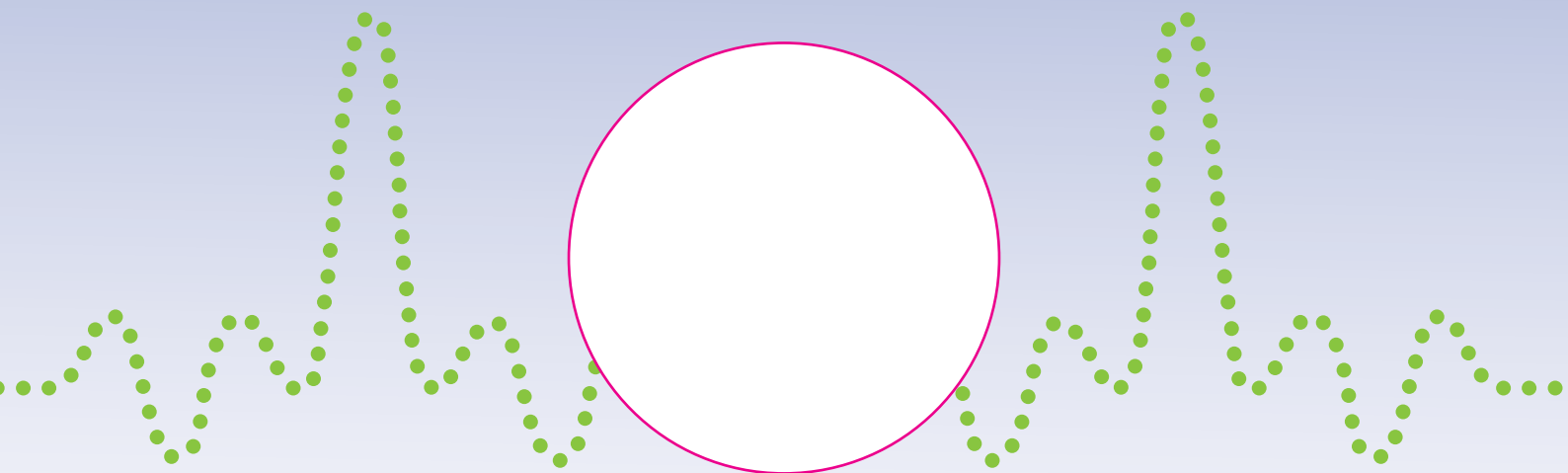


E-QUALITY IN E-HEALTH

Stakeholders' reflections on addressing e-health challenges at the European level



Improved Healthcare Through Innovative Solutions

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E-Quality in E-Health Foreword



John Bowis,
Honorary President Health First Europe

E-Health publication

As Europe moves forward through the **2020 strategy on sustainable economic growth**, it is imperative to remember that **quality healthcare is a vital investment for the future of its citizens.**

Indeed, as Health First Europe's Honorary President, I strive to uphold one of our core messages: that "health equals wealth." Health is a key productive factor in terms of employment, innovation and economic growth.

As we look to the future of healthcare and the impact of the economic crisis on our healthcare systems, our governments are responding by analysing **new ways of delivering healthcare services** from a cost-effective perspective while simultaneously respecting the principles of quality and safety.

So we can see many challenges ahead and the European Union, with its limited health competencies, is looking into those challenges. On one hand, they are seeking **to improve certainty on patients' mobility** and also into how **demographic challenges** can impact on the sustainability of our welfare systems. On the other hand, they want to **leverage innovation** and **take leadership** in the IT sector as applied to the health sector.

Politicians have started looking at future solutions for the improvement of healthcare systems. What will our health and care

services look like in 20 years? Will the IT revolution complete our healthcare landscape? Will a simple mirror be able to send accurate information to a remote screening centre to give us an accurate diagnosis? Will patients be able to cope with the new challenges? How will professionals process all the information? How will personalised medicine and new technologies transform our lives?

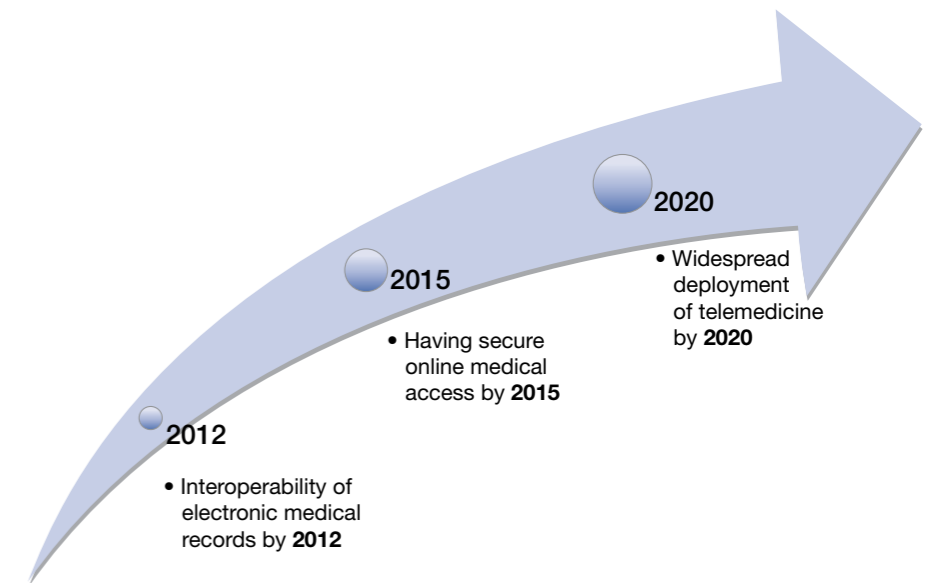
We are still at a preliminary stage in this exciting path of reform and discovery.

Health First Europe wants to put the emphasis on **patient-centred healthcare** and we welcome all initiatives that foster this goal.

Some specialists confirm that e-health can help tackle some rising challenges facing Europe's health sectors, such as **an ageing population, healthcare inequalities and patient mobility**. A framework for people-centred health systems based on e-health can **reduce costs** to tackle rising demand for services and **put patients and providers on a level playing field in terms of accessing healthcare, thereby reducing inequalities.**

Within the EU, the development of e-health falls within the **framework of the 2004 communication of an action plan for a European e-health area** and more recent legislation on telemedicine, interoperability of electronic record systems and safe and efficient healthcare through e-health.

The EU is moving fast on its **Digital Agenda Strategy**, which it recently adopted. Among the Commission's proposed actions are:



Health First Europe wants to put the emphasis on patient-centred healthcare and we welcome all initiatives that foster this goal.

Despite these achievements, we are aware of the many challenges that lay ahead. There is an urgent need for more **member state coordination, better security, streamlined regulation and greater leadership** by health authorities in order for wider and faster implementation of a genuine European e-health area.

HFE recognizes these challenges and through our actions, we seek to make the coming decade of healthcare in Europe truly patient-centred. ■

Yours Sincerely,

John

John Bowis
Honorary President Health First Europe

List of Contributing Organizations

For further information on the contributing organizations to the e-Quality in e-Health publication see below:



European Alliance for Medical and Biological Engineering and Science (EAMBES)

www.eambes.org



European Federation of Nurses Associations (EFN)

www.efnweb.org



European Health Telematics Association

www.ehtel.org



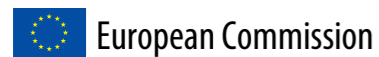
Eucomed

www.eucomed.org



European Federation of Public Service Employees Secretary General (EUROFEDOP)

www.eurofedop.org



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European Commission - DG SANCO, Public Health and Risk Assessment Unit

ec.europa.eu



Dr. Milan Cabrnoch, Member of the European Parliament, European Conservatives
and Reformists political group, Member of the Committee on the Environment,
Public Health and Food Safety

www.europarl.europa.eu



International Alliance of Patients Organization (IAPO)

www.patientsorganizations.org



Health First Europe

www.healthfirsteurope.org



E-Health is About The Patient



Improved Healthcare Through Innovative Solutions

The European Union and, in particular, the European Commission have been very active especially since 2004 on e-health initiatives.

This topic is very complex and should be defined as a tool that serves to improve quality of patient care. When we talk about e-health, we talk about new innovative ways of delivering healthcare, enhancing prevention, diagnosis, monitoring and managing health and lifestyle.

The complexity and the broadness of e-health (from prevention, to screening, to telemonitoring...) and the different stakeholders concerned by all its utilities, made this publication necessary. Health First Europe is an alliance of multiple leading health stakeholders that wants to take part in the ongoing discussions about managing healthcare services.

Our members have different views about e-health. These approaches reflect their different experiences in regards to e-health and some of their expectations.

Ultimately, this contribution wants to serve as a sharing information point to look into the future of e-health and its potential impact.

E-health has the potential to promote a philosophy where patients are put first through innovation. *E-health* also bears a signature of solidarity, building the technological bridge to reach its patients because it considers timing and health information availability a must for a healthier Europe.

Overall, *e-health* reduces the risk of error in both prescription issue and processing, empowering patients and optimizing services and continuity of care. However, when looking towards the future of the EU healthcare policy, **usability and accessibility** stand out as barriers of implementation which need to be tackled with more urgency as we are facing many demographic and health-related challenges.

In **Chapter 1** we understand why health information should be made available directly to patients and why electronic information is the best means of information sharing. A few important aspects related to these issues are laid down: trustworthiness and comprehensibility. **Information should be available to patients in all languages so that when faced with such information, all patients can have the opportunity to understand it with the maximum level of responsibility and data security.**

Moreover, another feature of modern technologies is **technical interoperability, which should be seen as a future ‘must do’ so that information becomes not only mobile but accessible.** In light of this, e-health should bring with it the simplification of administrative procedures and should be a source of education and evaluation for the medical profession, **facilitating the patient-doctor relationship.**

Moreover, another feature of modern technologies is technical interoperability, which should be seen as a future ‘must do’ so that information becomes not only mobile but accessible.

In this sense, the two major problems identified in **Chapter 1**, **data protection and interoperability** raise a common set of questions that need to be answered in the future: what type of legislation is needed to ensure simultaneously data protection and interoperability, what funding should be allocated for this and how can we bypass connectivity issues?

Chapter 2 tries to answer just that, explaining **why we are so sure that e-health is a tool that empowers citizens.** It will deliver key services such as rapid access to medical records, making it possible that a chronic disease could even be remotely monitored or that 5 million yearly prescription errors could be avoided. Thus, it improves the management of healthcare and what is essential to remember is that we know it works. A similar program has already been implemented in **Sweden** and people there could tangibly feel that it delivered on its promises. In addition, **Malta, Germany, Slovenia and Slovakia** have developed ID cards where health and illness information is accessibly stored.

Chapter 3 then explains two aspects about **ICT technologies**: that projects such as the Virtual Physiological Human were

a success and that in spite of **being an advanced technological tool e-health is still in its infancy and has even greater potential for innovation.** Hence, this chapter explains in specific terms what *e-health* does and most importantly what it could do in practice.

Last but not least, **Chapter 4** puts the topic into perspective, telling of present and future challenges that affect the medical profession and overall, the EU and its patients. The two articles both recognize that **under the pressure of an ageing population phenomenon, healthcare services need the digitisation that could be brought by e-health investments.** In this sense, the main points voiced refer to training professionals in the best way possible, facilitating for them both hardware and software material.

Overall, *e-health* policies should be seen from many angles – those of **Europe 2020** priorities with regard to innovation, **the Barcelona Declaration on patients safety** or in the **frame of sustainable development and harmonisation of EU27 healthcare policies.** This should offer governments and other stakeholders alike an impetus to continue their efforts in consolidating *e-health* policies. ■

1 | Citizens' E-Health

The main aspects of the eHealth policy of the European Union and the challenges ahead



Dr. Andrzej Jan Rys,
Director Public Health and Risk Assessment Unit,
DG Sanco, European Commission

EHealth is a rather new policy field at European Union level and “despite the availability and proven benefits, eHealth systems and services are not yet widely used in real-life medical or health situations” (Commission Action Plan, 2004¹).

So far, the eHealth deployment remains limited, even at national level due to the extent of the transformations needed. It includes: *confidence-building of the users; cost of deployment (even more at a large scale); organisational changes of the whole health systems; necessity to develop new skills in users; interoperability*

of the eHealth systems; market fragmentation; lack of regulation; and of course confidentiality and security issues. However, all Member States now realise that investing in eHealth is necessary and inevitable. They all face the same challenges and they are all seeking a comprehensive model of development of eHealth systems.

So, what is eHealth? eHealth is used interchangeably with the term ICT (information and communication technologies) in the healthcare field. More precisely, it can be defined as “an emerging field of medical informatics, referring to the organisation and delivery of health services and information using the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a new way of working, an attitude, and a commitment to networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology” (Eysenbach, 2001, adapted by Pagliari et al, 2005).

In 2004, the EU Action Plan on eHealth identified several technologies as eHealth technologies. These examples include: *“health information networks, electronic health records, telemedicine services, personal wearable and portable communicable systems, health portals, and many other information and communication technology-based tools assisting prevention, diagnosis, treatment, health monitoring, and lifestyle management”.*

1) The added value of eHealth solutions to reach Public Health objectives

In the European Commission, we think that eHealth is a powerful instrument to implement general public health objectives, such as the safety of emergency care and the continuity of non emergency care, especially in the context of cross-border healthcare.

Thus, in a public health perspective, eHealth is a tool which can contribute to these public health objectives and improve the quality of care and patient safety. This can be achieved through making knowledge available to health

staff and providing support to help avoid mistakes (by proper transfer of important medical data or scans). It can help prevent diseases or diagnose them at an early stage, increase patient safety, ensure continuity of care; it can help to improve access to healthcare, through telemedicine making services accessible even to remote regions and across Member States; and it can improve sustainability and efficiency of health systems, by enabling better collection of comparable health data, which can then be used for medical research and the better management of health systems; improve sustainability of health systems by empowering patients and enhancing patient-centered and outcomes oriented healthcare.

For patients, eHealth means better and safer care and more comfort as doctors have quick electronic access to their medical details - such as any allergy they may have - without needing to carry out additional tests. For health professionals, eHealth may translate into better access to the latest medical research. It can also

mean quicker and safer ways of passing information to colleagues when there is a changeover of staff. It can simply mean spending less time dealing with red tape, but we also know that it will imply major changes in their working methods and organisation and therefore require trust from all sides.

These tremendous future improvements in the healthcare field will however need a specific focus on inter-operability and compatibility of IT systems. eHealth applications should be able to “talk” at each level: across hospital services, local, national and European borders.

In the European Commission, we think that eHealth is a powerful instrument to implement general public health objectives, such as the safety of emergency care and the continuity of non emergency care, especially in the context of cross-border healthcare.

¹ Commission Communication, “e-Health - making healthcare better for European citizens: An action plan for a European e-Health Area”, 2004:
<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2004:0356:FIN:EN:PDF>

2) Action at the EU level

In order to tackle these huge challenges, voluntary intergovernmental cooperation at European level has been ongoing for some years. The Commission has financed projects in order to foster the development of technological and non-technological aspects of eHealth through:

- 1) One of the three operational programmes of the Competitiveness and Innovation Framework Programme (CIP, 2007-2013): the *Information Communication Technologies Policy Support Programme* (ICT-PSP), which aims at stimulating a wider uptake of innovative ICT based services and the exploitation of digital content across Europe by citizens, governments and businesses, in particular SMEs (€ 730 million for 2007-2013);
- 2) *The Seventh Framework Programme for Research* (FP7), which spends 100 M€/year in various fields: Personal Health Systems (€ 72 M in 2007, € 63 M in 2009), Patient Safety (Safer surgery, detection of public health events, clinical care and research (€ 30 M in 2007, € 30 M in 2009),

Virtual Physiological Human, Modelling/simulation of diseases (€ 72 M in 2007, € 68 M in 2009);

- 3) The *Structural Funds*, with a total of € 5 billion planned for e –services, including eHealth;
- 4) The *Public Health Programme*, which surveys the citizen's use of internet for health purposes, summarizes the evidence of eHealth implementation cases, assesses the effects on health organizations of the introduction of Electronic Health Records;
- 5) The *European Public Health Portal*, which provide access to reliable health information across the EU, in all the official languages. In the future, this can expand to health tutorials: tools to empower patients, capable of guiding and supporting them while they are learning about their health or navigating the health systems.

All in all, to date, over 450 joint projects have received a total of around a billion euros of European funding. This has contributed to a solid knowledge base on the potential eHealth benefits for patients, professionals

and health systems' management. It enables us to provide a good basis for an EU evidence-based policy.

On the policy side, the abovementioned "action plan for a European eHealth Area", which covers all aspects of eHealth and sets out the steps needed for widespread adoption of eHealth technologies across the EU by 2010. The plan calls on Member States to develop tailored national and regional eHealth strategies. EU's role is to encourage each health authority to learn from the experiences of others. The action plan, an umbrella for policy development, is due for revision in 2011.

3) The benefits of closer cooperation between Member States

The EU projects conducted so far have gathered evidence and knowledge on the benefits of closer cooperation on eHealth. The current discussions on the proposed *Directive on the application patients' rights in cross-border health care*, which includes an article on eHealth in its chapter on "Cooperation in healthcare", are particularly topical in this respect.

The Commission proposes to establish within an experts committee measures to achieve the interoperability (standards and terminologies) of ICT systems in the field of healthcare. A constructive discussion between the Council and the Commission led to identify three concrete areas where cooperation could be formalised and for which there is an added value to act at EU level. As a result, the Council position (September 2010) now proposes to build on existing EU projects (epSOS²) and to focus on:

- 1) a non-exhaustive list of data that is to be included in patients' summaries and that can be shared between health professionals to enable continuity of care and patient safety across borders;

- 2) effective methods for enabling the use of medical information for public health and research purposes, supporting for instance the development of personalised healthcare and assessing the effectiveness of treatments on a large scale; and

- 3) common identification and authentication measures to facilitate transferability of data in cross-border healthcare.

We are now at a crossroad. The proposed Directive is still currently discussed by the Members of the European Parliament and Member States. They will need to decide to what extent they are ready to really engage in cooperation on eHealth at EU level. After a decade of financing intergovernmental voluntary projects, which were essential for the development of evidence-based policy, a political decision should be taken on whether or not the eHealth field requires a higher level of ambition.

Last March, the European Commission launched the "Europe 2020 Strategy for smart, sustainable and inclusive growth" to exit the crisis and prepare the EU economy for the next decade. In order to foster a "smart growth" in Europe, the Commission proposes a Europe 2020 agenda consisting of a series of flagship initiatives. One of these is called "A digital agenda for Europe" and intends to deliver sustainable economic and social benefits from a Digital Single Market based on an ultra fast internet. One of the key actions foreseen under the Digital Agenda relates to eHealth and the need to "undertake pilot actions to equip Europeans with secure online access to their medical health data by 2015 and to achieve by 2020 widespread deployment of telemedicine services". Therefore, eHealth has been identified as a priority for future

action through partnerships between the Commission and the Member States.

In this respect, two crucial tests for the EU's capacity to shape an answer to eHealth are expected in the near future: the *European eHealth Governance Initiative*, which may provide a mechanism for European intergovernmental cooperation on eHealth, combining Member States' political commitment and technical support with the Commission funding; and the proposed Directive.

Highlights

- eHealth solutions help fulfilling public health objectives as well as improve the quality of care and patient safety.
- eHealth means better and safer care for patients.
- Two main EU initiatives may help to shape the eHealth landscape. The European eHealth Governance Initiative, which may provide a mechanism for European intergovernmental cooperation on eHealth, combining Member States' political commitment and technical support with Commission funding, and the Commission proposed Directive on the application of patients' rights in cross-border health care, which includes an article on eHealth.

For patients, eHealth means better and safer care and more confort as doctors have quick electronic access to their medical details.

² <http://www.epsos.eu/>

1 | Citizens' E-Health

What would e-Health bring to common citizens?



Dr. Milan Cabrnock,
Member of the European Parliament -
European Conservatives and Reformists,
Member of the Committee on Environment,
Public Health and Food Safety

Our society is constantly changing. However, modern changes are influenced more than ever by new technologies, including those in information and communication.

We are in daily contact with these new technologies at home, at work and when we entertain ourselves. Of course, we therefore cannot avoid these technological developments in the health field. On the contrary, the health field is a domain where new technologies find their place rapidly and on a broad scale.

When we say e-Health, we imagine the use of information and communication technologies for health care and throughout the health sector. Information technologies are used by specialists as part of devices, surgery practises and hospital equipment. Yet, what kind of benefit does modern communication technology bring to patients and citizens?

Health is of the highest value for each of us. People are becoming more and more interested in health care especially with regards to general health information, **how to care for their health and how to prevent disease and maintain a healthy lifestyle.**

Information technologies are the new method of presenting health care information to citizens. For such types of information, **trustworthiness and comprehensibility** are extremely important. On the internet, an immense quantity of health information can be found including information related to healthy living, disease, treatment and drugs. However, not all the information is factual, comprehensive and correlates to a scientific knowledge base. It is one of the tasks of

governments to **guarantee the accuracy of sources** in the health sector.

The second substantial condition for information accessibility is language. The majority of health information on the internet is in English. However, information in other languages, used by smaller nations, remains less accessible. If we want the wider public to have access to the information, we must offer such information in native languages and in simpler forms comprehensible even to those with a basic education.

Information processing is also a substantial part of health care. Modern medicine encompasses a huge quantity of information. One patient is being taken care of not by one doctor, but by several teams of specialists working in different departments, in various health-service institutions and often in various cities or countries.

It is necessary to ensure that the available information is delivered to the right place on time. Information must be accessible where it is needed and in a timely manner so that further health care decisions can be made.

The path to the best practice of processing of health information is through electronic documentation. Electronic information can easily be stored, shared, transmitted and classified and allows for specific detailed searches. Likewise, the accurate processing of health information is a prerequisite for providing high quality healthcare.

Also part of health documentation, electronic processing of prescriptions and medical certificate information could also bring a series of benefits.

We came to the conclusion that the best way is to provide the information directly to patients. It is the patients who are most often present in the place where decisions are made concerning their health.

Firstly, electronic processing allows for the simplification of administrative procedures pertaining to prescriptions, drug dispensation at the pharmacy and subsequent reimbursement by health insurance companies. The electronic form reduces the risk of error during prescription preparation and during its processing. It is also reduces the risk of forged prescriptions.

Secondly, electronic processing provides significant support to the decision making process. During electronic preparation of prescriptions, both the doctor and pharmacist may access much needed information about the drugs, their characteristics and also information on the various drugs the patient is currently taking in addition to their prescription history in order to better understand the complete patient profile.

Thirdly, electronic prescription processing provides the data necessary for the evaluation of doctoral behaviour by providing a record of the drugs prescribed by doctors and the subsequent distribution

by pharmacists of generic substitute drugs. This information may be used for educating doctors and pharmacists and as a supportive measure to the proper prescribing and dispensing of drugs. Information on prescribed and dispensed drugs could be extremely useful for decision making related to health and the pharmaceutical politics of the country.

The modern European health service is focused on the citizen and the patient. If we want the patient to participate in decision making in the health service and also to accept some share of responsibility for health behaviour, we should be providing access to patient information. Electronically processed information should be more easily accessible for the patient than hard copies.

It is patients who are most interested in the quality and safety of provided health care. It is therefore evident that the availability of information and its proper processing is one of the necessary conditions for the provision of quality and safe health care.

At the same time it is patients who are the absolute owner of confidential personal data and only patients should decide whom they provide such sensitive information to.



We have spent considerable time looking for the method of how to arrange existing information in order to be available at the right time in the right place, i.e. at the place where the further health care of the patient is being decided.

We came to the conclusion that the best way is to provide the information directly to patients. It is the patients who are most often present in the place where decisions are made concerning their health. At the same time **it is patients who are the absolute owner of confidential personal data and only patients should decide whom they provide such sensitive information to.** Therefore, we see the future process as a combination of an electronic health record - electronic health documentation created and administered by the health-service institution and a personal health record of patients owned by the patient, which can be distributed by patients at their discretion. It is clear that the personal health record

should mirror the health documentation of the patient maintained by each health-service institution.

It is a challenge for the EU to quickly create standards on the basis of which individual countries, individual health-service institutions and individual authors of health information systems may all contribute. The result must be interoperability. Individuals, patients and health-service staff must be easily identifiable across the whole EU. Data stored in individual information systems must be stored in such a way as to allow their shared use by all information systems. They must also be open to compatibility with information systems outside the EU.

Another topic for use of modern communication and information technologies is the field of long-term care. Our society is getting older and more of our citizens need long-term care. The number of persons living alone is increasing as well as the number dependant on daily or uninterrupted care of relatives. New technologies allow the provision of effective care at home as an alternative to institutional care.

Technologies also allow **better communication with the disabled.** We are aware of the impact of loneliness and the need for contact with not only nurses and doctors but also relatives is an imperative need of the long-term ill. Besides simple communication, technologies may be used for aid calling, locating the position of patients with limited orientation and for transmitting medical information such as temperature, blood pressure, heartbeat and blood sugar levels.

We understand the many good reasons for supporting the relocation of long-term care patients from institution to home.

Most significant is **quality of patient life**, much higher if they can live at home, in addition to the benefits of cost efficiency. Sources are limited and there is no doubt that home care is more economical than institutional care.

It is important that we discuss many other specific applications and new possibilities deriving from modern technology. Even more fundamental is that the use of the new possibilities provided by communication and information technologies greatly benefit health-service provisions in comparison to other options. Of great importance for **effective use of such technologies is interoperability.** In case that information can be transferred between individual information systems, between health-service institutions and even between countries, ensures an advantageous service to both patients and the health sector.

Information and communication technologies should, in principle, realign the position of the citizen in the health care system. **Access to information** gives opportunity to all to better care for their health. The **patient** may become an **informed partner** of the doctor during decision making procedures about their health and then may take on more responsibility for such decisions.

E-Health tools are changing reality where we live and work. It is not important whether we agree with this reality or not. What is important is **how fast we are able to adapt to the changing world** and use its benefits to ensure better health for us all. ■

Dr. Milan Cabrnock
Member of the European Parliament

Highlights

- e-Health is synonymous with the use of information and communication technologies for health care and throughout the health sector.
- e-Health cannot exist in isolation from the values of quality and safety of health care provision - the core of patients' interests.
- e-Health functions under conditions of information mobility, accessibility as well as interoperability. These are some of the means that grant patients the choice to become informed partners of the doctor and take part in the decision-making procedures which concern their health.

1 | Citizens' E-Health

Patient-centred e-health: helping to improve quality of care through e-health



Rod Mitchell,
International Alliance of Patients
Organization (IAPPO)

E-Health represents a significant avenue to empower patients and their carers as well as aid other healthcare stakeholders in providing truly patient-centred healthcare.

Many of the benefits of e-health have been stated in this report, however it is worth reiterating the opportunities that innovation in information and health technologies can bring.

As Europe and the world face the double challenge of an **ageing population** and an **increase in non-communicable diseases** there is a growing **need to adapt** health systems in a cost-effective way that meets the needs and preferences of patients. E-health systems can aid patient choice, improve patient-health professional

communication, assist in the day-to-day management of long-term conditions, improve diagnostics and prevention, and connect people in remote areas to healthcare providers. These benefits cannot be underestimated, however there are **challenges** that need to be met such as **data security and interoperability** before they can be realised.

Much has been written about the new e-health technologies that are **already available, but, among others, there are outstanding national and cross border**

legal, funding and connectivity issues that must be resolved. These uncertainties are hindering the introduction of new Europe-wide IT systems. Unfortunately, the wheels of negotiation grind slowly and when adding in the reluctance of politicians, media and the end users to support the wider development of new e-systems, many of our health providers and end users who do see the positive benefits, often wait frustrated by the bureaucracy, which surrounds us all.

Many of us working within the patient community to improve the quality of care of people with rare, chronic and other conditions believe that until the major issues surrounding the interoperability of e-health systems are resolved, within and across the different health related structures of each European Union (EU) member state, there is a fear that many of the already reported positive e-health initiatives being put in place by the EU and others will have little impact in improving the e-health arena and consequently the lives of the European citizens affected by ill health.

It is important to remember that for many citizens across Europe and beyond **the security of e-health IT systems** is a major concern as they do not believe that their most personal (ill) health information/records will be secure when held within a transportable/shared IT system. Many are concerned that reported access abuses of the health information systems mean their records are seen by people not authorised to have the information. So it is vital that the citizens are reassured now!

Adverse media reports concerning new e-systems found to be not fit for purpose remind us that huge sums of money have been wasted whether through write

...until the major issues surrounding the interoperability of e-health systems are resolved, within and across the different health related structures of each European Union (EU) member state, there is a fear that many of the already...

offs, or costs substantially increased as a result of serious delays or very extended commissioning dates. This has led to much criticism among European citizens and taxpayers, who have often funded a good portion of what they see as waste and inefficiency. This is particularly abhorrent during this extended period of increasingly scarce resources, longer life expectancy and, for many, the personal difficulties caused by the ongoing economic uncertainties.

In the past, uncertain e-Health cost benefit research outcomes have also impacted negatively on purchasers decision-making so in the future we must better identify which systems can be of real benefit and which are less efficient and in doing so can use them to improve the quality of care of European citizens. In time many of the positively evaluated systems can also be made available to other parts of the world.

So the co-ordinated stakeholder action plans of the European Commission in collaboration with EU Member States should help us overcome many of the remaining issues, most notably - as previously mentioned - **the interoperability issues**. Therefore, we must ensure that the end user - the patients and patient organisation(s) - together with the consumer/citizen group (s) - are represented early on in all multi-stakeholder structures, debates and discussions.

Patients have both **rights** and **responsibilities** and while increasingly they better understand their bodies, it is known that they can benefit from sharing in their care, from interacting with their healthcare professionals and from being responsible citizens. Having a voice in multi-stakeholder structures at EU level and within the member states will also help achieve these aims.

...reported positive e-health initiatives being put in place by the EU and others will have little impact in improving the e-health arena and consequently the lives of the European citizens affected by ill health.



Widening the empowered patient population through training and/or self-education/self management should be further progressed – specifically providing simple well-constructed easily understandable information faster will help this process.

What we now need is a Europe wide initiative involving citizens of all ages though first piloting the use of those “volunteers” who understand and use IT in their daily lives. This would actively involve European citizens and their friends across the world who already communicate with one another in huge numbers using mobile phones and the world wide web who could then transfer their IT skills to the accredited teaching about the benefits of e-Health and how they can assist in resolving the uncertainties that exist in people’s minds. On-line toolkits also have a role to play but we must not forget the many people without access to the latest technologies in their everyday lives.

The EU is based upon solidarity among its people and health is at the top of its agenda so we must encourage our leaders and politicians at all levels to involve their citizens, as many will also have constructive ideas to share.

We know already that e-health systems can successfully provide us with opportunities for regular monitoring, on line contact with physicians allowing variation in treatment programmes for those with long-term conditions and a shared care facility and the collection of data. In scaling up these systems we should reduce costs.

Much has already been mentioned about the importance of e-Health records being highly secure and accessible. Some EU countries are progressing their introduction and further development.

We have learnt from projects like the **WHO Patient Safety** initiative with its **Patient Safety Champions** and the consequent introduction of similar projects in Europe, that the patient community has a role to play in reducing medical errors so improving patient safety. Just moving from illegible hand written records to easily understood electronic records shows what benefits can quickly follow when we work together, most importantly building trust among one another too!

We know that **European patients** are seeking equitable and in most cases **faster access** to services and treatments including provision of social/home care. There are very many areas ripe for the introduction of e-health systems but we must each have a willingness to better understand these benefits and to set aside old dogmas.

While the majority of European citizens hold a bank account and trust their bank to hold their personal financial information in a secure IT environment and increasing numbers undertaking their transactions via the web connected bank services, very many remain unwilling to accept that the same level of **high security systems** are available for their **health records**. So it is essential that before we invest huge public sums in developing IT e-health systems further we must overcome this reluctance.

This, I am sure, would be helped immensely if we could bring ourselves to trust one another and understand one another’s ways of working, cultures and customs. The community of patients’ organisations like the members of the **International Alliance of Patients’ Organizations – IAPO, the European Patients Forum - EPF, EURORDIS - the European rare diseases “umbrella”** together with the myriad of different disease specific organisations, societies and groups, whether at the EU level or across member states, have all demonstrated that people from different backgrounds and communities can work together to achieve goals.

Health is critical to all aspects of our lives so let us use our **skills, compassion, energies** and our **extra time** to assist in **improving the lives of our citizens** through building trust and removing old prejudices. Let us therefore work together to constructively harness the benefits of e-Health to meet the health challenges of the future and deliver patient-centred healthcare for all. ■

The EU is based upon solidarity among its people and health is at the top of its agenda so we must encourage our leaders and politicians at all levels to involve their citizens, as many will also have constructive ideas to share.

Rod Mitchell on behalf of the International Alliance of Patients’ Organizations

Rod Mitchell,
International Alliance of Patients
Organization (IAPO)

Highlights

- e-Health works for the patient if major challenges such as data security, interoperability and other outstanding national and cross border legal, funding and connectivity issues are overcome.
- e-Health is a tool that enhances quality of care to the benefit of patients but they still need to be reassured that health security systems exist and will protect their health records. As with a bank account, patients personal health records can be safe.
- e-Health provides patients faster access to health and other services – such as home care. Understanding as well as communicating the benefits of e-Health remains one of the essential tasks of stakeholders.

2 | E-Health and Health Services

e-Health: delivering better, faster and more efficient health services



Anna Lefevre Skjöldebrand,
Chairwoman of Eucomed's E-Health Task Force and Managing Director of Swedish Medtech, The Swedish Medical Technology Industry Association

Patients, clinicians and healthcare providers alike have a stake in Europe being at the cutting edge of medical innovation. After all, new technology enables the provision of better, faster and more efficient healthcare.

Unfortunately, the speed we associate with the online world is not always replicated offline and in reality the pace of e-Health uptake has been slower than European healthcare stakeholders would wish.

The concept of e-Health encompasses a vast number of services which apply to both clinical and non-clinical settings. It uses range from delivering rapid access to medical records, to allowing remote monitoring of a chronic disease, through to allowing real-time tracking of medical supplies – e-Health is a technology that is

equally effective whether it is being used for clinical, administrative or educational purposes.

From a healthcare delivery perspective, e-Health offers many attractive cost-reduction features and timesaving measures. By leveraging information and communication technology, e-Health also gives patients the opportunity to connect with their caregivers and healthcare systems as never before.

As Europe grapples to find a financially sustainable healthcare model, e-Health

holds the keys to improving the effectiveness of healthcare systems and to delivering patient-centred care.

In 2009, the Swedish Presidency of the EU commissioned a report in order to foster understanding of how improvements in healthcare can be supported by technology and how these technologies can resonate with five key health policy goals – availability of service; continuity of care; patient empowerment; patient safety; and quality of care. The findings emphasised in no uncertain terms that e-Health can deliver significantly better use of healthcare resources.

For the six EU Member States covered by the study it was found that:

- 5 million yearly outpatient prescription errors could be avoided by using electronic prescriptions;
- 100,000 yearly inpatient adverse drug events could be avoided through computerisation – which would free up 700,000 bed-days per year; and
- 9 million bed-days yearly could be freed up through the use of electronic medical records for patients - an opportunity to increase throughput and decrease waiting times, equivalent to a value of nearly €3.7 billion.

Clearly, e-Health has the power to be a game-changer for European healthcare systems. It can significantly improve workflows and day-to-day management of healthcare. Technologies such as electronic medical records, computerised physician order entry, electronic transfer of prescriptions, image archiving and communications systems and Radio Frequency Identification (RFID) are already being used to varying degrees across Europe.

From a healthcare delivery perspective, e-Health offers many attractive cost-reduction features and timesaving measures.

The market I know best, Sweden, has been an early adopter of e-Health services and is among the EU's leaders in terms of the development of computerised patient records and the use of electronic prescriptions.

If I had to draw some conclusions from the Swedish experience to date, I would say that, firstly, e-Health is very effective in facilitating the flow of information and homogenising communication and secondly, that it is a real driver of patient empowerment.

In healthcare, diagnostics and treatments are often both complex and time-sensitive. Medical information needs to be accessible at the right place and at the right time - so any tool which can instantaneously get relevant information to the healthcare professional makes a real difference to the quality of care. Likewise, e-Health benefits patient safety by improving the quality of information in the Swedish healthcare system through more standardised reporting and by avoiding misunderstandings due to illegible scripts – which had been a considerable problem.

e-Health is also a great facilitator of patient-centred care. The technology is enabling patients to become more informed partners in the healthcare decision-making process. From telemedicine to online patient portals, patients are demonstrating a desire to take control of their health records and monitor their medical conditions. Pilot studies in Sweden have found that patients appreciate the ease of access to first line support that e-Health solutions can provide. Interestingly, clinicians report that patients do not abuse the new tools, such as electronic appointment booking. On the contrary, there has been a reduction in the number of unnecessary face-to-face consultations since introducing the new technology.

The Swedish experience of e-Health has been that investment and commitment to technology has improved the timeliness, efficiency and effectiveness of services. Healthcare providers and patients have seen real benefits from this commitment to making e-Health work.

By leveraging information and communication technology, e-Health also gives patients the opportunity to connect with their caregivers and healthcare systems as never before.

doctors in different hospitals - and perhaps one day in different countries - can manage a patient's care more efficiently. Some healthcare decision-makers may still consider e-Health as being yet another cost to manage. But the bottom line is that investment in this new technology enables healthcare systems to become rapidly more effective. ■

Anna Lefevre Skjöldebrand

Anna Lefevre Skjöldebrand is the Chairwoman of Eucomed's e-Health Task Force and the Managing Director of Swedish Medtech, the Swedish medical technology industry association

However, there are clearly many hurdles to overcome. For example, a national patient record project linking together hospitals, clinics and GPs – whereby certain health-related metrics would be accessible electronically no matter where in Sweden the patient is being treated - is due to be launched in 2011. Although electronic health records are the norm in Sweden, the challenge has been to integrate diverse IT systems – in Stockholm alone there are over 400 different patient record systems in operation.

The solution to managing this heterogeneous IT environment has been to agree on a series of standards which each system has to attain. Standardisation is a driver of interoperability, allowing new applications to run on top of more mature technologies. The new national system will act as a kind of 'google' which clinicians nationwide can use to search for and access the patient information they need to make appropriate healthcare decisions.

Aside from technical requirements, a range of aspects - legal, ethical, organisational, etc - need to be addressed to attain e-Health interoperability. The national patient record project also revealed the poor level of IT training of many healthcare professionals. It is essential that healthcare providers invest more in educating their staff in the proper use of their e-Health systems.

It is also worth remembering that no e-Health system is without its problems. In Sweden, we have occasionally seen issues with stability and response times. But overall, healthcare policymakers have found e-Health to be an instrument to enhance quality, access and safety in healthcare.

There really is a long way to go before reaching the full potential of e-Health. In Europe, we are only beginning to appreciate the benefits of an interconnected healthcare system. When systems are interconnected,



Highlights

- e-Health encompasses a vast number of services - the delivery of rapid access, the monitoring of a chronic disease through to allowing real time tracking of medical supplies - which apply to both clinical and non-clinical settings.
- e-Health offers a series of attractive cost-reduction features.
- e-Health offers time saving measures.

2 | E-Health and Health Services

Improved effectiveness; implementation of e-Health; better, faster and more efficient health services



David Lloyd Williams,
Representative European Health Telematics
Association (EHTEL)

These were always the goals of what came to be called e-Health. In the early days, the vehicle for achieving this was the European Commission's Research & Technology Development programme.

There was much talk of "magic solutions", "silver bullets" and "paradigm shifts" with a somewhat impractical commitment to the implementation of wide ranging standards. Like many similar new communities, it spent huge amounts of time and money talking to itself, with little direct connection to health care professionals and the real world of clinical practice. For some time now it has been clear that to bring

together technology and health care, the academic and technological emphasis would have to be rethought creating some method of building bridges and securing active collaboration between the various stakeholders. The challenge now is to find ways of realising these goals.

The European Commission (DG INFSO) has consistently worked to support

a number of **e-Health** activities and projects and this was underlined at the **e-Health** conference in Barcelona in March 2010. The European Commission's continuing support for **e-Health** will be crucial, but we have learnt that the Commission cannot do all of this on its own. Its key responsibilities and priorities are declared, but e-Health is not just a top down affair. There are some components to be dealt with at European level but these are rather restricted without a European market for health care or for **e-Health**; other elements, in particular deployment, will be taken care of at national, regional or local level. The next key step is to increase the understanding of the importance and value of **e-Health** among all the stakeholders.

Over the last few years, much attention has been paid to issues of healthcare transformation and to the role of **e-Health**. The results have been disappointing (with some notable local exceptions), particularly where centralist strategies have tried to impose 'one size fits all' solutions. Issues of scale and complexity in healthcare are still little understood in relation to **e-Health**. Even now, it seems evident that working with population groups above 5 million involves a major shift in complexity beyond the practical application of today's IT technology in a health care environment. Experiences with the UK National Programme for IT, with medical records in France and the demise of GIP-DMP, and the smart card programme in Germany, all serve to underline this issue.

What about healthcare users – how do they view **e-Health**? The simple answer is that they are only now beginning to see it as a priority. The prevailing perspective is rather limited and varies significantly across different user categories. Many

users are clinical professionals across a range of specialties and functions from paramedics and nurses to hospital consultants. In their own private lives, most will be IT users at some level. Yet, at work, corporate IT capabilities often do not extend support to enable them to do their

Much of what we have learnt in the past decade is not new, but rather a pragmatic reflection of the difference between popular perception and prevailing reality.

jobs more effectively. There are also some concerns among clinicians and patients, centred on the view that medicine is a personal relationship between clinician and patient, which should be kept that way.

The work EHTEL has done with patients groups leading up to the publication of the Patient's Charter, highlights very real issues about quality, access, convenience, and confidentiality but also about the sustainability of present prevailing models of care. Choice and empowerment sound good, but do they offer any practical help when you are seriously ill or coping with chronic disease? Looking ahead for users, the prognosis is good: they will be better informed and more notice will be taken of their individual preferences. They are likely to be given more responsibility for their own health, but there is still a large gap in understanding between patients and other stakeholders.

Much of what we have learnt in the past decade is not new, but rather a pragmatic reflection of the difference between popular perception and prevailing reality. New business models and working relationships are now required where citizens are given both choice and

responsibility; where this is encouraged and informed; where clinical professionals are supported and informed to be more effective, to work as part of broader care teams looking towards more personal and personalised care; where regions, national governments and politicians are confident enough to apply the principles of subsidiarity.

Support at the European level will need to be more focussed. The Lead Market Initiative (LMI) and the recent ICT Policy Support Programme are both examples moving the focus towards local deployment. There are many good initiatives under way, with projects such as Calliope (Call for Interoperability in **e-Health**), epSOS (Smart Open Services for European Patients) and Renewing Health (Regions of Europe Working Together for Health). The focus is now on interoperability, telemedicine, personal

health systems. But the real potential for connecting to care episodes and consultations, and then to patients and citizens is still far from fulfilled. We have learnt that, despite considerable investment, industry does not yet have the capability to apply itself to health as it has done to most other industries; there is no effective global market and still no common solutions. But we have seen some progress here too, with Microsoft, Google and Intel taking major initiatives. We have seen the rise of Open Source as an alternative model for reducing the constraints of technology 'lock in'. Perhaps most importantly we have now

seen the beginnings of convergence between IT, telecoms, medical equipment and medical devices.

What we have still not seen is any truly scalable collaboration model to overcome the silos and protective interests in healthcare. Nor have we seen clear and unequivocal business cases for **e-Health**; clear explanations of what **e-Health** can do, for whom; how to go about using it; how to present results and lessons learnt to a wider audience, so that people in local communities can understand how they can implement ideas and proposals to deliver better, effective, personal care

with better value. Existing cost savings models are too simplistic for **e-Health** and we will still need to spend time and effort finding answers, which are honest, and clear but also effective in a practical local care environment.

This will be a challenging decade for healthcare. Cost will as ever be the prime one – how will Europe and its Member States cope with the rising cost of healthcare. Demographic patterns across Europe clearly show an ageing population with more and more people in the age groups associated with higher proportional costs. Widespread increases in the incidence of chronic disease are a testament to our growing ability to avoid premature death – but also an economic and societal challenge that demands changes in delivery management. New drugs, new procedures, new equipment are emerging to help, but unit costs are rising rapidly and health infrastructures struggle to cope with them. Beyond this, there are new opportunities and challenges – the concept of personalised medicine, the use of stem cell technology, genomics and many others will develop and provide new ways of protecting and preventing disease. It is a faint hope indeed that the healthcare sector will become less complex, or that there will be simple answers. While much can be done by organisations like WHO and at European / national level, the hard reality of improving the effective of healthcare services and the contribution of **e-Health** will increasingly be at personal, local and community levels.

Given these contexts and the current economic crisis, where are we now with **e-Health**? We know there are no simple answers or panaceas, no single immutable way forward. **e-Health** is just

one enabler for healthcare transformation. We are close to having the technology we need, interoperability of information and the systems that share it, but not yet information collected at the point of care, stakeholder collaboration, the transformational change in mentality and the flexibility of approach needed. **e-Health** is accepted as a concept but not yet as a practical, valuable and essential support tool for facing many of these challenges. Now we have a global financial crisis which for **e-Health** underlines the challenge of investing to keep our heads above water.

The direction of travel is towards information-based care, built on evidence and collaboration; more informed self-management and responsibility for both patient and citizen. The role of technology will increasingly be to provide and support this information from the lowest level up, deriving management, public health and research information at the point of care as an integral part of the care process. We will progress by learning the lessons of the last two decades, putting them into practice wherever they are effective, by understanding the complexity of the healthcare process, following good practice by decomposing complexity into manageable components. We have to work harder to bring stakeholders together looking for synergies and common purpose, including and involving industry, learning where best to invest, with whom, in successful partnerships.

Our aspirations for this decade should include a much more common community care model (irrespective of funding sources), where information is an automatic by-product of the care process, **e-Health** becomes an integral part of care, and where IT and medical technology converge at the level of usefulness and value.

Innovation has to be encouraged, rewarded and deployed, reducing not just 'time to market' for products and services but also 'time to generate value' in successful user deployments. ■

David Lloyd-Williams
EHTEL

New business models and working relationships are now required where citizens are given both choice and responsibility; where this is encouraged and informed; where clinical professionals are supported and informed to be more effective, to work as part of broader care teams looking towards more personal and personalised care; where regions, national governments and politicians are confident enough to apply the principles of subsidiarity.

Highlights

- e-Health is an enabler for healthcare transformation.
- e-Health is accepted as a concept but for it to deliver information needs to be collected at the point of care, stakeholders need to collaborate and there needs to be a transformation in mentality and more flexibility in approach.
- e-Health points towards a future of an information-based care, built on evidence and collaboration.

3 | E-Health in Practice

Future of computer modeling of physiology and disease in the virtual physiological human and its application to medicine



The theoretical debate on the definition of e-health is far from being over – meanwhile, researchers are bringing in new practical solutions to previously unmet needs.

Jos A.E. Spaan
European Alliance for Medical and Biological Engineering and Science (EAMBES) representative in HFE¹

By pooling the expertise of top level medical researchers, engineers and ICT experts, **Biomedical Engineering (BME)** is a discipline that is constantly searching for solutions to the needs of patients

and highly innovative sectors. Today, “e-health” is often associated with **data exchange, internet applications for self diagnosis** and **tele-monitoring**. However, the opportunities that **ICT** could

provide in terms of healthcare are rapidly expanding. Although there is limited knowledge about **BME** in some European Member States, recent projects are raising awareness of the potential of **BME** and its applications. One of the most promising examples of ICT-based solutions, known as the **Virtual Physiological Human (VPH)**, will finally take e-health into daily clinical practice. This chapter provides an overview of the VPH, which is supported by the **European Union’s 7th Framework Programme (FP7)** in the ICT for Health activities².

The **VPH** is intended to be a comprehensive model of human physiology, which integrates knowledge about the various levels of body system organization – such as the body, organs, cells or proteins. This comprehensive tool will allow a better understanding of the relationships between processes across the different levels of physiological organization.

The **VPH** can be compared to popular applications such as **Google Earth**. The latter provides a complete view of the world, a country, a city or specific streets. These are mapped, and images are incorporated at each level. **Biomedical** engineers and other basic and clinical scientists are developing the **VPH** by performing a similar mapping of the human body and its components, but they are going even further. The level of precision of their work could be comparable to **Google Earth** adding individual houses, identifying individuals living in them as well as describing their social interactions and thus, showing how society is organized and functions at each level. The **VPH** is an undertaking of gigantic proportions that needs to be continuously updated, and it will take more than a decade to complete it. **Biomedical Engineers** behind this project

notably have to bring together excellence in disciplines such as physiology, biology, mathematics and medicine.

Physiology is the science about the functioning of the human bodies (various) components. It entails measuring the manifestation of an organ, a cell, a protein or subsystems of the body, as well as its interaction with other subsystems – rather than just watching their on/off manifestation. **Physiology** is essential to understanding the development of a disease, as most conditions are due to the gradual disruption of a subsystem. Furthermore, such derailment often remains unnoticed, as compensation is provided by other bodily processes, a stronger stimulus or another organ. The body as a whole can appear to perform normally, even if one of its parts is not functioning properly– but ignoring the dysfunction would be like beating a tired horse to keep him running at the same pace. For example, if one kidney does not function properly a person’s second kidney can provide compensation however, masking the problem at hand, which can lead to permanent damage if not treated. The **VPH** will therefore integrate the description of such functional interactions between all the body’s subsystems.

The **VPH** itself is based on mathematical models that simulate a bodily process, which enables researchers to better understand a normal physiological process and the development of a disease. The **VPH** has multiple applications in the clinical arena: it can be used for diagnosis, for predicting the outcome of a treatment or for training clinicians on delicate procedures without involving actual patients. Many model-based simulators, treatment robots and diagnostic tools with clinical applications

already exist. A perfect analogy is often drawn with flight simulators. Seen as a toy in the beginning of these developments some 30 years ago, they have developed into a training tool for pilots accounting for more time of experience than real flights. Nowadays, pilots are required to train for responses to rare events that may have detrimental outcomes such as the failure of a subsystem, an engine or even bad weather. Similarly, **biomedical** engineering is developing model-based clinical tools that will form the rational basis for clinical treatment in many, if not all, areas of healthcare.

Throughout the past decades of human genome research and development, there has been a belief that for each disease a molecule exists and many thought that unraveling the genome would bring cures for all diseases. However, it has become increasingly apparent that the genome only describes our molecular building blocks and thereby, only represents a small part of our complete system. Such blocks interact with all other systems necessitating understanding at both the cellular and organic levels. It is obvious that something would go wrong if an essential building block is missing. However, the lack of one building block may be compensated for by others in many cases. The development of a disease is not necessarily caused by one single dysfunctional gene, but rather by a combination of multiple dysfunctioning genes. Moreover, some genetic conditions may lead to diseases in one person but not in another depending on the interaction with other factors such as lifestyle. Examples can be found in the development of cancer and diabetes.

Let us go back to the essentials of simulators and models: the mathematical

¹ <http://eambes.org/>

² http://ec.europa.eu/information_society/activities/health/research/fp7vph/index_en.htm

This comprehensive tool will allow a better understanding of the relationships between processes across the different levels of physiological organization.

description of functions of subsystems at all levels. There are several types of models and the most important ones include descriptive and predictive models. The boundary between these two models is difficult to clearly delineate, but both are useful to the **VPH**. In a predictive model, the mathematical relationships describing the processes of a system are based on biophysical or biochemical processes essential to the system. In a descriptive model, the subsystem is considered a “black box” and the input-output relations are based on heuristic analysis of a large dataset related to function and mal-function of the system.

A good example of how both types of models are integrally applied is the functioning of the heart, which is currently being studied in a **FP7** project: **euHeart**³. Although the heart has the simple task of providing blood flow to all organs, it is a complicated system, which can fail in many different ways. For example, a heart valve may become leaky or lose its flexibility due to calcification. In both cases, the heart’s pump function becomes less efficient. The wall of a coronary artery may become damaged and thickened in response, thereby obstructing the blood flow through the microcirculation where oxygen is needed for the cells to function.

In cases where the heart muscle or parts of it, have to function mechanically at too high a level, or on the verge of a failing oxygen supply, its structure will adapt and cope with these situations by altering the organization of muscle fibers and cellular function. These structural changes have an effect on the electrical conduction of the pulse that the heart needs for an organized contraction. Age and function of the heart’s atria effect the organization of cells and fibers which may result in atrial fibrillation- though not deadly since the heart has compensation mechanisms for atrial dysfunction. However, this type of fibrillation allows blood clots to form in the atrium - which may cause a stroke. The instances that can make these effects cause death are based on the predisposition of the molecular machinery of the heart⁴.

For example, the images in Figure 1 are reconstructed by using a self developed cryo-microtome at the department of **Biomedical Engineering and Physics** at the AMC, Amsterdam the Netherlands. At the left the whole heart has been reconstructed from about 4000 images which resemble the middle panel. The larger arteries run over the surface of the heart. The middle panel demonstrates how arteries penetrate into the heart

muscle. The width of the hearts in the left and middle panel is about 7 cm. The right top demonstrates the branching patterns within a tissue area of a few millimeters with the smallest visible vessels 0.03 mm. In the panel right bottom demonstrate the capillaries which have a diameter of 0.007 mm. In the **VPH** approach the biophysical and biochemical events at all these different levels are integrated mathematically since these are mutual dependent. Such models can then be used to analyze ischemia, contraction abnormalities, blood distribution problems and so on by coupling the relationships between critical phenomena.

Hence, a comprehensive understanding of all these mechanisms, and especially their interactions, are a prerequisite for an appropriate clinical response to any disease of the heart. Deviations of the body systems at every level circulate through the heart and eventually through the body.

Biomedical engineers developing the **VPH** models process all physiological and diagnostic information, in order to simulate the likely reaction of an individual patient to possible treatments or interventions. Such tools will not only improve the quality of treatment of ill or injured patients. They could also be used in preventive medicine, as to predict occurrence or worsening of specific diseases in people at risk e.g. through family history. The **VPH** clearly has the potential to enable clinicians to better understand and diagnose some of the most misunderstood body processes. Through the use of internet technologies, the **VPH** could likely revolutionize the healthcare sector as a whole. **VPH**-derived technologies will integrate, as we have seen, in all kind of healthcare-related technologies.

Translation of the **VPH** approach to daily medical care in combination with a wealth of micro and nano sensors that are presently being developed will provide improved health care accessible across boundaries within the European Community. The **VPH** project shows the benefit of promoting interdisciplinary research and **Biomedical Engineering**, and we can hope that the European Union will continue to support collaborations between the ICT community, physiology, biology and medicine. The **VPH** is strongly supported by EAMBES which aims at improving the health, wealth and well-being of the people by the application of medical and biological engineering and sciences. ■

Jos A.E. Spaan
EAMBES representative in HFE

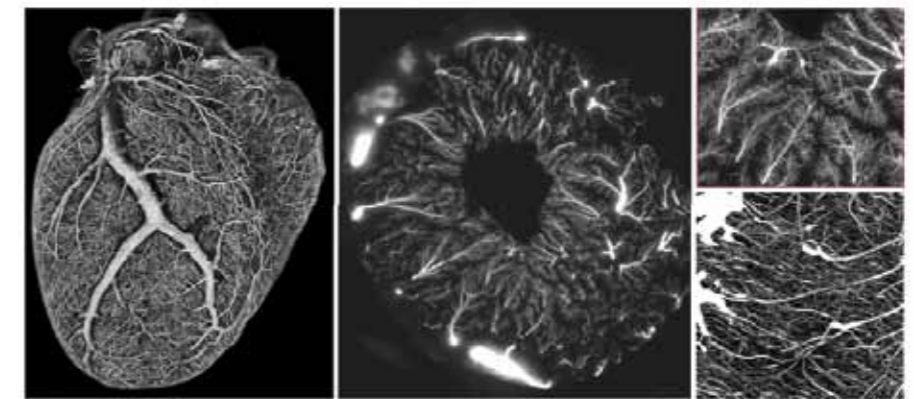


Figure 1: **VPH** approach illustrated for understanding the blood supply to the heart¹

Highlights

- e-Health is most often associated with data exchange, internet applications, self diagnosis and tele-monitoring.
- e-Health represents an ICT based solution to healthcare quality enhancement.
- The Virtual Physiological Human will finally take e-health into daily clinical practice.

³ <http://www.euheart.eu/>

⁴ Bezzina CR et al. Genome-wide association study identifies a susceptibility locus at 21q21 for ventricular fibrillation in acute myocardial infarction. *Nat Genet.* 2010, 42(8):688-91.

¹ **With acknowledgements to Jeroen van de Wijngaard PhD and Pepijn van Horssen MSc at the department of Biomedical Engineering and Physics at the AMC, Amsterdam the Netherlands.

4 | E-Health and Labor Challenges

E-quality for e-safety: a nurses' view on e-Health



Paul De Raeve
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of Nurses Associations (EFN)

The issue of e-Health has been in the limelight for some time in EU health policy as part of the **e-Europe initiative**. More recently, the **European Commission in its Europe 2020 strategy and particularly in its flagship initiative Digital Agenda for Europe**, has put forth a strategy for smart, sustainable and inclusive growth, to develop an economy based on knowledge and innovation.

Within this agenda **e-Health** is highlighted as a means of fostering quality of care and independent living particularly for older people and those suffering from long-term conditions. Similarly, the **Council of the European Union** in its **Meeting Conclusions** in December 2009 call for the Member States to commit politically and strategically to **e-Health** as one of the main instruments to enhance quality, access and safety in healthcare, particularly by building confidence in and acceptance of **e-Health** services, bringing legal clarity and ensuring protection of health data, and solving technical issues and facilitating market development.

The European Federation of nurses associations (EFN) welcomes and supports actively the **e-Health** movement and acknowledges in its [Position and Policy Statements](#) that nurses must remain a part of this initiative as emerging health care challenges such as the ageing population, workforce shortages, increasing health care expectations and rising health care costs are driving the demands for a more efficient, accessible, high-quality and affordable healthcare. During EFN 91st General Assembly, October 2009, EFN Members reported on the actions, initiatives, and concerns that the Nursing community faces on the topic of **e-Health** throughout the EU Member States reporting on:

- the expected benefits of the **e-Health** movement such as optimization of services and continuity of care;
- National **e-Health** advancements like electronic documentation, patient and health professional cards, and telenursing;
- the barriers faced towards implementation such as accessibility and usability; and
- concerns regarding future **e-Health** developments including privacy and patient contact.

EFN members perceive that developments in **e-Health** should focus on patient safety and patient empowerment and support continuity of care throughout the patient's journey. Equally important, **the nursing profession believes that ICT should safeguard citizens'** privacy with mandatory standards for managing confidential information. **EFN** Members support many developments in their respective Member States with the most notable being electronic health records and patient cards. Electronic Health Records are currently in place in many MS such as **Spain, Lithuania and Finland** with success. This is seen as enabling quicker access to vital patient information. In countries like **Malta, Germany, Slovenia and Slovakia** patients are provided with a "health ID card" which allows storing of their health and illness information. Moreover, **e-Health** services are seen as having enormous potential in facilitating information **exchange between hospitals** and communities, streamline the delivery of nursing services, and reach out to remote areas. **EFN** members have been innovating in some cases taking best advantage of current technological advances like **internet enabled communications**. **e-Health** in this context has been

EFN members perceive that developments in e-Health should focus on patient safety and patient empowerment and support continuity of care throughout the patient's journey.

particularly useful in advancing the work of community nurses via enabling direct communication with patients in remote areas via webcam conferencing, exchanging advice between community nurses and more specialized nurses in hospitals, participating in discussions on various patient cases, and even transmitting patient data like x-ray, test results, or wound images. For example, in **Croatia such technologies enable patients** on the various islands to have follow-up care while in Denmark telenursing has been instrumental in supporting individuals with diabetes or chronic pulmonary diseases.

Currently, there are numerous projects, policies and proposals on the matter of **e-Health** from different stakeholders. A combination of trend, strong political will, and financial support from the industry has resulted in a mayhem of initiatives, widely dispersed and with overall coordination or self-interest focus. Therefore, **EFN** calls on putting in place mechanisms to foster dialogue, instil a sense of ownership of reform and reduce resistance to change prior to **e-Health** design. Furthermore, **national governments should make the case for investment in e-Health** applications together with the users, all

users, which requires better marshalling of existing evidence to show that it works. Finally, a critical assessment of financial flows in health systems to determine if they act as incentives or disincentives for **e-Health** provision should be undertaken.

Nevertheless, from a nursing profession perspective, and in setting clear priorities, the three policy priority areas of e-health could focus on **Workforce, Education, and Quality and Safety**.

POLICY PRIORITY WORKFORCE

Nurses as the single largest professional group in healthcare are asked to play a lead role in ensuring the provision of effective, efficient and quality services. Considering the continuous global shortage of nurses and the rising demands for efficiency, proper **e-Health** solutions can act to support nurses' work processes. Rapid access to **patient information** and prompt communication with other **healthcare professionals** can save valuable time which nurses can redistribute to direct bedside care. The nursing workforce is frequently asked to engage in numerous data collection or

data input activities for purposes of quality assurance and statistical estimations of indicators to healthcare effectiveness such as patients' length of stay, infection rates, mortality etc. Properly developed ICT systems can potentially automate

such data communication and analysis thus relinquishing even more time for patient contact. We need to bring the nurse closer to the bed-side and e-health can support this process.

POLICY PRIORITY QUALITY AND SAFETY

Nurses need to review and share patient information in a standard and secure way. This is meant to ensure safety by reducing care omissions and errors,

Equally important, the nursing profession believes that ICT should safeguard citizens' privacy with mandatory standards for managing confidential information.

and improve quality of care across the health care delivery system. **Electronic records can therefore act to strengthen communication, and standardisation in information exchange.** The development of **e-Health** systems can also contribute greatly to prevention of disease and to improving **patient access to information and health literacy.** With the internet being used increasingly as a source of information, nurses have an important role to play in guiding and helping patients and their next of kin to handle the vast flows of information they could potentially be met with.

POLICY PRIORITY EDUCATION

EFN concurs with the Norwegian Nurses Organisation **e-Health** strategy 2009-2013, arguing that if nurses are to practice knowledge-based nursing, they must have access to updated research and quality assured knowledge. Electronic remote access to sources of knowledge such as nursing procedures, guidelines, or research in digital databases would act as a great facilitator to this while at the same time keep nurses in the clinical area close to the patients. **e-Health** is rarely included or described in nursing curriculum and it is therefore a challenge to ensure that nurses receive knowledge to utilise the opportunities offered by **e-Health.** Therefore, it could be explored how **e-Health** can be supported to be included in nurses' Continuous Professional Development to better prepare them for clinical practice.

Highlights

- e-Health represents knowledge based nursing and that requires from medical professionals to have access to updated research. One example would be electronic remote access to sources of knowledge.
- e-Health systems development contributes to overall health literacy rates and most of all to the preventive side of illnesses.
- e-Health can help in bringing the nurse closer to the bed side as it could automate data communication and analysis.

In conclusion, the EFN believes that in order for the **e-Health** movement to succeed nurses and nursing practice must be involved in all stages of development and **implementation of electronic solutions.** Moreover, it is crucial to ensure that developments are health-driven and not market-driven, while **e-Health** devices should take into consideration both usability and user-friendliness and reflect multi-professional practice. Furthermore, healthcare professionals and support staff require education and training for all aspects of **e-Health.** Nurses' IT skills must be identified as important and integrated into all levels of education,

including the **Continuous Professional Development (CPD)** programs. Social Cohesion policy would go a long way in this respect particularly by providing the requisite resources. Also, integration of international terminologies (such as International Classification for Nursing Practice) in the electronic health record would serve to achieve continuity, increase communication and secure relevant and reliable data about nursing practice and outcomes. Finally, it is seen as necessary to develop EU quality and safety standards regarding new **e-Health** applications and nursing information systems.

The EFN is convinced that **eQuality and eSafety** will mark the way to **e-Health** for the benefit of the EU citizen as well as for the profession of Nursing. Although **e-Health** has enormous potential for Nursing – particularly in supporting nurses deliver more efficient, safe, and quality care – **EFN** Members are cautious of the excessive use of **e-Health** in order not to endanger personal contact with patients. Nurses must be supported in their aim to remain close to the patients' side. ■

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4 | E-Health and Labor Challenges

Can e-Health improve quality of care in an ageing europe?



Bert Van Caelenberg
Secretary General - European Federation
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Europe's ageing population risks overwhelming the national healthcare systems in the years ahead, and the financial pressures on our medical infrastructures will be further intensified by the deepening economic crisis.

But although caring for the post-war 'baby boom' generation now entering retirement will be expensive, the digital revolution in medical technology and patient information is set to change our healthcare economy.

What contribution can e-Health, and associated novel telehealth services, including diagnosis, treatment and monitoring at home make to cutting the costs of the chronically ill, who although comparatively few in number already account for four fifths of Europe's spending on healthcare? And what role can and should the EU play in fostering the spread of e-Health?

We clearly state that e-Health development necessitates further investment in the training of healthcare professionals. e-Health offers promising perspectives for both patients and healthcare professionals but it cannot develop without further investment in healthcare professionals

e-Health offers promising perspectives for both patients and healthcare professionals but it cannot develop without further investment in healthcare professionals themselves

themselves. They will always remain the most important element in the provision of healthcare services, which include the diagnosis, care and treatment of patients. e-Health is there to facilitate their job and to improve the overall efficiency of healthcare systems. In order to gain the full benefits of e-Health, it is therefore necessary to train healthcare professionals in the use of the relevant e-Health tools and increase the patients' acceptance of these new modes of healthcare.

The Recommendation on interoperability is a hot talking point amongst healthcare professionals.

For now, e-Health development is weakened by a lack of harmonised standards and by legal uncertainties.

Eurofedop indicates the following points to be investigated by the European Commission:

- How many people in the EU are 'technology literate'?
- Is there enough confidence in the technology?
- Directly linked to the accessibility of e-health services is a possible digital divide. Could this lead to a new form of social injustice?
- What about the service providers and those working with the e-health tools?
- How are the personnel affected by the use of more technological services?

Elements of which Eurofedop thinks should be taken into account with the implementation of e-Health, are :

1. **e-Health** is an instrument and offers many opportunities.
2. Trade unions must not adopt a conservative attitude in the discussion about the implementation of **e-Health**. They must be aware of the opportunities that reside in this field and see what can be realistically achieved.
3. Nevertheless, the human and social aspect should be essential.
4. Also, the ethical values that go with the development of **e-Health** need to be given attention. In spite of the openness of the new media, there are certain limits to connectivity e.g. privacy.
5. Lifelong learning is a requirement for further implementation and it goes without saying that workers must have a say in their training. Moreover, training says something about the worker and a flexible attitude towards **e-Health** can be expected from him or her.
6. Workers must have at their disposal all means, software and hardware, by which they can do their work in a modern way.
7. Moreover, there is a danger of a new/further dualism in our society. The gap between knowledge and ignorance, between the haves and have nots, increases in the information society. Not only at national levels, but also between the countries, the differences are still too great and, in this context, especially the future member states of the European Union, need to be given more attention. Indeed, the 'e-chain' can only be as strong as the weakest link.
8. With the application of **e-Health**, social dialogue should offer an essential, more suitable platform for discussion.
9. **e-Health** can also create new health risks. Therefore, more attention needs to be given to these new health risks.

Health First Europe Recommendations

Health First Europe believes that the European institutions, in partnership with stakeholders, should:

- 1 Patients' needs should remain at the centre of *e-health* policies. These needs are primarily **access and quality of care**.
- 2 Patients' trust in *e-health* solutions will accelerate uptake of these new methods of healthcare delivery. To encourage patient uptake, the EU institutions should support efforts aimed at **awareness-raising, sharing of information amongst patient groups as well as defining a proper architecture for data protection** specifically for health and ensuring a health-driven purpose in all developments.
- 3 Involve **healthcare providers such as nurses, doctors, hospitals and other carriers** so to take a broader view of the needs of these groups in increasing *e-health* uptake. In particular how to underpin training in *e-health* solutions so that it adds value to health professionals and workers' careers.
- 4 Market issues such as interoperability, standardisation and ICT definitions are critical in reaching solutions for patient needs. HFE supports the efforts of the EU institutions to resolve these issues based on the needs of the patient. The EU institutions must explore every possible competence granted under the Lisbon Treaty to investigate the barriers to *e-health* posed by **inadequate reimbursement and funding systems in Member States and local health systems**. These should help identify best practices and highlight innovations in funding - such as systems which provide that health professionals are properly paid while working with *e-health* technologies and remote services.
- 5 Demand that all Member States have an *e-health* ROADMAP/strategy which looks at the *e-health* uptake, resource optimization, reimbursement opportunities and overall architecture for *e-health* delivery.
- 5 The EU should allocate funds for *e-health* proportional to current needs and continue to assess the need for greater *e-health* funding based on current and projected trends in areas such as the ageing population, growing proportion of chronic, elderly and immobile patients and the prevalence of denied access to *e-health* solutions.



Improved Healthcare Through Innovative Solutions

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