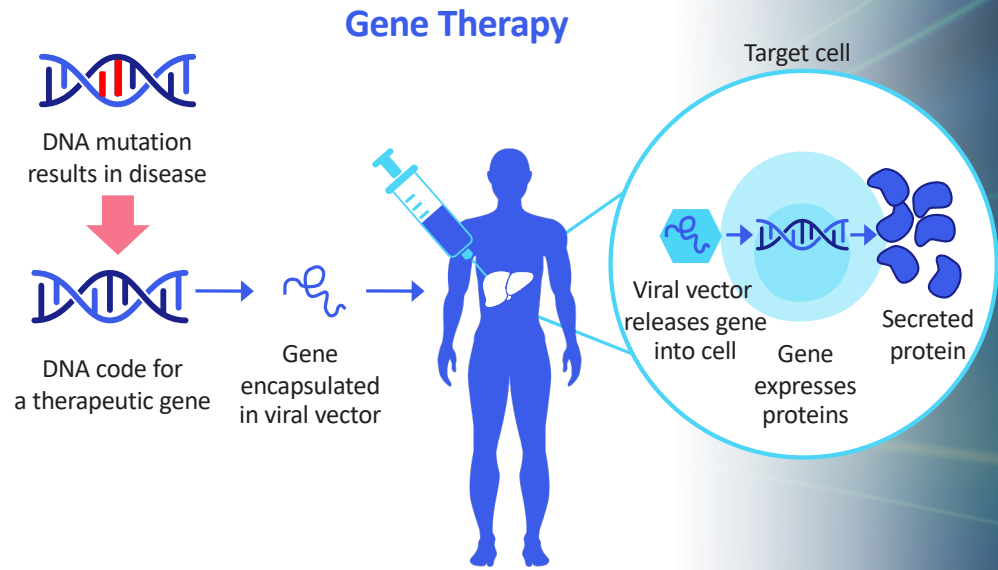
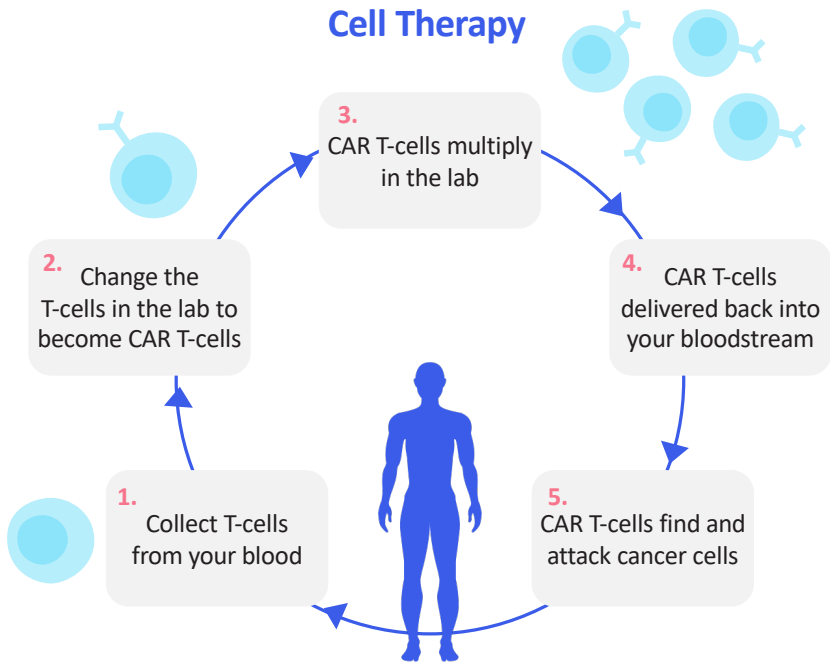
- The idea of using the DT in the surgical field is to create a patient model for multi-disciplinary teams to plan a surgery and verify the anatomy and thus avoid inadvertent damage to structures.
- Several surgical specialties evaluated patient-specific simulation, including neurosurgery, vascular surgery and interventional radiology.
- The use of the DT in treating cardiovascular disease is growing and there is an emerging interest in the application of AI in vascular surgery.
- The virtual model established using DT technology can be used to develop diagnostic tools.

Orthopedics



- With the development of numerical simulation and worn devices, the use of a DT for the real-time monitoring and analysis of the lumbar spine has become a highly promising cutting-edge technology in the biomechanical field.
- In applying the DT in the field of orthopaedics, it is important to develop physics-based experimental models and data-driven numerical models, which have the advantages of low cost and high integrity.
- DTs with agents and multi-agent systems technologies in healthcare and presented a first case study about the application of agent-based DT to the management of severe traumas

CGT: Multiple novel approaches to treat disease



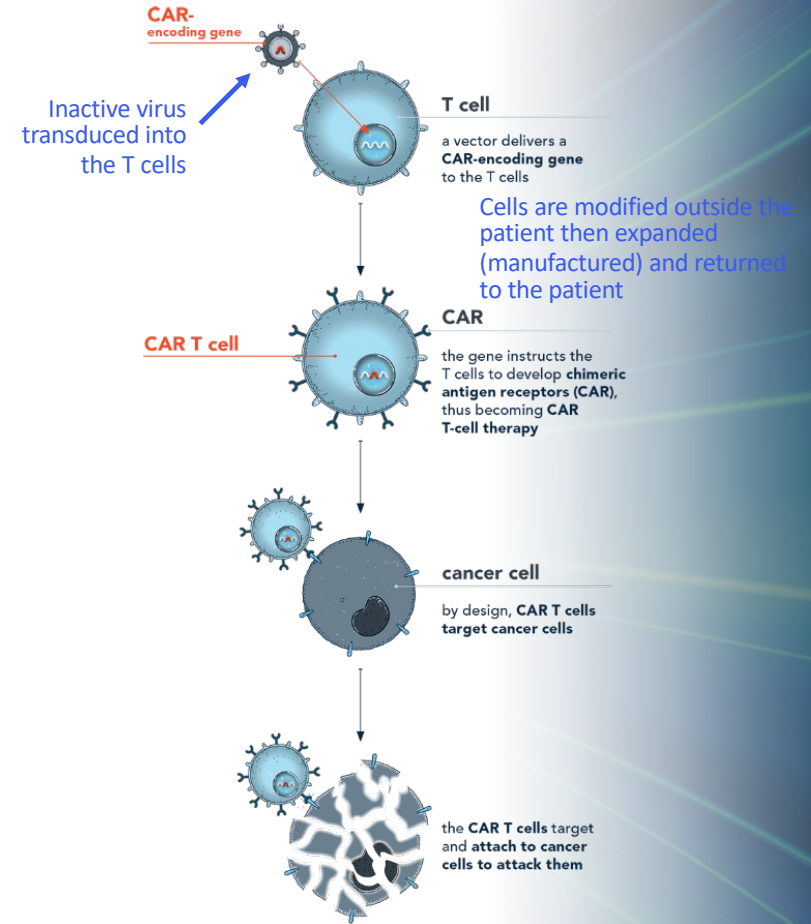
CELL & GENE THERAPY DEVELOPMENT DIFFERENCES

Living Drugs | One Time Treatment | Potentially Curative | Complex Logistics | Rapid Timelines

What is cell therapy?

Cell therapy is an investigational therapeutic approach in which viable cells are injected, grafted or implanted into a patient in order to effectuate a medicinal effect and they have the potential to treat a wide range of diseases.

- A variety of cell types being utilized (pluripotent & multipotent stem cells, fully differentiated cells) and optimal cell type depends on therapeutic application
- **They fall into 2 general categories:**
 - Autologous cell therapy: derived directly from the patient – one patient, one drug
 - Allogeneic cell therapy: derived from healthy donor cells and are considered “off-the-shelf” therapies
- **The cells can be:**
 - **Genetically modified:** CAR T cells, CAR NK cells, etc. Most common type of cell therapy, predominantly for oncology indications, 6/7 FDA approved cell therapy products are autologous cell therapies
 - **Non-genetically modified:** Stem cells and/or differentiated cells, tumor infiltrating lymphocytes, used/investigated in a broad range of therapeutic areas (cartilage replacement, cardiovascular)



<https://www.thegenehome.com/how-does-gene-therapy-work>

What is gene therapy?

Gene therapy is an investigational therapeutic approach that aims to add, delete, or correct genetic material to treat a disease

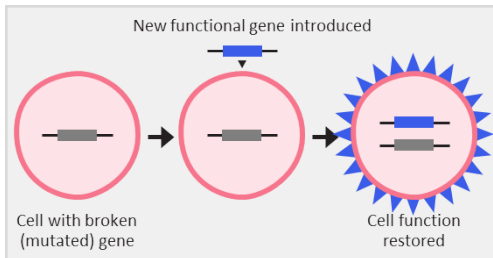
There are two approaches for gene therapy: Gene Addition and Gene Editing

Gene Addition: adds genetic material to either replace or silence a patient's cells to replace a "faulty" gene

Gene Editing: disrupt or correct the function of a gene through direct, targeted modification of the DNA

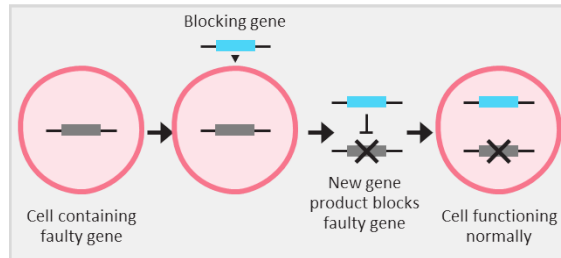
The vehicle that carries the corrected material is called a vector – this can be viral or non-viral

Gene Replacement



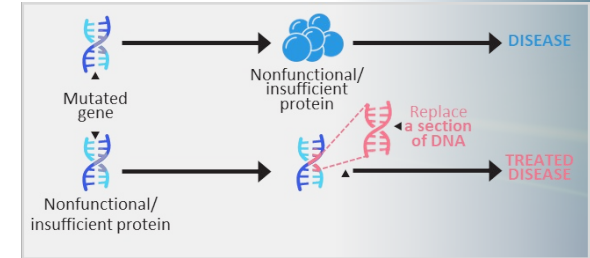
- Introduction of therapeutic protein to correct a non-functional gene
- Inherited blindness, Duchene's Muscular Dystrophy, etc.

Gene Silencing



- Expression of an inhibitory RNA (si/shRNA, miRNA) that prevents expression of a defective gene
- Huntington's Disease, ALS, etc.

Gene Editing



- Expression of gene editing enzymes (e.g. CRISPR) that directly corrects a disease-causing mutation
- CRISPR edited T cells (ex vivo, oncology)
- Non-oncologic heme malignancies (sickle cell disease, β -thalassemia, etc.)
- Rare monogenic diseases (transthyretin amyloidosis, hereditary blindness, etc.)
- **140 clinical trials with gene-edited products**

<https://www.thegenehome.com/how-does-gene-therapy-work>

IoT (Internet of Things) technology continues to proliferate for daily use

Access to low-cost, low-power sensor technology. Affordable and reliable sensors are making IoT technology possible for more manufacturers.

Connectivity. A host of network protocols for the internet has made it easy to connect sensors to the cloud and to other “things” for efficient data transfer.

Cloud computing platforms. The increase in the availability of cloud platforms enables both businesses and consumers to access the infrastructure they need to scale up

Machine learning and analytics. With advances in machine learning and analytics, along with access to varied and vast amounts of data stored in the cloud, businesses can gather insights faster and more easily

Conversational artificial intelligence (AI). Advances in neural networks have brought natural-language processing (NLP) to IoT devices (such as digital personal assistants Alexa, Cortana, and Siri) and made them appealing, affordable, and viable for home use.

IoT (Internet of Things) has the potential to improve patient monitoring and outcomes

Improve Patient Monitoring

Sensors / Wearables Enabled Patient Monitoring

- Monitor patient vitals
- Rapidly alert healthcare providers of abnormalities
- Detect SAEs/AEs during clinical trials
- Incorporate data into patients' medical records for improved understanding of natural history and disease progression
- Potential opportunities for virtual hospital ward monitoring
- Increase drug compliance and improve patient outcomes

Challenges to Broad Adoption

Precision Medicine Test Journey

- Improvements in clinical device miniaturization
- Limited availability of clinical devices (12-lead ECG)
- Availability of devices that can collect / process blood

Technology-Enabled value capture hinges on establishing clear corporate goals and objectives with compelling and measurable return on investment

Key Considerations for Success

- Enhanced Cyber Security Posture
- Improvements in Data Quality
- Regulatory Compliance
- Cost Containment (Infrastructure, cloud hosting, storage)
- Development of a prioritized strategic roadmap with clear ROI
- Experimentation, fail fast, rapid prototyping

