



# EU\*US eHealth Work Project H2020-SC1-HCO13-2016

*Mapping Skills and Competencies; Providing Access to Knowledge, Tools and Platforms; and Strengthening, Disseminating and Exploiting Success Outcomes for a Skilled Transatlantic eHealth Workforce*

## **Case Study: An Overview of How Portugal Adopted Nursing Informatics to Improve the Healthcare System**

Escola Superior de Enfermagem do Porto, Portugal

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## TITLE An Overview of How Portugal Adopted Nursing Informatics to Improve the Healthcare System

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### ORGANIZATION

Over the past two decades, the integration of nursing informatics (NI) in Portugal has resulted in a small, but significant, revolution in healthcare that has accelerated the adoption of electronic health records (EHRs). To have useful and efficient electronic health systems, it is necessary to include the evidence-base to support practice. In order to do this, informatics-educated health professionals are necessary to transform and improve healthcare through the visionary application of information and communication technology (ICT). At a 2012 Conference in Norway, Nick Hardicker, RN, PhD, Professor of Nursing and Health Informatics, Associate Head, Research & Innovation, University of Salford School of Nursing, Midwifery & Social Sciences in Wales, stated, *“We may considerer that ‘great systems need great nurses.’”* To be great nurses, an understanding of health ICT is now a requirement.

The introduction of nursing documentation in electronic format brought with it the need to use taxonomies and nursing ontologies. Its use allowed healthcare professionals to evolve from systems-based on paper support (free-text) to electronic systems-based on structured languages. Twenty years ago, we understood that the introduction of nursing documentation in electronic form was an opportunity to make nursing care more meaningful for citizens by reflecting on professional practices, determined by the need to incorporate structured language in information systems [1].

We would like to highlight that one of the key areas for successful implementation of the new health informatics system was the significant development of nurses equipped with basic computer and informatics competencies.

### BACKGROUND

In the 1980's, Portugal took its first steps towards integrating informatics training for all health professionals. During this period, training spaces were only directed at the use of word processing software and, at times, to the use of health data management software.

In 1987, a “Group for Nursing Informatics” (GUIE - Grupo para a Utilização da Informática em Enfermagem, in Portuguese) emerged and was associated with the European projects that took place between 1990 and 2000: Telenursing (1990-1994); Telenurse (1994-1998); and TelenurseID (1998-2000). These projects were concerned with promoting the development of telematics applications and were designed to register and organize data describing the quality of clinical practice in nursing as seen from various viewpoints of the profession. The idea of an International Classification for Nursing Practice (ICNP®) as a common

classification to use in nursing modules for electronic patient records, in hospitals wards, or in primary care to describe nursing diagnoses, interventions and outcomes, emerged from these projects [2].

We can say that the main trigger in Portugal for the development of NI took place in 1995. Abel Paiva e Silva, PhD, Nursing Sciences, Abel Salazar Institute of Biomedical Sciences, developed a study centred on the analyses of nursing documentation (then still on paper) and spoke to the opportunity for starting electronic patient records (EPR) [3]. The first step for the initial project to change Nursing Information Systems (NIS) in use was the translation of ICNP® to the national language (1996). Between 1997 and 2001, Paiva e Silva developed an action-oriented research study to build a nursing data model by adapting the NIS currently in use of hospital context. The core concepts that describe nurses' practice – diagnosis, outcomes and interventions – was specified. At the same time, it integrated a nursing terminology into the NIS – ICNP® [4]. A group of academic staffs from the Nursing Porto College (ESEP) replicated the same project in benefit of nursing focused primary care [5].

NIS was assumed as an area of particular relevance to research in ESEP. A group of teachers from the Nursing College took this subject on for almost two decades as a subject of study, research and development in their research unit for NIS (USINE - Unidade de Investigação: Sistemas de Informação em Enfermagem). The International Council of Nurses (ICN) accredited this research centre ten years later (2010) as a "Centre for Information Systems and ICNP® Research and Development".

The first years of this century marked the beginning of nursing electronic records research, which allowed for the development of a new data model for nursing information documentation. Debates on terminology and standards for EHRs became essential. This work also allowed the creation of the initial nursing data model that supported the development of the Nursing Practice Support System (SAPE® - Sistema de Apoio à Prática de Enfermagem). With the results of these projects, the Informatics Department of Health Ministry developed the first software for the national health software solution.

This continued work allowed Portugal to stand out internationally as a pioneer country in the use of information technologies by nurses. This development spread all over the country, reflecting nursing practices based on the central concepts that draw from the full spectrum of the nursing discipline.

### **STATUS/CURRENT DEVELOPMENTS**

Regarding the use of new technologies, the key success of its implementation was the significant development of nurses equipped with basic computer and informatics competencies. The acquisition of digital skills has become an extremely important part of the implementation process. This momentum had a positive impact on nurses' confidence to use information and technology devices effectively and efficiently. In Europe, the Digital Agenda (Technology for Change) proposed different activities aiming at increasing digital qualifications in the field of health [6, 7].

The Portugal INCoDe.2030 Initiative addresses the concept of digital competencies in a broad manner. It includes the notion of digital literacy (e.g., the ability to access digital media and ICTs, understand and critically assess contents and communicate effectively), as well as the production of new knowledge through research, which involves processing information and communicating, interacting with and producing digital content [8].

Formal programmes and certifications in health informatics (HI) such as masters' programmes in Health Information, Medical Informatics and NIS were developed. However, some of these programs have a general focus and do not have a focus on the nursing professional specialization. In graduate programmes, nursing schools prepare their students by developing key competencies in NI and basic skills for use of ICT in health. To aid this, we brought together nursing stakeholders to develop a shared vision, strategies and specific actions for improving nursing practice, education and the delivery of patient care using health information technology (IT).

### **ACTIVITIES/MEASURES**

In today's workforce, it is essential that all nurses have competencies for the use of healthcare ICT. In fact, all Portuguese students on admission to the nursing programme already have a set of basic computer competencies that were developed during high school which overlap with the "TIGER (Technology Informatics Guiding Education Reform) Informatics Competencies Recommendations - Basic Computer Competencies" report [9]. Therefore, during graduate nursing studies, students are well prepared to develop key competencies in Information Literacy Competencies and Information Management Competencies.

In addition, with the informatics aspects integrated in nursing graduate programs, as well as continuing education programs at various health institutions, the investment in post-graduate education is a reality in Portugal.

From the analysis of the different documents, we have identified a set of nursing informatics core competencies related to Portugal's needs. This document reports the competencies necessary for nurses in Portugal to use EHRs. We share the opinion of Canada's Health Informatics Association about the Health Informatics Professional (HIP®) Core Competencies. We supported our decisions using the "HIP® Competency Framework." This framework *"sets out a common core or shared set of skills, knowledge, attitudes, and capabilities necessary for each of us to effectively perform, regardless of the route by which each of us originally entered the field of Health Informatics, or our current of area of practice within the diverse field of Health Informatics"* [10].

### **INFORMATION LITERACY COMPETENCIES**

- Determine the nature and extent of the information needed
- Access necessary information effectively and efficiently
- Evaluate information and its sources critically and incorporate selected information into his or her knowledge base and value system
- Individually, or as a member of a group, use information effectively to accomplish a specific purpose
- Evaluate outcomes of the use of information

### **INFORMATION MANAGEMENT COMPETENCIES**

We argue that there are two levels of information management competencies: one geared towards the nursing undergraduate level, and the second at the postgraduate level.

#### **FOR NURSING UNDERGRADUATE LEVEL:**

- Understand the implications of ethical, legislative and regulatory requirements related to the management of health information
- Understand the key attributes of data and information (e.g., quality, integrity, accuracy, timeliness, appropriateness) and their limitations within the context of intended use (e.g., clinical and analytical uses)
- Understand the data interrelationships and dependencies among the various health information systems (e.g., decision support systems, electronic health records, order entry, registries, etc.)
- Apply accepted policies, principles and guidelines for the management of health information practices e.g. from Portuguese Nursing Association (OE- Ordem dos Enfermeiros)
- Understand and apply relevant health information standards and their appropriate use (e.g., classifications, vocabularies, nomenclature, etc.)
- Integrate data quality principles into the identification, use and management of information (referential data integrity)
- Apply knowledge of basic clinical concepts in health information
- Apply knowledge of nursing care processes in health information
- Recognize commonly used formats, structures and methods for recording and communicating clinical data
- Demonstrate knowledge of health and health systems in Portugal and appropriately apply information to work products and services
- Demonstrate knowledge of how people, resources and information flow through the health system
- Promote the safe and appropriate use of health information technologies to ensure patient safety

FOR NURSING POSTGRADUATE LEVEL (Masters Programmes in Health Information, Medical Informatics and NIS):

- Engage relevant stakeholders at the appropriate stages of the system lifecycle
- Address information and technical requirements to meet the full range of stakeholders' information needs
- Contribute to the selection and utilization of appropriate information technologies to meet business requirements
- Apply appropriate health informatics standards and enterprise models to enable system interoperability (e.g., terminology, data structure, system-to-system communication, privacy, security, safety)
- Apply knowledge of health data, information and workflow models to IT solutions
- Apply IT best practices (e.g., quality management systems, testing, service level agreements, business continuity and incident management) throughout the system life cycle
- Apply best practices and solutions required to manage the security of data, systems, devices and networks
- Demonstrate an understanding of architectural relationships between key health IT components and best practices in enterprise architecture frameworks/perspectives

- Recognize commonly used formats, structures and methods for recording and communicating clinical data and how these are incorporated into system and application use
- Foster the adoption and use of health information systems (HIS) in clinical settings
- Facilitate appropriate consumer use of health ICTs
- Assess and mitigate clinical safety risks associated with health information and systems throughout the system lifecycle
- Facilitate the use of electronic decision support tools in accessing evidence to support practice
- Apply knowledge of the roles and relationships of health professionals along with the organizational and regulatory structure in which they work
- Address the challenges related to the adoption and realization of clinical value of information systems in the health sector
- Understand the need to balance the privacy of personal health information with improved care delivery and health system management
- Contribute to organizational plans and strategies to ensure that information and systems enable business goals and strategy
- Promote an information culture by facilitating appropriate uses of information and knowledge
- Facilitate self, individual, team and organizational learning and development using appropriate technologies, communication channels and organizational skills
- Contribute to ongoing evaluation of the functionality of systems so that they can evolve to support best practice in clinical care
- Perform documentation/records audit
- Apply project management principles and best practices (e.g., project charter, scope, life cycle, budgets, resourcing, timelines, milestones and monitoring and status reports)
- Work collaboratively and contribute to project planning, implementation, monitoring and evaluation
- Anticipate issues, opportunities and mitigate risks associated with projects
- Identify and frame information queries in collaboration with stakeholders in order to meet their needs for analysis and interpretation of data
- Identify relevant sources of data and information in order to assess the quality of information and draw appropriate conclusions
- Demonstrate an understanding of appropriate analytical and evaluation techniques and concepts (e.g., qualitative and quantitative methods, basic statistical and epidemiological techniques, indicators and evaluation measures)
- Contribute to quality analysis by organizing and transforming data into reliable and meaningful information for diverse audiences
- Present data and information in a way that is effective for users
- Demonstrate knowledge of indicators and metrics for healthcare delivery and systems management
- Recognize commonly used formats, structures and methods for recording and communicating clinical data and how these are incorporated into system and application use

## CHANGES

The gradual replacement of nursing records on paper by computerized information systems has led to a significant transformation of health care, with an outcome of a progressive increase in awareness of the relevance of information as the essential resource for nursing care quality.

## RESULTS

HI is currently receiving more attention in Portugal. Promoting the improvement of EHRs and data sharing at the national and/or international level are vital as they are now considered the key instruments for improving healthcare and as relevant tools for the effectiveness and efficiency of a modern healthcare system. In this sense, education and skills development in the field of NI are essential. In addition, with the informatics aspects integrated both in nursing graduation and continuing education in existing in health institutions, the investment of Portuguese nurses in postgraduate education is a reality and benefit in Portugal.

## OUTLOOK/LESSONS LEARNT

The implementation of an information system involves the organization's mutual transformation through the technology and the system. As it is a socio-technological change process, the implementation should not be performed only as a technical project. It must be managed as an organizational development process, designed as a strategic asset to transform organizational structures and processes and to promote the organization's objectives. In addition to including the technical team in the implementation of the system, it should include the group of future users and the executives of the health organization.

Our experience has showed us that it is important to include users in the early stages of the development and implementation of electronic health systems. This appropriate design of ICT can lead to more productivity, reduce errors, better-fit workflow, improve accuracy, be learned easily and lead to more satisfied healthcare providers.

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### Checklist

Checklist of eHealth topics (competencies)	Apply? Yes/No	Describe how topic applies to your organization/case study
<p><i>Role of “Peopleware”:</i> human factors, awareness, satisfaction and acceptance of health IT, usability measurements, evaluation of health IT, communication, leadership, change management, ethics and IT and similar topics</p>	<p>yes</p>	<p>Peopleware can refer to anything that has to do with the role of people in the development or use of computer systems. As we said before, the implementation of an information system involves the organization's mutual transformation through the technology and the system. As it is a socio-technological change process, the implementation should not be performed only as a technical project.</p> <p>According to this model, technological change is seen as a social process involving producers and users who are profoundly affected by cultural setting, political institutions and marketing strategies. Therefore, in attention aspects centred on professional involvement in all activities, we use the Technology Acceptance Model (TAM) as a reference. It is a good way to predict the use and acceptance of information systems and technology by individual users.</p> <p>Nurses use computer systems to document care in all clinical services. There are audits to evaluate the quality for both the data and system in use. As a consequence of evaluating, reflection processes emerge with proposals of continuous quality improvement.</p>
<p><i>Role of inter-professional approaches:</i> inter-professional versus mono-professional training and learning activities. What subjects lend themselves to inter-professional vs. mono-</p>	<p>yes</p>	<p>The training activities on the use of information systems are performed by a mono-professional approach. In this way, we develop some activities centred on:</p>



<p>professional classes, learning environments and similar topics</p>		<p>Nursing terminologies (e.g. North American Nursing Diagnosis Association (NANDA)/Nursing Interventions Classification (NIC)/Nursing Outcomes Classification (NOC) and ICNP; implications of ethical, legislative and regulatory requirements related to the management of health information; key attributes of data and information (e.g., quality, integrity, accuracy timeliness, appropriateness) and their limitations within the context of intended use (e.g., clinical and analytical uses).</p> <p>However, based on the data shared among different health professionals, we use strategies of debate about "that data produced by a particular professional group are relevant for the consumption of others". For instance, data inter-relationships and dependencies among the various health information systems.</p>
<p><i>Role of healthcare data sciences: data and information acquisition including documentation, data quality, data, information and knowledge management, data analysis and statistics, clinical decision making instruments, reporting and similar topics</i></p>	<p>yes</p>	<p>In this area, we develop skills to collect, validate and communicate all types of clinical, linear and complex data produced in the scope of scientific and / or clinical activity. The data analysis focuses on research on methods of data collection, validation, communication, analysis and synthesis, as well as methods to support decision-making in health, based on ethical and management criteria.</p>
<p><i>Fusion of medical technology &amp; informatics: software as a device, smart devices, automatic data acquisition via devices, risk and safety management</i></p>	<p>yes</p>	<p>Some activities include research on instruments, sensors or digital devices for monitoring and self-management of chronic diseases, with a view to empowering citizens, increasing the cost-effectiveness of interventions and improving health outcomes.</p>
<p><i>Role of process and workflow management: clinical and administrative processes, information continuity and information logistics, management of processes, workflow management systems and similar topics</i></p>	<p>yes</p>	<p>We are promoting the improvement of patients' electronic records, to contribute to the optimization of the flow of health information, to process and performance management and to data security and integrity.</p> <p>Strategies were developed for information sharing between different services within the same institution and between different health care contexts, namely sharing information between primary and differentiated health care in some institutions.</p>
<p><i>Role of ethics, legal and data protection issues: ethics and IT, legal requirements, data protection and information self-determination, data safety and similar topics</i></p>	<p>yes</p>	<p>We are a National Ethics Council for Life Sciences, within the scope of its ethical issues related to "Health Information", the records of this information in electronic format and the respective accesses and uses. There are also guidelines from the National</p>

		Commission for Data Protection, whose duties are to control and supervise the processing of personal data, in strict respect for human rights, freedoms and guarantees enshrined in the Constitution and the law.
<i>Role of learning and teaching:</i> learning techniques (“learn how to learn”), learning and teaching styles (online, blended, face-to-face), learning management, information management for learning and teaching and similar topics	yes	Some activities include education and research on to the integration of new training methods. Health professionals (especially nurses) use simulation-based technologies.
<i>Role of management related topics in health informatics and IT:</i> principles of management, strategic management, stakeholder and change management, leadership, financial management, risk management, quality and safety management, resource planning and management and similar topics	yes	We debated about aspects that affect information management due to the exponential increase in the amount of data to be managed, the number of professionals who control the processes and the demands for real time access. Therefore, we defined the strategic position of health organizations regards the treatment of informational resources, as well as the choice of an IT tool capable of bringing organizations the expected benefits.
<i>Role of interoperability:</i> systems integration, IT standards, terminologies and classifications	yes	This is an area of current debate in all training processes, with particular emphasis on issues centred on semantic interoperability. We apply appropriate HI standards and enterprise models to enable system interoperability.
<i>Role of technology:</i> information and communication systems, telemedicine, telematics, assistive technologies, life-cycle-management including systems development/engineering, mHealth, applied computer science and similar topics	yes	It is already possible to experience different portals of remote connectivity when meetings and committees are accompanied by all participating in real time, even if they cannot be present in the physical space where the event is being held.
<i>Role of consumers and populations:</i> consumer health informatics, public health informatics	yes	Our debate centres on the information needed to give to consumers and their families, clinicians and developers with a clear understanding of the value proposition for consumers related to HI particular to them.
<i>Role of Research:</i> information management in research, data analytics	yes	We have been developing different research studies in the NI field. On the other hand, we encourage its development in academic courses (masters and PhD)

## Checklist of eHealth topics (gaps and deficiencies)

*Teaching the teachers:* Are there any activities in your organisation to teach health IT/eHealth to teachers in healthcare?

Yes. We currently have some programs that teach health IT and eLearning.

*Supporting participatory design and acceptance testing/research:* Are there any educational activities to teach or practice participatory design? Are there any activities including research in user acceptance testing and satisfaction measurement?

Yes. In some development processes of information systems, we focus on the end user's needs for ensuring their effective satisfaction by the high degree of usability, accessibility and quality. We have completed some research in this field.

*Integrating eHealth/health informatics into traditional curricula:* Are there any activities to include eHealth/health informatics into traditional curricula of physicians, nurses and other health professionals with direct patient care?

Yes. We have some undergraduate and postgraduate programmes that include some of this content. In addition, some of our postgraduate programs touch upon HI specifically.

*Motivating clinicians and managers:* Are there any incentives and opportunities for clinicians and healthcare managers to acquire and update digital eHealth/health informatics skills and knowledge?

Yes. We have some workshops/seminars to acquire and update digital eHealth/health informatics skills and knowledge.

*Engaging women:* Are there any activities to attract female students in eHealth/health informatics or employ female health IT staff?

No. All of our current strategies are focused on attracting both male and female students.

*Adjusting job descriptions and enable continuing education:* Are there any activities to adjust job descriptions, e.g., for clinicians, that include health informatics competencies (also proper use of health IT/eHealth systems) and are there activities to support staff updating and upgrading their health IT related skills and knowledge? This topic is mainly related to provider organisation and also to IT vendors.

Yes. All these kinds of activities are integrated into the workshops and seminars.

*Updating teaching and learning material:* Are there any activities to ensure that the material is up-to-date and of high quality?

Yes. We produced reports based on our research.

*Availability of courses including electronic courses:* Are there any additional activities to improve the availability of courses such as implementation of new courses, new course formats that recognise previous experiences/training in particular for continuing education?

Not yet, but we are thinking about the best strategy to respond to this need.

*Informal caregivers:* Are there any educational activities to teach health IT usage to informal caregivers, e.g. for assistive technologies?

Not yet.

*Shortage of health informatics specialists:* Are there any programmes to attract health informatics specialists?

Yes. At the university, we have a master's program directed at interdisciplinary health professionals; this program has a big focus on HI.

*eHealth Budget:* Does your organization, area or region have a dedicated budget set aside for eHealth/health informatics training, education or workforce development initiatives?

No.

*eHealth Specialty Areas:* Does your organization address any of these speciality settings/areas of training or outreach for eHealth education or workforce development: ambulatory care, social medicine, geriatric/ageing medicine, rehabilitation?

No.