



UNIVERSITÀ
DI CAMERINO

The Camerino University PhD Program in "e-Health and Telemedicine"

1. Rationale

The words **e-Health** and **Telemedicine** are sometimes confused or broadly used interchangeably. e-Health broadly speaking, refers to the administration of health data electronically. Telemedicine normally refers to the practice of medicine, or provision of medical services from a distance, while, Some widely accepted definitions are given below and illustrated in Figure 1.

Over the last decade, the need to develop and organize new ways of providing efficient health-care services has been accompanied by major advances in information and communications technology (ICT). This has resulted in a relevant increase in the use of ICT applications in health care, collectively known as e-health.

"e-Health is the use, in the health sector, of digital data—transmitted, stored and retrieved electronically— in support of health care, both at the local site and at a distance." (WHO definition).

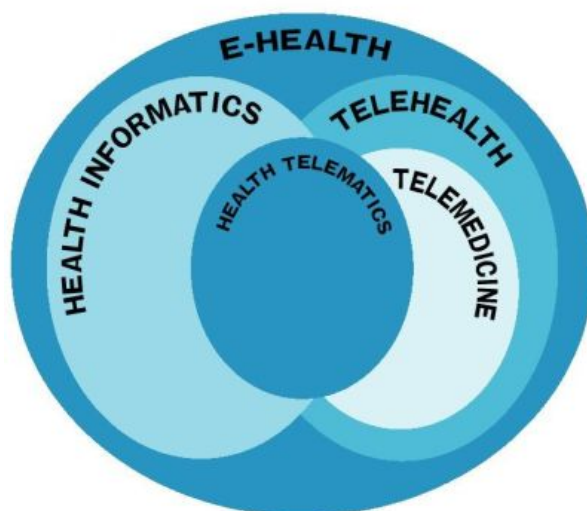


Figure 1: Branches in which e-health is articulated

- In general, e-Health refers to the use of modern information and communication technologies to meet needs of citizens, patients, healthcare professionals, healthcare providers, as well as policy makers. (Ministerial Declaration, e-Health, 22 May 2003)
- e-Health refers to the use of information and communications techniques including health-related activities, services and systems carried out over a

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distance for the purposes of global health promotion, disease control and healthcare, as well as education, management and research for health. (L. Androuchko, ITU-D, ITU Workshop on Standardisation on e-Health, 2003)

- e-Health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterises a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve healthcare locally, regionally, and worldwide by using information and communication technology. (Journal of Medical Internet Research, 2001)

Today the integration and assimilation of e-health into the everyday life of health-care workers is becoming a reality in developing as well as developed countries, as well as in providing high quality medical assistance in remote sites.

Everybody talks about e-health these days, but few people have come up with a clear definition of this comparatively new term. Barely in use before 1999, this term now seems to serve as a general "buzzword," used to characterize not only "Internet medicine", but also virtually everything related to computers and medicine. The term was apparently first used by industry leaders and marketing people rather than academics. They created and used this term in line with other "e-words" such as e-commerce, e-business, e-solutions, and so on, in an attempt to convey the promises, principles, excitement (and hype) around e-commerce (electronic commerce) to the health arena, and to give an account of the new possibilities the Internet is opening up to the area of health care. Intel, for example, referred to e-health as "a concerted effort undertaken by leaders in health care and hi-tech industries to fully harness the benefits available through convergence of the Internet and health care."

Because the Internet created new opportunities and challenges to the traditional health care information technology industry, the use of a new term to address these issues seemed appropriate.

These "new" challenges for the health care information technology industry were mainly:

1. the capability of consumers to interact with their systems online (B2C = "business to consumer");
2. improved possibilities for institution-to-institution transmissions of data (B2B = "business to business");
3. new possibilities for peer-to-peer communication of consumers (C2C = "consumer to consumer").

Telemedicine is the use of telecommunication technologies to provide healthcare services across geographic, temporal, social, and cultural barriers.

The delivery of healthcare services, where distance is a critical factor, by healthcare professionals using information and communications technologies for the exchange of valid information for diagnosis, treatment and prevention of diseases and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interest of advancing the health and their communities. (WHO, 1997).

In practice, telemedicine is the use of medical information exchanged from one site to another via electronic communications to improve patients' health status. Closely associated with telemedicine is the term "tele-Health," which is often used to encompass a broader definition of remote healthcare that does not always involve clinical services. Videoconferencing, transmission of still images, e-health including patient portals, remote monitoring of vital signs, continuing medical education and nursing call centers are all considered part of telemedicine and tele-Health.

Telemedicine is not a separate medical specialty. Products and services related to telemedicine are often part of a larger investment by health care institutions in either information technology or the delivery of clinical care. Even in the reimbursement fee

structure, there is usually no distinction made between services provided on site and those provided through telemedicine and often no separate coding required for billing of remote services.

Telemedicine encompasses different types of programs and services provided for the patient. Each component involves different providers and consumers.

To guarantee the best levels of e-health and telemedicine delivery is important an adequate background of health and other professionals involved in the field. Unfortunately, university education initiatives in these areas and more in general in the field of ICT applications to health problems are sparse. This situation is further complicated by the scarce attention of PhD programs to the competence and skills needed for fulfilling managing roles in e-health and telemedicine such as project coordinators, managers, administrators, science communicators, decision makers and, most important, trustable references for the political authorities, particularly of the least developed countries.

Based on these considerations the group of scientists and researchers working at Centro di Ricerche Cliniche, Telemedicina and Telepharmacy of Camerino University (UNICAM) decided to develop an articulated PhD Course in e-Health and Telemedicine for education leaders with a deep knowledge of applications in areas healthcare and hi-tech industries for making benefits thanks to the convergence of healthcare and ICT. This with particular reference to access, costs, quality and portability of ICT solutions to the health care scenario.

2. Why at UNICAM

Camerino is a small town, with about 7,500 inhabitants today, located 661 meters above sea level, on the dorsal that separates the valley of Chienti from that of Potenza, in the heart of Marche, a region in the centre of Italy. The University of Camerino is an old institution been a center of learning since no later than 1200 offering degrees in civil law, canonical law, medicine and literary studies. Gregorius XI with the papal edict of 29 January 1377 authorized Camerino to confer, after appropriate examination, bachelor and doctoral degrees with apostolic authority. On the 15th of July of the same year, Benedict XIII founded the Universitas Camerinensis Studii Generalis with faculties of theology, jurisprudence, medicine and mathematics. On April 13th 1753 the emperor Franz I Stephan of the of Habsburg Lorena extended the validity of the degrees from Camerino to the whole territory of the Holy Roman Empire. Today, approximately 10,000 students attend UNICAM courses. UNICAM has 7 Schools (Architecture and Design, Biosciences and Biotechnology, Jurisprudence/Law, Environmental Sciences, Medicinal and Health Products Sciences/Pharmacy, Science and Technology and Veterinary Medicine). There are numerous and innovative degrees being offered in the different Schools of UNICAM and distinguished faculty members of UNICAM have received prestigious national and international recognitions.

PhD courses were introduced in Italy approximately 25 years ago, and since the beginning UNICAM was active in doctoral training. PhD courses of UNICAM have been recently assembled within an International PhD School (the UNICAM School of Advanced Studies), with the objective of boosting doctoral training in the macro-areas of Science & Technology, Pharmacy & Medicinal Chemistry, Veterinary Medicine, Architecture & Design, Legal, Social & Political Sciences. Within each macro-area, and in some cases across them, *curricula* are identified with a dedicated staff of professors and junior fellows, who provide research training and mentoring, enriched with the expertise of international research groups and/or of leading industries operating in a given field. The aim of the School is to merge intellectual and technical expertise and to offer dynamic

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interdisciplinary training programs preparing candidates for future challenges, either in academic career, or in the broader work market, in business and professions.

The School recruits approximately 100 candidates/year, at least 20% of which are non-EU citizens (and this proportion is expected to increase in the coming years), and performs training activities in English (see booklet: "Undergraduate, Postgraduate and PhD courses, studying at UNICAM").

Since 2004 UNICAM begun postgraduate initiatives in education and training in e-health and telemedicine. These activities, included a Master in e-health, this year at his 5th edition and a Master in Oil and Gas Telemedicine and Telepharmacy (MIOGATE), this year at his 3rd edition. The Master in e-health is focused on education and training of in e-health and telemedicine of professionals working primarily for the Italian National Health Service for providing them qualification and skills for improving healthcare to remote patients through telemedicine and for improving potentialities of second and third level specialist advice in case it is required. MIOGATE is designed to provide a specific training in e-health, telemedicine, telepharmacy and their practical applications to health professionals working in oil and gas fields or offshore platforms. It is the first articulated postgraduate university course in the world in the field of oil and gas medicine.

Besides the above educational activities, UNICAM has established a Centre for Clinical Research, Telemedicine and Telepharmacy. This Centre, the first university telemedicine centre in Italy and among the first in Europe is collaborating with leading Italian institutions in the field of telemedicine for developing an university level culture in this rapidly developing area of interaction between health sciences and ICT. Among partners of our activity worthwhile of mentioning is Centro Internazionale Radio Medico (CIRM), the historical institution of Italian telemedicine established since 1935 and providing free medical assistance to ships and planes without a doctor on board. Besides a network of collaborations, UNICAM Centre of Telemedicine and Telepharmacy is starting its own activities for introducing high quality telepharmacy services primarily in mountain areas close to Camerino (Monti Sibillini National Park).

We estimate that, thanks to the wide spectrum of disciplines which are present and to the consolidated networking with other universities and research institutes in Italy and abroad, UNICAM is well in the position of proposing itself as a Centre for Doctoral Training of candidates from LDC on "*e-Health and Telemedicine*".

3. Learning outcomes of the PhD Program in e-Health and Telemedicine

The capabilities and capacities that the PhD candidates are expected to acquire during the 3 years cycle are listed below.

They will include for e-health centered program:

1. **Efficiency.** One of the promises of e-health is to increase efficiency in health care, thereby decreasing costs. One possible way of decreasing costs would be by avoiding duplicative or unnecessary diagnostic or therapeutic interventions, through enhanced communication possibilities between health care establishments, and through patient involvement.
2. **Enhancing quality of care.** Increasing efficiency involves not only reducing costs, but at the same time improving quality. E-health may enhance the quality of health care for example by allowing comparisons between different providers, involving consumers as additional power for quality assurance, and directing patient streams to the best quality providers.
3. **Evidence based.** e-Health interventions should be evidence-based in a sense that their effectiveness and efficiency should not be assumed but proven by rigorous scientific evaluation. Much work still has to be done in this area.

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4. **Empowerment of consumers and patients.** By making the knowledge bases of medicine and personal electronic records accessible to consumers over the Internet, e-health opens new avenues for patient-centered medicine, and enables evidence-based patient choice.
5. **Encouragement of a new relationship between the patient and health professional.** This could be achieved towards a true partnership, where decisions are made in a shared manner.
6. **Education of health professionals.** This will be achieved through online sources (continuing medical education) and consumers (health education, tailored preventive information for consumers).
7. **Enabling standardized information exchange.** In e-health, change of communication in a standardized way between health care establishments represent a relevant prerequisite should be pursued.
8. **Extending the scope of health care beyond its conventional boundaries.** This is meant in both a geographical sense as well as in a conceptual sense. e-health enables consumers to easily obtain health services online from global providers. These services can range from simple advice to more complex interventions or products such a pharmaceuticals.
9. **Ethics.** e-Health involves new forms of patient-physician interaction and poses new challenges and threats to ethical issues such as online professional practice, informed consent, privacy and equity issues.
10. **Equity.** One of the promises of e-health is to make health care more equitable. At the same time there is a considerable threat that e-health may deepen the gap between the "haves" and "have-nots". People, who do not have the money, skills, and access to computers and networks, cannot use computers effectively. As a result, these patient populations (which would actually benefit the most from health information) are those who are the least likely to benefit from advances in information technology, unless political measures ensure equitable access for all. The digital divide currently runs between rural vs. urban populations, rich vs. poor, young vs. old, male vs. female people, and between neglected/rare vs. common diseases.

In addition to these 10 essential e's, e-health should also be

- easy-to-use,
- entertaining (no-one will use something that is boring!) and
- exciting

and it should definitely exist!

These goals should be clearly focused and understood by PhD students during their 3 years course. This to make them to approach properly e-health problems and technologies in their everyday practice.

Learning outcomes will include for telemedicine centered program:

a. Telemedicine services

- **Specialist referral services.** They typically involve specialists assisting a general practitioner in rendering a diagnosis. This may involve a patient "seeing" a specialist over a live, remote consult or the transmission of diagnostic images and/or video along with patient data to a specialist for viewing later. Recent surveys have shown a rapid increase in the number of specialty and subspecialty areas that have successfully used telemedicine. Radiology continues to make the greatest use of telemedicine with thousands of images "read" by remote providers

each year. Other major specialty areas include: dermatology, ophthalmology, mental health, cardiology and pathology. According to reports and studies, almost 50 different medical subspecialties have successfully used telemedicine.

- **Patient consultations.** Consultations using telecommunications to provide medical data, which may include audio, still or live images, between a patient and a health professional for use in rendering a diagnosis and treatment plan. This might originate from a remote clinic to a physician's office using a direct transmission link or may include communicating over the Web.
- **Remote patient monitoring.** This may be achieved using appropriate devices to remotely collect and send data to a monitoring station for interpretation. Such "home tele-Health" applications might include a specific vital sign, such as blood glucose or heart ECG or a variety of indicators for homebound patients. Such services can be used to supplement the use of visiting nurses.
- **Medical education.** This provides continuing medical education credits for health professionals and special medical education seminars for targeted groups in remote locations.
- **Consumer medical and health information .** It includes the use of the Internet for consumers to obtain specialized health information and on-line discussion groups to provide peer-to-peer support.

b. Delivery mechanisms

- **Networked programs link tertiary care hospitals and clinics with outlying clinics and community health centers in rural or suburban areas.** The links may use dedicated high-speed lines or the Internet for telecommunication links between sites.
- **Point-to-point connections using private networks .** They are used by hospitals and clinics that deliver services directly or contract out specialty services to independent medical service providers at ambulatory care sites. Radiology, mental health and even intensive care services are being provided under contract using telemedicine to delivery the services.
- **Primary or specialty care to the home connections .** It involves connecting primary care providers, specialists and home health nurses with patients over single line phone-video systems for interactive clinical consultations.
- **Home to monitoring centre links .** These are used for cardiac, pulmonary or fetal monitoring, home care and related services that provide care to patients in the home. Often normal phone lines are used to communicate directly between the patient and the center although some systems use the Internet.
- **Web-based e-health patient service sites .** They provide direct consumer outreach and services over the Internet. Under telemedicine, these include those sites that provide direct patient care.

To achieve these outcomes, a personalized *curriculum* will be elaborated for each candidate, incorporating the main training objectives detailed below.

<i>Training objectives</i>	<i>Operational responsibility</i>	<i>Time dedicated</i>
To develop, perform and evaluate an original research project centered on e-health or telemedicine depending on the skills and possible future professional perspectives	Defined by the PhD candidate together with the supervisors	50 %

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to acquire basic knowledge and working methods in areas of selected areas of e-health and telemedicine	e.g. acquisition of skills in the above list main areas of e-health or telemedicine depending on the	20%
to acquire knowledge in ethics, legal, economics and business areas relevant to e-health and/or telemedicine delivery	costing of e-health and telemedicine activities/initiatives, macroeconomics for health, sustainable development, sociology of organization, health politics, project-cycle management, community-based health management, job training, etc.	10%
to acquire organizational capabilities for managing e-health/telemedicine projects and to interface with decision makers both at local, national or international levels		10%
to acquire general and transferable skills	e.g.: project management, communication skills, working in a team, fund raising	10%

Each PhD candidate will be followed by a Mentoring Committee composed of three supervisors, each responsible for one of the following activities:

- i) the PhD research project,
- ii) basic knowledge on e-health and telemedicine,
- iii) ethics, legal aspects and business applications for e-health and telemedicine.

The candidates will be assisted by a tutor, who will be responsible for the organisation of training at UNICAM and/or in other structures where PhD candidates will be attached, and for assisting them in organization and administrative problems.

At the beginning of the 3 year program, the Mentoring Committee will work out, together with the candidate, his/her PhD *curriculum* on the basis of "entry-knowledge", scientific interests, and ideas on a possible professional future. A panel of activities in transdisciplinary, general and transferable skills will be organized for all the candidates. A choice of a wide spectrum of related disciplines will be also offered.

Training will be accomplished by lectures by experts (either conventional frontal teaching and e-learning activities) , courses with practical experiences of e-health and/or telemedicine , case studies and problem solving by working groups. Seminars will be also given by senior PhD candidates under the guide of the supervisors, participation to workshops, meetings and conferences.

Different forms of mobility (geographical, intersectorial, inter- and trans-disciplinary) will be promoted, given that such experiences are most conducive to professional development. Training of at least 12 months in a structure of UNICAM or of associated organizations delivering e-health or telemedicine services will be required.

The state of progress of candidate training/learning will be verified yearly. Candidates will be requested to reassume the conducted research and training activities in the form of an annual report and to elaborate a work plan for the following year. The reports will be

reviewed by the respective Mentoring Committees and the work plans will be discussed and formally agreed on by the Committees and the candidates.

Candidates will be also asked to present the results of their research in front of the Faculty and the UNICAM scholar community. The yearly evaluation of the candidates will be based not only on the submitted reports, and scientific papers but also on the assessment of teamwork capacity, management of research, knowledge transfer, public awareness activities, multidimensional research activities.

At the end of the PhD program, the candidates will defend their thesis in front of an international expert panel.

4. PhD Program Faculty members

The PhD Faculty members are members of different schools of Camerino University for guaranteeing the largest interdisciplinary approach to the topics of e-health and telemedicine.

Proposers originate from the School of Medicinal and Health Products Sciences/Pharmacy (Prof. Francesco Amenta and Fabio Petrelli), from the School of Biosciences and Biotechnology (Prof. Daniela Accili and Maria Gabriella Gabrielli) and from the School of Science and Technology (Prof. Rosario Culmone).

Prof. Francesco Amenta has a practical experience in e-health and telemedicine, with a background of providing medical assistance to remote patients (on board ships and planes). Besides his position of full professor at Camerino University, he is also Scientific Director of Centro Internazionale Radio Medico (CIRM), the historical institution of Italian telemedicine.

Prof. Fabio Petrelli has experience in legal and regulatory problems related to delivery of health services and therefore of e-health and telemedicine.

Prof. Daniela Accili has experience in microanatomical techniques (applicable to tele-didactics and tele-pathology) and in nutritional biology. These latter specific skills can be applied to the delivery of e-nutritional services in pharmacies or in other basic health structures.

Prof. Maria Gabriella Gabrielli has experience in microanatomical techniques (applicable to tele-didactics and tele-pathology) and in nutritional biology. These latter specific skills can be applied to the delivery of e-nutritional services in pharmacies or in other basic health structures.

Prof. Rosario Culmone has experience in web services, mobile agents and domotic. These competence can be applied to the e-health and telemedicine.

5. Collaborating structures

Leading public and private organizations with specific experience in e-health and telemedicine will collaborate with UNICAM PhD Program in e-health and telemedicine. These organization will offer to the course their highly experienced staff (lectures, seminars, case studies) as well as the possibility of stages for PhD candidates.

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Fondazione Centro Internazionale Radio Medico (CIRM; International Radio Medical Centre) Roma

CIRM is one of the oldest existing organizations providing telemedical assistance in the world. CIRM is headquartered in Rome, where specially trained physicians and radio operators are on continuous duty and provide free medical assistance to ships and airplanes without a doctor on board. In addition highly qualified specialists in all medical branches can be consulted. The duty-doctor, by means of consecutive calls, maintains regular contact with the ship requiring radio-medical assistance until their arrival in a port with adequate medical facilities or until the complete recovery or evacuation of the patient.

SAIPEM

Saipem is a large, international and one of the best balanced turnkey contractors in the oil and gas industry. Saipem has a strong bias towards oil and gas related activities in remote areas and deepwater and is a leader in the provision of engineering, procurement, project management and construction services with distinctive capabilities in the design and the execution of large-scale offshore and onshore projects, and technological competencies such as gas monetization and heavy oil exploitation.

Saipem is a global contractor, with strong local presence in strategic and emerging areas such as West Africa, North Africa, FSU, Central Asia, Middle East, and South East Asia. Saipem is a truly international company. Along with its strong European content, the major part of its human resource base comes from developing Countries. Saipem employs over 35,000 people comprising more than 100 nationalities. Saipem has a distinctive Health & Safety Environment Management System, with several medical structures located in oil and gas fields and off-shore platforms. Telemedicine is currently used in health activities managed by Saipem group to guarantee the highest quality medical care to their employees in remote areas.

Me.Te.Da.

Me.Te.Da. is a private firm headquartered in San Benedetto del Tronto, a city where some structures of UNICAM are located. They originate from a twenty-year experience of a group of people that have always worked in the field of software and hardware systems design for physicians. The aim of Me.Te.Da. is to offer and promote technologically advanced solutions. The core of Me.Te.Da. activity is the production of managerial medical software, with particular attention to clinical data elaboration and development of innovative technologies of telemedicine and teleconsultation. In this area, Me.Te.Da. today recognizes and overcomes several common current issues of data management, confidentiality and design. Hardware development is an integrated part of completion and efficacy of our medical software. Me.Te.Da. supplies an on-line constant and advanced assistance service to all users. Identification and translation of clinical needs into informatics instruments are their target.

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