Enabling the safe and effective implementation of health informatics systems – validating and rolling out the ECDL/ICDL Health Supplement

Michael J. Rigby[a], Carol Hulm[b], Don Detmer[c], Luca Buccoliero[d]

[a] *Centre for Health Planning and Management, Keele University, United Kingdom*
[b] *British Computer Society, Swindon, United Kingdom*
[c] *American Medical Informatics Association, Bethesda, MD, United States of America*
[d] *CeRGAS Centre for Research on Health Care Management, Bocconi University, Milan, Italy*

Abstract

Effective understanding by end-users (health professionals and support staff) of key e-health principles and challenges is essential for the safe, effective, and sustainable use of health informatics systems. This is separate from, and ideally a precursor to, training on a specific system. However, hitherto this aspect has been little understood or addressed. Over the last few years, the concept of a customised Health Supplement to the well-established European/International Computer Driving Licence has progressed from idea to reality, through initial support for consultation by the then UK NHS Information Authority, followed by establishment of an international Expert Group by the global ECDL/ICDL Foundation. As a result, the ECDL/ICDL Foundation has endorsed a formal syllabus. This paper reports progress in the development of local training and testing materials and firm implementation plans in three countries, and the successful progress of piloting.

Key Words

Health informatics education; end-user; ECDL; ICDL; sustainability

Introduction

As defined by the theme for Medinfo 2007, there is increasing recognition and dependence in all countries on the future major role of health informatics systems in enabling national health systems to be increasingly effective, efficient, and evidence based. Whilst each country starts from a different base line, all are moving forward at their local pace in increasing the use of informatics systems.

Rightly, the priority is increasingly for sustainability, which must include the reliable and efficient use of such systems, in line with intention and with capability. However, the fundamental oversight is to focus solely on systems design and implementation, important though they are. What is so often overlooked is the fact that systems are only as good as their users' understanding and capacity to use them appropriately.

Health informatics systems are a vehicle for collecting, processing, and making available relevant health information at the point of need. Therefore informatics systems should not dominate or hamper health practitioners' activities except so far as they can make them more effective or efficient. However, all too often end users – health practitioners and their support staff – can find such systems threatening and restricting, and in turn this means that systems are used inefficiently and ineffectively, and either perform badly or fall into disuse.

Resistant Mature Staff

Though often a surprise to many, this picture of end-user poor compliance is well documented over a period of time, and thus should be anticipated [1]. Health professionals have in round terms a professional lifespan of approximately forty years. In nearly every country those practicing for more than ten years will have undertaken their basic professional education and early practice in an environment based on paper-based records. In many countries of the world electronic systems will only have been brought in even more recently. Furthermore, the most senior and experienced health practitioners – forming the professional champions and leaders – will certainly have been educated ahead of the e-health revolution. It is into this workforce environment that governments, health policy makers, and health informatics system advocates are seeking to introduce radical and comprehensive electronic systems.

An Atypical IT System User Population

Secondly, a further complication is that not only are health information system end users more well versed in paper-based systems, but in many other ways too they differ from the end users of most all other organisation-wide modern electronics records systems such as found in banking or the travel industry [2,3]. Not only are health users senior and mature staff rather than new entrants; they are totally dependent on information systems in order to carry out their principal daily business. However, this core work is not itself focussed on the information system - in general use of the information system only forms between 10% and 20% of their duties - and to them this is a low-skill element of their work. Thus senior doctors, nurses, and other health professionals will not give the same level of importance to being trained in new-generation information systems as they will two new clinical or healthcare techniques. Yet, even though only part-time users, they are senior and often autonomous employees, and they have professional accountability over and above their duty to their immediate employer. Thus they themselves will only be effective, reliable and regular users if they both understand the way to harness a system, and trust in its integrity and that of all partner users (who are largely unknown to them individually). The deeper analysis undertaken of these differences of health informatics system end user profiles compared to others system user profiles has been published [2, 3].

Change-Inducing Systems

Added to these challenges, heath informatics systems in themselves do not support clinical practice in the simplistic ways that telephones support and replace meetings and written correspondence, or dictation systems replace the need for the physical presence of a secretary. Instead, health information systems require a very different pattern of working, ranging from new data recording processes, through to how to search a past record (which is navigated very differently if it is held in computer files compared with if it is a large collection of paper charts in a physical folder).

Informatics System Sustainability but Practice Challenge

Therefore sustainability is highly dependent as much upon the pattern of use as it is on the pattern of design, yet is affected also by the user population's characteristics. Thus it is clearly naive to expect the complete cohort of the most senior and experienced practitioners in their country universally to welcome and endorse new systems which require radically different physical and cognitive skills, and which require immediate changes to patterns of data recording and assimilation honed over a life time. Thus, however good the system introduced, it will not be sustainable if the principal stakeholders are not comfortable with issues.

Counteracting the principal risks of health information systems

Apart from recognising the challenge to traditional practice of new health informatics systems, it is also important to recognise the inherent risks these bring if introduced without due preparation. Moreover, professionals will be aware in general terms of these risks, and be likely to militate against introduction of such systems with good intent unless they feel that these risks have been addressed and controlled. There are three types of such risk, as shown below.

Risks generated by the need for new skills

The use of a health informatics system requires a radical range of new skills. These commence with the basics of operating any computer system, through to the skills required to record data electronically as apposed to by hand writing or filing a chart, to the skills needed to navigate a record which is stored in a highly structured and efficient way but which needs a new mind set in order to negotiate it effectively to find key and relevant information items. It would be unreasonable to expect a surgeon to use a new type of instrument or a radically new surgical procedure without adequate training, yet governments and policy makers worldwide are inappropriately labelling as "obstructive" health practitioners who are reluctant to change information management approaches with which they are familiar, for ones which they find unknown and intimidating. Further, 'smart' systems may make good evidence-based calculations, recommend particular treatment patterns or warn against particular prescribing intentions. These are safe provided the end user understands the rationale in both the clinical and computing logic inbuilt, but carry risks if the end user does not understand and know how to ascertain that logic.

The risks of new constraints

A key aspect of most health informatics systems is the fact that they require a standard approach to the description of histories, investigations, results, diagnoses, and interventions - in other words, the benefits of standard terminologies and taxonomies should reduce ambiguity and render observations and findings interpretable accurately by all. However, the converse of that is that an individual's well-developed means of indicating valuable subjective information such as uncertainty, provisional views, or feelings as apposed to hard evidence are rendered impossible. This may either exclude uncertain information, or result in it being recorded with a spurious impression of certainty. Users may know the clinical approach and specific skills of colleagues who hand-record narrative information, but this authorship and personalisation may be lost with electronically captured and stored data.

Risks of misuse

The very strength of health informatic systems – that they can search and present information from very large databases extremely quickly – is a potential risk as well as being a core purpose. Files can become increasingly comprehensive, and information can be obtained about many people. Careless use of such information can lead to inappropriate divulgence of confidential information, and without safeguards there are clearly risks of an ethical or malicious misuse. Thus all end users need to be educated to avoid these risks, and to adhere to robust corporate policies to control usage.

For all these reasons it is therefore important for end users to be adequately educated as to how to use systems soundly and effectively. This is a key part of the sustainability of systems. Evidence (or even suspicions) of misuse of systems, or of clinical decision making because of inability to use systems, will provide a rapid means of ensuring their demise. Such evidence or suspicions may come either through professional sources, press reports, or collective patient anxieties.

The move to a health end-user qualification

The Need to Recognise End Users

The educational needs of end users are very different from those of technical health informatics staff. Over a decade ago a European Commission Concerted Action entitled EDUCTRA identified the informatics educational needs of health professionals as being different from those of IT staff [4]. This work suggested a range of necessary learning outcomes for each group – though for health professional users they focussed primarily on basic curricula for new entrants. Subsequently the International Medical Informatics Association (IMIA) addressed this topic, and produced recommendations of what should form the basis of health informatics education globally for each of the two staff communities. Both before and since these recommendations, the prime focus has been on informatics education, with development of many formal courses, and on the introduction of some informatics training into basic health professional education. Neither of these groups, however, form the general body of the practice community to whom new organisation-wide informatics systems are introduced or imposed.

The Concept of an End User Qualification

To overcome these anxieties and risks it seems self-evident that an appropriate end-user educational programme, and related qualification, for health informatic systems should be developed, but this was not being addressed. Meanwhile, virtually all countries in the world have a qualification requirement for drivers of motor vehicles or pilots of aeroplanes, as such equipment is seen as extremely beneficial yet extremely risky if misused through ignorance or lack of skills. It is seen as a societal responsibility to provide a qualifications framework and regulation, and a citizen responsibility to ensure qualification before becoming a user.

This approach has already been taken with the more general use of computers, with the development of the European Computer Driving Licence (ECDL) to a standard international curriculum, as most of the issues of using computers safely and effectively are generic and universal. This has now developed into the global International Computer Driving License (ICDL), available in virtually all countries of the world [6].

It therefore seemed logical to develop a specific supplement or module for the ECDL/ICDL, given the risks and responsibilities inherent in using such systems. This concept was first promoted in 1999 in a European context [7]. Subsequently, the idea was developed at conceptual level in more detail, and support gradually developed [8]. Of significance for Medinfo 2007, details were sought by a principal Australian health informatics journal [8].

Practical Steps to Development

Following these moves towards the development a health supplement to the ECDL/ICDL as the best means of meeting this need, and thereby ensuring sustainable and safe implementation of health informatics systems through education, assurance, and empowerment of end users, many practical steps have been made towards achieving this reality.

In 2004 the NHS Information Authority, the then lead body in this field for the National Health Service in England, agreed to support two consultation workshops – one for key opinion leaders in health informatics from eight European countries, and one for a range of delegates from the National Health Service across the United Kingdom. As a result of the strong enthusiasm at both these meetings, the European Computer Driving Licence Foundation (the global regulatory and licensing body for the ECDL/ICDL) agreed to consider formalising the development process. The ECDL Board endorsed this, and in 2005 an Expert Group was set up comprising representatives of six European countries and of the United States of America. The resultant recommended syllabus was signed off by the Expert Group in early 2006.

The ECDL/ICDL Health Supplement Content

The final EDCDL/ICDL Health Supplement consists of a competencies framework defining knowledge and skills the candidate needs to possess in order to operate a health information system safely. It excludes issues generic covered in health professional training or staff induction (such as basic principles of confidentiality). Regarding computer operation it focuses on those aspects which are different, or have different emphasis or importance, in health applications.

The core contents of the syllabus are copyright to the ECDL/ICDL Foundation, and comprise the following topics:

- Concepts
  - Health Information Systems
  - HIS Types
- Due Care
  - Confidentiality
  - Access Control
  - Security
- User Skills
  - Navigation
  - Decision Support
  - Output Reports
- Policy and Procedure

For each topic a number of defined knowledge areas or competencies are specified. The content is designed to accommodate specific national language and terminologies, organisations, and legal and professional frameworks. The

normal pattern of assessment will be electronic, through a testing framework available on line or by other electronic means. It is based on the assumption that the candidate will already be competent in basic computer user skills.

International trials and validation

Since the specification phase, rapid progress has been made in significantly different countries, with very different health systems, different languages, and also different terminology and nomenclature within the same language group.

United Kingdom

In the United Kingdom, the British Computer Society as national licensee for the ECDL, and with a strong relationship with the National Health Service, organised piloting of the syllabus utilising an interim training manual and testing framework in six very different sites. These encompassed very different localities, different healthcare environments ranging from primary care through secondary care to mental health, and different health professions from research staff to medical consultants, and also health informatics and health data experts. This pilot involved 84 persons, who were all very positive value of the knowledge and competencies covered in the syllabus. The only significant comments received were about the interim testing framework, which was only ever intended to be temporary in order to facilitate consideration of the syllabus. More detailed reporting of these results is in press [10].

Consequent upon these successful pilots, a full electronic training resource is being developed from the interim one, and a definitive electronic testing framework is also being built. These should all be signed off in December 2006, and the ECDL Health Supplement will be launched by NHS Connecting for Health, the current competent national body, to the NHS in England January 2007. It will also be offered to the NHS systems in Wales, Scotland, and Northern Ireland.

United States of America

The American Medical Informatics Association (AMIA) and the national ICDL licensee, ICDL-US, worked closely during 2006 to create a US-version curriculum for 'anyone in a health-related entity who touches a keyboard containing person-specific health information' as well as an examination to certify mastery of this content. This will be entitled the Digital Patient Record Certification or DPRC. The curriculum group adapted the syllabus developed by the ECDL Foundation group; the US version was then reviewed by the ECDL group.

The test will be piloted in early 2007 with the expectation that the program will be functional later in 2007. ICDL-US and AMIA found the partnership to be mutually beneficial and there is a desire to work together on other products for the North American region.

AMIA has two major educational initiatives underway and this initiative is part of its "Got EHR?" Campaign. AMIA also seeks to educate the general public about electronic health records and especially integrated personal health records, particularly as an integral part of the electronic medical record. The campaign also strives to increase the use of EHRs in small practice environments. The second initiative is the "10x10" Program, which is an effort to educate 10,000 applied clinical informaticians by 2010. This program now involves two universities and will involve at least four by the end of 2007.

Italy

The Italian Association for Computing and Automated Calculation (AICA), which is the Italian national ECDL licensee [11], instructed CERGAS Bocconi to work out and complete the Italian health syllabus, based on the core syllabus, and the test structure. The next step is to develop the related manual. By the end of 2006, Italy plans to implement a first pilot edition of the course addressed to about 40 medical doctors and nurses of the Dolo (Venice) Local Healthcare Unit. Participants will be offered four courses of ECDL Start (24 teaching hours), plus a specific course of ECDL Health (8 teaching hours). At the end of the courses, final exams will be held and skill cards will be issued accordingly (including, for the first time ever in Italy, those relating to ECDL Health). The examination to obtain the ECDL Health skill card will include practical exercises simulating the use of patient records management software. The courses will be included in national and regional programmes aimed at the continuous education of the NHS medical personnel and will enable participating medical doctors to obtain some compulsory education credits. In 2007 these courses are expected to become a key element of the education and training programmes nationwide.

The Italian experience stands out for its special focus on the preliminary planning of the initiative, also being based on a scientific research project conducted in 2004 aimed at measuring the potential benefits of information education and training in the healthcare sector [12]. This research project has analysed and evaluated the "cost of IT ignorance" in the Italian healthcare sector through a sample survey, empirical measurement tests, and experience of a similar research project conducted on private businesses. Ignorance in the information field has proved to be a notable hidden cost for the Italian healthcare sector and the potential value of information education and training of the NHS personnel amounts to about 2 billion Euros per year. After being published and officially presented, the results enhanced the institutional awareness regarding development of targeted educational programmes.

Discussion

Development of any new qualification takes a considerable period of time, commencing with identification of the need. This initiative has sought to achieve this in a way that matches the differing needs of countries globally, and to pilot and validate it in differing countries in two continents. Though the piloting, and the development of the educational and testing frameworks and systems, was grounded on the needs of the individual countries involved, the resultant tools and productsre likely to yield wider benefits and use by other countries wishing to follow suit.

As well as being a key contribution towards sustainable health informatics systems, this initiative also marks a successful policy development for the ECDL/ICDL Foundation. Given the standardised nature of the core ECDL syllabus, the Foundation has increasingly recognised that more advanced applications need to be more closely tailored to national requirements including patterns of practice, culture, language, and legislative frameworks. As a result the Foundation has created the broad concept of Endorsed Products, for which the core syllabus is specified by the Foundation, but where the individual national license holders then propose the format in which the related national qualification is developed and assessed within a specific country, ensuring that this has local relevance. This has particularly well fitted the Health model, given that every country has its own unique health system, and that this system not only uses the languages of the country, but has specific terminologies and taxonomies for health care practice and delivery, as well as specific professional and legal codes. Thus the ECDL/ICDL Health Supplement is the first successful implementation of the Endorsed Product concept.

Conclusion

With the increasing importance of health informatics systems, and the need to ensure their effective and safe usage, there has been a steady and increasing recognition of the importance of an end user qualification as a contribution to effective sustainable implementation and development of such systems. Moreover, given that the issues and risks are basically generic, coupled with increasing mobility of health staff, the advantage of devising a generic solution has become self evident. From this position, the progress in the last two years through an expert committee identifying and confirming the core syllabus, and three different countries undertaking trials and detailed implementation plans, is significant and encouraging.

Like motorcars, aeroplanes, or other items of advanced technology, health informatics systems are only as good as the competence (and confidence) of their users. Hitherto this has gone largely unnoticed, except for possible training in a particular system's operational instructions. The ECDL/ICDL Health Supplement has broken new ground, by recognising the high importance of the education and empowerment of the end user, whatever they level or professional. It thus makes a vital contribution to the sustainability of health informatics systems.

Moreover, this is a global solution, linking common generic requirements with local need through the ECDL Endorsed Product concept. Having been developed by an international expert group, endorsed by the ECDL/ICDL Foundation, and now validated simultaneously in three very different countries, this product is now available for use in any nation.

References

[1] Anderson JG, Aydin CE, Jay SJ (eds.). Evaluating Health Care Information Systems: Methods and Applications; Sage, Thousand Oaks CA, 1994.

[2] Rigby M. Improving Governance and Reducing Risk in Electronic Patient Record Systems: Ensuring Appropriate Competencies for Support and End-User Staff. In M Fieschi, E Coiera, Y-C J Li (editors). Medinfo 2004 - Proceedings of the 11th. World Congress on Medical Informatics, IOS Press, Amsterdam, ISBN 1 58603 444 8, 2004, 926-930.

[3] Rigby M. Protecting the Patient by Promoting End-user Competence in Health Informatics Systems – Moves towards a Generic Health Computer User "Driving License"; International Journal of Medical Informatics, 73, 151-156, 2004.

[4] Staff of EDUCTRA Concerted Action. Education and Training in Health Informatics: Guidelines for European Curricula; in Hasman A *et al.* Education and Training in Health Informatics in Europe; IOS Press, Amsterdam, 1995.

[5] International Medical Informatics Association. Recommendations of the International Medical Informatics Association (IMIA) on Education on Health and Medical Informatics; Methods of Information in Medicine, 39, 267-277, 2000. (also available on www.imia.org/wg1/rec.pdf)

[6] www.ecdl.com/main/index.php

[7] Rigby M, Draper R, Sheridan A. Confidentiality, Competence, and Confidence - Ensuring Ethics whilst Recognising Reality; in Proceedings, EuroRec '99 Third European Conference on Electronic Health Care Records, 1999, Sevilla, España; Sadiel, Sevilla, 1999.

[8] Rigby M. Protecting the Patient by Ensuring End-User Competence in Health Informatics Systems – Moves Towards a Generic Health Computer User "Driving Licence"; in Proceedings of IMIA Working Group on Education Conference, Portland, Oregon, 2003.

[9] Rigby M. The Health IT roll out: supporting the end users; Health Information Management, 33, 3, 93-94; 2004.

[10] Rigby M, Hulm C. Piloting in England of a Health Supplement for the European Computer Driving License (paper accepted for HC 2007).

[11] www.aica.it

[12] Buccoliero, L., C. Caccia. Un approccio aziendale ai sistemi informativi in sanità. [*A corporate approach to information systems in the healthcare sector*.] In Borgonovi, E., Camussone, P. F. and Occhini, G., Eds. L'Ignoranza informatica: il costo nella sanità. [*IT ignorance: how much it weighs on healthcare*] Milan, Mc-Graw-Hill., 2004: 31-69.

Professor Michael Rigby, Professor of Health Information Strategy, Centre for Health Planning and Management, Darwin Building, Keele University, Newcastle-under-Lyme, Staffordshire, ST5 5BG, UK. Telephone +44 1782 583191, Fax +44 1782 711737, Email m.j.rigby@hpm.keele.ac.uk