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Healthcare systems face enormous challenges over the coming years. The increasing demands of an aging population, the rising cost of treatments and medications, and budget shortfalls are all issues that will need to be addressed if Europeans are to continue to enjoy high standards of care. eHealth, enabled by information and communication technologies, offers Europe solutions that can help avoid healthcare crisis. eHealth is a broad definition for a variety of technologies and services, from electronic health records to telecare systems that enable patients to be treated remotely while staying in the comfort of their own homes. But while the implementation and application of eHealth systems may vary, the overriding goal is fundamentally the same: using ICT to provide better care more efficiently at lower cost.

Neelie Kroes, Vice-President and European Commissioner for Digital Agenda for Europe has said that 'we need to reflect on and integrate the recommendations presented by the eHealth Task Force members: like how to put patients in control of their personal data; like the need to get all our systems connected and talking to each other; how to revolutionise health through transparency and accountability; and how to include everyone in this revolution, including those without Internet access.'

EU-funded ICT projects are making a big contribution toward achieving that goal. Across many different scientific disciplines, from bioinformatics and sensor technology to semantic analysis and wireless communications, researchers are overcoming the hurdles to the widespread implementation of eHealth systems.

Electronic Health Records

The SemanticHealthNet project is one such initiative. Involving more than 40 internationally recognised experts, the project has established a Network of Excellence to develop a scalable and sustainable pan-European organisational and governance process for the semantic interoperability of clinical and biomedical knowledge. The aim is to ensure that Electronic Health Record (EHR) systems are optimised for patient care, public health and clinical research across healthcare systems and institutions.

EHRs are a crucial part of any eHealth implementation. By storing patient data electronically, EHR systems allow information about a patient's medical history, current illnesses or prescription requirements to be accessed quickly and efficiently. EHR's not only save time, but can also save lives, reducing the risks of adverse drug interactions or underlying conditions going unnoticed. The EU-ADR project has proved that EHR can make a difference in pharmacovigilance and improve post-marketing surveillance for medicines by detecting Adverse Drug Reactions faster and more accurately.

To make best use of them, EHR data should be accessible anywhere at any time. Building on that concept, the 'European Patients - Smart open Services' (epSOS) project is developing technology to enable secure cross-border access to health records. epSOS is funded by the EU's Competitiveness and Innovation Framework Programme (CIP). It started to deliver a service of ePrescriptions that allows patients to pick up their prescribed medicines in any country of the EU (currently in piloting phase).

Advancing our understanding of clinical judgment and decision making, and supporting them via ICT, could help design more 'intelligent' EHR systems. The TRANSFORM project is developing a 'rapid learning healthcare system', driven by advanced computational infrastructure, that could improve patient safety and the conduct and volume of clinical research in Europe. King's College London leads the consortium of 15 European universities and two private partners. The project aims to integrate decision-support directly into doctors' electronic records systems and speed up the recruitment, management and follow up of patients for research studies by enabling EHR systems to link to research databases.

Although the time and cost advantages of using EHRs are huge, there are also some risks. Data protection and the privacy of sensitive medical data remain big issues.

The TAS3 project focused on these hurdles, developing an ICT architecture and trusted services to manage and process distributed personal information. Applicable to many sectors, the service-oriented architecture is particularly useful in eHealth scenarios allowing patients, healthcare professionals, trusted third-parties and even automated sensor systems to input and access information in highly secure manner.

While EHR systems promise to have a big impact on the efficiency of healthcare systems, the biggest impact of eHealth in terms of quality of care is likely to come from their marriage with sensor technology, remote monitoring and ambient intelligence applications.

From remote monitoring to robots for rehabilitation...

By using wearable sensors to monitor patient's vital signs and symptoms, doctors can closely monitor a patient's condition and be alerted immediately if there is a change. Combined with telecare applications and ambient intelligence, such 'personal health systems' will allow people to remain in the comfort of their own homes and live more normal lives while receiving care remotely and avoiding inconvenient visits to the doctor's office.

The PERFORM project has developed a remote monitoring system for people suffering from neurodegenerative diseases such as Parkinson's. Tested in four pilot trials in Greece, Spain and Italy, the advanced sensors developed by the PERFORM team are designed to be attached to clothes and accessories to sense the user's behaviour and motor status. The data are then processed and seamlessly transmitted to the centralised system for evaluation so that health professionals can personalise treatment and medication schedules.

'PERFORM will allow doctors to carry out standardised, unbiased assessments of the status of the patients and develop personalised adjustments of therapy plans. Doctors will consequently be assisted in the management of an increasing number of treated patients. Better care will generate improved quality of life, more autonomy and increased social inclusion for the patients,' the project team explain.

Focusing specifically on the communications side of telemedicine, the team behind the CONCERTO project is developing networking technology to enable interactive multimedia eHealth applications over wireless networks. By generating, encoding and transmitting flawless 3D and 4D images, the CONCERTO system will assist doctors with early diagnosis and remote care.

For patients recovering from an illness, a virtual reality (VR) rehabilitation platform being developed in the REWIRE project will enable them to stay at home for much of the rehabilitation process supported by remote monitoring by healthcare professionals in a VR environment.

Another approach to in-home rehabilitation is being taken in the SCRIPT project. The team are

developing two prototype robotic devices aimed primarily at helping people recover after a stroke.

'SCRIPT will reduce hospital and home visits for patients and carers, and therefore have a large impact on reducing hospital costs as well as improving the quality and standard of care,' the researchers, coordinated by the University of Hertfordshire in the United Kingdom, say.

Such systems, from remote monitoring and ambient intelligence to virtual reality and robotics, will also contribute to the development of 'Ambient assisted living' (AAL) environments for patients and people requiring long term care and supervision, such as the elderly.

AAL is likely to be a huge market over the coming years given that the total European population older than 65 is set to increase from 16.1% in 2000 to 27.5% by 2050.

'Europe's population in general is getting older, and one side effect of that is that increasing numbers of older people are living alone. They don't have their families close by and they need to find ways to cope: they might forget to take their medicine, turn off the stove or suffer an accident at home. They are in a risk zone that can be addressed by ICT,' explains Theresa Skehan of the Swedish Institute of Assistive Technology (SIAT).

Ms. Skehan is the manager of the MonAmi project in which a research team has been working on interoperability solutions for AAL applications. The universAAL project is integrating the knowledge of various projects such as MonAmi to produce a standardised open platform to assist in developing AAL solutions in future.

Though some new technologies may not become mainstream for some time, all will have a role to play in the future as European healthcare systems increasingly become e-healthcare systems.

As Vice-President Kroes has pointed out: 'In Europe we're rightly proud of our healthcare systems: but if we're going to keep them going we'll have to do things differently. We must guarantee tomorrow's citizens high-quality healthcare, wherever they are in Europe, and at a

eHealth offers Europe solutions that can help avoid healthcare crisis

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cost society can afford and with the help of smart and innovative solutions in healthcare.'

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