# Insights Series



# **Providing access that matters**

Innovative mobile health units made in Japan

A thought leadership paper on "Achieving operational excellence" and "Transforming the system of care"



# **Preface**

#### The Insights Series

The Siemens Healthineers **Insights Series** is our preeminent thought leadership platform, drawing on the knowledge and experience of some of the world's most respected healthcare leaders and innovators. The Series explores emerging issues and provides you with practical solutions to today's most pressing healthcare challenges.

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### Introduction

The COVID-19 pandemic taught us many lessons over the past two years. One important lesson is that most, if not all, health systems are unprepared for sudden crises and have significant shortcomings when it comes to dealing with them. Another lesson concerns availability. Health systems are constantly dealing with the challenge of providing care whenever and wherever it is needed. During extended periods of continual stress, such as a pandemic, that challenge becomes more pronounced.

Given the importance of providing available healthcare to as many people as possible, it may be surprising to learn that an effective model for doing so already exists, though it is largely underutilized. Mobile healthcare units have been used for decades, but their value has never been fully recognized, and even today, they have not been leveraged to the extent one might expect. In fact, it would be fair to say that mobile health clinics represent a significant "untapped resource for health systems" across the globe.

Mobile health units are, as the name implies, customized vehicles outfitted with all manner of medical technology that travel to patients in their communities to deliver needed healthcare services. The services they are able to deliver are wide-ranging, and the units can be staffed by many different kinds of healthcare providers, including physicians, nurses, and community health workers. These rolling doctor's offices are an excellent example of healthcare making itself available to patients, eliminating whatever barriers exist to people obtaining the health services they require.

This paper explores the notion of bringing healthcare to people—moving care closer to patients, rather than forcing them to go looking for it. Mobile health units are gradually being recognized as one of the best examples of that kind of solution. In this paper, we dig deep into a case study from Japan, where the concept of moving care to patients has been updated to reflect the potential presented by 21st century technology.

# The challenge

Research into healthcare availability and the problem of underserved communities and populations indicates that while there a number of reasons why people might have difficulty obtaining care, there are two overriding challenges to availability: One is geography, which is a factor that is always in play, and the other is a temporary breakdown in health infrastructure resulting from either a pandemic or some form of technological or natural disaster.

#### Geography

The role that geography plays in healthcare delivery has been well documented. Physicians and other health professionals often prefer to live in larger urban centers rather than in rural areas. By way of example, there are only 1.3 physicians for every 1,000 people in rural areas of the United States.<sup>2</sup> Conversely, in urban areas, there are 3.1 physicians for every 1,000 people.

In China, this discrepancy is even wider, with just 1.8 physicians for every 1,000 people in rural areas, compared to 4.0 in urban areas.<sup>3</sup>

In addition to facing a scarcity of physicians, people living in rural areas often have to travel long distances to reach either a specialist or a hospital. In Northern Finland, patients must travel around 400 kilometers to reach their nearest hospital. In India, 65% of people live in rural parts of the country, but only 41% of physicians and 37% of hospital beds are located in those areas. As a result, the majority of India's rural population has to travel long distances to receive even basic healthcare services.

This pattern is repeated around the world. In Africa, 80% of patients living in rural areas lack modern healthcare.<sup>8</sup> In Australia, 30% of the people who live in outer regional areas and 58% of those who live in remote areas report not having a specialist nearby. In major cities, only 6% have that problem.<sup>9</sup>



"When you think about it, all the pieces have been in place for a long time. We have the technology. We have the healthcare professionals. And we certainly have all manner of vehicles. The key was to find ways of putting them all together so we could deliver not just care, but the very best care, wherever it is needed."

Motohisa Kojo, CEO Hakuhokai Group

#### Temporary disruptions

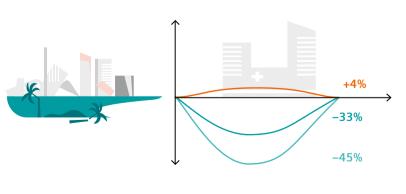
The COVID-19 pandemic reminded the world that we are only ever a single disaster away from health structures buckling and possibly breaking. There have been times over the past few years when hospitals were strained to absolute capacity, and there was real concern not only for the people being treated, but also for the many non-COVID patients who either could not be admitted or stayed away from hospitals out of fear.

Natural disasters may not have the same widespread effect as pandemics, but in the areas where they occur, they can cause spikes in demand for medical care. In 2011, the U.S. experienced one of the largest and costliest outbreaks of tornadoes ever recorded. One hundred seventy-five tornadoes struck, leaving catastrophic destruction in their wake, with the states of Alabama, Georgia, Mississippi, and Tennessee incurring the most severe damage. Hundreds of people were killed, and hospital admissions increased by 4% during the worst 30-day period.<sup>10</sup>

Scenarios like this one occur almost any time nature lashes out unexpectedly. Studies on the effects of bushfires in Australia, for example, show increasing admission rates for patients with respiratory diseases.<sup>11</sup>

Yet there are also studies that come to the exact opposite conclusion. Due to natural disasters, access to hospitals is inhibited in the short term, thus causing an unexpected drop in admissions. This effect was illustrated, for example, in a study examining the impact of Typhoon Haiyan on the Philippines in 2013. A 45% decrease in admissions related to pregnancy, childbirth, and puerperium was observed in particular.<sup>12</sup>

The clear lesson here is that healthcare systems today are too reliant on structures that are not nimble and responsive enough to deal with unexpected events, so when the unexpected occurs, availability is reduced. What is needed is an innovative approach to expanding capacity and increasing availability, both in response to ongoing geographic need and temporary disruption.



#### <sup>a</sup>30 days period

<sup>b</sup>week -1 prior typhoon vs. week 1 post typhoon

#### Natural disasters



increase hospital admissions<sup>10</sup> Tornados in 2011, Alabama, Georgia, Mississippi and Tennessee:

• Hospital admissions increase by +4%

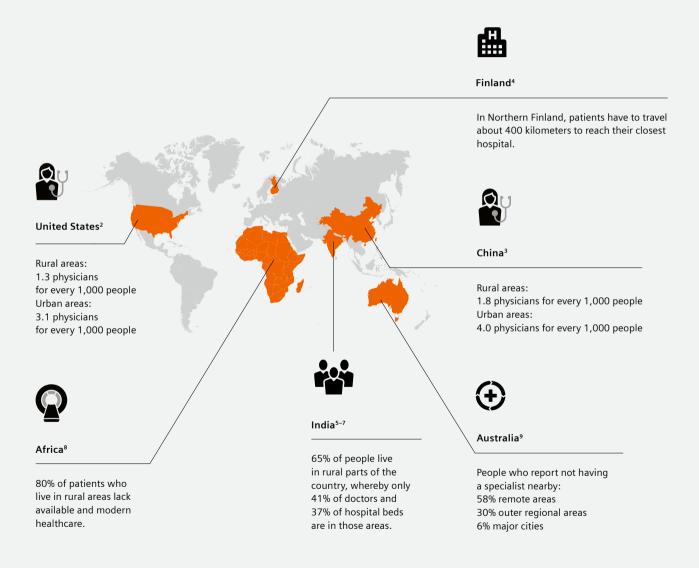


can also hinder access to hospitals in short term<sup>12</sup>

Typhoon Haiyan in 2013, Philippines— Hospital admissions decrease:

- Overall by −33%<sup>b</sup>
- Pregnancy, childbirth, and the puerperium by –45%<sup>b</sup>

# Geography plays a critical role in healthcare delivery



### The solution

#### Shifting the point of care

Thankfully, innovative approaches do exist, and governments and providers are increasingly open to exploring them in order to increase healthcare availability. These approaches are often referred to as "outreach programs," because they rely on providers extending a helping hand, in one form or another, to people who need it.

The first of these approaches is to find ways of bringing people to healthcare by offering transportation from rural areas to urban health facilities, for example, using buses, helicopters, boats, or rescue planes. There are situations in which this can be effective, particularly if circumstances have made it impossible for people to travel in search of care on their own.

A more consistently effective approach, however, is finding ways of bringing healthcare to people—shifting the point of care away from established facilities to wherever patients are located. To this end, health systems have long been investing heavily in outpatient centers, home and community care services, and telehealth solutions.

Another way of shifting the point of care to where patients are located is through mobile healthcare units. These have been proven effective in places where the rural/urban divide is a barrier to care availability as well as in situations where standard healthcare channels

have been disrupted by a technological, natural, or epidemiological disaster. Over the past decade or so, these mobile clinics have demonstrated their potential all over the world.

In 2005, Hurricane Katrina ravaged New Orleans, causing more than 1,800 deaths and \$160 billion in damage. The flooding caused by the massive storm destroyed most of New Orleans's transportation and communication facilities, leaving tens of thousands of people without access to food or shelter and with no way to seek medical attention. Thankfully, medical attention sought them out instead.

In what was termed Operation Assist, mobile medical units visited 23 sites in the stricken area, treating people with respiratory illnesses, skin conditions, and minor injuries. <sup>14</sup> They also administered vaccines and dealt with chronic medical problems such as hypertension, diabetes, and asthma. More than 1,000 patients who might otherwise not have received care were helped. <sup>14</sup>

Mobile healthcare units are not only used in developed countries, however. They are just as effective in developing countries, where they may be even more essential. One extraordinary example out of Kenya demonstrates how this model can be employed, assuming that a creative approach is taken.

"One of our innovations was to design a comprehensive but highly mobile solution that is able to offer the kind of high-level and coordinated services that can usually only be found in a regular hospital or clinic."

Yasuhiro Yamamoto, Director Hakuhokai Tokyo Hikifune Hospital

There are regions in Kenya where even sturdy vehicles cannot get around easily. One solution has been to achieve the "mobile" in mobile healthcare units by using camels instead of trucks. So-called camel clinics travel to communities in dire need of health services to treat common diseases such as malaria and diarrhea. A clinic comprises medical staff together with seven or eight camels, which are known as "ships of the desert." For more than 15 years now, these convoys have traveled long distances to remote communities, pitched tents, and set up medical services, serving between 30 and 80 people over several days before moving on to the next community. 15

Mobile healthcare units have proven capable of delivering a wide range of services, including vaccination, screening and diagnostics, pain treatment, curative care, and even surgery. Where the model seems to have fallen short is in delivering multiple services in a single vehicle and also in keeping up with advances in technology.

The emerging challenge for mobile healthcare units, therefore, has been to answer two main questions:

- 1. Could we equip our mobile clinics with more devices and the latest technology, so that we can offer the kind of comprehensive care that patients today demand?
- 2. Could we provide at least two mobile clinics, each with different equipment and functions, that could work together to form a kind of onsite emergency room with most, if not all, of the capabilities of a brick-and-mortar facility?

Our case study from Japan can answer both of those questions in the affirmative. Yes, we can. And we have. Thus, it provides an interesting glimpse of what may well be a big part of the future of healthcare, both in Japan and around the world.

#### Medical-ConneX in Japan

Medical-ConneX was unveiled by the Hakuhokai Group at its Tokyo Hikifune Hospital in November 2021. The choice of hospital was not an accident—Tokyo Hikifune is known to provide advanced emergency medical care and is responsible for responding to natural disasters, such as earthquakes and typhoons, as well as accidents.

The Medical-ConneX mobility solution was developed with the goal of "connecting" patients and physicians as well as "connecting" both patients and physicians to high-quality medical care anytime, anywhere. Specifically, it was designed to address four unmet needs identified by the Hakuhokai Group. These are as follows:

#### 1. Disaster medicine

When healthcare providers respond to disasters, the greatest challenge is often implementing what are known as the "primary survey" and "secondary survey" in advanced trauma life support care. The primary survey, or initial assessment, is designed to help the emergency responder detect immediate threats to life. The secondary survey is performed once the patient has been resuscitated and stabilised. It involves a more thorough examination, and the aim is to detect other significant injuries.

#### 2. Infectious disease response

The most important challenge facing healthcare providers in the event of an infectious disease outbreak is containment. They need to be on the scene, establishing temporary isolation facilities for the purpose of both treatment and infection prevention.

#### 3. Home and community care

The ability to perform tests and examinations on the spot, where people live, constitutes a significant advance in patient-centered healthcare.

#### 4. Bridging the rural/urban divide

Japan is a large country consisting of thousands of islands, encompasses a great deal of remote territory. To deliver medical care in remote areas, healthcare providers have to find a way of getting that care to those areas.

Comprehensive healthcare consists of both in-vivo and in-vitro products and solutions. The term "in vitro," which is Latin for "in glass," describes procedures, tests, and ex-periments that are performed outside of a living organism. In other words, they are not performed directly on a patient, but rather in a controlled environment, such as a test tube or petri dish. "In vivo" is Latin for "within the living," and refers to tests, experiments, and procedures that researchers perform in or on a living organism—in this case, a patient.

The fact that Medical-ConneX is able to perform both these functions at an extremely high level is a testament to the combined efforts of several Japanese stakeholders, including government, healthcare providers, humanitarian groups, the medtech industry, the trucking industry, and the telecommunications industry.

The result of that collaboration is arguably one of the most advanced solutions in the history of healthcare mobility. When Medical-ConneX was introduced, it was touted as the world's first mobility solution equipped with both a CT device and an immunobiochemical analyser. This claim is true, but in reality, the solution has even more to offer.

The most obvious use for Medical-ConneX is to deliver prompt medical care to disaster sites. It is also ideal for responding to pandemic situations in which conventional healthcare facilities are overwhelmed and people are either unable or afraid to go to their doctors. COVID-19 is a clear recent example of such a case. In addition, Medical-ConneX is effectively a "moving hospital"— equipped with a wide range of devices, systems, and technology—that can deliver physicians, nurses, and other providers to most areas where they are needed, both in times of crisis and under normal circumstances.

The size and flexibility of the two trucks and their ability to adapt, connect, and cooperate with other vehicles and facilities mean that they will be able to accommodate more and different equipment and offer more and different services when the need arises.

#### Medical-ConneX—the future vision

As impressive and comprehensive as the Medical-ConneX solution is today, its future potential is even more exciting. The long-term plan is to expand the trucks' capacity to set themselves up as temporary, but full-fledged, medical facilities. This may involve modifications to their physical design, but more importantly, it will require the incorporation of the newest and best equipment.

"I really believe this is still the tip of the iceberg in terms of where this idea can go. Think about what we can now do with mobile clinics and the technology we have. Think about the new technology we are going to bring in, more use cases, more remote and hybrid healthcare services."

Motohisa Kojo, CEO Hakuhokai Group

One example is the robotic arm, already in development, that would be used for robotic-assisted vascular intervention. With this technology, the physician would sit in a radiation-shielded workstation in the truck and use a set of joysticks and touchscreen controls to guide the arm while positioning catheters and stents.

The main strength of Medical-ConneX is the fact that the model was designed to adapt and evolve, meaning that it will continue to incorporate the latest technology, and patients will never be left behind.

#### Vehicle for examination & lab test

Length: 12m

Gross weight: 20 ton

#### Vehicle for power supply

Length: 8.5m

Gross weight: 10.9 ton



- CT scanner including AI solution for automatic post-processing
- Clinical chemistry and immunoassay analyzer
- Hematology system
- Ultrasound device
- Bedside monitor
- Defibrillator

- Power Generator
- Ultrasound device
- Three handheld, wireless blood analysis systems
- Simple PCR test equipment for COVID-19
- Two tabletop centrifuge machines
- Blood coagulation analyzer
- Two refrigerators for reagent

### Portable hospital solution



## **Conclusion**

The concept of bringing healthcare to people is not a new one, and mobile healthcare units have been doing just that for some time now. We know that they have extraordinary potential to bridge the rural/urban divide that geography can sometimes create, fill gaps that exist in some countries' healthcare delivery safety nets, and respond to unexpected emergencies in ways that standard healthcare structures cannot.

What this best practice demonstrates is that where mobile healthcare units might once simply have delivered a doctor via truck to patients in a disaster area, they now have the potential to bring the full weight of healthcare technology and human resources to bear on a variety of situations, from disaster relief and pandemic management to geographic isolation.

The Medical-ConneX initiative suggests that in an advanced, industrialized country, it is possible to bring various stakeholders together to improve healthcare availability not only in short term emergencies but also over the long term, helping meet the needs of patients

across the country. It is also clear, however, that this approach can be successful in developing countries, particularly with the involvement of the global community.

Today, more than ever, healthcare systems are working to meet the demands of patients for immediate, available care while also tackling the upstream and downstream challenges of providing good population health management. The comprehensive nature of the Medical-ConneX health solution allows providers to engage with many social determinants of health, while its mobility enables them to provide more equitable access to care than ever before.

All in all, the success of mobile health units around the world over the past several years, combined with the potential of the Medical-ConneX approach to leverage advanced technology, makes it hard not to conclude that mobile healthcare units must form part of the healthcare delivery planning strategies in communities around the world. People are demanding great care, and it is becoming increasingly possible to bring it to them.

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Motohisa Kojo has a lengthy and successful career in the medical field. He graduated from Nihon University School of Medicine in 1984 as Doctor of Medicine, then attended Okayama University Second Surgery. He continued his professional career in Okayama National Hospital and Kurashiki Daiichi Hospital, and has also worked at Hakuhokai Ako Central Hospital. Since 2001, he has served as Chairman of the medical corporation Hakuhokai Ako Central Hospital.

Motohisa Kojo holds the following certifications: Doctor of Medicine, Japan Surgical Society Certified Registered Physician, Japan Sports Association Certified Sports Doctor, and Japan Medical Association Certified Industrial Physician.



Yasuhiro Yamamoto Director Hakuhokai Tokyo Hikifune Hospital

Yasuhiro Yamamoto has a distinguished career in the medical field and has won several awards for his work. He graduated Nippon Medical School in 1968 and received his Doctor of Medicine in 1974. He worked at the Nippon Medical School Hospital Critical Care Center (currently Advanced Critical Care Center) and has served as Director of Critical Care at Tamanagayama Hospital, Director of Chiba Hokuso Hospital and Director of the Advanced Critical Care Center at Nippon Medical School Hospital. Since 2017 Mr. Yamamoto is Director of Medical Corporation at Hakuhokai Hospital.

Additionally, Mr. Yamamoto has participated in disaster relief activities since 1980 in Japan itself, and in providing help for the Japanese government around the globe. He has received several commendations for his outstanding work.



Noriharu Yamamoto Head of Customer Service Japan Varian, a Siemens Healthineers Company

Noriharu Yamamoto has a distinguished career in the field of medical imaging. He currently serves as General Manager of the Customer Support Division at Siemens Healthineers (Varian). He has also held senior roles in Account Management, Sales, and in Technical Support with various organizations. He began his professional work in medical imaging almost 25 years ago, with Kodak Medical Co. Ltd., later joining Siemens Asahi Medical Technologies Ltd. (later Siemens Healthcare). He studied at St. Andrew's University in Japan and is qualified as a Class II Information Technology Engineer.

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Ralf Meinhardt leads Siemens Healthineers' thought leadership activities related to Transforming Care Delivery. Previously, Ralf worked in the pharmaceutical industry, as well consulting and scientific research. Ralf holds a Doctor of Economics and Social Sciences degree from the University of Erlangen-Nuremberg. He also holds a Master of Science degree in Management as well as a Bachelor of Arts degree in Business Administration. In addition to his academic work at the University of Erlangen-Nuremberg, he also studied at the Indian Institute of Management, Bangalore (IIMB). His scientific background is in the field of corporate strategy, a subject on which he has authored several publications.



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#### Suggested follow-up on

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- Insights Series, issue 35:
   Healthcare: available, affordable, and accepted –
   Best practices from three continents. Available at:
   siemens-healthineers.com/insights/news/
   healthcare-available-affordable-accepted
- Insights Series, issue 15:
   Achieving healthcare happiness –
   The Finland model. Available at:
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