

eHealth – Technology for health

SUMMARY

'eHealth' is a recently-coined term for the use of information and communication technology (ICT) in health, and refers to an interdisciplinary field with multiple uses. It aims to improve the quality of healthcare and make health systems more efficient and effective.

For patients, eHealth has the potential to bring them improved awareness of their condition and foster their involvement in the care process. It will also facilitate access to healthcare for certain groups of people, help the elderly live independently for longer and help adults with dementia to stay mentally fit. More generally, eHealth will support patient mobility and facilitate cross-border healthcare.

eHealth will allow health professionals to interact remotely with patients and other professionals, access specialised knowledge and facilitate research. Moreover, it has the potential to increase the effectiveness and efficiency of healthcare, thus alleviating the burden on European health budgets, and should foster growth in the areas of research, health, medicine and ICT.

Among the limitations and drawbacks of eHealth are the risks of impersonality and isolation, which may be detrimental to the importance of preserving a human dimension in healthcare and contrary to the desire to reinforce the patient-doctor relationship.

eHealth tools will not bring the expected benefits if they are not user-centric, user-friendly and universally accessible. Furthermore, there is a need to enhance self-confidence in eHealth use and to raise awareness of, and training in, eHealth. There are also reservations regarding privacy and confidentiality. And lastly, it is essential to guarantee the security and protection of health-related data, to build confidence and to ensure patients consent to the use of their data.

The outlook for eHealth covers several perspectives: political, technological, economic, research, international cooperation and stakeholders.



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Glossary¹

eHealth: information and telecommunication technology (ICT) tools and services for health used by healthcare institutions and administrations, health professionals and patients.

eHealth literacy or digital health literacy: the capacity to find, understand, appraise and use health information from electronic sources in order to address a particular health issue.

Electronic health record (EHR)/patient summary: a medical record of the physical and mental state of health of a person in electronic format/a subset of EHR providing key personal health information needed for a particular use, e.g. for care abroad or in an emergency situation.

ePrescription/eDispensing: a prescription for medicines or treatments in electronic format/electronic retrieval of such a prescription and administration of the medicine to the patient.

Interoperability: the ability of applications to communicate seamlessly with each other. Levels include cross-border, semantic, technical, legal and organisational interoperability.

Telemedicine: the provision of healthcare services – teleconsultation, teleradiology, telesurgery etc. – at a distance. The term is sometimes used in a wider sense and as a synonym for telehealth and/or eHealth.

Health and ICT**Definition**

'eHealth' has been used since the turn of the millennium or so as an umbrella term denoting an increasingly broad concept that has no single, clear definition. An interdisciplinary field, it lies at the intersection between health, information and communications technology (ICT), computational science, and mobile and web applications.

[Directive 2011/24/EU](#) on the application of patients' rights in cross-border healthcare refers to eHealth in its recitals and in particular in Article 14(2), which sets up a voluntary EU-wide eHealth Network. This brings together national authorities responsible for eHealth designated by the Member States. Now in its third year of existence, this network is the main decision-making body on eHealth at EU level.

The European Commission's second [eHealth Action Plan 2012-2020](#), 'Innovative healthcare for the 21st century', published in 2012, deals with research, development and innovation, international cooperation, interoperability and deployment. It defines eHealth as 'the use of ICT in health products, services and processes combined with organisational change in healthcare systems and new skills, in order to improve health of citizens, efficiency and productivity in healthcare delivery, and the economic and social value of health. eHealth covers the interaction between patients and health-service providers, institution-to-institution transmission of data, or [...] communication between patients and/or health professionals.'

eHealth can also be taken to stand for a [paradigm shift](#), a general [mind-set](#) of networked, global thinking to improve healthcare by means of ICT.

Application and use

eHealth comprises a wide range of tools and utilities for health-service management, patient care, and public-health monitoring, as well as health information and research. Based on the interlinked and overlapping categories defined in the European Commission's [Lead Market Initiative \(LMI\)](#) on eHealth, such tools and utilities may be grouped as follows (the list is non-exhaustive):

- **Systems used by health professionals for patient care (clinical systems) within or outside care institutions:** radiology and nursing information systems, intensive care information systems, medication management systems, medical imaging, computer-assisted diagnostics and surgery, general practitioner and pharmacy information systems.
- **Systems for personalised telemedicine and homecare services:** remote wearable patient monitoring devices (digital blood pressure monitors, blood-glucose measuring devices, smart watches for recording daily activities and heart rate, activity trackers, fall detectors), teleconsultation, teleradiology, telesurgery.
- **Systems for integrated health information:** electronic health records, ePrescription and eDispensing, patient summaries.
- **Systems used for health aspects not linked to treatment (non-clinical systems):** *health education and promotion systems* for the general public, such as health portals, online health information services, online support groups and chat rooms; *specialised systems for research and the collection and analysis of public health data*, such as biostatistical programmes for infectious diseases; and *support systems for the administration and management of care institutions* such as billing or scheduling systems, patient flow management systems.

mHealth

mHealth – or mobile Health – is dealt with in the European Commission's 2014 [Green Paper on mobile health](#), which was adopted in response to the recommendations of the Commission's [eHealth Task Force](#). mHealth is a new [component](#) of eHealth and involves mobile phones as well as more complex functionalities and applications (apps). It is a rapidly emerging field and considered key to the transformation of healthcare. By 2017, an [estimated](#) 3.4 billion people worldwide will own a smartphone, and half of them will be using mHealth and wellbeing apps. The distinction between health, medical, lifestyle and fitness information is becoming increasingly blurred: the myriad examples include apps for quitting smoking, losing weight, staying fit, finding the right sleep-cycle and meditating.²

Better and more efficient health systems

eHealth aims to deliver better healthcare to citizens and bring greater efficiency and effectiveness to health systems. A broad range of advantages and benefits are expected.

For citizens/patients

eHealth enables easy access to health information. It could therefore help patients gain better insight into health-related subjects, greater awareness of their symptoms, an improved knowledge of their condition and, ultimately, the capacity to manage their own health (also known as patient '**self-care**' or '**self-management**'). Diabetics, for example, could better self-manage their disease by testing their blood-sugar level with a glucose measuring device that transmits the readings in real-time to a portal. In doing so, the patients could consult their glucose history online and adapt insulin-dosage accordingly, or get instant feedback from a healthcare provider. This would not only permit more controlled monitoring, but could at the same time promote the independence and autonomy of patients and foster their involvement in the care process (which is also referred to as '**patient empowerment**').

eHealth may **facilitate access to healthcare** for socioeconomically disadvantaged groups as well as for people living in remote or under-served areas (the '[include everyone' approach](#)'). It thus has the potential to foster solidarity in healthcare and reduce health inequalities.

eHealth solutions may help the **elderly live independently**, in their own homes, for longer. An example is the [USEFIL project](#) that is based upon use of a smart watch and a smart mirror: the watch records daily activities and vital signs. These are combined and shown on the mirror as infographics, together with a calendar and clock. This information is then shared with carers who can use it, among other things, to prescribe appropriate medication or send reminders of appointments through the mirror.

Older adults suffering from mild forms of **dementia** could benefit from eHealth utilities to stay mentally fit and even socially engaged. This is illustrated by [SOCIABLE](#), a platform created under a European co-funded project with the aim of motivating social interaction among the elderly. SOCIABLE runs on tablets and a number of applications. These can be used for cognitive training exercises (logical reasoning, memory or language training etc.), but also for improving social interaction and for management of data on the elderly by healthcare professionals.

Virtual Physiological Human (VPH) – 'The equivalent for the human body of Google Earth' (Prof. Peter Coveney)

VPH was funded by the [Commission](#). It is an [advanced computer modelling tool](#) that replicates the human body: by comparing the data of one patient with the data gained from the observation of other patients with similar symptoms, it can simulate the reaction of patients to possible treatments. This is an example of *in silico* modelling (i.e. performed via computer simulation). VPH follows an integrated, holistic approach to medicine that looks not at separate organs, but at the human body as a whole. It aims for predictive, preventative, individualised healthcare. In its resolution on the eHealth Action Plan, Parliament hails VPH as having successfully 'demonstrated the great value of eHealth solutions'.

The use of eHealth might also support **patient mobility** and facilitate cross-border healthcare, as laid down in the Directive on patients' rights in cross-border healthcare.

For health professionals, hospitals and academia

According to the [World Health Organization \(WHO\)](#), eHealth offers health professionals the possibility to have **remote interactions** with patients (teleconsultations) and other professionals (second opinions and professional networks). It could also provide access to up-to-date specialised knowledge for their continued professional education.

Hospitals could use eHealth to **improve care processes**, for instance via patient flow management systems. They could also **reduce medical errors** through intensive care information systems or medication management systems.

Academia could utilise eHealth solutions for **research** with a view to improving disease prevention, diagnostics and treatment.

For health systems and governments

eHealth has the potential to increase the effectiveness of healthcare so that it can deliver a **more patient-centred** service tailored to individual needs. It could benefit, in particular, patients with chronic diseases such as diabetes, heart failure or chronic obstructive pulmonary disease (COPD). A number of projects co-funded by the Seventh EU Research Framework Programme (e.g. the [WELCOME](#) project for patients suffering from COPD and associated chronic conditions, and the [D-LIVER](#) project for patients with chronic liver disease) seek to create adapted technology solutions: patients could be monitored remotely at home or on the move, instead of in hospital. They would, for

instance, receive devices that allow them to monitor and submit information about their health parameters to a cloud platform, where health professionals could access it. Alerts would only be created in the event certain parameters exceed the levels individually set for a particular patient.

In this way, eHealth could **improve healthcare efficiency** and thus contribute to alleviating the burden on European health budgets.³ Solutions for patient self-management (see the examples above) could contribute to reducing the number and length of the hospital stays of chronically ill patients. Other eHealth tools, such as electronic health records, could be used to avoid the duplication of medical examinations and help access patient information faster.

Moreover, eHealth solutions could contribute to meeting the need for a **rapid, coordinated response to global threats** through the exchange of relevant information, as foreseen by [Decision No 1082/2013/EU](#) on serious cross-border threats to health. Such cross-border health concerns included, for example, the volcanic ash cloud in 2010 and the Fukushima nuclear disaster in 2011 as well as the 2009 H1N1 pandemic, the *E. coli* outbreak in 2011 and the Ebola pandemic that started in March 2014 (see box).

Ebola and eHealth/mHealth technology

The Ebola crisis provides examples of the use and potential of eHealth and mHealth. A [combination of technology and social media](#) was key in fighting [Ebola in Nigeria](#), one of the countries affected by the epidemic that has since been declared 'Ebola-free'. There, health workers used mobile phones with an Android app to trace all contacts of a suspected case and report them (in doing so, reporting delays, previously around 12 hours, were first reduced by half, then by 75% and finally to almost real time). Next, laboratory technicians scanned and uploaded the results to a database, upon which field teams received text-message alerts informing them of the results. Moreover, journalists were shown how to create graphics, e.g. by using Google Maps, to illustrate their story. A volunteer from Nigeria subsequently created the 'Ebola Alerts' Facebook page to educate the population about the disease online. Misinformation circulated by text messages (for instance, that drinking salted water would prevent infection) was countered in almost real time on Twitter.

How far can eHealth go?

Despite the widely recognised potential of eHealth, there are limitations and drawbacks.

A number of concerns were voiced at the [Workshop on eHealth](#) held at the European Parliament (EP) in September 2013. It brought together representatives of the European Patients' Forum (EPF), the European Public Health Alliance (EPHA) and the Standing Committee of European Doctors, among others. The workshop was organised in the framework of an own-initiative report by the Environment, Public Health and Food Safety (ENVI) Committee (rapporteur: Pilar Ayuso, EPP, Spain), which formed the basis of the [EP resolution on the eHealth Action Plan 2012-2020](#).

Among the issues raised were that eHealth is shifting the focus from the face-to-face relationship between patients and their healthcare providers to a 'virtual' interaction. In this context, stakeholders are worried about the risk of impersonality and isolation. They stress the importance of preserving a **human dimension** in healthcare and of reinforcing the patient-doctor relationship. According to some, eHealth is a complement to conventional services, rather than a substitute for human contact.

The use of eHealth presupposes a certain level of skills and competence (eHealth literacy). The EPF, for example, has argued that eHealth tools need to be **user-centric** instead of technology-driven. Some feel they ought to be user-friendly and universally accessible so as to avoid the danger of health inequalities resulting from the 'digital divide'. These inequalities could affect, in particular, people with disabilities, the elderly and vulnerable communities, i.e. those who cannot or choose not to use eHealth technology. As a remedy, it has been suggested to enhance the self-confidence of patients and health professionals in the use of eHealth tools and to raise awareness for and training in eHealth among all involved.

Stakeholders have also expressed reservations regarding **privacy and confidentiality**. They have underlined the need for safeguards to guarantee the security and protection of sensitive health-related personal data.⁴ The lack of transparency and legal clarity regarding the collection and use of such data (particularly around health and wellbeing apps) has also been mentioned. The issue of **ownership** has been raised – who do the data belong to and who can access, modify or delete them? Further questions concern storage (*inter alia*, by means of cloud computing). It appears necessary to **build citizens' confidence**. Ensuring patients give consent to the use of their eHealth data is also considered essential.

'Web 1.0' use of the internet is currently shifting to 'Web 2.0' use in health matters ('Health 2.0'): the one-way mode of accessing health information is making way for an interactive approach of searching for and sharing health information in the social media. In view of this, [Cilia Boyer](#) of the Health On the Net Foundation has pinpointed the dangers of uncontrolled medical content and the need for quality criteria to assure the accuracy and reliability of the information provided.

Outlook – different perspectives

Political perspective

eHealth is an element of what the European Commission's eHealth Action Plan refers to as 'redesigning the delivery of care'.

The [eHealth Governance Initiative \(eHGI\)](#) operates in the framework of the eHealth Network and consists of eHealth stakeholders. Its aim is the delivery of coordinated eHealth in Europe by developing strategies and guidelines. The eHGI supports cooperation between Member States with a view to establishing a governance structure.

In his answers to Parliament's questionnaire and during his hearing on 30 September 2014 before the ENVI Committee, Health Commissioner Vytenis Andriukaitis committed to work on promoting eHealth.

In its [Conclusions](#) on the economic crisis and healthcare of 10 July 2014, the Council recognised that eHealth can improve the resilience of health systems. Member States were invited to 'promote the implementation of [...] eHealth solutions to ensure quality of care and health literacy'.

Parliament has demonstrated its interest in eHealth with its resolution on the eHealth Action Plan, in which it recognises the 'great potential of eHealth' and promotes an 'eHealth culture'. It urges the Commission to continue working towards the general deployment of eHealth services throughout the EU. Moreover, it specifically stresses the need for 'continuous and specialised assistance and training in eHealth'.

Technological perspective

Substantial progress has been achieved towards building up a state-of-the-art EU-wide eHealth infrastructure. However, one of the main barriers to the large-scale deployment of eHealth appears to be the lack of interoperability, of common standards and specifications. In order to overcome this obstacle, funds from the [Connecting Europe Facility \(CEF\)](#) will be allocated for interoperable cross-border eHealth services throughout the EU. In addition, the European Regional Development Fund (ERDF) will be leveraged to improve access to, and wider use of, eHealth services. The Commission intends to propose an eHealth Interoperability Framework by 2015; a [study](#) commissioned to this effect was finalised in 2013.

eHealth: variations in deployment

When it comes to eHealth, EU Member States show differences both in terms of readiness (because of varying degrees of broadband penetration) and actual use. In the framework of the Digital Agenda for Europe, two surveys were conducted: one on benchmarking [eHealth services in hospitals](#), which was monitored by the Joint Research Centre (JRC), and one on benchmarking [eHealth services among general practitioners](#) (GPs). Their findings revealed that the top performers in terms of eHealth uptake in hospitals are Denmark (66%), Estonia (63%), Sweden and Finland (both 62%). In Denmark, Estonia, Luxembourg, the Netherlands and Sweden, 100% of hospitals share health information with GPs electronically. The best achievers in terms of digitising patient health records are the Netherlands (83.2%), Denmark (80.6%) and the UK (80.5%). Estonia (100%), Croatia (99%) and Sweden (97%) are forerunners in the use of ePrescription, while Denmark (100%), Estonia (70%) and Italy (62%) are top of the list when it comes to doctors interacting with patients by email about health-related issues.

Economic perspective

eHealth is one of the most rapidly growing areas in healthcare. The global eHealth market is estimated to have a [potential value](#) of €60 billion, in which Europe has a €20 billion share. According to [market forecasts](#), this share will expand to roughly €22 billion in 2016, which would represent an annual growth rate of over 18%. Through its eHealth Action Plan 2012-2020, the Commission intends to promote the development of a competitive eHealth industry in Europe. It wants to improve the market conditions for entrepreneurs, in particular SMEs, and support those who want to enter the eHealth market. The Commission plans to utilise mechanisms that facilitate closer cooperation between research and industry to make sure that research results are better taken up by businesses.

Research perspective

The EU Framework Programme for Research and Innovation, Horizon 2020,⁵ foresees support for research, development and innovation (RD&I). It is specifically targeted at the areas of ICT, engineering, advanced analytics and diagnostics, new digital media and mobile technologies.

In its resolution on the eHealth Action Plan, Parliament called for the establishment of a platform for collaboration in research bringing together academia, industry and professionals.

International cooperation perspective

[WHO](#) in particular has emphasised that the challenges surrounding eHealth require a collaborative global approach, especially in cases where a rapid response to the health consequences of serious cross-border health concerns is needed.

Stakeholder perspective

The [eHealth stakeholder group](#) (eHSG) is a Commission advisory body made up of patients, consumers, health professionals and companies active in the eHealth sector. In May 2014, it presented four [reports](#) on the challenges in specific areas of eHealth. The [recommendations](#) are geared towards improving patients' access to their electronic health records; deployment of telemedicine services; and strengthening the interoperability and accessibility of EU healthcare through ICT tools.

Main references

[Connecting for Health. Global Vision, Local Insight. Report for the World Summit on the Information Society](#), World Health Organisation, 2005

[eHealth Task Force Report: Re-designing health in Europa for 2020](#), 2012

[eHealth: Legal, Ethical and Governance challenges](#), Carlisle George, Diane Whitehouse, Penny Duquenoy (eds.), Springer Verlag, 2013

[Proceedings of the workshop e-Health](#), European Parliament, Directorate General for Internal Policies, Policy Department A, 24 September 2013

[European Commission eHealth website](#)

[WHO eHealth website](#)

Endnotes

- ¹ Sources for the glossary include: [epSOS glossary](#), [Commission Recommendation](#) on cross-border interoperability of electronic health record systems, [Commission Staff Working Document](#) on telemedicine.
- ² For recent examples of wearable (health) technologies, such as a device to monitor the wound healing process, see also the in-depth analysis on '[Ten technologies which could change our lives](#)' of January 2015 by Parliament's Scientific Foresight (STOA) Unit.
- ³ Health expenditure [is expected](#) to increase from a current 9% of GDP to around 16% by 2020. The main causes for this rise are the ageing of the population, the sharp increase in chronic illnesses due to unhealthy lifestyles, the high cost of new technologies, the need for more specialised skills, and the rising expectations of citizens in terms of high-level care.
- ⁴ The confidentiality of health data [has been recognised](#) by the European Court of Human Rights to be a fundamental aspect of the 'right to respect' under Article 8 of the [European Convention on Human Rights \(ECHR\)](#).
- ⁵ Horizon 2020 is the financial instrument for implementing the [Innovation Union](#), one of the flagship initiatives of the Europe 2020 Strategy. eHealth will fall under the programme section '[Health, demographic change and wellbeing](#)'.

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