Future trends in Health Informatics European Union initiatives

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Abstract

The Health Informatics field is becoming more challenging as the globalisation of economy, the advancement of the technology as well as innovative breakthroughs are being incorporated in the discipline. In Europe as well as in other countries the funding into the research areas of this field is increasing. In this paper, a brief overview of the field as well the trends of Health Informatics are discussed with respect to the new dimensions that the education of the health care professionals has to tackle in the foreseeable future.

Keywords: Biomedical Informatics, eHealth.

Challenges of Health Sector

We know that Medical informatics deals with problems concerning the representation and processing of data, information and knowledge. Computers and technology are just tools, which we often, but not always need. However, one cannot deny that technological advances have often driven the research topics in medical informatics [2]. Sometimes, because the technology allowed procedures that were not possible before, sometimes the new technology was used, however, to reinvent the wheel.

Health sector is facing great challenges in managing the rising costs, growing demands from consumers (patients), demographic changes, aging population, and free market. What is the role of new technologies in healthcare (eHealth) in meeting these demands? We know that Information Technology is a great tool for information intensive sectors. Is the health care an information intensive sector? We know a large number of quite successful applications of Health Informatics. A small number is mentioned: hospital information systems (overall, modular), electronic patient records, dedicated systems, laboratory systems, ECG analysis, radiology, and departmental systems. In research successful areas such as: signal and image processing, decision support, Bayes, pattern recognition, natural language processing, terminology (UMLS), standardization (e.g. HL7, CEN, ISO), Social, organizational and legal aspects of the introduction of information systems. We should note that most of today's challenges were also challenges 30 years ago. Today we are more involved in the following research areas: electronic patient records, computerized guideline systems, reminder systems, knowledge management, logistics and simulation, knowledge discovery, new ways of developing information systems, (web services, future proof systems via the two model approach), and evaluation [2].

eHealth

eHealth applications [1] can provide benefits such as improvements in access, quality of care, and cost benefits if applied as an enabling tool for re-organisation accompanied by the necessary skills (training).

The main goal and vision of *eHealth* is the person-centered health systems. To achieve better quality of care, to increase access to the system, and hence increase efficiency we need *Continuity of care*. This should be done through all the stages of health care — prevention, diagnosis, care, rehabilitation; across all the points of care — hospitals, primary care, lab, pharmacy. To achieve this a new approach in health is required, the *Shared Care*, among health care professionals — doctors, nurses, paramedics, health managers & authorities, epidemiologists by sharing common data having various views of interoperable *Electronic Healthcare Records*.

Past efforts in eHealth

From the late 1980's and during the 1990's the European Union initiated a series of framework programmes that included ICT applications in healthcare. They were known as: Preparatory AIM phase (20 million euros), Main AIM programme (100 million euros), Telematics Applications programme (140 million euros), and IST in healthcare (200 million euros). The first
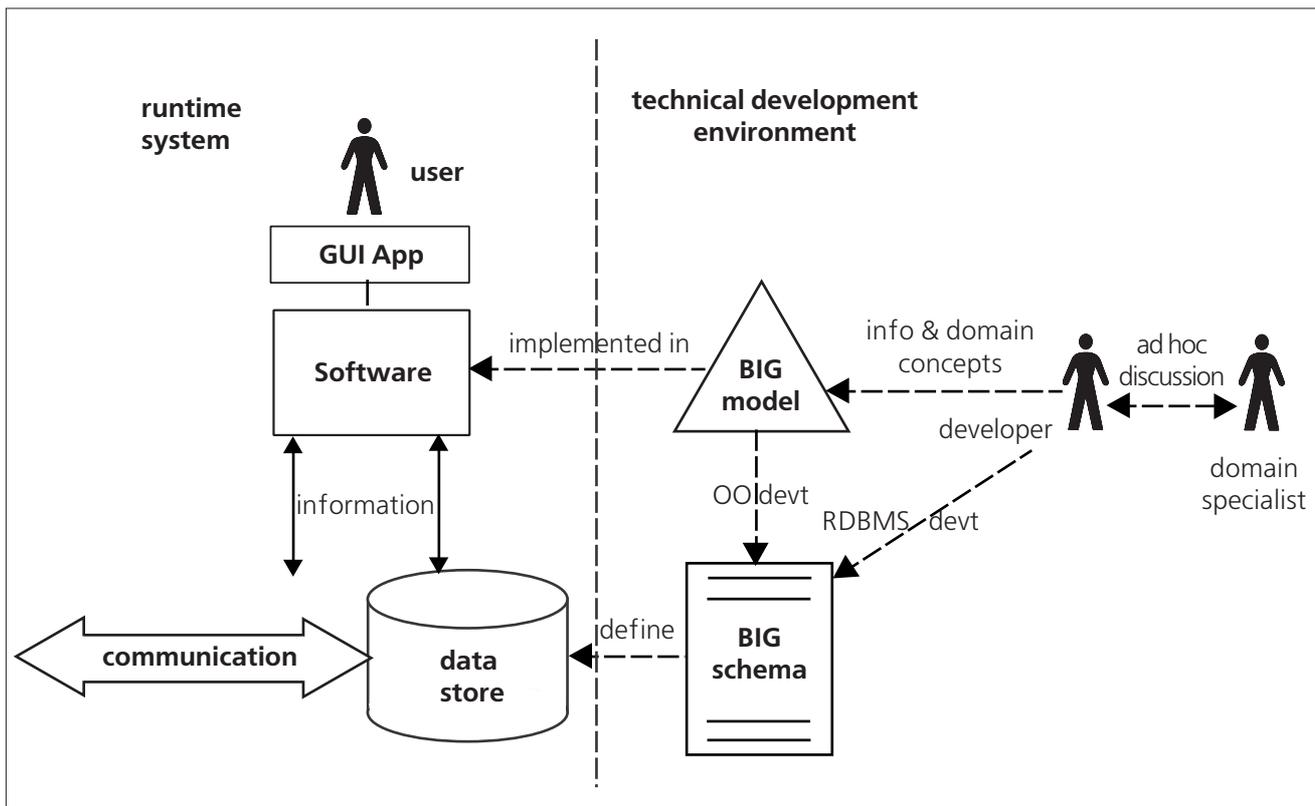
Перспективы развития Европейской
биомедицинской информатики

Fig. 1. The classic model of system development [2].
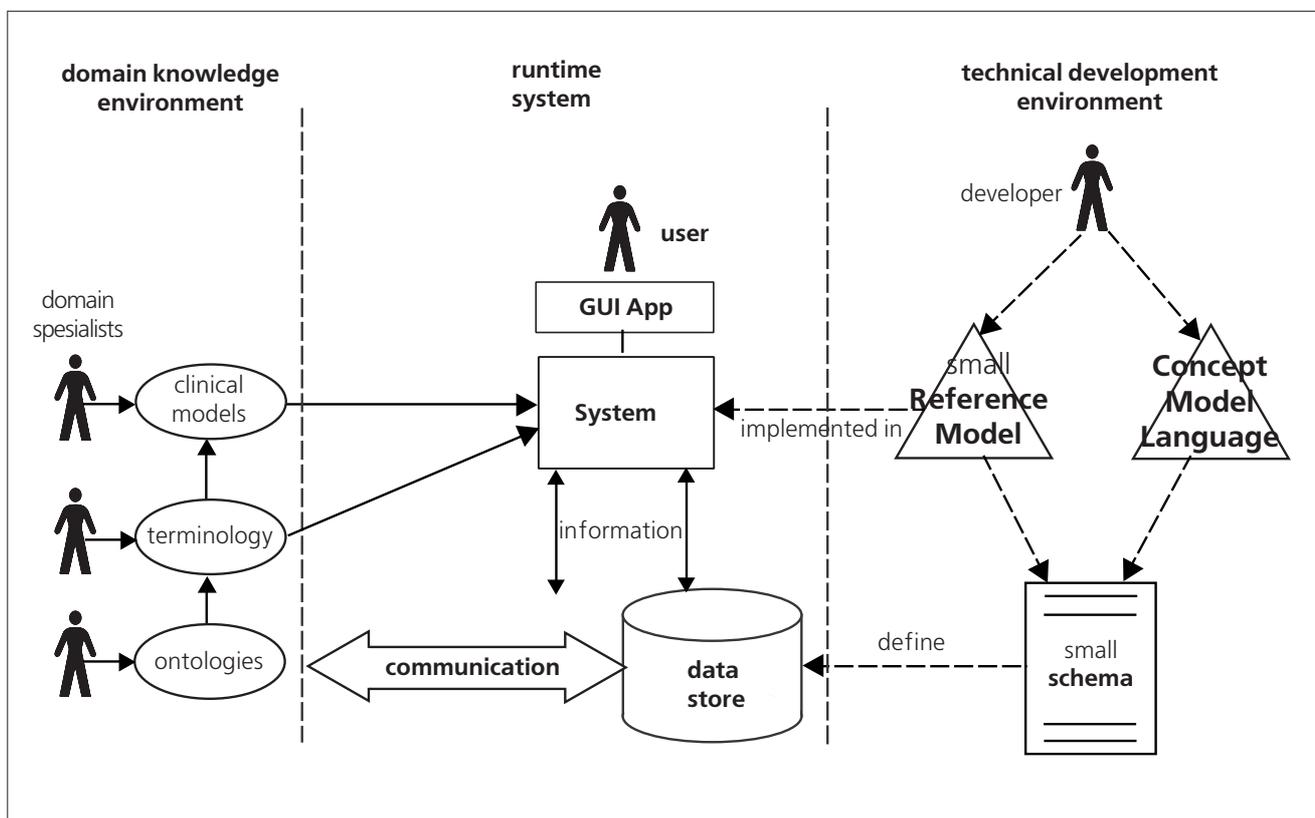

Fig. 2. The knowledge–enabled model of system development [2].

two phases were focused on Computer Applications for Doctors and in Telemedicine systems and services. The two recent phases are more on Regional Health Information Networks, Home-care systems, and Personal Health Systems. Also they developed real products that can be marketed, and in addition that gave the incentives to initiate a health telematics industry in Europe.

Now the first generation of proven and beneficial eHealth applications and services exist and a problem arises to properly implement on large scale.

Present and future of eHealth [1]

The European Union (EU) is supporting this effort through *eEurope 2005* initiative and of course through structural funds.

Technology will influence medical informatics in the future. *Nano-technology* makes it possible that smart sensors can be used on and in patients or healthy people. We are speaking of body area networks via which the various sensors are communicating with a central station on the body that then sends the information via telecommunication to stations, where the data can be further analysed.

Bio-informatics is a new field that gets a lot of attention nowadays. A cooperation between medical informatics and bioinformatics would be very fruitful.

New sensors make it also possible that the elderly can stay longer at home, even when they are ill. We speak of *domotics* in this case.

In the area of health information networks we are referring to the successful

MEDCOM currently handles over 80,000 messages daily. 100% of hospitals, pharmacies, emergency doctors, 90% of general practitioners, 98% of laboratories, 55% of specialists, and 20% of municipalities are connected to it. MedCom enables hospitals to use electronic referrals, and avoid data re-entry. The professional quality of referrals has risen, and discharge letters are stored directly. The monthly status and number of messages per month can be monitored at *www.medcom.dk*. First studies suggest that MEDCOM has delivered substantial savings. In terms of human resources, more than 25 thousand person-months are saved. Given the average monthly employee salary of 3,350, euros this translates into savings of 22.5 million euros.

NHS Direct Online, http://www.nhsdirect.nhs.uk/ established in 1999, provides health information online and access to a 24-hour nurse helpline via telephone. Six million people have accessed NHS Direct Online website in about two years. There were half a million visitors in January 2003. The website has been available since July 2000. It gives information on over 70,000 physical national health service (NHS) sites providing health services to the public. NHS Direct call centres direct people to these physical offices. NHS Direct has also put 200 touch screen kiosks in popular locations, equipped with printers and accessible to wheelchair users. Locations include NHS centres, chemists, libraries, and supermarkets. Around 300 people use each kiosk every month, which adds up to around 60,000 users a year.

At the same time EU is launching new 10 year cycle of research focusing on intelligent environment for HC professional and patients as well as new research area «Bio-

medical informatics» where the synergy of *medical informatics*, *bioinformatics* and *neuroinformatics* is sought for advancement of medical knowledge through synthesis of knowledge from the level of molecule (through the level of cell, tissues organ, person) to the level of population.

Use of the internet

eHealth should not be confused with health on the internet — although the internet provides a very significant element of support to both lay people and medical practitioners. Today eHealth is about much more than internet based health information, intent based medical journals and internet based support to patients. But the number of medical practitioners using an internet connection in their practices is a good indicator of the rise of eHealth. We can see from this Eurobarometer table (Table 1) than in general, the uptake of internet by medical practitioners is good.

The three successive polls show steady rise in the use of eHealth tools. While use of the internet by medical practitioners has reached saturation in many member states now the use of eHealth specific tools in growing steadily.

Although the use of telemedicine services, such as home monitoring as well as direct contact with patients via e-mail is still low this is also showing promising signs of growth.

It should be noted that much of what is holding back this growth is adjustments in the legal and administrative rules in member states for the provision of healthcare; if a GP cannot be reimbursed for providing home monitoring or for answering a patients questions electronically he or she will not use it.

Tab. 1. Use of GPs of the Internet and its applications to medicine.

Eurobarometer	*2000*	*2001*	*2002*
GPs with internet connection	44%	77%	78%
for continuing education	34%	70%	72%
to transfer patient medical data	9%	37%	46%
to offer telemedicine services	5%	7%	12%

Similarly, if prescription for drugs can only be issued on approved note pads then the role of electronic prescribing will be very slow to grow.

Towards European eHealth Area [1]

In the eHealth 2003 Ministerial Conference May 22–23, 2003 it has been demonstrated the benefits of real life eHealth solutions. eHealth systems for Patients/ Citizens included Telemedicine services, e.g. for homecare, Wearable systems for health status monitoring, and Systems providing Quality Health Information to Citizens. Regarding the Health Professionals eHealth tools for fast access to vital data anywhere, anytime; collaboration, risk management and research; Support to public health & management.

EC is working hard to stimulate wide deployment based on the success of R&D

and proven benefits and to provide environment for integration of relevant policies:

• Communication on eHealth;
• Priority topics interoperability and standardisation, electronic health records, regional health networks, on line services (e-prescription, e-referral, telemedicine), health cards;
• Series of ministerial conferences;
• Council conclusions on eHealth;
• Other DG involvement — devices, public health, safety, medical research.

To achieve wider implementation a number of challenges should be met, such as: Organizational-cultural, National / regional strategy, Industrial issues, Legal — confidentiality and security of data, Technology and standards, User acceptance, The European parliament has issued a number of directives and recommendations, such as: 95/46/EC on the processing of personal data and free movement of such data to be implemented 24/10/98; 96/9/EC on the Legal Protection of Data-

bases, 97/66/EC — concerning the Processing of personal Data and the protection of Privacy in the Telecommunication Sector; Council of Europe recommendation on the protection of medical data (NoR.(97)5) Adopted 13/2/97; New EC Committee on ethical issues — «infoethics».

Definition of Biomedical Informatics

From the original and mostly used term *Medical Informatics* we have gone to the more generic term *Health Informatics* that engulfs all disciplines in the field. How-
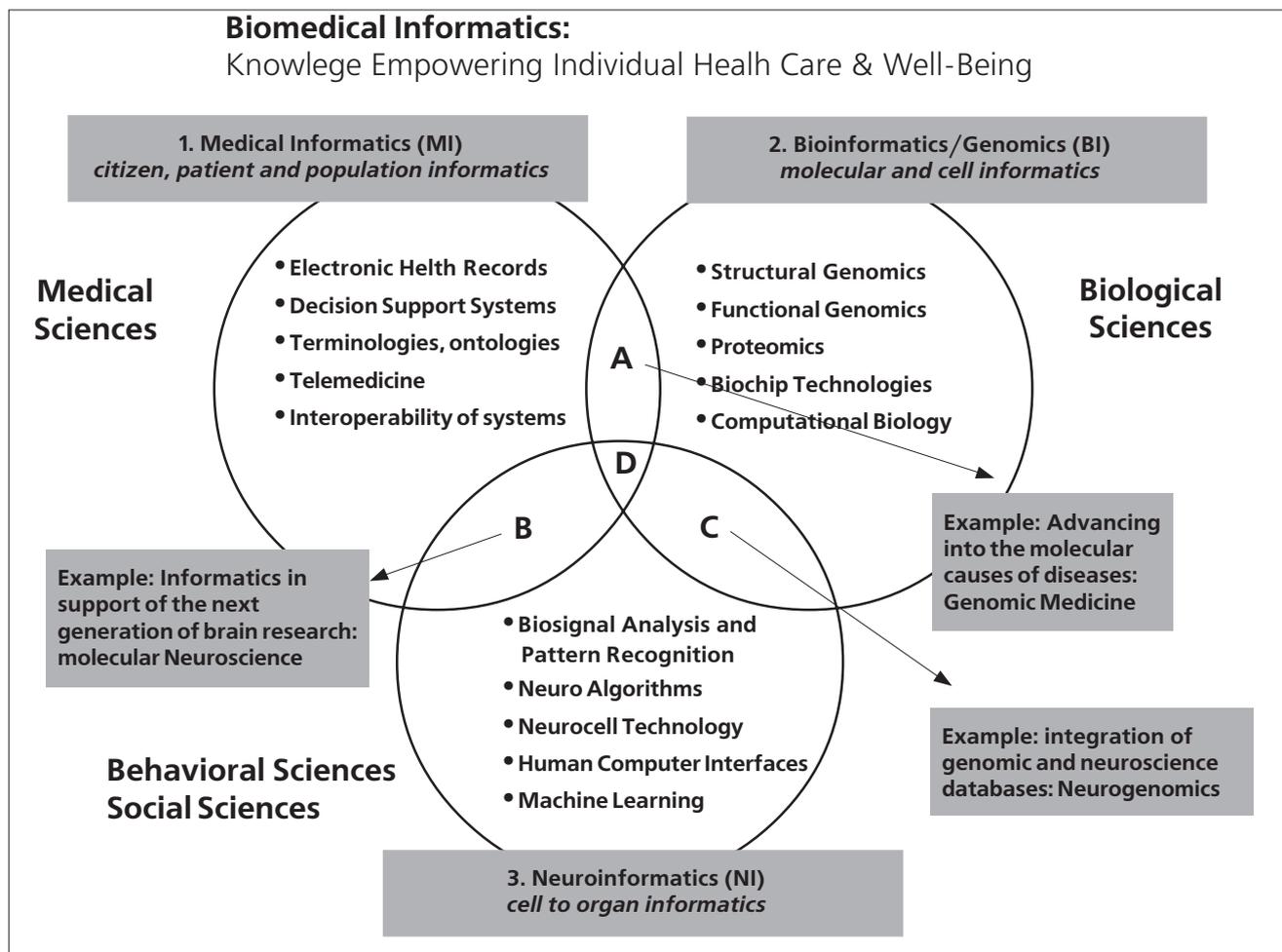

Fig. 3. Biomedical Informatics seen as common ground between Medical Informatics, Bioinformatics, and Neuroinformatics[1].
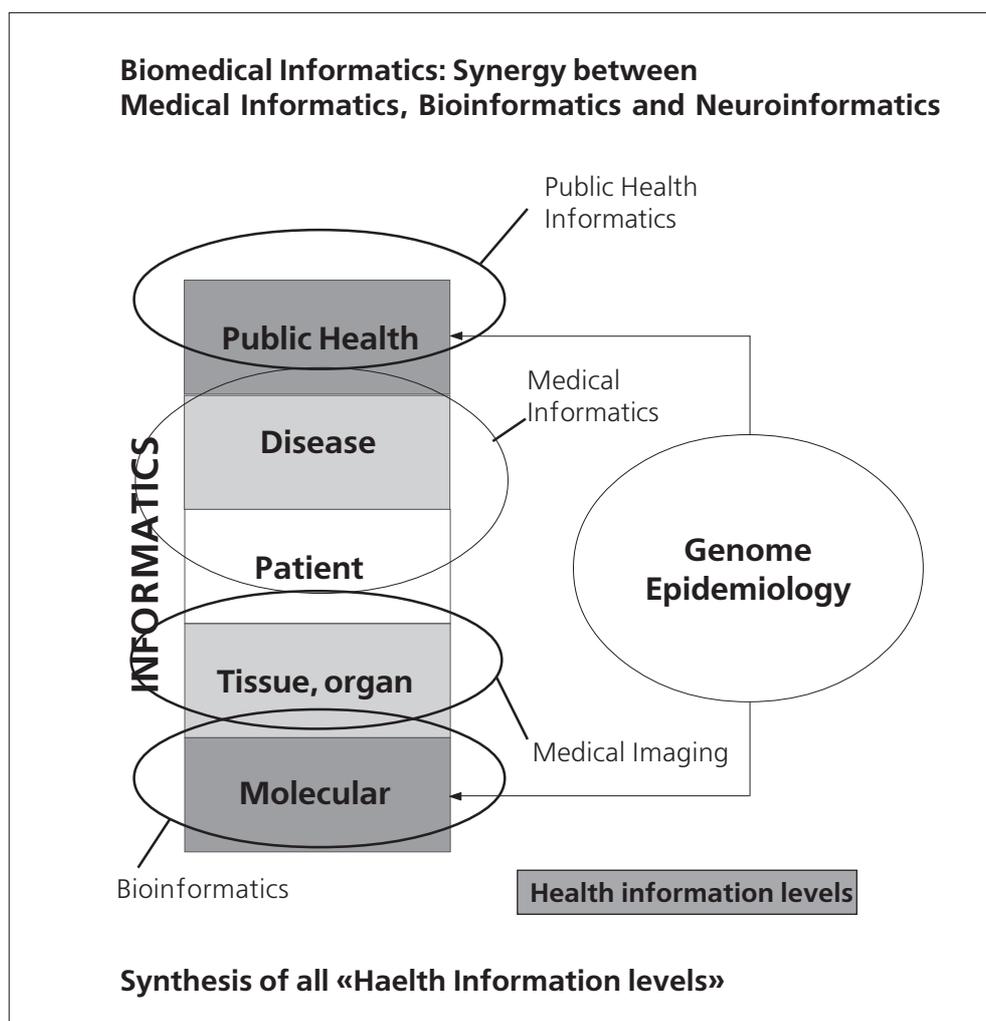
Biomedical Informatics: Synergy between Medical Informatics, Bioinformatics and Neuroinformatics

Public Health Informatics

INFORMATICS

Public Health

Disease

Patient

Medical Informatics

Genome Epidemiology

Tissue, organ

Molecular

Medical Imaging

Bioinformatics

Health information levels

Synthesis of all «Haelth Information levels»

Fig. 4. A Layered depiction of the synergy between the various fields constituting the field of Biomedical Informatics[1].

ever, the advent of *bio-informatics* has pushed again the terminology problem of our field into the front seat. The new term that seems to start dominating our field is Biomedical Informatics. The discussion can go on as the term Health Informatics is still more generic (e.g. it includes Nursing Informatics that Biomedical Informatics seems to forget it; and in addition to most of us Health includes Biology).

In the previous figure (Fig. 3) we see that Biomedical Informatics is defined as the discipline that covers the three domains of: (a). *Medical Informatics* or *Health Informatics* that studies the applications of electronic patient records, hospital information systems, decision support systems, terminologies, ontologies, telemedicine, and the interoperability of such systems. The field of study is the Medical Sciences or Health Sciences. In this domain the applications of informatics are focused on citizens, patients, and to community (population). (b) *Bioinformatics* that studies the applications of structural and functional genomics, proteomics, biochip technologies, and computational biology. The field of study is the Biological Sciences. Here the applications of informatics are applied to the level of the human cell, genome and molecule. (c) *Neuroinformatics* that studies the applications biosignal analysis and pattern recognition, neuro-algorithms, neurocell technologies, human computer interfaces and machine learning. The field of study is the Behavioural Sciences and the Social Sciences. The applications of informatics can range from cell to organ.

We can structure the above definitions in a multi-level layer tower (Fig. 4) starting from the lower at a molecule level going to the higher level at community level to depict the levels of informatics applications starting from bioinformatics through the classical medical/health informatics up to the public health informatics. There are also direct interconnections between the extreme levels such as molecular level and community level, which is the genome epidemiology.

Also there interconnections between the two fields of study medical informatics and neuroinformatics that can support the next generation of brain research, which is the Molecular Neuroscience. Another example is the assistance of bioinformatics and neuroinformatics that can lead to the integration of the genomic and neuroscience databases creating the field of neurogenomics. The most common example of the assistance of medical informatics and bioinformatics is the advancement into the molecular causes of the diseases giving ground to the new field of Genomic Medicine.

The implementation problems and the new challenges

In the previous section we have demonstrated the new field and the era that sooner rather than later will arise. However, during recent year in Europe but also in US and elsewhere we are trying to re-evaluate the shortcoming of our efforts to achieve the goals that had been set up. What we have learned can be summarised in the following [1].

1) *Ensure well thought-out strategy.* Most failures occurred due to lack of well planned strategy to tackle managerial problems such as change and crisis management. Usually technical issues had been thought from the beginning but not implementation and managerial issues in applications such as hospital information systems.

2) *Break the pattern of large scale all at once implementations.* Governments and politicians like very much to announce large scale projects. However, it is safer to progress in step-by-step strategy than in a large scale plan, where there no similarities always even in the same health care system or in a region. Small projects can be more successful and can be become successful stories as well that can be copied elsewhere.

3) *Ensure commitment of the «leaders».* Since the major eHealth applications are requiring first approval by heads of organisations, hospitals or regional headquartes it is evident to bring those decision makers into the scene from the beginning of the whole process.

4) *Keep it up... do not just set it up.* In the implementation phase we are requiring every effort to make the application successful and acceptable by the users. But this is not enough the whole effort should continue with the same effectiveness as before in the months and years after. A great number of implementations failed just after we were celebrating great success of their implementation.

5) *Ensure (legal and ethical)* compliance. The applications should be flexible (parametric) enough to be adapted to any change of the law or the organisational structure of the hospital/regional information system. The system should conform to all local and international accepted recommendations covering the critical issues of security and confidentiality of the citizen/patient.

6) *Do not underestimate user acceptance.* Most of the well-known cases of system failure occurred because the administration and the company developing and implementing the system underestimated the acceptance of the system by the users. The users in the health care domain are diverse with different backgrounds (physicians, nurses, paramedics, administrators, technicians, etc) and each group can provide different attitudes in favour or mostly against the implementation of the system. According to the experience we had so far the remedy is not simple. What we suggest is: to bring users from the beginning into the design of the system, make the system user friendly, give motivation to the users to take benefit of the usage of the system, and last but not least, especially in budgetary terms, train and educate the users as much as possible not only in the beginning of the implementation of the system but also later providing them continuing education of the advantages and updates of the system.

7) *None of the parties (administration, industry, users) can do it alone!* The traditional way of thinking was the following: the administration decides to buy a system, the industry develops it and finally the users have to work with it. That was one of most common reasons of failure. For a successful completion of reasonable big implementations all parties must work together from the beginning and throughout all the phases of the life cycle process of system development, implementation and maintenance. The team work is another important challenge of eHealth implementation.

Planning for the future in Europe — From Theory to Action

The field of Health Informatics usually lacks good demonstrations of best practices. Recently we know of successful stories that can play this role. In European Union during the 6th framework plan and the eHealth action plan it has been demonstrated the willingness to proceed along this path, that is providing real applications to the citizens across member states. In the following sections one can find the communication of the European Commission to the European Council to adopt the agenda for eHealth for the next years to come. Due to the importance of this document we have included some of the important conclusions [3].

Action plan

The actions outlined below should allow the European Union to achieve the full potential of eHealth systems and services within a European eHealth Area. There are three target areas:
• how to address common challenges and create the right framework to support eHealth,
• pilot actions to jump start the delivery of eHealth, and
• sharing best practices and measuring progress.

Issue 1: Addressing common challenges

Health authorities leadership

European Health Ministers have already shown eHealth leadership in their Ministerial Declaration at the 2003 eHealth Ministerial conference. The ministers welcomed Commission initiatives to explore the possibilities to promote co-ordination at a European level. They proposed to meet the targets and objectives laid down in the eEurope Action Plan and in the Programme of Community Action in the field of Public Health (2003–2008) set out in decision 1786/2002, and liaise with other Community initiatives. The conference also highlighted the importance of monitoring and benchmarking progress by developing an open method of co-ordination in this area. These words must now be transformed into action on the basis of regional and national eHealth strategies.

By end 2005, each Member State is to develop a national or regional roadmap for eHealth.

This should focus on deploying eHealth systems, setting targets for interoperability and the use of electronic health records, and address issues such as the reimbursement of eHealth services.

Interoperability of health information systems

Member States have expressed the need to support actions that cover the development of standards addressing the interoperability of diverse systems and services and to explore in particular the possibilities of open source applications

to achieve this objective. In this context, the need for future standards is clearly emphasised so as to solve interoperability concerns in a way which will benefit all stakeholders through the possible adoption of Open Source reference implementations for care services. In addition, an open and more free access to future and existing eHealth standards should be recommended, taking inspiration from models such as the World Wide Web Consortium. The exchange of experience in the use of open standards and open source solutions among health administrations in Member States should be promoted.

Patient identifiers

The need to identify a person unambiguously is an important component of the interoperability of health information systems. The eEurope2005 action plan already supports the development of standards for a common approach to patient identifiers and electronic health record architecture. The new European Health Insurance Card includes a patient's personal identification number as part of the data allowing people to use the card to get treatment outside their home Member State.

By end 2006, Member States, in collaboration with the European Commission, should identify a common approach to patient identifiers. This should take account of best practices and developments in areas such as the European Health Insurance Card and identity management for European citizens.

Interoperability of electronic health records

Achieving a seamless exchange of health information across Europe requires common structures and ontologies of the information transferred between health information systems.

By end 2006, Member States, in collaboration with the European Commission, should identify and outline interoperability standards for health data messages and electronic health records, taking into account best practices and relevant standardisation efforts.

Mobility of patients and health professionals

Within the European Union, patients and health professionals are becoming increasingly mobile. The Communication on patient mobility has made a number of proposals to manage the challenges resulting from this development. Recommendations include improving the exchange of information, and establishing specialised reference centres on health information.

The Communication on patient mobility is presented as part of an overall strategy on health care together with the present communication and that on the open method of coordination.

Work is already underway to improve information on patient mobility and mobility of health professionals at European level, and is being taken forward in particular through the health systems working party under the information strand of the public health programme.

Enhancing infrastructure and technologies

Building on eEurope's focus on accelerating the roll-out of broadband communications, full use should be made of broadband to support eHealth systems and services. Broadband networks carry large throughput and can also save critical time in accessing the network and give sub-second responses to information queries which can often be vital in the context of healthcare. They can bring considerable cost and performance benefits. Availability and affordability are also key to wide deployment. Service level convergence (operators offering services on top of fixed lines or mobile telephony) opens up new possibilities for eHealth applications. Public authorities can play a role in stimulating both supply and demand for broadband, while Community funding may help to support broadband delivery in underserved areas. Programmes such as eTen or the new IDABC programme may also play a role in supporting eHealth applications and health information networks. The Commission actions will enable the deployment of Europe-wide computer-supported networks, based on broadband infrastructures and Grid technologies.

During the period 2004–2008, Member States should support deployment of health information networks for eHealth based on fixed and wireless broadband and mobile infrastructures and Grid technologies.

Conformity testing and accreditation for an eHealth market

There is need for a set of agreed attributes and norms beyond existing standards that define good quality products and services. Many countries have proceeded with accreditation of eHealth systems that are becoming models for other regions, such as those in the United Kingdom and Belgium. Another example of conformance testing and accreditation is the interoperability guidelines of Integrating the Healthcare Enterprise in Europe (IHE).

By mid 2005, the Commission should produce a summary of European best practices as guidance for Member States.

By end 2007, a Member States should adopt conformity testing and accreditation schemes following successful best practices.

Leveraging investments

A shared approach among Member States to support and boost investment in eHealth is needed. Regional funding structures are already available (for example, INTEREG III regional funds) in the European Commission, as well as a number of other international collaboration activities. Additional funding that could leverage eHealth developments could be sought at the European Investment Bank. The Bank is currently investing in a very wide range of eligible projects — if they represent cost-effective health policy gain. The World Bank also provides possibilities for funding international eHealth programmes both for the European Union and worldwide.

By end 2006, a collaborative approach should be undertaken among Member States to supporting and boosting investment in eHealth.

Legal and regulatory issues

There needs to be a baseline set for a standardised European qualification for eHealth services in clinical and administrative settings. Furthermore, certainty of eHealth product and service liability within the context of existing product liability legislation would be beneficial.

Information and communication technology developments should contribute to a safer working environment for practitioners; and greater legal certainty with regard to eHealth services within the context of freedom of movement of people, goods and services is increasingly necessary.

By end 2009, the European Commission, in collaboration with Member States, should undertake activities to:

•	Set a baseline for a standardised European qualification for eHealth services in clinical and administrative settings.

•	Provide framework for greater legal certainty of eHealth products and services liability within the context of existing product liability legislation.

•	Improve information for patients, health insurance schemes and providers regarding the rules applying to the assumption of the costs of eHealth services.

•	Promote eHealth with a view to reducing occupational accidents and illnesses as well as supporting preventive actions in the face of the emergence of new workplace risks.

Issue 2:
Pilot actions: accelerating beneficial implementation

Information for citizens and authorities on health education and disease prevention

In the context of its Public Health Programme, the Commission is preparing the establishment of a European Union-wide public health portal that will provide a flexible information technology platform to disseminate evidence-based information on public health relevant to European citizens, and to provide a single point of access to information on health.

The Commission is also co-funding the development of a set of quality criteria for health related websites («webseals»). Its aim is to increase transparency among health-related websites in the interest of serious service providers and users, ranging from citizens to health professionals.

Strengthening of the Health Surveillance System for Communicable Diseases, with a focus on the real-time collection of clinical and laboratory data and analysis, will enhance the capacity of early warning at national level and Community levels. It will improve the surveillance of diseases of major concern and potential bioterrorism threats.

Preparing valid and reliable statistical information on provision of health care at European level as requested by Member States and Commission Services alike will profit substantially from the unique patient identifier, common standards, and protocols. Better information will then be made available to decision-makers and the interested public in a more timely way.

By end 2005, a European Union public health portal will give access to European level public health information. Health portals shall offer dedicated information on safety at work and workplace health risks.

By end 2005, there will be a strengthening of early warning, detection, and surveillance of health threats through enhanced information and communication technologies tools.

Towards integrated health information networks

Health information networks link hospitals, laboratories, pharmacies, primary care and social centres. Thus, they communicate in a secure manner. Examples include standardised messaging systems such as e-prescription and e-referrals or the provision of telemedicine services such as teleconsultation (the provision of sec-

ond medical opinion) or telecare (the home monitoring of patients).

By end 2008, the majority of all European health organisations and health regions (communities, counties, districts) should be able to provide online services such as teleconsultation (second medical opinion), e-prescription, e-referral, telemonitoring and telecare.

Promoting the use of cards in health care

There are two types of cards that may be used in the health care sector: health cards and health insurance cards. Health cards may carry emergency data (such as blood types, pathologies, treatments) or medical records, or may allow access to these data over a secure network. Health insurance cards allow access to health care and make management and billing easier.

In relation to the European health insurance card, decisions have been taken to kick off its deployment as from June 1st, 2004. It will replace all the current paper forms needed to benefit from medically-necessary care while on a temporary stay (for purposes of travel, posting abroad, study, and so on). On the health side, the eEurope 2005 Action Plan states that actions will be taken to build on the European health insurance card. Activities will be launched to support common approaches in Member States that are related to electronic health records, emergency data sets, and electronic patient identifiers.

Promoting the use of cards in the health care sector. Adoption of implementation of an electronic health insurance card

by 2008.

Issue 3:
Working together and monitoring practice

Disseminating best practices

Success in developing a European eHealth Area will draw on sharing best practices and experience across the Union, as systems are deployed and organisations redesigned. The Commission must play a central role in spreading this activity. The experiences could be either bi-lateral or multi-lateral between or among Member States, since Member States may be at very different stages of development and implementation. Attention should be paid to sharing experience in the use and impact of eHealth applications, and approaches to ensuring the interoperability of diverse systems and services, while respecting the multi-cultural and multi-lingual tradition of European health care sys-

tems. Open source applications may play an important role in achieving interoperability.

eHealth should be supported by the widespread dissemination of best practices. These should include the impact on access to healthcare and on its quality, assessments of cost benefits and productivity gains, as well as examples of addressing liability in telemedicine services, reimbursement schemes, and accreditation of eHealth products and services.

In 2004, a high level eHealth forum should be established, the role of which will be to support the Commission services. It should involve all necessary stakeholders, including at national, regional, or local hospital authority levels, thereby enhancing the understanding of the Commission services with regard to the current and planned status of development of eHealth in Member States. Its task should be to follow up the various roadmaps, and to identify further actions including a strong focus on users and access for all to eHealth, as well as to develop a strong evidence basis for the case for eHealth. The work of the eHealth forum will also be closely associated with the implementation of the Community Public Health Programme.

During the period 2004–2008, Member States with the support of the European Commission will organise special events such as high level conferences in order to disseminate best practices.

In parallel, **by the end of 2005,** the European Commission, with contributions from Member States, should establish an effective way of disseminating best practices and supporting actions within the European eHealth area.

Benchmarking

Progress also needs to be measured. Appropriate benchmarking on citizens' awareness of eHealth, and how citizens are using eHealth effectively and efficiently is essential for future eHealth measures.

This means assessing and quantifying the added value that eHealth is expected to deliver. It also means reviewing how eHealth solutions are contributing to key health challenges, including in employment, access and equity. These measures should be accompanied by proper monitoring of eHealth's impact on health and health care in the Community. All stakeholders should have a role in this process which should feed in to further improvements in eHealth systems and services.

During the period 2004–2010, every two years, the European Commission will publish a study on the state of the art in deployment, examples of best practices, and the associated benefits of eHealth.

By the start of 2005, Member States, in collaboration with the European Commission, should agree on an overall approach to benchmarking in order to assess the quantitative, including economic, and qualitative impacts of eHealth.

International collaboration

What we do in Europe on eHealth can have an important influence on meeting global health challenges within an information society. This can complement the work launched by the United Nations World Summit on the Information Society (WSIS) held in December 2003, as well as specific initiatives being developed by the World Health Organisation. An assessment of eHealth developments should be completed ahead of the second part of the World Summit to be held in Tunis in 2005.

Conclusions

eHealth offers important opportunities for improved access to better health systems. It can empower both patients and healthcare professionals. It offers governments and tax payers a means — through substantial productivity gains — to cope with increasing demand on healthcare services. It can also help to reshape the future of health care delivery, making it more citizen-centred.

The eHealth Area will provide a framework for exchanging best practices and experience. It will allow common approaches to shared problems to be developed over time. This action plan focuses on specific actions to bring this about, so that by the end of the decade:
• The European Union as well as other countries will be well placed to measure the impact of eHealth in terms of better access and better, more efficient, services as well as on the overall productivity of the healthcare sector.
• eHealth will have become or rather should have become commonplace for health professionals, patients and citizens; and eHealth will be and should be adequately resourced within healthcare budgets, and contribute to boosting wider objectives, such as competitiveness, jobs and cohesion.

The widening scope of Health and Biomedical Informatics is also a challenge for the e-learning community of this interdisciplinary and multidisciplinary field, which hat to adapt its scope, curricula and delivering methods for effective, quality assured and properly updated education and training having as a vision the forthcoming trends of our area well beyond the year 2010.

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