Education and Training in Health Informatics.
The IT EDUCTRA Project

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In this contribution the AIM project EDUCTRA and the Telematics Applications Programme IT-EDUCTRA will be described. EDUCTRA had as its aim to investigate what gaps in knowledge health professionals have about health informatics and to provide educational material to fill these gaps. It was believed that a basic understanding of health informatics was present and that educational material should only cover the knowledge necessary for appreciating the products of the AIM programme. It appeared that the knowledge with respect to health informatics was deplorable. Guidelines for curricula were developed to change the situation. In IT-EDUCTRA the necessary course material will be developed.

Introduction

During the third framework programme AIM of the European Commission the EDUCTRA Concerted Action was initiated. EDUCTRA had as its goal to provide education and training in health informatics. It was decided to focus on professionals working in the field of health care. The target group would be similar to the group of health professionals for which AIM projects were carried out. EDUCTRA would determine the areas of health informatics that should be taught to European health professionals in order to keep them up to date with respect to new developments in the area of health informatics as brought about by the AIM programmes: if health professionals did not have adequate knowledge they would not use the new products. It was believed that health professionals had a basic understanding of health informatics and that education and training were only needed for the more specialised subjects.

In order to determine the gaps in their knowledge a survey was carried out by the representatives of the various co-operating countries. From the survey it was concluded that in almost all of the countries taking part in the survey, healthcare professionals lacked knowledge with regard to the possibilities and limitations of computers. When professionals use information systems they usually do not have a total view of the system. Their mental image of the system is confined to the part that they are working with and even then they sometimes do not know how to use all the possibilities of even that part. It was stated several times that although courses in IT when available are usually satisfactory for teaching how to use specific programs they are often insufficient to offer a broader overview of the potential of IT. There is a need for a broader introduction to health information systems so that staff can appreciate the context of a particular computerised task. Training should also be provided about the legal and ethical issues surrounding health informatics such as systems security and protection of confidentiality.

From the survey it became apparent that most health care professionals have an inadequate knowledge of the principles of health informatics. Health professionals use PCs for word processing, database management and graphics but their knowledge of the functions of health information systems in particular and of the possibilities and limitations of computer information systems in general is inadequate. It also became apparent that this deplorable situation is unlikely

to change in the near future. Although younger professionals have more experience in the use of PCs, they still lack the relevant background knowledge of health informatics. The principles of health informatics are often neglected in universities so that also the new generation of graduates are not better informed than existing professionals. Moreover there is an enormous shortage of professionals who are well trained in health informatics, a situation which seems unlikely to change in the coming years.

On the basis of the results of the survey it was concluded that guidelines should be formulated for use by trainers to design their courses. Health care professionals can be divided into two subgroups: a) health professionals, directly responsible for patient care delivery, e.g. doctors, nurses, dentists, pharmacists, radiologists, pathologists, technicians, etc. and b) administrative staff, ranging from hospital clerks or medical secretaries to health administrators.

The objective of the guidelines for a European curriculum in health informatics is to provide trainers with a framework according to which they can design their courses. A course in health informatics should be beneficial to both categories of professionals mentioned above and at the same time bring them closer together and help them understand their respective information needs better. The contents described in the guidelines are such that they can serve as an introduction to all staff groups. The level and amount of detail may however vary from one category to another.

The guidelines are described from the point of view of the staff member, considering which objects and concepts can be discerned in the domain, which information is needed and for what purposes, etc.

The guidelines are built up along the following lines:
-   section 1 describes the objects and concepts about which information is needed
-   in section 2 the actors that generate and use information are discussed
-   in section 3 characteristics of health information are presented
-   in section 4 operations that can be performed on data are elaborated
-   section 5 deals with quality control
-   section 6 discusses benefits and drawbacks of health informatics
-   section 7 presents ethical issues
-   section 8 presents an overview of existing applications

Each of the sections summarises items that could be discussed in a course. The complete guidelines were published [1]. In APPENDIX I an example is presented of part of the guidelines from section 1.

The IT EDUCTRA project

Because of the experiences of EDUCTRA and other projects it was felt necessary to develop learning materials for health professionals based on the guidelines produced in EDUCTRA. Therefore a new project was submitted to the Fourth Framework programme (the Telematics Applications Programme). The project was accepted and IT EDUCTRA started at the beginning of 1996. IT EDUCTRA is run by a consortium of seven full partners. A user forum of fifteen experts acts as the Advisory Board. Information about IT EDUCTRA is available via the WWW node: http://www.fundesco.es/iteductra.

IT EDUCTRA has defined 10 worksets covering different IT subjects. The definition of the worksets was based on an analysis of the user needs, performed by the consortium. Following a survey, topics were prioritised. The topics to be covered include: healthcare records in all forms,

diagnostic methods, hospital information systems, use of reference sources, communication in healthcare, etc. Authors have been contacted and commissioned to write the contributions.

The material of the worksets will take different forms: "Background on" material is meant to introduce readers to a topic. The "Some details of .." material will introduce the same subjects in a more detailed way, whereas "What is" material are composed of slides for presentation. In addition exercises will be provided.
All the material will be available via the Web site of IT EDUCTRA. CD ROMs will also be made available, containing the same material.

The materials will be tested out in practice. Courses will be provided in different countries on the basis of the developed material. The centres organising these courses are called diffusion sites. The idea is that these centres pilot the materials in their courses. The courses can then be taken over by other institutions so that after some time a large number of health professionals will be reached. Since CDs will be directly available for health professionals they can also use the material for self learning purposes.

Midway through 1997 the material will be available and courses can then start. The material will be translated into several languages, including Spanish, Italian, French and German in order to make the material more worthwhile.

Conclusion
The EDUCTRA Concerted Action made it clear that health professionals lack the necessary knowledge of health informatics. The results of European programmes like AIM and the Telematics Applications Programme will be only useful if they are used by health professionals. It is therefore of paramount importance that health professionals are introduced to the field of health informatics.

In order to make this happen, guidelines for European curricula were developed and made available. The idea is that prospective trainers can use these guidelines for setting up courses.

It was recognised that setting up such courses would still be difficult because of the lack of suitable learning material. The IT EDUCTRA programme therefore aims to develop course material that can be used both by educational institutions for use in their courses and by health professionals themselves for self learning. Halfway through next year the results will be ready for dissemination.

References
1.   Hasman A, Albert A, Wainwright P, Klar R, Sosa M. (eds.). *Education and training in Health Informatics in Europe.* Amsterdam: IOS Press, Studies in Health Technology and Informatics, vol.25, 1995.

APPENDIX I. Example of a part of the guidelines.
Building Blocks of Health Information

In this section, the objects and concepts about which information is needed are presented. All health staff should clearly understand how and why information is collected in healthcare. This part of the curriculum is essential for administrative staff, but would also be a useful review for medical professionals. Both professional and administrative staff should understand the methodological limitations of acquisition and generation of health information and the methodological restrictions of present knowledge. They should also understand the possibilities

and the responsibilities of health informatics for progress in medicine and healthcare.

Aims of the Module:
1. To understand the objects and concepts of health information
2. To understand how and why information is generated in healthcare

The patient
Learning Outcomes:
The student should be able to:
1. Demonstrate an understanding of the centrality of the patient to the production of health information.
2. Demonstrate an understanding of the nature of patient information, including biographical data (e.g. name, sex, age, address) and medical data (e.g. test results, diagnosis, vital signs) and describe the nature and function of minimum data sets.
3. Demonstrate an understanding of the importance of unique patient identification numbers.
4. Discuss the importance of the availability of patient information, to those who need it, that is timely and accessible.
5. Explain the importance of confidentiality of patient information, from the ethical and legal perspectives, and discuss problems of access and data security.
6. Understand the difference between data that may change from time to time (e.g. age, address, occupation) and data that must not be changed once entered (e.g. date of birth, place of birth, diagnosis, prescription) and discuss the concept of an audit trail.
7. Understand the difference between stand alone systems, LANs, WANs, and distributed data systems, and discuss the merits of such systems for patient records.
8. Discuss different storage methods for patient records, such as paper records, magnetic media, optical media etc.
9. Discuss the concept of data quality and describe methods of ensuring accuracy and integrity of data.
10. Discuss the concept of the patient centred record, from the perspective of the healthcare professional, the administrator and the computer scientist.
11. Demonstrate an understanding of the need to control access to information on a "need to know" basis, including password controls to limit access to authorised users, and from the perspective of "application views" to present the information required for different professional groups.

Patient history and physical examination (signs and symptoms)
Learning Outcomes:
The student should be able to:
1. Discuss the role of the patient history in representing the patient's past and present state, family and social history and contrast the concept of history with that of signs and symptoms which describe current complaints.
2. Describe ways in which signs and symptoms can be recorded, stored, retrieved and presented by computer systems and contrast the pros and cons of such systems with conventional manual records.
3. Understand different systems for recording signs and symptoms such as:
   - textual representation in natural language
   - coding and classification systems (local, national, international)
   - and describe their uses and limitations
4. Describe different levels of detail for recording symptoms from simple (binary, yes/no, presence/absence) to complex and discuss hierarchical structures of coding systems.

5. Discuss the use of database software for recording, storing and retrieving data concerning signs and symptoms for purposes of follow up, audit and research.
6. Have an appreciation of the importance of the accuracy of data and the consequences of inaccurate records, with particular reference to computerised patient records.

Diagnostic methods
Learning Outcomes:
The student should be able to:
1. Understand the methodological limitations of the acquisition or production of patient or health information by means of diagnostic procedures, the methodological progress achieved by modern information technologies and what remains to be achieved.
2. Differentiate between the demands of curative and preventive medicine with respect to diagnostics.
   Understand the different kinds of data subsumed within within diagnostics findings e.g.:
   - patient data (administrative, demographic, anthropometric, etc.)
   - technical data (e.g. laboratory methods, xray direction, current and voltage, film size)
   - validity of diagnostic methods (sensitivity, specificity)
   - physician's interpretation regarding normal or abnormal findings (pathology or radiology reports, laboratory values exceeding reference values, etc.)
3. Have an appreciation of the range of laboratory tests available (e.g. chemistry, haematology, microbiology, virology, endocrinology etc.) and the implications for patient information of modern trends towards multiple testing of patients.
4. Understand the importance of associating test results with complementary information such as:
   - name
   - units
   - reference values (sex/age dependent)
5. Understand the significance of the (mainly numerical) nature of laboratory test results, the volume of data and the consequences for record size and structure.
6. Discuss the importance of expert systems to assist with the interpretation of laboratory test results and the possibilities of linking such systems to patient information systems.
7. Discuss the different means of analysis of test results, for example longitudinal trend analysis for one test, profile analysis from single results from many tests.
8. Appreciate the historical importance of laboratory information systems in the development of healthcare informatics and discuss the nature of typical laboratory information systems.
9. Discuss the issues surrounding laboratory data acquisition, validation and interpretation.
10. Appreciate the importance of computerised laboratory information systems and the extent to which modern healthcare is dependent upon such systems.
11. Discuss the telematic transfer of laboratory results from laboratory systems to hospital information systems, individual patient records, or to general practitioners.
12. Understand the specific issues surrounding laboratory information for individual staff groups such as:
    - doctors
    - nurses
    - laboratory technicians
    - administrative staff