

ISSUE 08  
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HEALTH

# SPRING WISE **FUTURE NOW**

THE TOP 10  
**NEAR-HORIZON**  
HEALTH  
INNOVATIONS



## ABOUT FUTURE NOW AND SPRINGWISE

**Solutions require innovation, and the hunt for those that make a real impact is the lifeblood of Springwise. We publish three new innovations every day across our ecosystem and every month, we compile a list of 10 of the most exciting and impactful innovations in our report, Future Now.**

**If you have any requests for what you'd like to see covered in a future edition of Future Now, get in touch! We'd love to hear your feedback. Email our Content Director at [angela@springwise.com](mailto:angela@springwise.com)**

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## FEBRUARY 2024

# Healthcare: a snapshot of the near horizon

Get ready for some of the most exciting healthcare innovations we've spotted over the last few months. The industry is vast and the need for change is great, both in terms of caring for the human population and the planet.

COP28, held in December 2023, was the first to include a health programme. The conference provided the setting for a declaration, endorsed by 123 countries, that called for health systems to be 'climate-resilient, low-carbon, sustainable, and equitable,' with a specific objective to 'promote steps to curb emissions and reduce waste in the health sector.' In this edition, we share just a few of the innovative ways that startups are making inroads into the challenges hospitals face around waste – in some expected and unexpected areas.

But before we get there, no near-horizon scan of the healthcare technology space would be credible without a nod to Artificial Intelligence (AI) and the variety of ways it is enabling breakthroughs previously unimaginable.

Likewise, the field of biomimicry, the practice of designing models or systems based on those found in nature, is offering researchers viable alternatives to animal testing and potential solutions to the current 90 per cent failure rate of clinical trials for new medicines.

All things that would've felt like science fiction a decade ago, but are now poised to make positive impact on the here and now.

Change is possible!

**Angela Everitt,  
Content Director, Springwise**

**FEBRUARY 2024**  
**HEALTH**

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## GAMECHANGING ARTIFICIAL INTELLIGENCE

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## AI that spots early signs of health decline

The home-based system helps social care teams pick up on small changes that often go under the radar

According to the World Health Organisation, by 2030, [one in six](#) people globally will be aged 60 or over, which will bring added pressures on health services, including emergency departments.

Against this backdrop, UK Physiotherapist Louise Rogerson and data scientist Jonathan Burr decided to find a way to prevent emergency admissions by deploying smart home care earlier. The co-founders therefore built Howz, a smart home care monitoring system that works to prevent falls and other injuries by identifying slight behaviour changes.

Using artificial intelligence (AI), alongside a motion sensor, smart plug, door sensor, and hub, Howz's package helps

carers track energy use and at-home movements. The AI quickly establishes a base routine for each patient and uses that information to identify early behavioural changes that indicate a possible need for support.

Those early alerts – such as no electric kettle use on a particular day – help care teams and family carers spot and react to small changes that may otherwise go unseen with current home care monitoring systems.

The Howz system is installed in minutes, and data is available via an app for individual carers. For those in charge of multiple patients, Howz provides round-the-clock monitoring and a care dashboard.

### Takeaway

An ageing population means increased demand for home care support, with most people wanting to live independently at home for as long as possible. Anything that facilitates this option helps reduce the burden on care homes, which are already short of space for dementia patients. Howz's intelligent platform helps plug some of the gaps that traditionally made it difficult for patients with mild cognitive impairment to live independently.

Results show that the use of Howz reduces emergency admissions by 32 per cent and the risk of care home admission by 42 per cent.

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Photo credit: Mediwave Pte. Ltd.

## Mixed reality and AI that can improve emergency medical care

A 'connected ambulance' is helping emergency responders in Sri Lanka provide better care when it matters most

1990 Suwa Seriya – Sri Lanka's national pre-hospital emergency ambulance service – is deploying an innovative connected ambulance that uses an integrated 'Emergency Response Suite' developed by Singaporean company Mediwave. This system combines the latest communications equipment with internet-of-things and augmented reality capabilities to enhance the efficiency of the emergency response eco-system.

The connected ambulance ensures swift response times and makes it possible to provide specialised care remotely through a Microsoft

HoloLens headset. The technology enables Emergency Medical Technicians (EMTs) – staff who man ambulances in Sri Lanka – to connect with physicians at the Emergency Command and Control Centre. These physicians then help the EMTs provide care during the so-called 'golden hour' of medical emergencies – care within one hour of a traumatic injury is essential for a positive patient outcome.

The system also includes an AI-powered transcriber to digitise electronic patient care records. This minimises human error and reduces delays once the patient reaches the hospital.

### Takeaway

Mixed reality (MR) refers to technologies that create immersive computer-generated environments in which parts of the physical and virtual environment are combined. With potential applications that range from education and engineering to entertainment, the market for MR is forecast to record revenues of just under \$25 billion by 2032.

Healthcare is one of the most promising use cases for the technology, and the groundbreaking partnership between Mediwave and 1990 Suwa Seriya is deploying MR and AI to create a fully connected ambulance that meets the needs of Sri Lanka's healthcare system.

## AI that detects the onset of diabetes via voice recordings

### Researchers are able to detect type 2 diabetes without testing blood sugar levels

According to the World Health Organization, around [422 million people](#) worldwide have diabetes, and 1.5 million deaths are directly attributed to the disease every year. Testing of blood glucose levels can spot pre-diabetes, a condition where blood sugar is high but has not yet developed into the full-blown illness. However, this test is not always easy to access – especially in the developing world where diabetes is most prevalent.

Now, research from Klick Health suggests that a very simple test involving speaking a few sentences into a smartphone could reliably determine whether a person is developing diabetes. The study, published recently in *Mayo Clinic Proceedings: Digital Health*, outlines how researchers created an artificial intelligence (AI)

model that can determine whether an individual has type 2 diabetes using around 10 seconds of a voice recording and basic health data.

Researchers asked non-diabetic and type 2 diabetic participants to record a phrase into their smartphone six times daily for two weeks. Signal processing was used to analyse 14 acoustic features from the recordings, and the researchers found that type 2 diabetes causes detectable changes in the voice, and that these vocal changes are different for men and women. The technology has the potential to remove barriers to testing, such as cost and time, allowing much earlier and more widespread testing.

The voice test is not the only recent breakthrough in diabetes made by Klick. Earlier this year, researchers at Klick developed a new way to catch the earliest signs of failure to control blood glucose levels, even before they reached the pre-diabetic stage. The method used an algorithm to spot impaired glucose homeostasis, a precursor to diabetes. Both of these tests could make early detection much faster, easier, and cheaper. This is vital because early detection allows patients to alter their diet and lifestyle, reversing or preventing diabetes.

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## Less admin, shorter wait times

### This AI system can prioritise 'at-risk' patients

In Brazil, healthcare technology company NeuralMed provides an AI-powered diagnostic tool for prioritising patients in care pathways. NeuralMed's algorithm reads a variety of documents, including plain text, PDFs, X-rays, EKGs, and CT scans. After analysing the information, the system lists patients in order of urgency.

The process reduces the amount of time it takes a patient to see a doctor after undergoing testing. And patients with an abnormality identified in screening results

are automatically moved to the top of the list of clinical priorities.

The NeuralMed team emphasises that the role of doctors is paramount in healthcare and that the AI is a powerful tool of assistance, not a replacement for human expertise.

The company provides its AI through two programmes that easily and quickly integrate with an organisation's existing technology infrastructure. 'TrIA' helps accident and emergency teams sort patients by the seriousness of symptoms after initial scans. 'HarplA', meanwhile, has two options – 'BI' for the creation of a historical database of patient data and 'Assist' for day-to-day record keeping.

## Takeaway

In 2021, the use of artificial intelligence (AI) in healthcare reached a global market size of \$11 billion. Forecasters expect that figure to continue growing and surpass \$188 billion by 2030. As of 2021, around a fifth of healthcare organisations around the world were in the process of introducing the technology to some part of their workflows.

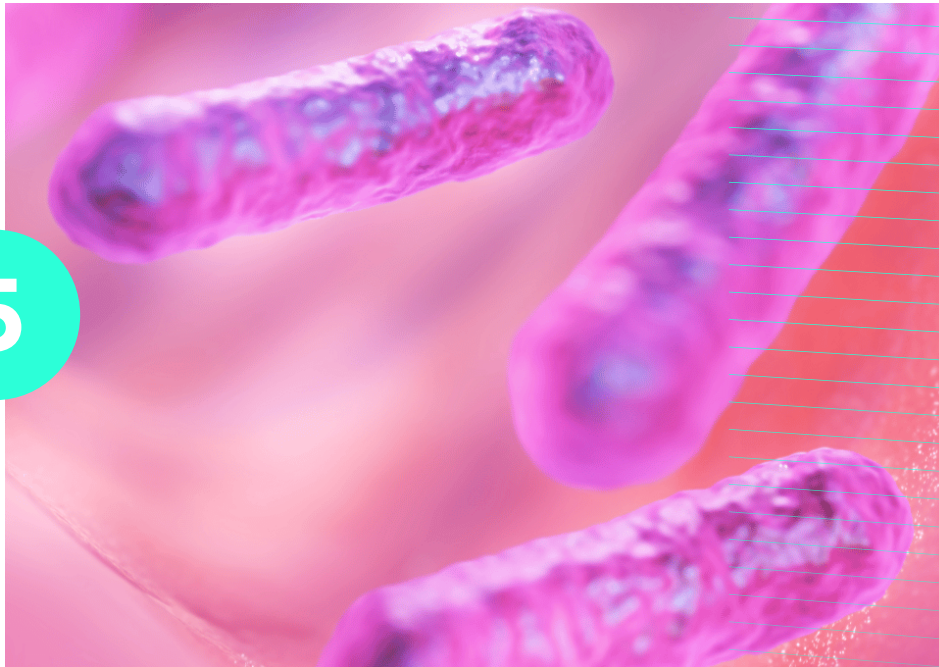
In addition to using AI's pattern-spotting capabilities for new diagnostic tests, the complexity of record keeping in healthcare is an area in which developing technologies could make a major difference.



## INNOVATION THAT REMOVES THE NEED FOR ANIMAL TESTING

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Photo credit: © iStockphoto from pixabay via Canva.com



# A model of the human gut allows for research without animal testing

This system provides detailed analysis with a 'world-first' model

Newcastle University spin-off Aelius Biotech has developed a lab-based model of the human gut that enables organisations to test out possible new products without using animals.

The new process speeds up the time it takes to research and develop pharmaceuticals and foods and eliminates the ethical concerns associated with testing on animals. The laboratory digestive model is a world-first as it simulates all three stages of digestion, in which substances pass through the gut, cross its surface layer of mucus, and are finally absorbed into the body.

The company offers a range of tools that provide partners with information on cell damage, nutrient absorption,

airway effectiveness, speed of flow throughout the body, and more.

Aelius Biotech's team has decades of experience in human trials and gastrointestinal research and provides consultancy services as well as support in designing trials for product research. The predictive lab has the space and technology to run a variety of tests and models, such as screening and testing for bioactive effects, reformulation of drugs to reduce toxicity, and bespoke analyses.

The company recently raised a £1.25 million funding round, which it will use to build and equip new lab space and triple the size of its team over the next two years.

### Takeaway

On December 29th 2022, President Biden signed the FDA Modernisation Act 2.0, removing the FDA's long-established requirement for drug developers to conduct animal tests before progressing to human clinical trials. Elsewhere, in 2021, the European Parliament called for the EU "to accelerate the transition to a research system that does not use animals."

Calls to end animal testing have a long history and are argued on practical as well as ethical grounds. The failure rate for drug candidates sits at around 90 per cent today, which suggests that animal testing is failing as an accurate model of human physiology. This is prompting innovators like Aelius Biotech to seek alternatives.

## Living human skin models for safety and efficacy studies

### A startup has found a way to turn skin left over from surgery into a drug testing model

Around the world, surgical procedures generate large amounts of leftover human skin. And with the informed consent of patients, US startup Genoskin is turning all this real, living human tissue into a valuable tool for testing the safety and efficacy of drugs, vaccines, medical devices and cosmetics.

The company has developed proprietary technology for keeping skin alive for up to seven days after a surgery. This gives organisations a week of opportunity for performing tests of new compounds on real human skin in a laboratory setting.

Within 24 hours of a surgery, the skin tissue is prepared into a ready-to-use assay that can be shipped to researchers anywhere in the world. Stabilised in the assay, the skin models retain immune response and cellular function. They will even heal themselves if they are cut.

Building on this core technology, Genoskin has developed three main services. NativeSkin is a full thickness epidermis and dermis model that can be used for toxicity and efficacy testing. InflammSkin, meanwhile, enables researchers to validate anti-inflammatory treatments. Finally, HypoSkin is the world's first skin study model for assessing the effect of subcutaneous and intradermal injections.

The company has also separately developed a unique method of obtaining primary mast cells from peripheral blood samples of healthy adults. These cells play a crucial role in the human immune system's response to pathogens, so their study can provide vital insights into the efficacy and safety of drug candidates.

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## Tiny organs help develop new medicines

### The technology is cracking the secrets of the immune system

'Organoids' are tiny 3D models of human organs that can be used as highly accurate test models. In fact, startup Parallel Bio claims that they are the most accurate models of disease in the world.

Thanks to advancements in machine learning and bioengineering, organoids can now be manufactured on a vast scale, and the company is taking advantage of this to apply them in one particular area of medicine: immunotherapy.

Immunotherapies interact with the human immune system's own defences to create vaccines and treat illnesses. For example, they can be used to kill tumours in cancer patients.

But today, this promising area of medicine is being held back by reliance on ineffective animal testing, a lack of population-level information, and difficulties with marrying immunotherapy to computational drug discovery approaches (which use computer modelling techniques to screen large numbers of drug candidates).

Parallel Bio's platform combines best-in-class organoids with computational approaches to facilitate analysis of the many cells and molecules involved in the immune system.

## Takeaway

By providing human skin tissue in a standardised format, Genoskin is enabling drug developers to obtain reliable data on potential new drugs without using animal testing. This, in turn, de-risks the many steps involved with drug development and accelerates the process of bringing potentially life-saving drugs to market.

Parallel Bio's technology can also accelerate drug development. But, beyond this, it has the additional benefit of enabling researchers to predict how a therapy will work across the whole population not just a single individual.



## REDUCING WASTE IN THE HEALTHCARE SECTOR

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## TREATING BIOHAZARDOUS LAB WASTE ON-SITE

**A new system that allows laboratories to recycle their waste**

The global healthcare industry is responsible for [more than four per cent](#) of worldwide greenhouse gas emissions, while healthcare waste accounts for [one to two per cent](#) of all urban waste.

A significant proportion of healthcare-related waste is biohazardous laboratory waste, with Irish biotech startup Envetec highlighting that 41 million kilogrammes of this type of lab waste is produced every day. And, to tackle this problem, the company has created a proprietary biodegradable chemical that can be used to process lab waste on-site.

Called Generations, the low-energy, non-thermal system transforms potential pollution into recyclable polymer flakes that are usable in a huge

range of other manufacturing processes and are safe to handle and transport.

The Generations process is carbon-neutral and set up within or very near a laboratory. The technology requires far less water than traditional treatment systems, and Envetec works with teams and organisations in the diagnostics, food and beverage, and pharmaceutical industries to design bespoke treatment and recycling processes that meet their needs.

The on-site nature of Envetec's technology is particularly crucial given that 5.9 million tonnes of CO<sub>2</sub> equivalent emissions are generated transporting lab waste to treatment sites every year.

### Takeaway

Envetec's clients are already reaping the benefits of the system. For example, a pharmaceutical plant in the UK, which had previously been sending its waste to a treatment site 50 miles away, saw an 84 per cent emissions reduction after it implemented the Generations system.

Similarly, a diagnostics facility in Ireland, which was transporting its waste a whopping 168 miles, achieved an over 90 per cent emissions reduction.

Crucially, these reductions can help organisations meet emissions reduction goals for scope two and three emissions.

## Creating a circular economy for anaesthetic gases

### A novel system allows exhaled anaesthetic gases to be captured and reused

We don't often think of anaesthetic gases as contributing to global warming, but [two per cent](#) of the UK NHS's greenhouse gas emissions come from anaesthetic and analgesic practices. During an operation, only a tiny percentage of anaesthetic agents are absorbed and metabolised by the patient's body, meaning that the vast majority of this volatile anaesthetic is expelled as waste. Currently, waste hospital anaesthetic gas is captured by centralised systems and vented into the atmosphere. These systems are built into the hospital's infrastructure during construction, preventing hospitals from easily expanding operating capacity.

To address this, SageTech Medical has developed a flexible, modular system that allows hospitals to capture exhaled waste anaesthetic gas in reusable canisters in the operating theatre. The canisters are then emptied into bulk storage tanks and collected.

Captured gases are recycled to yield active pharmaceutical ingredients, which are then bottled for reuse. This process reduces the energy and carbon needed to manufacture the virgin gases, as well as the environmental impact of their release, creating a circular system.

Recent orders made by NHS trusts, including in Manchester and Hull, mean that SageTech's circular technology will soon be in use in certain NHS hospitals. The next key milestones for the company include achieving significant UK sales and gaining the CE Mark for its SID-Dock capture machine, so that SageTech can then distribute across Europe too.

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## Closed-loop recycling for hospital plastic

### A startup is remanufacturing otherwise single-use plastic into new medical products

Hospitals are major generators of plastic waste, such as utensil packaging, gowns, and sterilisation wrap – which is used to protect sterilised equipment. This 'hospital plastic' is particularly likely to be landfilled or incinerated due to concerns about contamination.

To fight against this seemingly endless tide of single-use plastic, Australian startup GreenMed has created a closed-loop recycling scheme

that installs collection stations for plastic within healthcare facilities. Through partnerships with local social enterprises, the startup then processes and prepares the collected waste for recycling into new, useful products specifically for the healthcare sector.

The company's initial pilot focused on polypropylene sterilisation wrap, which was collected from the operating theatre of a hospital in Tasmania. This form of waste, the company points out, is ideal for manufacturing a range of plastic products through a process that requires no water use, releases no toxins, and only has a small transport and energy footprint. These remanufactured products include 'GreenGuard' – protective corners for sterilisation trays.

## Takeaway

While anaesthetic gases have become an integral part of surgical practices, they are also potent greenhouse gases with extremely high global warming potential. Their use is therefore a unique decarbonisation problem for healthcare facilities. SageTech is providing a solution that improves planetary health without compromising on patient care.

Another particular problem when it comes to healthcare waste is the fear of contamination. GreenMed, however, is showing that despite this additional consideration, it is possible to create a circular economy for hospital plastic.

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# DIRECTORY

## FEATURED INNOVATIONS

**1 Howz**

[howz.com](https://howz.com)

**2 Mediwave**

[mediwave.io](https://mediwave.io)

**3 Klick Health**

[klick.com](https://klick.com)

**4 NeuralMed**

[neuralmed.ai](https://neuralmed.ai)

**5 Aelius Biotech**

[aeliusbiotech.co.uk](https://aeliusbiotech.co.uk)

**6 Genoskin**

[genoskin.com](https://genoskin.com)

**7 Parallel Bio**

[parallel.bio](https://parallel.bio)

**8 Envetec**

[envetec.com](https://envetec.com)

**9 SageTech Medical**

[sagetechnical.com](https://sagetechnical.com)

**10 GreenMed**

[greenmedical.com.au](https://greenmedical.com.au)

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