Building the Case for Interoperability and Personal Connected Health

Personal Connected Health Alliance

With a mission to help people make health and wellness an effortless part of daily life, the Personal Connected Health Alliance is a nonprofit organization formed by HIMSS to convene the global personal connected health community, and to accelerate the technical, business, policy and social initiatives necessary to advance the personal connected health field.

FOUR YEAR DATA: Continua Certified, Interoperable Remote Monitoring Solution Demonstrates Significant, Long-Term Impact On Blood Pressure Control & Treatment Cost In High Risk Patients Following Major Earthquake & Tsunami
First Long-Term Follow-Up of Home Blood Pressure Monitoring Following a Disaster

PROBLEM

Following a disaster, medical support for survivors must shift from emergency medical treatment to daily primary healthcare and disease management to mitigate health risks associated with stress and environmental changes (Noji 292). Experience from the 1995 Kobe earthquake in Japan shows that 14% of fatalities were realized after victims had initially survived the event (Hays).

Living in an evacuation camp is associated with several factors that can increase cardiovascular risk (WHO 42). Stress from significant changes in lifestyle can cause increased storage of salt in the body, while salt intake is also likely to increase due to lack of access to fresh foods. Physical activity tends to decrease among evacuees in camps, especially among older people. Since it is less convenient to drink water and use the toilet, evacuees can become dehydrated. These factors can lead to elevation of blood pressure or even blood clots. Another risk, which arises in part from evacuees remaining confined or inactive, is deep vein thrombosis (Hogan 26).

Studies have demonstrated increases in cardiac events in the immediate hours and weeks after an earthquake (Noji 292). Long-term impacts of disaster on cardiovascular events has also been observed: Researchers at Tulane University concluded in a study published in January 2010 that chronic stress following Hurricane Katrina contributed to a 300% increase in heart attacks in New Orleans—more than two years after the event.

After the Great East Japan Earthquake of 2011, Dr. Kazuomi Kario, Chairman of Cardiovascular Medicine at Jichi Medical University in Tochigi, Japan, was concerned about elevated cardiac risk in survivors. He contacted medical device manufacturer A&D Medical about developing a remote monitoring program for evacuees at a camp in the town of Minami-Sanrikucho, in the Miyagi Prefecture, which had suffered enormous losses in the earthquake and subsequent tsunami.

Continua® DESIGN GUIDELINES

Complicating care at Minami-Sanrikucho was the fact that the disaster site lacked basic services such as electricity, water and sewer for the first three months, limiting the capability to monitor and treat patients and access medical records to assess pre-existing cardiovascular disease. A rapid response was needed and no off-the-shelf solution could meet the requirements.

SOLUTION

The Disaster Cardiovascular Prevention Network (D-CAP) was developed to remotely monitor the blood pressure of evacuees in campsites, with a goal to prevent cardiac events in survivors identified as "high risk." The program consisted of examinations and risk assessments to stratify high-risk patients, defined as having systolic blood pressure above 180 mmHg. Screening of 1,500 evacuees identified 400 people with elevated cardiac risk, who were enrolled in the D-CAP program (26.6% of screened evacuees). Patients with persistent symptoms were evaluated by physicians and prescribed oral medications as needed.

D-CAP registrants received electronic identification cards and were encouraged to measure their own blood pressure at automated stations within the evacuation camp. The data were sent via wireless communication to a data server and relayed to Jichi Medical University, about 200 kilometers away. Clinicians monitored the data and alerted on-site physicians by phone of any significant developments. Subsequently, high-risk patients were moved from the evacuation camp into temporary housing provided by the government and given individual blood pressure monitors that store a month of readings. Data could be downloaded at the hospital and then uploaded to D-CAP's data center and shared with the survivors' attending physicians. Of the original participants, 341 hypertensive participants continued to monitor their blood pressure for four years after the D-CAP program was established, with data stored in the cloud (Nishizawa et al)—and even five years after the Great East Japan Earthquake, the network continues to operate. Importantly, this is the first long-term follow up of home-monitored blood pressure following a disaster.

D-CAP participating companies and their component devices are: A&D Medical - automatic blood pressure monitors; Alive Inc. - gateway firmware; Ryoto Electro Corp. - data server; Panasonic – clinical PC; Toppan Forms - patient ID cards; Qute - web application development; Intel - project coordination. An important aspect of the program's launch was pre-existing interoperability between all the medical devices needed, since the component products were certified according to the Continua Design Guidelines (CDGs). The CDGs are a consensus-driven, non-commercial and internationally recognized framework for user-friendly interoperability of personal connected health devices and systems, published annually by the Personal Connected Health Alliance. The CDGs, developed on top of commonly accepted technology standards such as HL7, IHE and IEEE's Personal Health Device standards, are recognized by the International Telecommunication Union (ITU-T Standard H.810) and freely available to the public.

OUTCOMES

D-CAP has been credited with saving lives. Every one of the 400 "high risk" D-CAP evacuees was still living five years after the D-CAP network was launched. Of the 341 survivors who monitored their blood pressure over the four-year period, blood pressure decreased from an average of 151.3± 20.0/86.9 ± 10.2 mmHg to 120.2 ± 12.1/70.8 ± 10.2 mm Hg, which study authors define as 'strict control' of blood pressure, and superior to results typically obtained from monitoring via physician office visits. Further, while winter seasonal peaks in blood pressure are commonly acknowledged in cardiology, the amplitude of seasonal blood pressure variation was decreased and the duration from the lowest summer blood pressure values to the winter peak blood pressure values was gradually prolonged over the course of follow-up. These data were published in *The Journal of Clinical Hypertension* (Volume 18, Issue 7, July 2016).

Participating companies had certified their products for interoperability according to the Continua Design Guidelines, facilitating a time from launch to conception of just two weeks, or 12 man-weeks, at a cost of USD 27,000. In interviews conducted with participating companies, it was estimated that without pre-existing interoperability, launching the D-CAP program would have taken twelve weeks, or 72 man-weeks, at a cost of USD 166,000. According to these estimates, deploying interoperable technologies reduced launch time by 84%, or ten weeks, and saved USD 139,000. While it is impossible to measure the value of those first ten weeks in terms of cardiovascular events averted or lives saved, it is certainly easy to imagine the risk to 400 survivors of a devastating earthquake had they received no specialized screening, cardiac monitoring or care for two and a half months following the disaster. Conceived another way, the cost savings derived through pre-existing interoperability would fund five additional programs (without accounting for economies of scale), providing monitoring for another 2,000 patients in the D-CAP program.

The D-CAP program clearly demonstrates the clinical, time and cost advantages of Continua-certified interoperability for program implementation following a disaster, when time is of the essence and, further, that the ready availability of Continua-certified devices supports innovation in connected healthcare. Study authors concluded: "This ICT-based approach was useful to achieve strict HBP [home blood pressure] control and minimize the seasonal BP variation even in a catastrophically damaged area during a 4-year period after the disaster, suggesting that this approach could be a routine way to monitor BP in the community."

ACKNOWLEDGMENTS

The Personal Connected Health Alliance wishes to acknowledge Dr. Kazuomi Kario, Professor and Staff Physician at the Division of Cardiovascular Medicine, Department of Medicine, Jichi Medical University School of Medicine, Tochigi, Japan, for his responsiveness and creativity on behalf of survivors of the Great East Japan Earthquake, as well as M. Nishizawa, S. Hoshide, Y. Okawara and T. Matsuo who published the D-CAP findings in *the Journal of Clinical Hypertension*, together with Dr. Kario, and finally, D-CAP participating physicians and member companies, without which this program would not have been possible.

The Personal Connected Health Alliance (PCHAlliance) aims to make health and wellness an effortless part of daily life. The PCHAlliance, a non-profit organization formed by HIMSS, believes that health is personal and extends beyond healthcare. The PCHAlliance mobilizes a coalition of stakeholders to realize the full potential of personal connected health. PCHAlliance members are a vibrant ecosystem of technology and life sciences industry icons and innovative, early stage companies along with governments, academic institutions, and associations from around the world. To support its vision, the PCHAlliance convenes the global personal connected health community at the annual Connected Health Conference, the premier international event for the exchange of research, evidence, ideas, innovations and opportunities in personal connected health. The PCHAlliance publishes and promotes adoption of the Continua Design Guidelines. Continua is recognized by the International Telecommunication Union (ITU) as the international standard for safe, secure, and reliable exchange of data to and from personal health devices. The PCHAlliance accelerates technical, business, policy and social strategies necessary to advance personal connected health through its flagship Academy for Healthy Longevity to promote lifelong health and wellness. For more information visit: **www.pchalliance.org**

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