New Technologies SIG
Tom Shepherd

NEW TECH SIG UPDATE

New TECH SIG

We need ideas

All you have to do is send me an email about something you would like to learn more about at

newtech@grandcomputers.org

New Technologies SIG

Meeting every month
3rd Thursday 3:30

Contact Tom Shepherd for additional information at

newtech@grandcomputers.org

Here is what is coming up in December for New Tech SIG
Presented by Larry Laursen

Want to cut-the-cord between your device and display?
We will discuss technology that allows you to wirelessly connect your device to a display for viewing on a large screen with up to 4K resolution. The devices can be computers, tablets, and phones. It works with PC's, Mac', Game consoles, and iOS and Android tablets and phones. The displays can be monitors, and TV's and not limited to a single output or room.

I can also do a brief demonstration on how AI is used for photo editing in a photo editing program I have. It "automatically" separates areas of a photo that can be modified or replaced to create a new scene. I have some examples of sky and background changes. The program is a consumer+ program, not a professional level.

Thursday, December 21, 3:30 Chaparral Center - Classroom

Club Events for December

December 14 - 8:30am Chaparral Center, Pima Room

City of Surprise Library Update

Did you know that the transition of our local library from Maricopa County to the City of Surprise is now complete?

Are you not sure if or how you need a new library card?

Are you someone who checks out books online and wants to know what has changed?

Would you like to learn what new capabilities that the City will now be able to offer library patrons?

Please come to this session. It will feature a presentation from the City Library staff plus time for questions.

Today's Topic

Medical Technology – Key Trends for the Future

Top Trends as Shown by Analysts
Focus on 3D Printing
Usage of Portals
VR and AR Training
Wearables
Personal Experiences

FORBES > INNOVATION > ENTERPRISE TECH

The 10 Biggest Trends Revolutionizing Healthcare In 2024

Bernard Marr Contributor ⓘ

Follow

🔖 💬 0   Oct 3, 2023, 03:15am EDT

▶ Listen to article 8 minutes

A longer-living population, the emergence of transformative technologies with applications across the healthcare spectrum, and continued global economic uncertainty. These are the key societal

Generative AI In Healthcare

AI will be instrumental in many of the trends here, but generative AI, in particular, will be particularly impactful over the next 12 months.

 It will democratize access to other transformative AI applications, making it easier to implement and interpret results and generate personalized recommendations.

Generative AI In Healthcare

It will create synthetic data that can be used to train medical AI algorithms without compromising patient privacy or where there simply isn't enough relevant real-world data.

And it can create chatbots and virtual assistants to help at every stage of the patient journey

Morgan Stanley

RESEARCH

How Artificial Intelligence Could Reshape Health Care

Aug 15, 2023

The industry is in the early stages of using AI and machine learning to drive new revenue and boost efficiency.

➔ | 🐦 in f ✉

From the Morgan Stanley article

The biopharma industry is moving to unlock the potential of AI/ML across a range of areas, including drug discovery, clinical development, manufacturing and physician-patient engagement.

In 2021, more than 100 drug and biologic applications to the U.S. Food and Drug Administration included AI/ML components, up from 14 in 2020.

AI/ML could help to shorten development timelines for drugs, reduce spending on R&D, and increase patients' probability of success.

From the Morgan Stanley article

AI/ML offers an opportunity to drive change and efficiency where health care services and technology meet.

The tools' predictive capabilities make it easier for doctors and other health care providers to detect and diagnose disease more quickly.

This gives them more time with patients, which could improve patients' satisfaction as well as their health outcomes.

Some other benefits of AI for providers include more efficient and accurate patient access and allocation, diagnostics, risk coding, claims processing, supply-chain management and predictive modeling.

Personalized Medicine

At a high level, this term refers to the creation of tailored treatment plans for individual patients.

 In practice, this is increasingly being done with technology and data.

The most advanced applications are in genomics, where AI is being used to analyze patients' DNA to diagnose and treat diseases and to create medicines that are personalized to specific people down to the molecular level (sometimes called precision medicine).

Here is an example of Personal Medicine
Precision Oncology

It's still the case in most medical care systems that cancers are classified mainly by the type of tissue or part of the body in which they arose: lung, brain, breast, colon, pancreas, and so on.

But a radical change is underway.

Researchers are now identifying the molecular fingerprints of various cancers and using them to divide cancer's once-broad categories into far more precise types and subtypes.

Precision Oncology

They are also discovering that cancers that develop in totally different parts of the body can sometimes, on a molecular level, have a lot in common.

From this new perspective emerges an exciting era in cancer research called precision oncology, in which doctors are choosing treatments based on the DNA signature of an individual patient's tumor

Virtual Healthcare Assistants

Increasingly, they will interface with electronic health record systems and be used to book and schedule appointments.

They can also help patients stay compliant by reminding them to take medications or exercise.

They can even provide [companionship](#) for patients who live alone or in remote areas to improve their mental health!

Digital Twins

A digital twin is a virtual model of a real-world system, object, place, tool, or process.

It can be used to simulate anything from a single device, such as a needle, to understand how it works in different conditions to an entire hospital to understand how services are delivered.

Digital Twins

Digital twins of the human body and individual organs have been developed to model the effects of changes in treatment, medication and lifestyle choices.

Perhaps the most complex digital twin currently imaginable is a twin of the [human brain](), which researchers hope to advance by 2024.

Here's a little more about digital twins

AIDT In Healthcare

Prominent examples of AI digital twins in healthcare:

Cardiac digital twins
(Gutierrez et al., 2019; Shang et al., 2019)

- Building a digital twin model of the heart
- Detecting and Predicting Causes of Thrombosis
- Simulating the flow of blood through the heart

CeADAR

AIDT In Healthcare

Prominent examples of AI digital twins in healthcare:

The artificial pancreas
(Kovatchev, 2019)
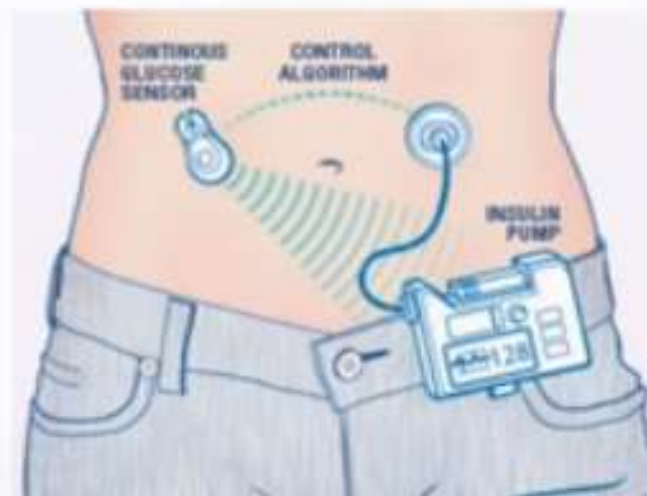
- Real-time signals monitoring.
- Automated insulin delivery.
- Control algorithms are capable of optimizing blood glucose fluctuation.

The Nokia web site has an interesting article about Digital Twins and the Human Immune System

NOKIA   Service providers   Enterprises and governments   Licensing   Partners   Insights and research   We are Nokia

Beyond ⁿ

Shape what's next

Explore the potential

Ready to meet your digital immune system?
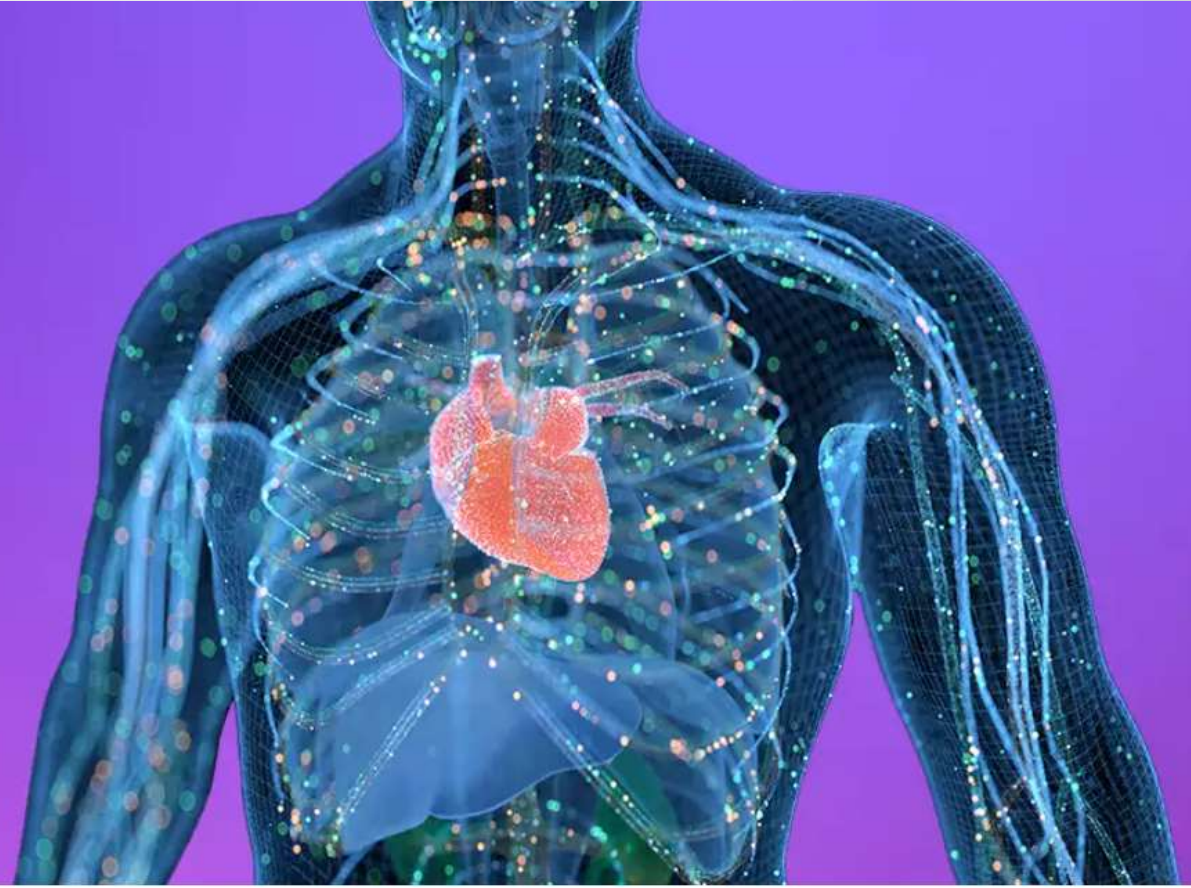
The first digital twin of the human immune system highlights the vast societal opportunities in physical-digital fusion. This project in the making could make us safer, healthier and better prepared for the next health crisis. Discover the exponential potential of true immunity modeling.

More from the Nokia article

Why do we need a digital twin of the human immune system?

Digital twins provide a raft of advantages in all walks of society and business.
The immune system project could mean:

A clear model of something very complicated

The chance to see – and understand – connections that were previously opaque

Immediate support for tackling immune-dependent conditions like organ transplants, cancer, and autoimmune diseases

Quicker and cheaper drug discovery

A doorway to drugs with less harmful side effects

The route to personalized medicine

More from the Nokia article

The first 25 cells lay the foundations for personalized medicine

In August 2022, the project won a $5 million slice of the University of Nebraska–Lincoln's first Grand Challenge to build a working model in five years through its expanded Digital Twin Innovation Hub.

The secret to the task is to be "iterative," says Helikar. So, first, the team worked with a host of respected immunologists to identify the first 20 – 25 cells necessary for the immune system to function.

The next ongoing challenge is to build out every cell and every physiology into a virtual model.

The initial question was how to "connect the cells mathematically," explains Helikar.

To achieve this, they began to model CD4 and T-Cells, which are the innate and adaptive immune system. "We got one of the hard parts," says Helikar. "Now we need to scale."

In terms of enhanced patient care, digital twins enable healthcare providers to gather and analyze a wealth of patient data from various sources, including electronic health records (EHRs), wearables, and medical devices.

This holistic view of the patient allows for personalized treatment plans, considering individual characteristics, medical history, and real-time physiological data.

With digital twins, healthcare professionals can make accurate diagnoses, monitor patients in real-time, and empower patients to actively participate in their own care

Here is the University of Nebraska-Lincoln Digital Twin Innovation Hub website
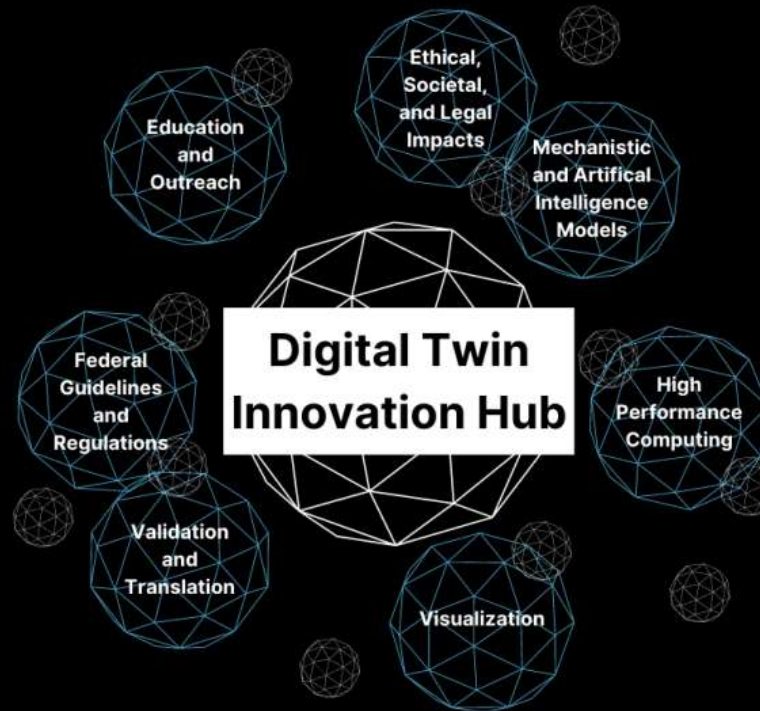
Here is the University of Nebraska-Lincoln Digital Twin Innovation Hub website

The Digital Twin Innovation Hub aims to position the University of Nebraska-Lincoln as a leading center for designing, researching, educating, and fostering creativity in predictive systemic models and simulations, specifically digital twins, for biological systems.

Our Goals

Leverage Cell Collective technology to develop a draft digital twin of the immune system

Perform and analyze immunological data from healthy patients under normal conditions to characterize systemic homeostasis of the immune system

Partner with educational and industry institutions to drive transformational change in life sciences education

Design simulation lessons for medical and health professional training that meet industry standards

EMAIL US

My two cents worth

The concept is that a "digital twin" is a mathematical representation of a real thing

For example, if you can build a digital twin of a person's immune system, you can then run simulations that model and predict the effect of a new medication for an individual.

Or you could build a digital twin of a person's spine, you could practice spinal fusion surgery and see potential outcomes.

IoT-Powered Virtual Hospitals And Telemedicine 2.0

This trend includes both telemedicine and wearable devices connected to the global network known as the Internet of Things (IoT).

By using connected devices to remotely monitor patients and provide communication channels for healthcare professionals, more elements of care can be delivered remotely.

IoT-Powered Virtual Hospitals And Telemedicine 2.0

We call this "telemedicine 2.0" because it goes beyond the simple delivery of remote care, such as remote consultations, to a holistic approach to remote patient care and treatment.

[Virtual hospital wards](#) are an example of this trend in action in 2024 - where a central location acts as a hub for monitoring multiple patients in their own homes.

A hospital in Tampa is moving into Virtual Hospital technology

Here is what the hospital says to explain why the move

The virtual platform gives care teams the ability to:

•Observe a patient's clinical progress virtually.
•Invite clinicians and providers for provider-to-provider consultations
•Host multidisciplinary calls.
•Connect specialists for on-demand remote consultations.
•Invite family members, caregivers or even friends to join the patient's virtual conversation.
•Set up alerts for fall risk, elopement and patient movement.
•Capture a patient's self-reported information.

Nishit Patel, M.D., chief medical informatics officer at TGH, says the platform gives clinicians the ability to care for patients using the right clinical content and context remotely. It allows caregivers to continuously observe at-risk patients from anywhere, at any time, driving a collaborative practice while improving overall patient outcomes.

Here is the website of the hospital
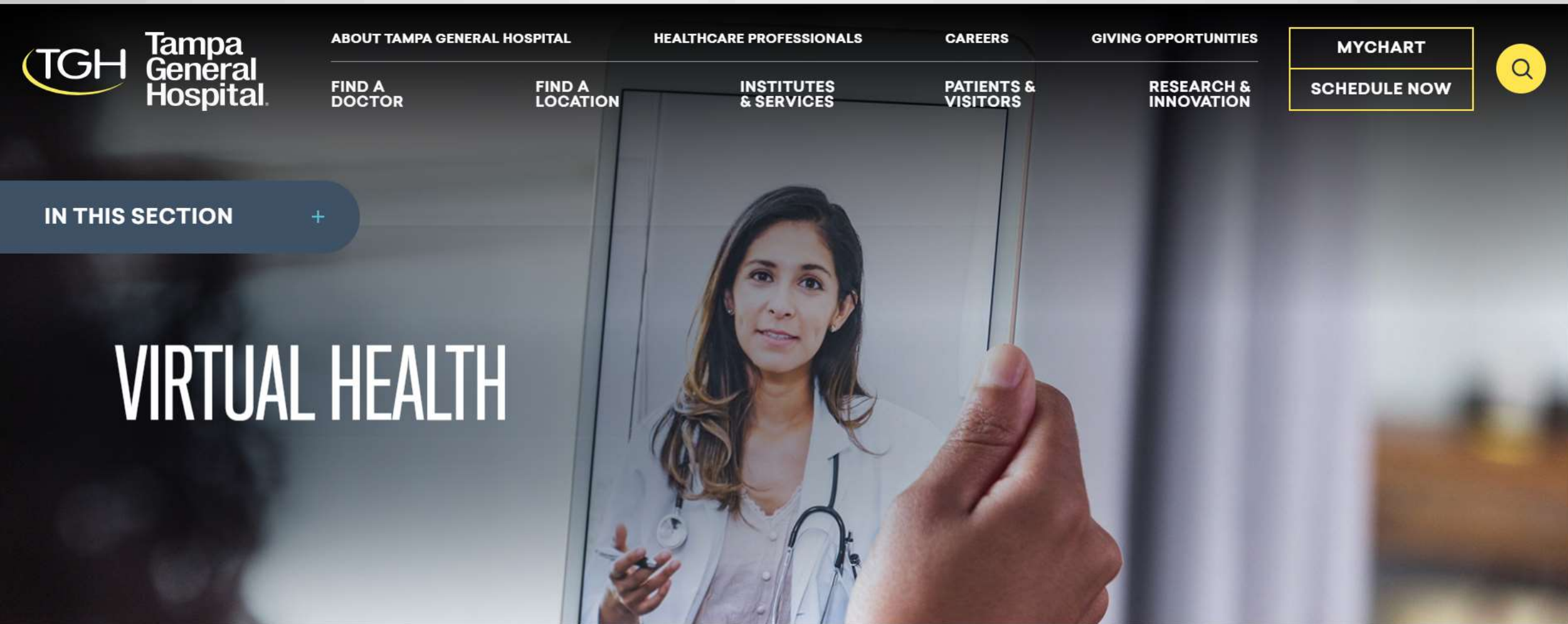
Here is the website of the hospital

Now you can visit a medical care professional live any time, anywhere on your smartphone, tablet or computer, 24/7/365. You're minutes away from being treated!

Download on the App Store

HOW IT WORKS

Patients, using an app on their mobile devices or computers, can explain their symptoms and hear the medical opinions and advice of an expert provider.

Providers will consult with patients via voice and video in real time.

- Live, face-to-face care for adults and kids.
- Prescriptions can be sent directly to your pharmacy.
- Wait time averages 6 minutes. A provider can typically resolve a health care problem in 10 minutes.

GET IT ON Google Play

Maybe my hospital room could be in my own home

SEARCH

FORTUNE

SIGN IN

Best Buy's Geek Squad is now going to start setting up virtual hospital rooms in your home

BY **CHRIS MORRIS**
March 7, 2023 at 8:18 AM MST

Most popular Health

An early use case in Charlotte

Best Buy began setting up virtual-care systems in mid-February for 10 hospitals in and around Charlotte, North Carolina.

The company said it aims to have about 100 patients in the program each day — roughly equivalent to a midsized hospital but without a building.

An early use case in Charlotte

Best Buy's Geek Squad will go to patients' homes, set up technology that remotely monitors their heart rate, blood oxygen level or other vitals and train the patient or others in the home how to use the devices.

The data would then be shared securely with doctors and nurses through the telemedicine hub from Current Health.

Here's from the Best Buy website

https://www.bestbuyhealth.com/

Preventative Healthcare

This covers many topics, including exercise, wellness, and immunizations, but it all boils down to the old adage that prevention is better than cure.

This shift from reactive to proactive approaches will be a strategic priority for healthcare providers in 2024.

Virtual And Augmented Reality In Healthcare

The use of virtual reality (VR) in healthcare is beginning to take off, with several innovative use cases now entering the mainstream.

 In particular, it has been shown to be effective in helping patients manage long-term chronic pain.

Virtual And Augmented Reality In Healthcare

Meanwhile, augmented reality (AR) is increasingly being used by surgeons to provide digital information as they work without the need to look at separate screens.

Another application is wound care management, where it enables non-invasive assessment of the severity, healing status, and best treatment options for a patient's wound.

Virtual And Augmented Reality In Healthcare

We will talk in more detail later in the presentation

Elderly Care

Many developed nations have aging populations, which will inevitably put increasing pressure on healthcare systems as people live longer and require more support in later life.

Innovative solutions that enable the elderly to remain in their own homes for longer, rather than taking up space in hospitals, hospices and nursing homes, will come to the fore.

3D Printing - From Implements To Organs

Additive manufacturing - where products are constructed using processes such as 3D printing - has a major impact on healthcare.

In parts of the world where medical equipment is hard to come by, it can be used to print tools and devices on demand, including surgical instruments, orthopedic or dental implants, and prosthetics.

3D Printing - From Implements To Organs

[Research](#) is also underway into the viability of 3D-printed organs for transplant using biological tissue taken from the patient's body.

If proven effective, this could provide a solution to the chronic shortage of organs available for transplant and dramatically reduce the cost of these procedures.

Convergence Of Mental and Physical Healthcare Delivery

For most of the history of medicine, mental and physical health care have been relatively siloed.

The COVID-19 pandemic has changed that, as providers increasingly recognize the intrinsic links between physical and mental well-being and the need for a holistic approach.

Medical Innovations and Technologies in 2023 | AMN Healthcare

Perm   Physician   July 5, 2023

By Debra Wood, RN, contributor

1. Advancing mRNA technology

Few people had heard about the synthetic messenger RNA genetic technology prior to the COVID-19 pandemic when this medical technology was used to create mRNA vaccines, which have been highly effective at reducing hospitalizations and deaths from the SARS-CoV-2 virus.

The companies that produced the COVID vaccines are now working on using the mRNA technology to create other vaccines and therapeutics.

Pfizer has announced clinical trials for an [mRNA-based influenza vaccine](#) and, with its COVID-vaccine partner BioNTech, is working on developing an [mRNA-based vaccine to prevent shingles](#).

Moderna describes their focus on mRNA
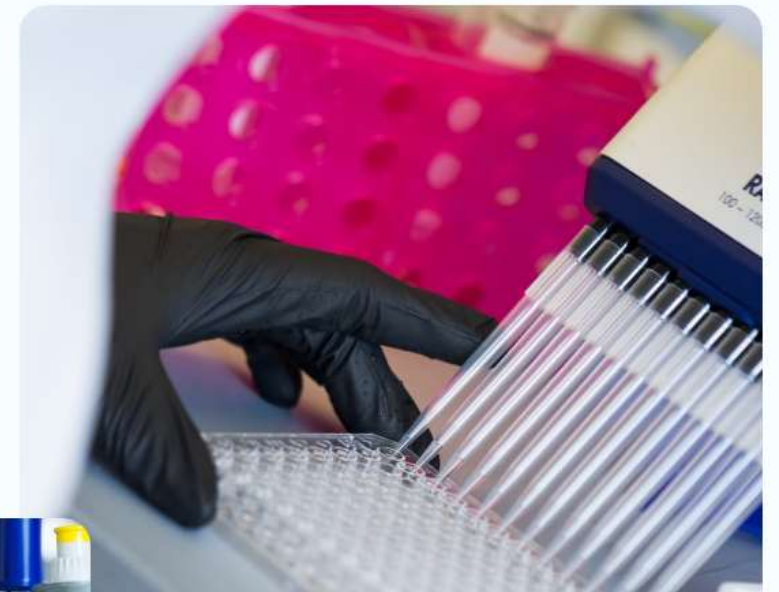
More from Moderna

mRNA could revolutionize medicine

Scientists have been studying mRNA **for decades**. And mRNA vaccines are **just the start**.

It's all about proteins

An mRNA can **teach the body** how to make a specific protein that can help your immune system prevent or treat certain **diseases**.

mRNA teaches the body how to make its own medicine

Scientists **design** each mRNA to give cells directions to make a particular protein.

1. Making an mRNA medicine

To protect the mRNA and help deliver it into cells, the mRNA is **wrapped** with lipids, or fats.

2. Deliver mRNA into the body

mRNA vaccines are given as an injection. Future mRNA treatments might be delivered by an infusion.

3. Creating the right protein

Once the vaccine is delivered, the **body takes over** and makes the protein according to the **mRNA's instructions**.
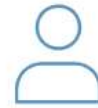
4. Breaking it down

mRNA doesn't stay in the body very long once its job is done. And it does not cause permanent changes or alter DNA.

2. Patients embracing telehealth

Telehealth and virtual visits have become and will continue to be much more common in 2023, as patients like the convenience.

A study released by [Elevance Health](#) last fall reported 94 percent of patients were satisfied with their use of virtual primary care, and 79 percent indicated it helped them take charge of their health.

3. Adapting to data integration and AI

Feldman expects "critical progress in data integration will bring about major improvements in healthcare," including enabling patients "access to their complete longitudinal health records on their phones."

While artificial intelligence (AI) and machine learning can help create accurate summaries, it will depend on improvements in data management and integration, Feldman added.

4. Securing healthcare data

The collection of all of that data, as the industry has almost completely transitioned to electronic medical records, has created concerns about data security associated with medical innovations in 2023.

Hannah T. Neprash, PhD, at the University of Minnesota in Minneapolis, and colleagues reported in *JAMA Health Forum* a growth in ransomware attacks from 2016 to 2021, exposing personal health information.

5. Creating new pharmaceutical products

The pharmaceutical industry will continue to make medical innovations in 2023.

The Cleveland Clinic has called attention to several new drug treatments, including inclisiran for lowering low-density lipoproteins, mavacamten for treating obstructive hypertrophic cardiomyopathy, and NK3R antagonists for menopausal hot flashes

6. Capitalizing on augmented and virtual reality

Healthcare technology trends include greater use of augmented reality (AR) and virtual reality (VR) for physician training and education purposes.

AR and VR also can be used to visualize veins, assist in surgeries and reduce patients' pain.

The Irish research firm [Research and Markets](#) predicts the global AR and VR healthcare market will grow 22.5 percent to achieve a value of $9.79 billion dollars from 2023 to 2027.

7. Implementing 3D printing

Three-dimensional (3D) printing in healthcare will continue being used in 2023 to develop models, medical devices, custom implants or joints, prosthetics, skin cells for burn victims and artificial organs as medical technology evolves.

8. Adjusting to wearables and in-home testing

More and more people are wearing Apple Watches and other wearable devices that can track steps taken, heartbeats, blood oxygen levels, and sleep patterns.

 Physicians and advance practice clinicians will need to incorporate the results from patients using these devices and others to monitor their health.

My two cents worth

The biggest aspects we will see will be

- More tests that we can do ourselves at home
- We can use AI to research our questions
- Wearables will become even more extensive
- We will more and more communicate with our providers via electronic means – less phone calls, less office visits

3D Printing
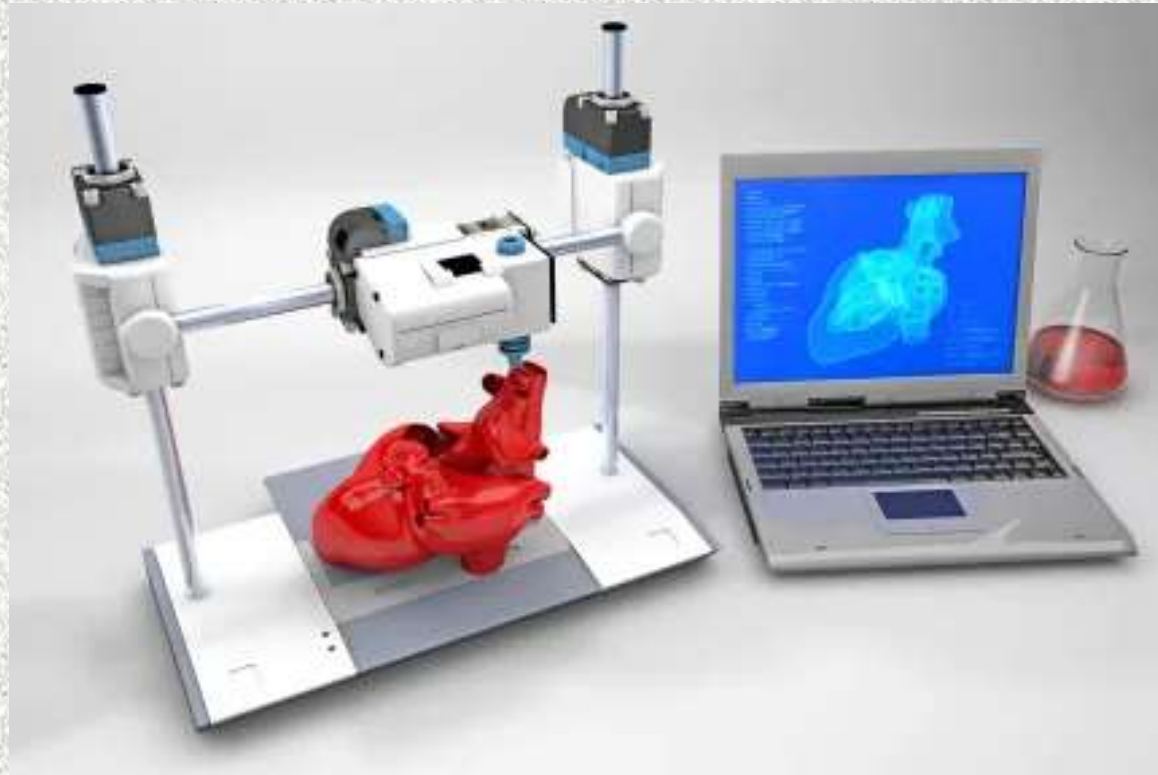
How does medical 3D printing work?

To develop a patient-specific 3D print, digitization of a patient's real anatomical structures must first take place.

This method leverages 3D scanning techniques such as MRI, X-ray CT or 3D ultrasound to produce a volumetric image of the anatomy.

The images must be labelled, via a process called segmentation, to isolate structures of interest and develop a 3D computer model.

The techniques used here are highly varied depending on the scanning modality, anatomical subject, and image quality.

Here is a video, we will just watch a few minutes, that shows 3D scanning and printing

https://www.youtube.com/watch?v=5M_oy0Ab3kY

How does medical 3D printing work?

The 3D models, which may be multi-part, are converted to a series of surface meshes and prepared for 3D printing through the addition of connectors and surface colour information.

The surfaces may also be partitioned to allow disassembly of the resulting print, making it easier to view pathologies or structures of interest.

The surfaces are finally exported to the 3D printer, typically as STL files for interpretation by the printer software, which adds support material and calculates and executes the printer head paths needed to layer material and reproduce the computer model as a physical object.

What does a 3D Printer look like?

To find out , I went to the website of a company that specializes in 3D printers

Javelin
A TriMech Company

PEOPLE ∨   TECHNOLOGY ∨   SERVICES ∨   ADDITIVE MANUFACTURE ∨   RESOURCES ∨   CONTACT US

3D PRINTER

Medical 3D Printers

Get medical devices and anatomy models created faster

I picked this printer

Stratasys H350

Stratasys H350 plastic powder bed fusion 3D printer produces accurate, production-grade parts with best-in-class consistency.

Stratasys J5 MediJet

Stratasys J5 MediJet Medical 3D Printer can create anatomical models and drilling and cutting guides that are sterilizable and biocompatible.

Stratasys J750 / J735

The Stratasys J750 and J735 3D Printers deliver unrivaled aesthetic performance including true, PANTONE colour capability with texture mapping and colour gradients.

Here it gets described

Here some more detail

The economical, compact, medical modeling 3D printer
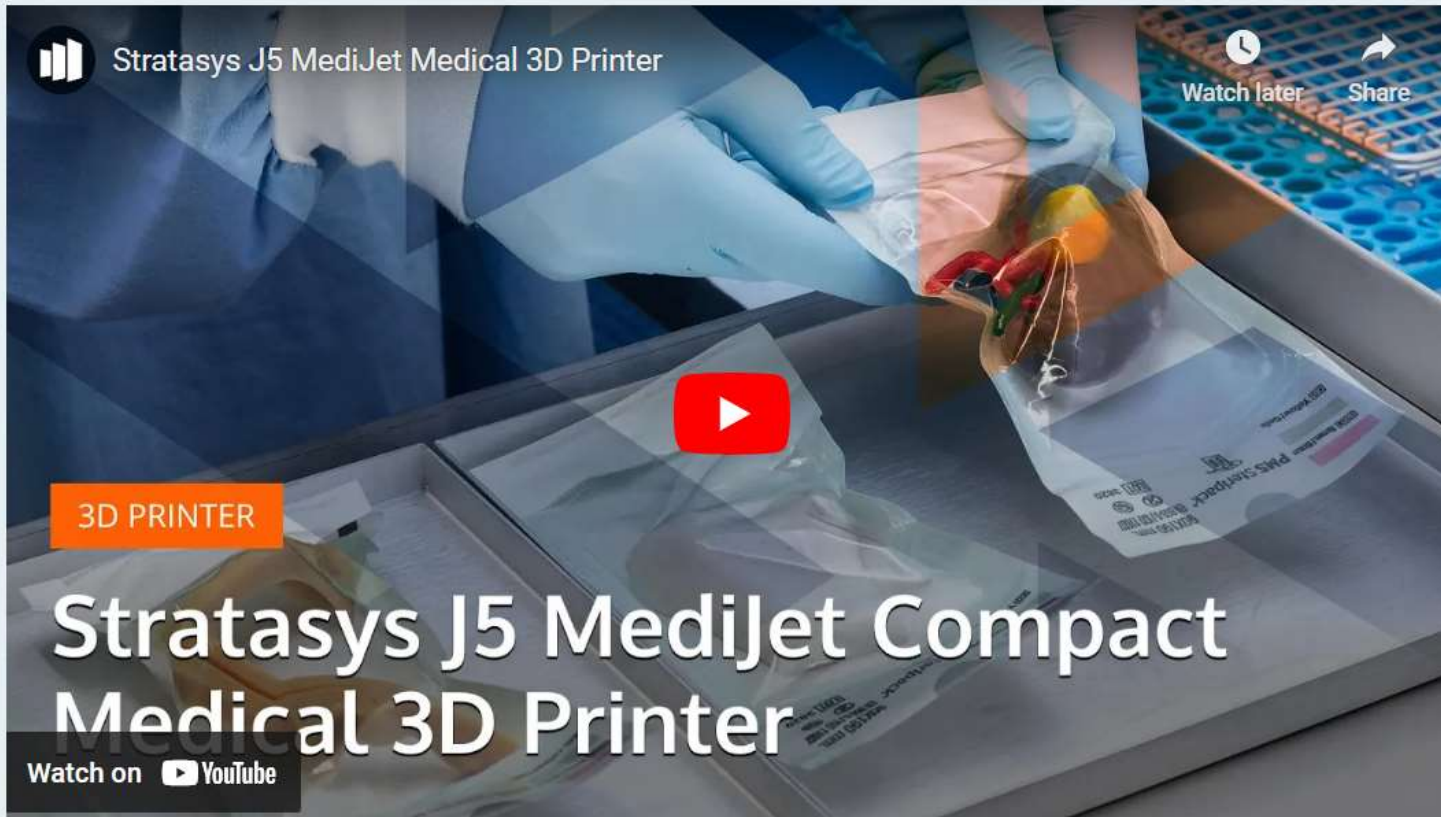
The all-in-one medical printer

The new standard for medical planning, education, and testing.

J5 MediJet™ sets a new standard for medical modeling. With multiple materials and multi-colour capabilities, academic medical centers, hospitals and medical device companies can create brilliantly vivid anatomical models and drilling and cutting guides that are sterilizable and biocompatible – all in one platform.

There is even a video

https://www.stratasys.com/en/resources/videos/introducing-the-j5-medijet/

3D Bio-Printing: What Does the Healthcare Industry Have Available Now?

So far, the majority of over one hundred 3D-printed medical products that have been reviewed by the FDA are medical devices, including orthopedic implants.

The FDA-approved products now list joint and limb replacements, bone plates, and surgical instruments and guides.

The first FDA-approved 3D-printed orthopedic implant was a titanium spinal fusion device designed to promote bone growth and help patients with degenerative disc disease or other spinal conditions.

3D Bio-Printing: What Does the Healthcare Industry Have Available Now?

While 3D printing technology is still relatively new in the field of orthopedics, two areas of 3D-printed orthopedic products have become more commonly used than others.

1.Patient-specific implants and prosthetics, especially knee or hip replacements and spinal implants, are customized to fit each patient's unique anatomy, which can improve their outcome and reduce the risk of complications, and can be produced more quickly and affordably than traditional prosthetics.

2.Surgical instruments, as well as guides for bone cutting and plate positioning, can help surgeons perform procedures with greater accuracy and precision.

Top 10 3D Printing Trends in Healthcare (2023)

3D Printing in Healthcare

- 3D Modeling & Scanning
- Injection Molding
- Tissue Engineering
- Medical Implants
- Artificial Intelligence
- Novel 3D Printing
- Prosthetics
- Laser Sintering
- Fused Deposition Modeling
- Biocompatible Materials

166

Startups & emerging companies analyzed

Data provided by **StartUs insights** — February 2023
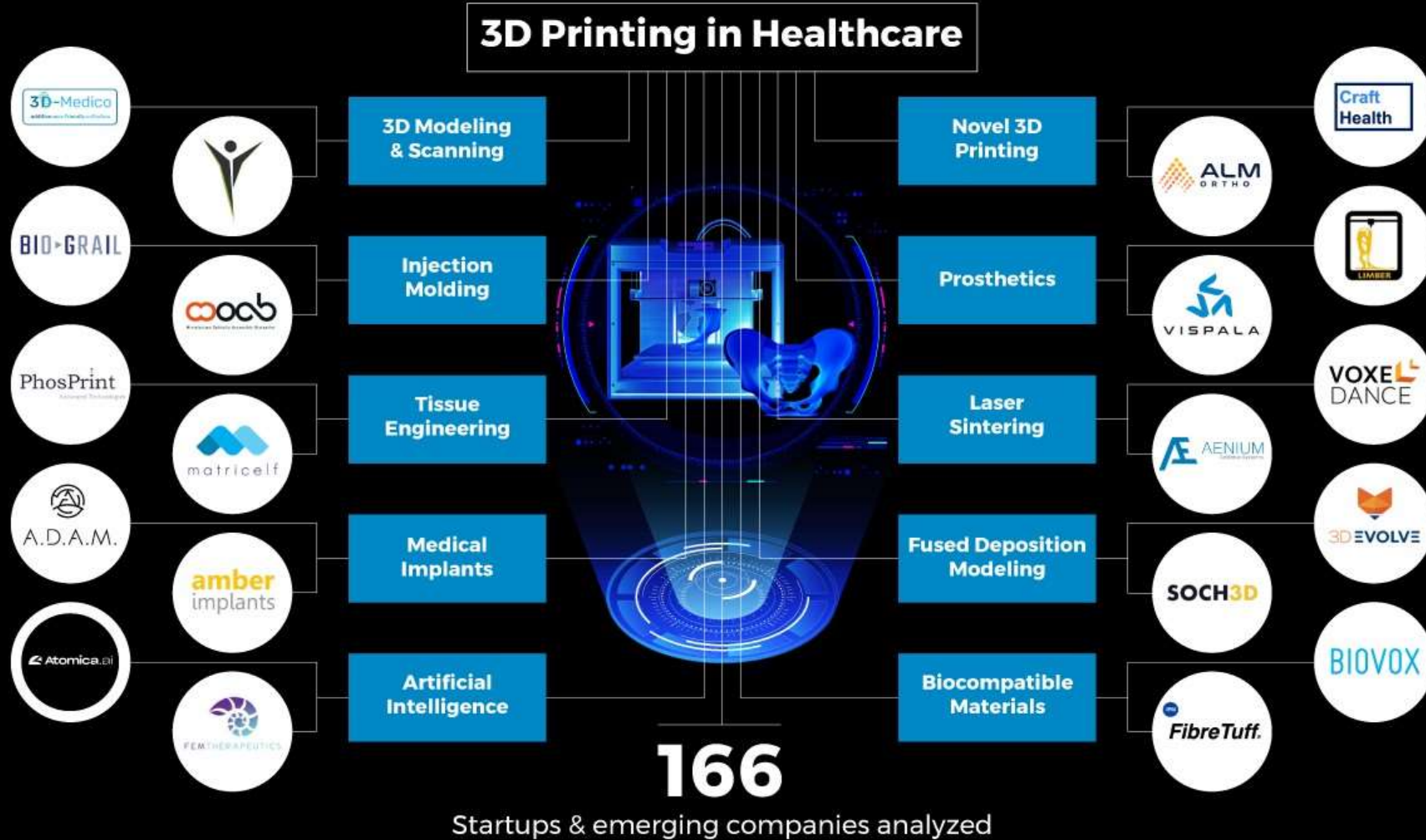
Top 10 3D Printing Trends in Healthcare in 2023

1. **3D Modeling & Scanning**

Conventional patient-oriented medical solutions do not factor individual characteristics like body shape, size, and skin surface area.

Additionally, replacing older implants and medical devices for patients requires remanufacturing to match the patient's body.

Rapid, high-precision 3D scanning and modeling accelerates product personalization and saves costs when combined with additive manufacturing workflows.

Besides, portable scanners, 3d modeling software, and medical visualization tools avoid the need for invasive medical procedures.

They allow medical professionals, like doctors and surgeons, to create custom components and detailed 3D medical models in a short time frame and without expensive equipment.

Here is a company that makes scanners for this

Artec 3D scanning applications in healthcare

Portable, safe and versatile, Artec 3D scanners are widely used by medical and healthcare professionals for creating custom-fit orthotic solutions, ergonomic prosthetic devices, back braces, dental implants, measurements, and more. Learn how specialists leverage their Artec 3D scanner to create an accurate 3D model of a patient's body or body part, and discover the ins and outs of 3D scanning for medical applications.

ROI for Orthopedics ⤓
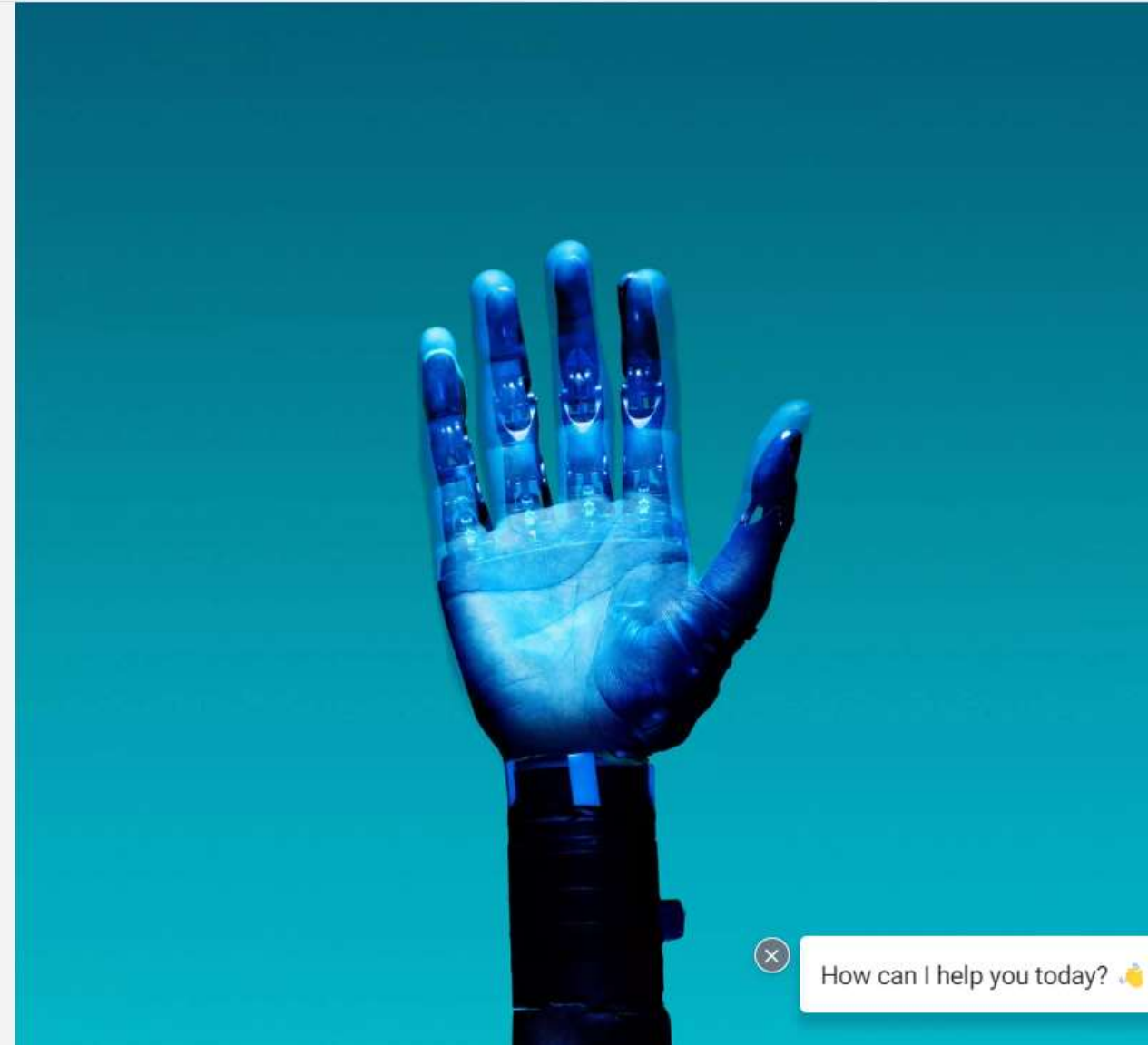
How can I help you today? 🤙

This is their sales pitch

This is their sales pitch

	TRADITIONAL METHOD **Manual Measurement**	NEW METHOD **High-speed 3D scanning with Artec Eva**
Time	30 minutes for casting, 1 hour for measurement, 3 hours CAD design, 30 minutes milling and finishing.	3 minutes for 3D scanning, 20 minutes post-processing & CAD, 30 minutes milling and finishing.
Cost	Approximate time: 5 hours.	Approximate time: 1 hour = 80 % time savings compared to traditional method.
Method	Plaster casting together with tape measures and calipers, with the final drawings being created in CAD software and sent to the milling machine.	3D scanning patient's feet from all sides with Artec Eva, post-processing in Artec Studio, converting to CAD, then sending to milling machine.
Level of accuracy	Slow and messy, as well as uncomfortable for patients. High risk of inaccuracy.	Up to 0.1 mm 3D accuracy.

ROI per orthosis	**Traditional + CAD**	**3D scanning + CAD**	
Time	5 h	1 h (80 % less time)	ⓘ THE CLINIC ACHIEVED 80 % REDUCTION IN TIME AND 69 % REDUCTION IN COSTS **USING 3D SCANNING**
Cost	Full cost	69 % cheaper	

Top 10 3D Printing Trends in Healthcare in 2023

2. Injection Molding

High cost of device and equipment production as well as complex manufacturing processes are critical issues in the healthcare and medical industries.

Injection molding, on the other hand, provides a scalable and cost-effective method for the mass production of implants, beakers, surgical equipment, orthopedics, and more.

Further, the use of advanced engineering and medical-grade plastics in the molding process results in better-finished products that also comply with medical guidelines.

Injection molding improves patient treatment and safety by enabling production using biocompatible materials and making medical devices more affordable.

Top 10 3D Printing Trends in Healthcare in 2023

3. Tissue Engineering

Conventional pharmaceutical treatments do not work on tissues or organs that are severely damaged and thus require transplant or reconstruction.

This is where additive manufacturing benefits healthcare providers and patients by creating personalized new tissues and organs in a laboratory setting.

Leveraging printable bio-inks and biomaterials, startups are growing tissues, bones, cartilage, and organs to improve patient care.

 Moreover, such innovations enable hospitals to overcome the shortage of organ donors and reduce the risk of rejection in transplant patients

This is an article a paper from Carnegie Mellon University

It Is not here yet, but it is coming

"It is no longer a question of if we can bioengineer new tissues and organs, but rather when we can translate that to the clinic and achieve FDA approval so everyone can benefit."

Adam Feinberg,
Professor, Biomedical Engineering and Materials Science and Engineering

More from the Carnegie Mellon article

"A forward-looking timeline projecting dates for major milestones in the clinical translation of 3D-bioprinted constructs is presented in the piece.

At the current pace of research, and barring changes in the regulatory landscape and current state of 3D bioprinting, 2042 is estimated as the timeframe for 3D-bioprinted solid organs to be approved as a clinical alternative for transplant, which would address the massive shortage in donor organs we face today."

Top 10 3D Printing Trends in Healthcare in 2023

4. Medical Implants

Medical implants may lead to multiple risks from implant failure, such as infection, tissue damage, and the need for revision surgery.
 Therefore, startups are developing digital platforms in combination with additive manufacturing to design and build personalized implants within days rather than weeks or months.

These solutions also enable the rapid prototyping of implants while supporting complex shapes and reducing material waste. Moreover, 3D-printed spinal, cranial, dental, and orthopedic implants provide customized products and solutions that enable hospitals and clinics to treat unmet medical issues.

Medical Implants are Big Business
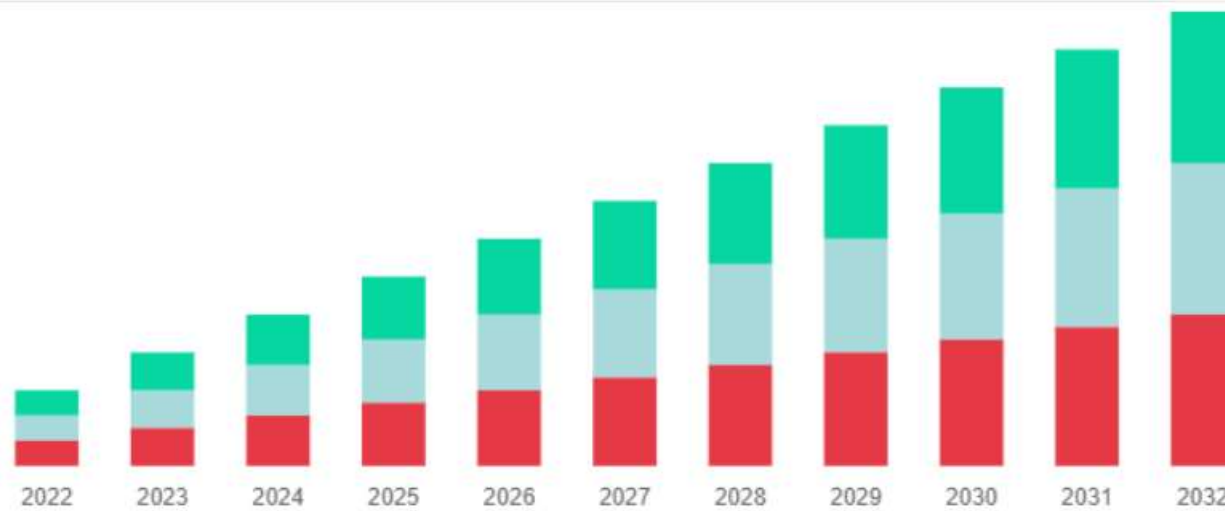
3D Printed Medical Implant Market Report 2023: Industry Overview, Size, Share, Trends & Forecast till 2032

Dashrath Wankhade
Associate Researcher at Custom Market Insights™

112 articles   + Follow

November 8, 2023

These are some of the reasons for that growth

3D Printed Medical Implants Market: Growth Factors and Dynamics

- **Technological Advancements**: Continuous advancements in 3D printing technology, including improved materials and printing techniques, are driving innovation in the medical implant sector. These innovations enable the production of more complex and customized implants, enhancing patient outcomes.

- **Customization and Personalization**: 3D printing allows for the creation of highly customized medical implants tailored to individual patient needs. This personalization improves implant fit, functionality, and overall effectiveness, which is a significant market driver.

- **Growing Geriatric Population**: The aging global population is more prone to medical conditions that require implants, such as orthopedic and dental implants. As the elderly population increases, so does the demand for 3D printed medical implants.

And more

- **Rising Chronic Diseases**: The prevalence of chronic diseases, such as cardiovascular conditions and orthopedic ailments, is on the rise. 3D printed implants are increasingly used in the treatment and management of these conditions, contributing to market growth.

- **Shorter Lead Times**: 3D printing enables faster prototyping and production of implants, reducing lead times compared to traditional manufacturing methods. This quick turnaround is essential in critical medical situations.

- **Cost-Efficiency**: Although the initial investment in 3D printing technology can be substantial, the technology often proves cost-effective in the long run due to reduced material waste and the ability to create implants on-demand, minimizing inventory costs.

Top 10 3D Printing Trends in Healthcare in 2023

5. Artificial Intelligence
Current additive manufacturing methods involve printing multiple prototypes due to the presence of defects and errors.
Additionally, 3d printers are prone to breakdown in large-volume production, causing delays.
 At the same time, AI-driven additive manufacturing workflows, like assisted maintenance and quality management, improve production throughput. This approach also cuts down production time and cost as well as delivers large amounts of data that aid medical device development.
This way, artificial intelligence in additive manufacturing enables hospitals and clinics to provide their patients with more efficient, accurate, and customizable solutions.

Top 10 3D Printing Trends in Healthcare in 2023

6. Novel 3D Printing
While additive manufacturing opens the possibilities of custom medical device production, many conventional 3D printing methods are not biocompatible.

That is why startups are providing biocompatible 3D printing technologies like electron beam melting (EBM), stereolithography, and binder jetting.

They overcome such problems by printing with medically approved biocompatible materials.

Innovations in 3D printing also allow the pharmaceutical, biotechnology, and medical industries to make unique formulations and reduce product turn-around times.

Top 10 3D Printing Trends in Healthcare in 2023

7. Prosthetics

Prosthetics generally cause discomfort, are high in cost, and have limited functionality.

Additive manufacturing enables healthcare and medical industries to create orthotics, knee braces, bionic limbs, and assistive devices tailored for specific patients.
Moreover, 3D printing processes produce prosthetics with innovative materials, such as metal composites and polymers, that provide improved strength, lightweight, and durability, reducing the need for replacements.

Top 10 3D Printing Trends in Healthcare in 2023

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Top 10 3D Printing Trends in Healthcare in 2023

8. Laser Sintering

By using a laser to bind together powder particles from a powder bed, selective laser sintering (SLS) improves product accuracy, reproducibility, and biocompatibility.

This enables the production of medical devices and implants with consistent and repeatable results. SLS also supports a wide range of shapes and geometries, which enables the production of complex and intricate medical devices.

This enables hospitals and clinics to reduce the risk of reactions from prosthetics and improve patient outcomes cost-effectively.

Top 10 3D Printing Trends in Healthcare in 2023

9. Fused Deposition Modeling

FDM constructs three-dimensional objects with a temperature-controlled head that extrudes thermoplastic material layer by layer.
This approach increases material selection choices, including thermoplastics, metals, and ceramics, and production accuracy.
 Its production process is relatively low-cost, removes the need for clinics to have sophisticated equipment, and produces larger parts compared to methods like SLS

Top 10 3D Printing Trends in Healthcare in 2023

10. Biocompatible Materials
The biocompatibility of materials is highly important in implants and devices due to the potential dangers of rejection by the immune system.

Therefore, startups are developing biocompatible materials like polyamide 12, silicon 30, and cyanate ester.

They do not trigger reactions when in contact with living tissue. Moreover, advanced materials mimic the characteristics of tissues and bones to enhance regeneration and improve patient outcomes.

Patient portals:

Patient portals are secure online websites that give patients convenient, 24-hour access to personal health information from anywhere with an Internet connection. Patients can use patient portals to:
- View their health records, including lab results, imaging results, and discharge summaries
- Request prescription refills
- Schedule non-urgent appointments
- Communicate with their healthcare providers through secure messaging
- Pay medical bills

Here is the web page for one of the Phoenix area's biggest healthcare providers

Their portal is called "MyChart"

This is their logon page

MyChart

Ver en Español
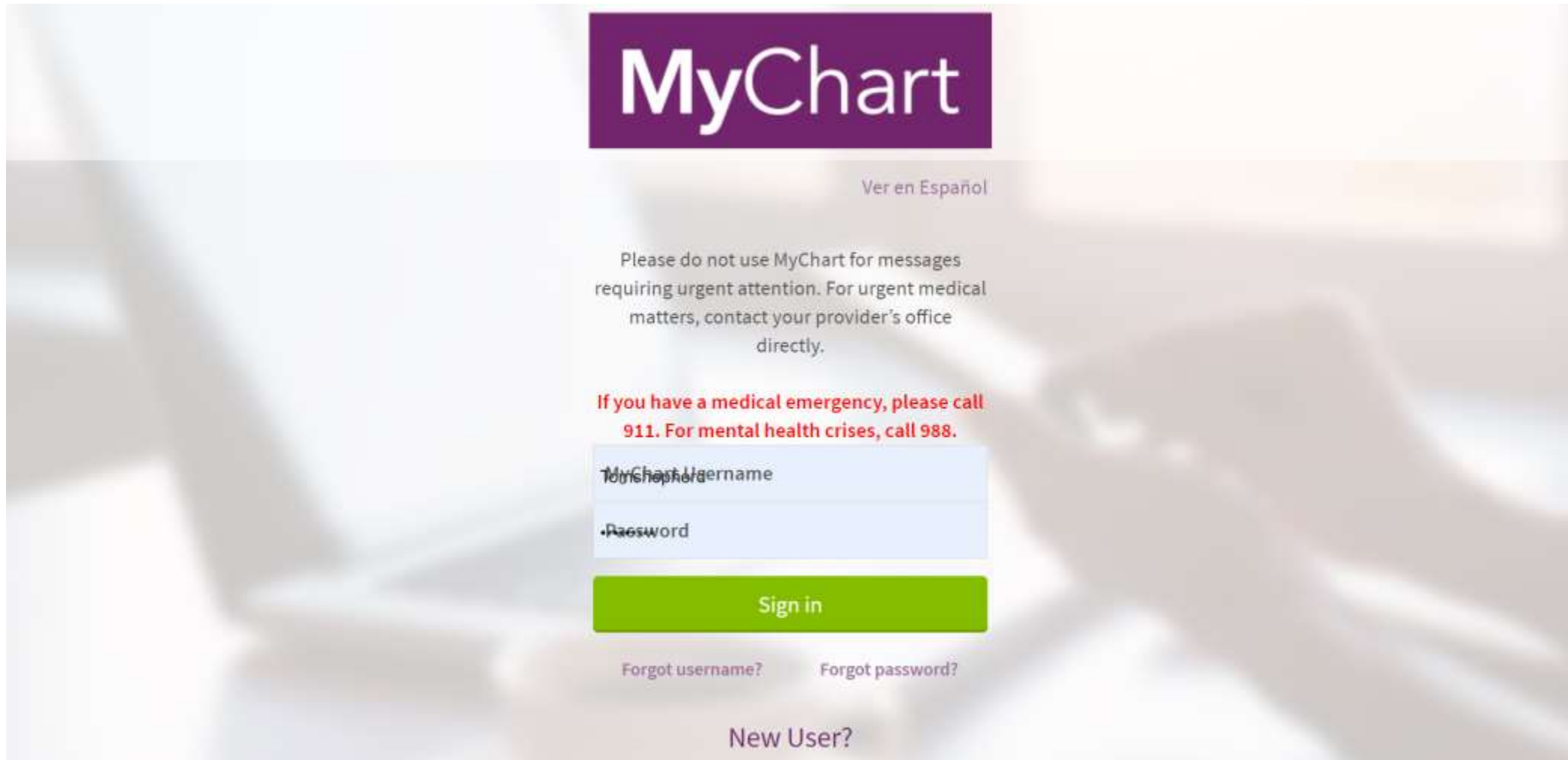
Please do not use MyChart for messages requiring urgent attention. For urgent medical matters, contact your provider's office directly.

If you have a medical emergency, please call 911. For mental health crises, call 988.

MyChart Username
Tomshophora

Password

Sign in

Forgot username?   Forgot password?

New User?

Here is the opening page

Click on visits

MyChart · MyChart by Epic · Log out

Menu · Tom ▾

📅 Visits · ✉️ Messages · ⚗️ Test Results · 💊 Medications

Welcome!

📅 Earlier appointment offers are no longer available for Established Patient on Thursday December 14, 2023 at 11:30 AM MST. | **Dismiss**

📅 **Follow Up Appointment**

Nov
17
Fri

🕐 Arrive by 10:45 AM MST

🏥 HonorHealth Orthopedics - Shea

👤 With Mary W

View details

And I see my upcoming appointments

A frequently used option is Messages

A frequently used option is Messages

MyChart | Menu

Visits | Messages | Test Results | Medications

Welcome!

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Dismiss

Follow Up Appointment

Nov
17
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With Mary W

View details

This is what shows up when you click Messages
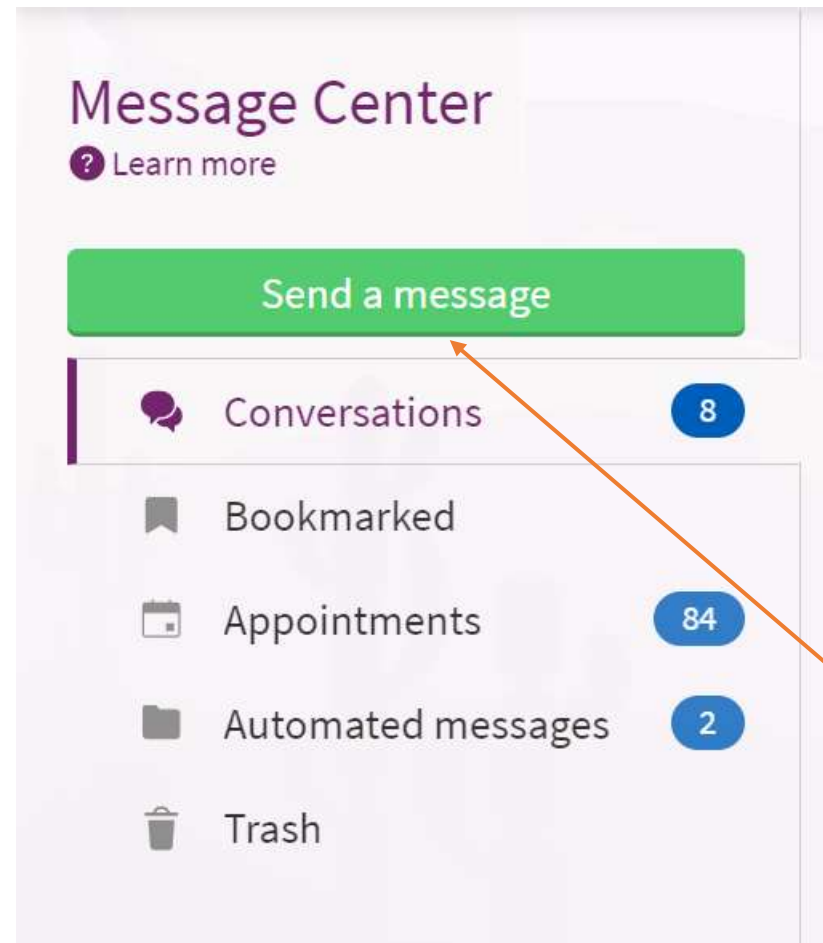
I can look at old messages, appointments, etc. – In this case I click Send a message
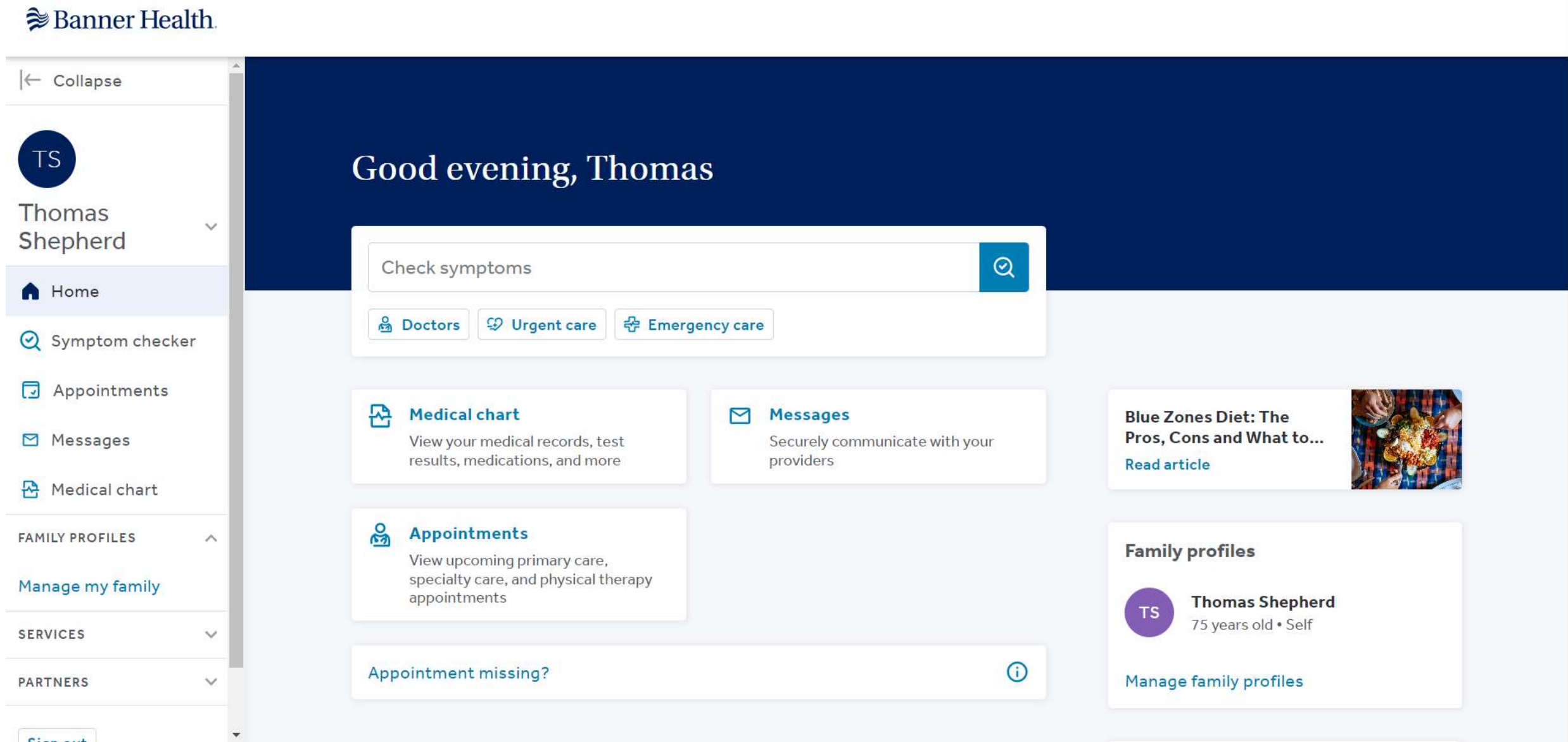
A popup guides me as to what type of message I would like to send

New message — ⤢ ✕

What would you like to do?

Schedule an appointment
Request or schedule an appointment with a member
of your care team from the Scheduling activity. →

Refill a medication
Request a refill for a prescription from your
Medications list. →

Ask a customer service question
You have a question about billing, insurance, or a
different non-medical concern. →

Ask a medical question
You have a simple medical question that doesn't
require an immediate response. →

Banner Health portal – it has similar options

My two cents worth

These Patient Portals will:

- Reduce the amount of time spent calling the provider

- Allow simple questions to be answered without having to schedule an appointment

What about Virtual Reality (VR) and Augmented Reality(AR)

And what's the difference between VR and AR ?

Google Bard says:

Virtual reality (VR) completely replaces the user's real-world environment with a simulated one.

This is done through the use of a VR headset, which blocks out the user's vision and replaces it with a computer-generated image.

VR headsets also often track the user's movements, so that they can interact with the virtual environment in a natural way.

Google Bard says:

Examples of VR:

•**Gaming: VR games allow users to immerse themselves in the game world and interact with it in a natural way.**

•**Education: VR can be used to create educational experiences that are more engaging and interactive than traditional methods.**

•**Training: VR can be used to train people for dangerous or complex tasks in a safe and controlled environment.**

Google Bard says:

Augmented reality (AR), on the other hand, overlays digital information onto the user's real-world environment.

This is done through the use of a smartphone, tablet, or other device with a camera.

The device's camera tracks the user's surroundings and displays digital information on top of it.

Google Bard says:

Examples of AR:

•**Navigation: AR apps can provide users with directions and turn-by-turn navigation instructions while they are walking or driving.**

•**Shopping: AR apps can allow users to see how products would look in their homes before they buy them.**

•**Gaming: AR games allow users to interact with virtual objects and characters in the real world.**

What about VR and Healthcare

- Surgical training is a great example

- VR can be used to train surgeons on new procedures and techniques.

- For example, VR surgical simulators can be used to allow surgeons to practice complex procedures without putting patients at risk.

Here is a short video showing how VR/AR can be used in training

https://www.medicalholodeck.com/en/newsroom/showcase-innovative-medical-vr-ar-apps-at-AMEE-2023-glasgow/
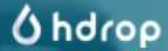
Here is another interesting video

https://www.immersivelearning.news/2023/03/24/6-use-cases-for-vr-and-mixed-reality-in-the-medical-field/

Let's switch
to Wearables

We primarily think of either Apple Watch or FitBit when the subject is Wearables – but there is a lot more do it

Here are some examples

Here are some examples

APOLLO

How to use ∨   Science ∨   Blog   Products ∨   **Get Apollo**

Apollo® Wearable   ~~$349~~ $299.99

Starting at $32/mo or 0% APR with **affirm**. Check your purchasing power

★★★★⯪ (1608)

The Apollo® wearable improves your body's resilience to stress, so you can relax, sleep, focus, recover, and feel better. Rather than tracking your health, the Apollo wearable is proven to actively improve it.

✐ Includes one medium band, which fits most adult and teen wrists and ankles. Large bands and small bands available separately.

🗓 Free domestic shipping

Here are some examples

Top 10 Medical Wearables Trends in 2023

Wearables in Healthcare

GILON

Alimetry

vital

CARDIOMEDIVE

byteSense

ACCELStars

POLYN TECHNOLOGY

OVERTONE

SHG

hippo

Artificial Intelligence

Telemedicine

Sleep Management

Hearables

Smart Eyewear

Wearable Robotics

Epidermal Technology

Smart Clothing

Fitness Trackers

Disease Management

EXISTO

angel robotics

PHARMA LATCH

ProtonIntel

PREVAYL

milbotix

hapt Dx

Posture Leader

sensowear

gaita

1038

Interesting and very current article mentioning wearables

Wearables Track Parkinson's Better Than Human Observation, Study Finds

By Matt Richtel

Published Oct. 15, 2023   Updated Oct. 17, 2023

🎁 Share full article   ↪   🔖

The News

An Oxford University researcher and her team showed that digital wearable devices can track the progression of Parkinson's disease in an individual more effectively than human clinical observation can, according to a newly published paper.

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Interesting and very current article mentioning wearables

By tracking more than 100 metrics picked up by the devices, researchers were able to discern subtle changes in the movements of subjects with Parkinson's, a neurodegenerative disease that afflicts 10 million people worldwide.

I thought might find this article interesting

Best health monitoring devices to use every day

Below is a curated list of the best products for different healthcare monitoring needs. Although smartwatches can do many things, **no smartwatch on the market accurately monitors blood pressure readings.** One study found that smartwatches failed to meet predefined accuracy guidelines set by Public Health guidelines when comparing data from a manual cuff to a smartwatch.

Although smartwatches can do many things, **no smartwatch on the market accurately monitors blood pressure readings.**

One study found that smartwatches failed to meet predefined accuracy guidelines set by Public Health guidelines when comparing data from a manual cuff to a smartwatch.

1. Blood pressure monitors

The Qardioarm Blood Pressure Monitor — this device is the best on the market and has over 2K 5-star reviews.

The monitor is placed on the right or left arm and accurately provides the user with a blood pressure reading right to their phone.

The [at-home blood pressure cuff](#) is still the most accurate device on the market, and the Quardioram Blood Pressure Monitor cuff can connect to a smartphone to store blood pressure and pulse data.

Here is what it looks like

2. Glucose meters

The Freestyle Libre 2 — this advanced blood glucose reading device is known to be the [best on the market for diabetic glucose monitoring](#). It offers a device placed on the upper arm and uses a phone sensor to measure the reading from the device. This device is ideal because it lessens the need for patients to "prick" their fingers, as the device can be used for up to seven days at a time.

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3. ECG monitors

The Apple Watch — Apple technology is always ahead of the competition. The Apple Watch is the only wearable device to detect abnormal heart rhythms and accurately provide ECG readings. However, although the Apple Watch technology is advanced, it cannot detect heart attacks, blood clots, strokes, or other heart-related conditions, such as congestive heart failure.

4. Fitness trackers

Fitbit Charge 5 — This smartwatch is known to be one of the most accurate and easiest-to-navigate fitness trackers available. This sleek and compact design accurately monitors everything from heart rate to steps and has a battery life that lasts up to 7 days. Fitbit has changed its technology over time and has very accurate and updated software to monitor and store your health and fitness information accurately.

5. Integrated Activewear

NADI X Activewear — Innovative technology has now been integrated into activewear and is available in all different shapes and sizes. The NADI X has hundreds of 5-star reviews. The brand uses mild vibrations from sensors integrated into the clothing to tell the wearer if they are practicing yoga moves accurately. This can help overall balance and lead to achieving better fitness goals.

Here is the website of a company that makes
Integrated Activewear

https://www.wearablex.com/collections/nadi-x-smart-yoga-pants

That is what I have for you – let's hear your experiences

Now let's hear from the audience

Share your experiences