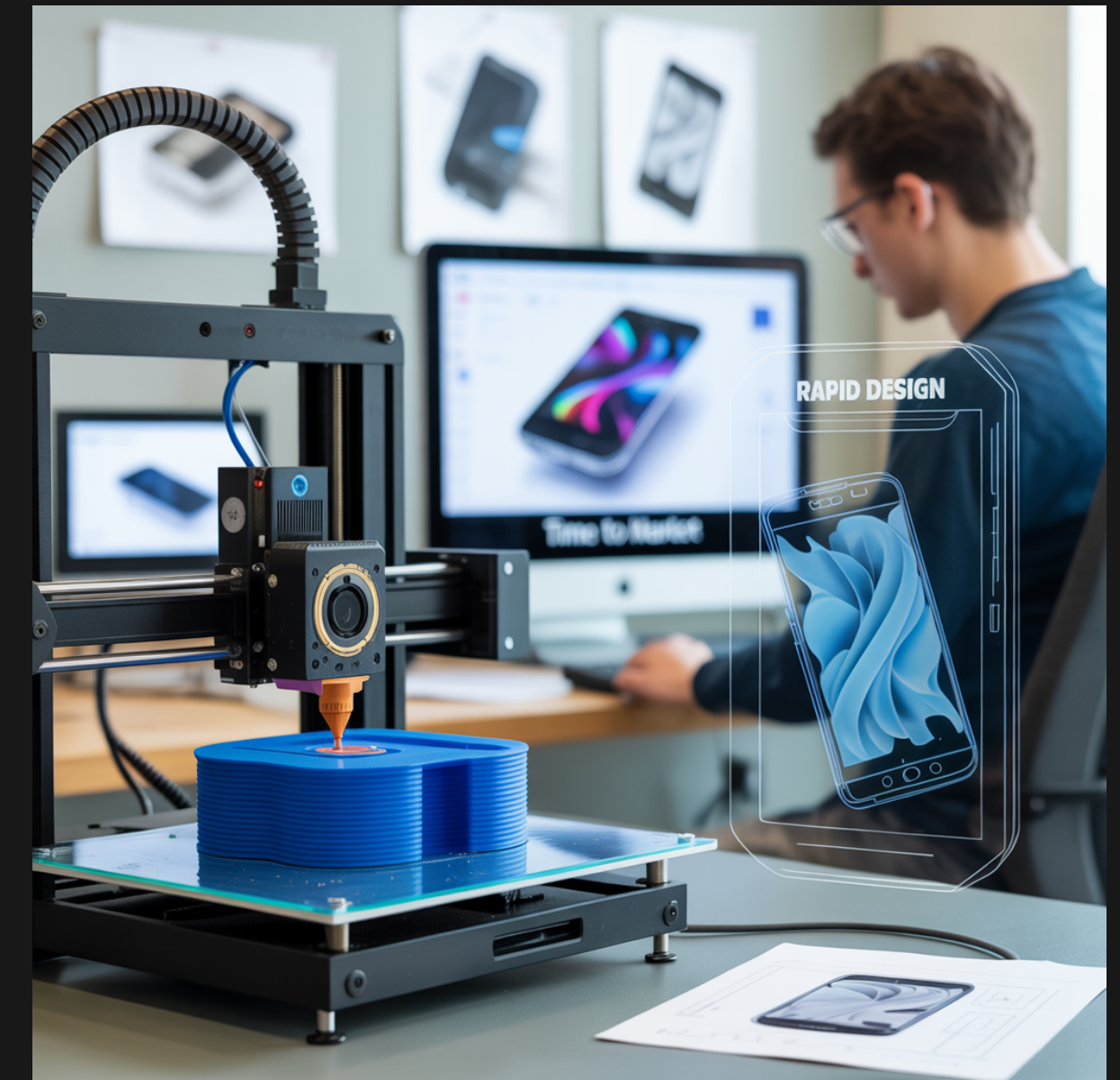




Changing relationship with personal health circumstances

New manufacturing design, development, process, time to market methodologies



Acceleration of medical science

Medical device transformation and disruption

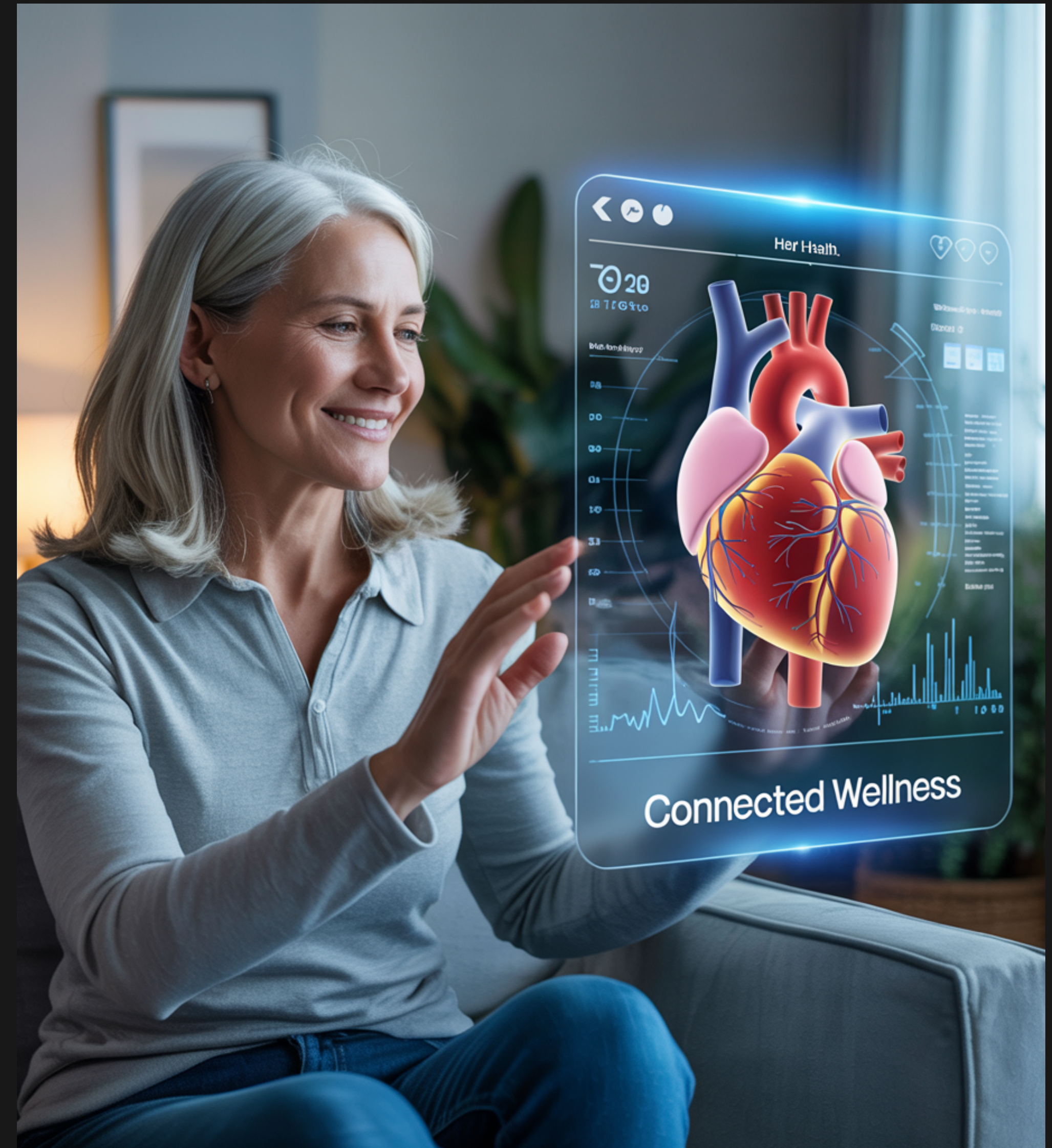
Medical device intelligence



PATIENT EMPOWERMENT

NOT YOUR GRANDDADS DOCTOR RELATIONSHIP!

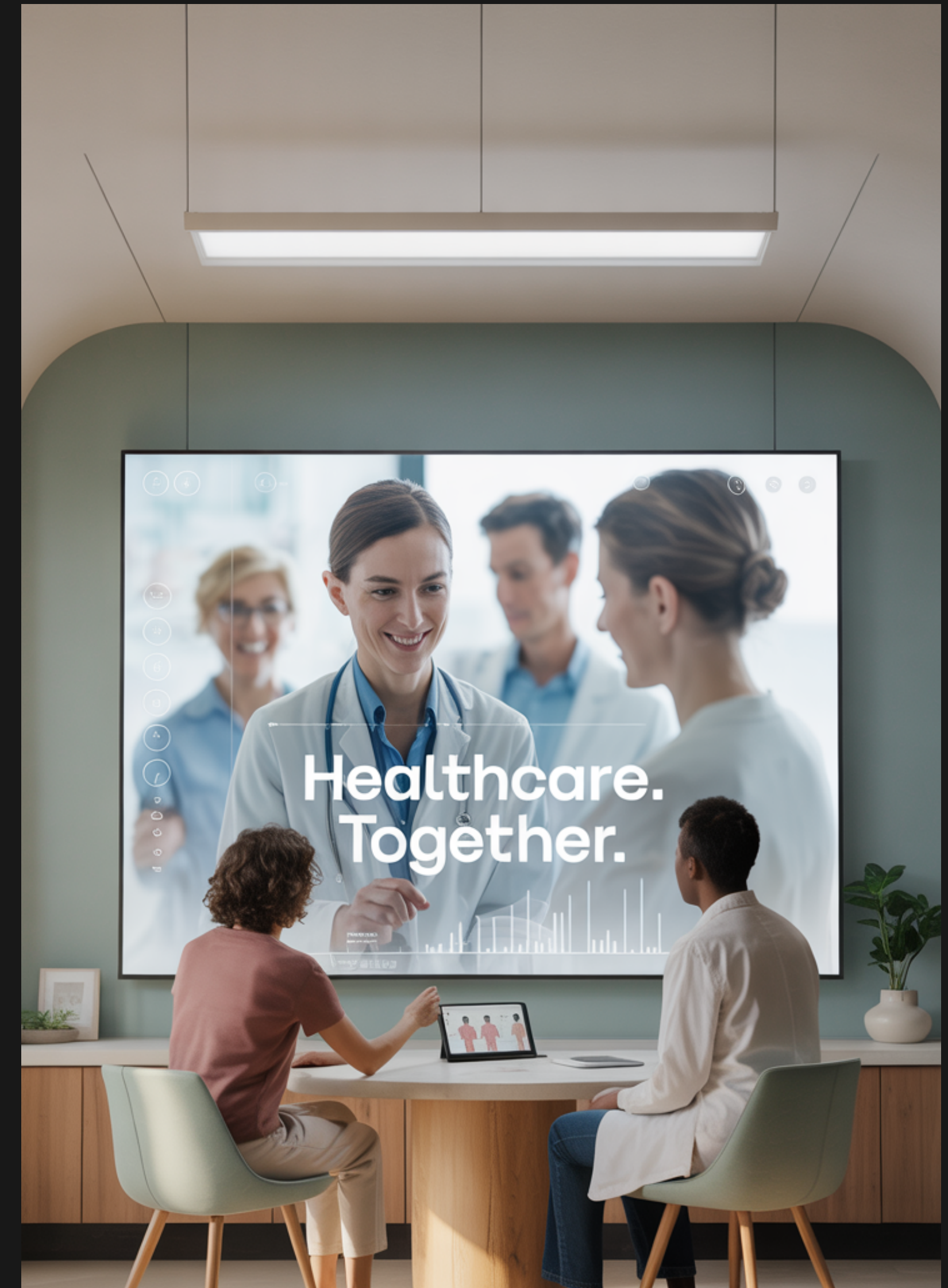
- Shift from provider-centric to patient-centric care
- Digital-first healthcare expectations
- Patient empowerment and self-management
- Personalized and data-driven care
- Value-based and outcome-focused care
- Accessibility and convenience demands
- Patient voice in healthcare design



PROVIDER-CENTRIC TO PATIENT-CENTRIC CARE

“GOOD HEALTH ONLINE” 1997

- “...the centuries old relationship between doctor and patient has forever changed...”
- patients becoming equal partners in their healthcare journey
- two way communication, not one-way



DIGITAL FIRST HEALTHCARE

SILICON VALLEY SPEED ACCELERATION!

- “healthcare consumerism”
- patient portals, mobile apps, telehealth and wearables all coming tougher
- patients developing a new and direct relationship with their health



PATIENT EMPOWERMENT AND SELF-MANAGEMENT

MASSIVE BEHAVIOURAL CHANGE

- patients taking proactive control over health decisions
- growing demand for easy access to personal health data
- self-monitoring tools enabling independent symptom tracking and lifestyle management



PERSONALIZED AND DATA-DRIVEN CARE

THE ERA OF "CONNECTED HEALTHCARE"

- AI-driven personalization tailoring treatments to individual needs
- wearables and IoT devices providing real-time health insights
- integration of social determinants of health data for comprehensive care



VALUE-BASED AND OUTCOME-FOCUSED CARE

THE NECESSITY OF COST REDUCTION

- shift toward prevention and efficient chronic disease management
- remote patient monitoring enabling continuous care oversight
- patient engagement directly tied to improved health outcomes
- “real time disease management”



ACCESSIBILITY AND CONVENIENCE DEMANDS

“AMAZON ERA EXPECTATIONS!”

- telehealth and remote monitoring reducing need for in-person visits
- flexible care options accommodating patient schedules and preferences
- the complete virtualization of healthcare



PATIENT VOICE IN HEALTHCARE DESIGN

TWO WAY SYSTEM INNOVATION

- patients contributing lived experience to clinical research and policy
- consumer groups influencing healthcare service design
- recognition of patient expertise in their own health journey



"The Big Future"

The Future of Healthcare

We're turning the global healthcare system upside-down with precision-medicine, targetted therapies and accelerated science - fixing people before they are sick rather than after!

<https://healthcare.jimcarroll.com>

CNVFILM F400



△ 14

△ 14



"The future of health isn't just in our hands; it's on our wrists, around our hearts, and guiding every decision. Smart, connected devices are writing a new chapter where every patient is empowered, and care is truly continuous."

“WHAT WE USED TO THINK OF AS FANTASY IS NOW SIMPLY ENGINEERING.”

FUTURIST RAY KURZWEIL

“ WE ARE AT THE BEGINNING OF A GOLDEN AGE OF MEDICINE, WHERE WHAT WAS ONCE PURELY IN THE REALM OF SCIENCE FICTION IS BECOMING SCIENCE FACT.”

DR. ERIC TOPOL



“ **WHAT WE DID FOR
HEART HEALTH IN THE
20TH CENTURY, WE CAN
DO FOR BRAIN HEALTH IN
THE 21ST CENTURY** ”

- Dr. Deepak Chopra, integrative medicine advocate



“

AT THE RATE RESEARCH LIKE ATALA'S IS PROGRESSING, SCIENTISTS PREDICT THAT REPLACEMENT ORGANS WILL BE A REALITY WITHIN YEARS, NOT DECADES.

(Wake Forest Institute for Regenerative Medicine)



“VIDEO GAMES DESIGNED AS DIGITAL MEDICINE WILL REVOLUTIONIZE HOW WE TREAT COGNITIVE DISORDERS. IN THE NEXT DECADE, WE’LL PRESCRIBE TECHNOLOGY ALONGSIDE—OR INSTEAD OF—DRUGS FOR CONDITIONS LIKE ADHD AND ALZHEIMER’S.”

- Dr. Adam Gazzaley, UCSF neuroscientist



“

"I THINK IT'S REASONABLE TO ANTICIPATE THAT IN THE NEXT FEW YEARS, WE WILL BE ABLE TO ENGINEER IMMUNITY TO MOST INFECTIOUS DISEASES AND REVERSE MANY ASPECTS OF AGING."

- Dr. George Church, Harvard geneticist



“

CRISPR GENOME EDITING TECHNOLOGY WILL TRANSFORM MEDICINE IN THE NEXT DECADE, ALLOWING US TO NOT JUST TREAT BUT ACTUALLY CURE GENETIC DISEASES AT THEIR SOURCE.”



- Dr. Jennifer Doudna, Nobel Prize winner for CRISPR



“

**"BY THE 2030'S, WE WILL
CONNECT OUR NEOCORTEX TO
THE CLOUD. THIS WILL EXPAND
OUR MEMORY, COGNITIVE
CAPABILITIES, AND ALLOW US TO
DIRECTLY INTERFACE WITH
ARTIFICIAL INTELLIGENCE."**

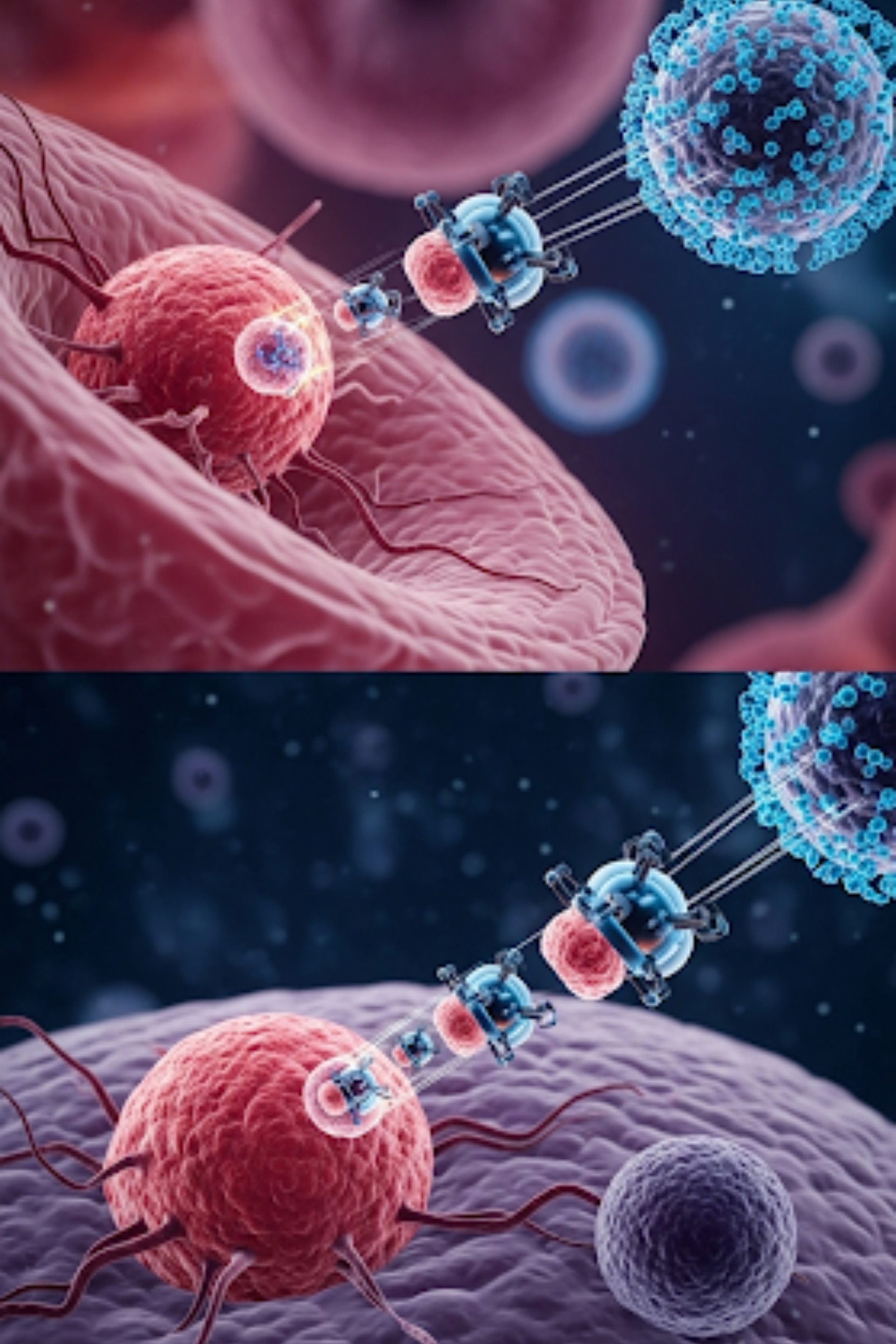
- Ray Kurzweil, futurist and Google's Director of Engineering



“

“WE WILL TRANSITION FROM REACTIVE MEDICINE TO PROACTIVE MEDICINE. WITHIN 10 YEARS, EACH PATIENT WILL BE SURROUNDED BY A VIRTUAL CLOUD OF BILLIONS OF DATA POINTS THAT WILL ENABLE US TO OPTIMIZE WELLNESS AND MINIMIZE DISEASE.”

- Dr. Leroy Hood, co-founder of the Institute for Systems Biology



“

"I BELIEVE THAT WITHIN THE NEXT DECADE, WE'LL SEE DRUG DELIVERY SYSTEMS THAT CAN PRECISELY TARGET DISEASED CELLS, DRAMATICALLY REDUCING SIDE EFFECTS AND IMPROVING EFFICACY OF TREATMENTS."

- Dr. Robert Langer, MIT Professor and biomedical engineering pioneer



“

"WE ARE MOVING FROM A SYSTEM OF 'SICK CARE' TO 'HEALTH CARE,' LARGELY DRIVEN BY UBIQUITOUS SENSORS AND AI THAT EMPOWER INDIVIDUALS TO MANAGE THEIR WELLNESS PROACTIVELY."

- Eric Topol, M.D., Director and Founder, Scripps Research Translational Institute, and author of "Deep Medicine."



“

**“CONTINUOUS, REAL-TIME
PHYSIOLOGICAL DATA FROM
WEARABLES AND IMPLANTABLES
WILL BECOME THE NEW VITAL SIGNS,
ALLOWING FOR PERSONALIZED,
PREDICTIVE INTERVENTIONS LONG
BEFORE SYMPTOMS APPEAR.”**

Daniel Kraft, M.D., Chair for Medicine & Neuroscience at Singularity
University



“

"THE CONVERGENCE OF MINIATURIZED SENSORS, ADVANCED ANALYTICS, AND REMOTE CONNECTIVITY WILL MAKE HOSPITAL-LEVEL CARE ACCESSIBLE FROM VIRTUALLY ANYWHERE, DEMOCRATIZING HEALTHCARE DELIVERY GLOBALLY."

- Peter Diamandis, M.D., Founder and Executive Chairman of the XPRIZE Foundation.

THE ACCELERATION OF LIFE SCIENCES

“THE SCIENCE BEHIND THE SCIENCE”

- ✓ medical image analysis
- ✓ personalized medicine
- ✓ medical device connectivity
- ✓ medical device monitoring
- ✓ disease diagnosis
- ✓ advanced patient monitoring
- ✓ digital twin / surgical planning
- ✓ chronic disease management
- ✓ medical chatbots
- ✓ medical research acceleration





HEALTHCARE AND AI (BEYOND LLM'S)

PREVENTATIVE, DIAGNOSTIC, FORWARD LOOKING

\$10 BN

2022

\$177.4 BN

2030

NEW OPPORTUNITIES: DRUG DISCOVERY

- Real-World Evidence Generation
- Enhanced Clinical Trial Design
- Biomarker Discovery and Validation
- Post-Market Surveillance and Drug Repurposing
- Precision Medicine Development



“GETTING PATIENT RECRUITMENT RIGHT”

“BOLD GOALS AT ICON”

- 80% of clinical trials fail to meet original enrolment deadlines
- 55% of trials are terminated due to failure to achieve full enrolment
- current clinical trials have a failure rate of 84.6% (“Trends in Pharmacological Sciences 44(9) 561-572”)
- Just 3% of US adult cancer patients participate in clinical trials and 40% of those trials fail to get minimum patient enrollment, per Johns Hopkins



OUTCOMES

“EARLY RETURNS”

- 20% reduction in cost of 20 drug development programs at Johnson & Johnson
- 80% accuracy in predicting trial outcomes - BioPhy, in analyzing 1500 clinical trials
- 10% improvement in clinical trial success rates (research reports)
- 70 to 80% improvement in accuracy in predicting patient response to immunotherapies - GE Healthcare AI models



DRUG DISCOVERY

ACCELERATING THE PACE OF PURE SCIENCE

- identify candidate molecules
- earlier disease diagnosis
- ability to look at past trial data sets
- predict patient response to treatments
- faster analysis of massive data sets
- alignment to disruptive 'real time trial' trend
- patient recruitment and enrolment
- predictive adverse reaction



“IT’S BETTER TO
DISRUPT THAN TO BE
DISRUPTED!”

(COMPANIES THAT DO NOT YET EXIST...”

Elligo and Avallano launch AI-powered clinical trials platform

myTrialsConnect aids patient recruitment and screens for patient eligibility through medical record reviews and chatbot-based surveys.


Phalguni Deswal | October 27, 2023

Share this article



The use of AI can potentially improve patient recruitment and retention for clinical trials. Image credit: SurfsUp / Shutterstock.

**CARLSBAD, CALIF., NOV. 7, 2023 /PRNEWSWIRE/
-- AMSETY, A LIVER HEALTH SOLUTIONS START-
UP ANNOUNCED THE RELEASE OF ITS NEW
ARTIFICIAL INTELLIGENCE-DRIVEN AMSETY
CLINICAL RECRUITMENT ENGINE ("ACRE")**



“ACRE COMBINES DECISIONAL AI AND MESSAGING TOOLS WITH A PROPRIETARY, SELF-SELECTED DATABASE OF OVER HALF A MILLION USERS TO HELP EFFICIENTLY REACH AND EFFECTIVELY COMMUNICATE WITH LIVER PATIENTS.”

WEARABLE HEALTH DEVICES

LEADING CONSUMER ADOPTION

- Smart Wearable Health Devices: Projecting substantial growth from \$13.8 Billion (2020) to \$37.4 Billion by 2028.
- High User Penetration: Over one-third of adults used health apps/wearables in 2023; approximately 60% of households now own a wearable device.



INTERNET OF MEDICAL THINGS (IOMT)

“CONNECTIVITY IS THE FUTURE OF EVERYTHING”

- Expected to surge from \$76.8 Billion (2023) to \$392.2 Billion by 2030 (CAGR 26.2%)
- Over 500 million connected medical devices expected in healthcare systems; U.S. hospitals average 10-15 connected devices per bed
- Patient Engagement Solutions: Forecast to reach \$72.46 Billion by 2032 (CAGR 17.12%), underpinned by high growth in AI in patient engagement (22.1% CAGR).



CONNECTED DRUG DELIVERY

“THE ERA OF SMART DRUGS”

- Connected Drug Delivery devices: Projecting significant increase from \$5.8 Billion (2023) to \$22.9 Billion by 2030(CAGR 21.7%)
- leading markets include diabetes management, respiratory (Asthma, COPD), oncology, rheumatoid arthritis, smart pill bottles



KEY SMART MEDICAL DEVICE TRENDS

NEW INNOVATION, NEW OPPORTUNITIES

- Patient Empowerment: Unprecedented access to personal health data
- Chronic Disease Management: Connected devices revolutionizing adherence monitoring
- AI-Driven Analytics: Real-time analysis enabling personalized treatment plans
- Next-Gen Innovation: Advanced sensors powering future wearable devices
- Healthcare Integration: Seamless EHR integration creating complete patient overviews
- Specialized Growth Markets: Glucose monitoring and implantable devices expanding
- Digital Platform Evolution: Virtual consultations creating comprehensive digital phenotypes



““

"WE ARE MOVING BEYOND TREATMENTS TO INTELLIGENT INTERVENTIONS. SMART, CONNECTED MEDICAL DEVICES ARE UNLOCKING A NEW ERA OF PROACTIVE, PERSONALIZED HEALTHCARE, WHERE DATA EMPOWERS HEALING."

Futurist Jim Carroll