Professional Competence and Computer Literacy in e-age, Focus on Healthcare

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Summary

Objectives: The healthcare sector is facing an enormous acceleration due to the emergence of new knowledge, drugs, devices and diseases. Professional competence, continuing education, service excellence and patient benefits can be facilitated by the developments in information and computer technology – computer literacy is becoming imperative for all who are involved in healthcare delivery. The paper attempts to identify solutions that can aid the process of ICT uptake for full benefit of patients and healthcare professionals.

Methods: With the support of published literature, the article considers the importance of ICT skills in general and in healthcare and presents some advantages of generic vendor-independent methods of ICT certification.

Results: Discussed are the preliminary results of the United Kingdom's National Health Service information technology reform which addresses the need for intensified use of ICT and applies the ECDL concept.

Conclusions: It is useful to complement the introduction of computer literacy as a qualification concept by a standardized accreditation of ICT skills. Solid level of computer literacy creates a reliable and efficient background for everyday activities of healthcare professionals, enables the application of further domain-specific training modules and prepares suitable environments for the introduction and acceptance of new technologies such as electronic health records and electronic transfer of prescriptions by positively transforming the attitudes of users towards them.

Keywords

Computer literacy, professional competence, continuing education, delivery of health care

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1. Continuing Education in the 21st Century

We are living in a knowledge society, where knowledge is one of the decisive keys to success. We have observed an enormous acceleration in the development of new technologies and technical devices, new drugs, as well as spread of new diseases. To make the most of the advantages of new technologies and to prevent the potential dangers, we have to have access to and be able to work with the newest information, and use new technologies efficiently as quickly as they appear. Professionals cannot rely, throughout their lifelong careers, only on the skills and knowledge acquired during their full-time education; lifelong learning and continuing education have become a necessity in our everyday reality. To remain competent, professionals have to learn during all stages of their careers and, rather than a matter of personal development, continuous attainment of professional competence has become a condition for practicing a profession. The ability to learn is now required not only from children attending schools and from university undergraduates but also from people at all stages of their professional life. Societies need to build infrastructures and educational systems that reflect and support this development. Three aspects appear to play an important role in building lifelong learner culture. These include support for lifelong learning, accessibility and flexibility of educational systems and accreditation. Flexible means enabling the acquisition of new knowledge even by people in full-time employment needs to be offered. Books, the traditional tool for self-study, should be complemented by new methods of teaching and learning. The educational and training systems need to be modular enough to allow everybody to learn and update their knowledge according to their personal needs and circumstances. The growing need to continuously update knowledge also increases the need for the implementation of reliable and standardized methods of knowledge certification.

1.1 Need for Computer Literacy – a New Phenomenon

Application of information and communication technologies (ICT) in education and training addresses many issues of accessibility and flexibility of educational and training programmes. This has been recognized as an opportunity by higher education institutions and training providers who now increasingly utilize ICT in delivering their programmes; e-learning has become an attractive and cost-effective addition to traditional methods of education and training. For example, Wutoh et al. [1] suggested that Internet-based continuing medical education (CME) programmes are "as effective in imparting knowledge as traditional formats of CME". Nevertheless, they also claimed that the utilization of the Internet-based CME continues to be limited, and that younger physicians tend to assume the new format more readily than others [2]. According to the authors, "not knowing how" has been the most frequently reported reason for the reluctant approach to Internet-based CME [3].

Anyone wanting to use ICT for (self)-education and training needs to know how to use it; has to be 'computer literate'. Furthermore, education and training are not the only domains of professional life where

skills, now referred to as computer literacy, are required. ICT has become an essential part of professional practice, used for the administration as well as delivery of professional roles. Irrespective of a professional field, every office is now equipped with a PC connected to the Internet, as computers and their memories have become an integral part of most processes. The number of jobs where employees are supposed to use ICT exceeds 50% [4].

However, ICT has developed extremely fast over the last few decades of the 20th century and many of the currently practicing professionals had already completed their full-time education at a time when access to computers at higher educational institutions was limited and when now widely used applications did not exist. Consequently, most of the graduates entered their careers unequipped with the level of computer literacy required for their current practice. As a result, the ICT skills held by many professionals are self-taught during practice and may vary. For example, a pilot study in the Czech Republic completed in 2003 [5] suggested that about 45% of people with a university degree were unable to accomplish a rather elementary task of sending an e-mail with an attachment. The authors claimed that the situation was even less favorable among people with lower levels of education.

A recent review reported that a significant number of employees (20-45%) did not feel confident working with a computer since they felt unable to use the ICT as required [6]. This does not only reduce the employees' job satisfaction but may have direct and measurable economic impact on the employer; such employees are unlikely to utilize ICT resources to their full potential. Studies in Norway [7] and Italy [8], commissioned to estimate this impact, indicated that employees lost 20 to 40 minutes a day because of the disparity between the actions of the computer and the intentions of its user, and that training in computer literacy may lead to significant time saving, estimated at 38 minutes [7]. Moreover, students' ability to evaluate and manage information and apply it in maintaining professional competence is now considered as one of the key outcomes of undergraduate education [9]. To facilitate achievement of this goal, information literacy has to be complemented by ICT literacy; ICT skills have become a necessary condition for information literacy as the Internet had acquired the position of the most accessible source of vast amounts of information. The need to raise general computer literacy has been recognised as one of the priorities enabling progress of information society [10] and ensuring sustainable human development [11].

A number of various educational programmes for improving ICT skills among the general public have been designed in the last decade by software producers, educational institutions and/or computer societies [12-16]. To document the progress achieved through such programmes, each of them has been complemented by a validated certification system [12-16]. These generic programmes share many features; they are normally modular and have flexible pathways to certification in recognition of different levels of candidates' prior knowledge and skills. Sometimes, the corresponding certifications serve as the first step towards advanced certificates [17-19]. One of these programmes, the European/International Computer Driving Licence (ECDL/ICDL) is described in more detail below.

1.2 The ECDL/ICDL

What does it mean that a person is computer literate? What is the extent of knowledge required? How should this be certified? ICT professionals, joined in the Council of European Professional Informatics Societies (CEPIS, www.cepis.com), attempted to answer these questions in the mid 1990s by defining the concept of ECDL/ICDL ('International' applies when the syllabus is used outside Europe) [13]. The underlying intention was to offer the means of certifying knowledge of essential ICT concepts, including competence in the use of a personal computer and of common computer applications. This goal has been operationalized through the combination of design properties defining the scope of skills required, corresponding certification and quality assurance systems.

The scope of ICT knowledge and skills defining the term 'computer literacy' and required for the ECDL/ICDL certification is described in the ECDL/ICDL syllabus. The syllabus is structured into seven domains (modules): basic concepts of ICT, using the computer and file management, word processing, spreadsheets, databases, presentations, and information and communication.

ECDL/ICDL uses standardized, reliable and transparent method of testing the skills from the ECDL/ICDL syllabus and issuing the ECDL/ICDL certificates. ECDL Foundation (the governing body of the ECDL/ICDL concept) applies a strict quality assurance policy with strong support from local professional computer societies around the world [20], which can become ECDL/ICDL licensees. Considerable attention is devoted to the design of up-to-date syllabus content and to development of the corresponding tests to ensure that the process is efficient, valid and justifiable. Towards this goal, the ECDL Foundation closely cooperates with its licensees as well as with standards bodies, expert groups, psychometric consultants and educational testing consultants, e.g. European Association of Skills and Knowledge (EASK), CITOgroep and ETS/Chauncey. The ECDL/ICDL concept has evolved from Version 1.5 (1997) to the most recent Version 4.0 (2003).

Similar to some other ICT training programmes, the ECDL/ICDL has been designed to be vendor-independent. This gives the candidates the flexibility and freedom to use their computer literacy skills in any circumstance of their personal and professional ICT use.

Also in accordance with other programmes, the ECDL/ICDL concept does not regulate the way in which ICT knowledge and skills have been acquired: candidates can self-learn using books, e-learning or practice, or they can attend traditional classroom training. The ECDL/ICDL certification only requires that the candidates prove their ICT knowledge by passing standardized tests, verifying that the knowledge and skills described in the ECDL/ICDL syllabus have been acquired. This may be beneficial to those who are already competent ICT users. This approach also

allows the participating training centres to 'fine-tune' the training to the needs of their clients using available educational materials or by offering new, client-specific solutions.

2. ICT, Computer Literacy and Health Sector

Medicine and pharmacy have always been closely associated with technology developments; many technological advances have been implemented in these scientific areas and medicine and pharmacy have driven many technological innovations.

It may therefore seem paradoxical that healthcare in general is not the fastest in utilizing ICT to its full benefit. Despite the arguments raised in the last decade, highlighting the benefits resulting from health care information technology, such as improvements in quality of services for patients as well as reduction of health care spending [21], implementation of new ICT in healthcare has been rather slow. For example, it has been reported that 83.7% of hospitals in the United States (US) use neither electronic health records (EHR) nor computerized physician order entry (CPOE) [22]. The situation is not much better in US outpatient settings [23, 24]. This should be considered in the context of healthcare services being provided to patients who are exposed to ICT developments. Not only is ICT a part of their everyday lives and professional practice, patients also have easy access to vast amounts of information and they are encouraged to use it; an informed and empowered patient who is able to be involved in decision making about own treatment (concordance) is the epitome of a modern patient. These patients should have access to a service that is equally well equipped with the latest ICT and professionals who can use and utilize it.

Healthcare educators and providers worldwide have now recognised and acknowledged the need for computer literacy and they are actively promoting it among their students [25] and staff [26]. The report of a 2004 ACMI discussion [27] claims that "... the computer skills of students should be at a reasonable level before they begin clinical training so that they can more readily use the EHR once they begin seeing patients". This recommendation implies a natural question: What is the best way for health care professionals to reach this goal? Would a general purpose ICT literacy programme be suitable or would it be better to design specialist ICT literacy programmes dedicated to health professionals only? Also, can the same solution be applied for university students and for lifelong training in health institutions? Introducing a minimal recommended generic ICT skills standard seems to be a reasonable first step. This may be subsequently complemented by additional specialised courses focusing on local healthcare ICT solutions.

The ECDL/ICDL serves as this first step in some organisations, including medical and nursing education institutions as well as healthcare provider bodies. For example, all Italian Universities have included a complex computer literacy course based on the ECDL/ICDL syllabus as an integral part of medical education. The same approach has been adopted by the University of Zimbabwe's Medical College. Employees of Greek Medical Insurance for Civil Servants are asked to demonstrate their ICT competence by passing the ECDL tests. The Austrian IT company IGV, providing services to the local healthcare sector, offers the ECDL courses to medical staff. The ECDL has recently been adopted as a reference standard for basic ICT skills of the National Health Service (NHS) staff in England, Wales and Scotland.

2.1 The Role of ICT in the UK's Current National Health Service

The NHS, a free at the point of care, government-funded healthcare service in the UK, is currently undergoing a major reform that impacts on all areas of the system, including ICT. One of the many outcomes of (while also being a tool to) the reform is the formation of two discrete but interlinked driving forces for improved computer literacy among the NHS staff: the developments of the service itself with modernization and intensified use of ICT that necessitate computer literacy, and the requirement for lifelong learning and continuing professional development (Fig. 1).

The UK Government's plans for ICT modernization were detailed in the 'National Programme for Information Technology' [28, 29] launched in October 2002. The ICT was to be modernized to enable healthcare professionals to work together and to share information. This was envisaged to support other aspects of the NHS reform and result in greater patient and professional satisfaction.

To achieve the aims of the ICT reform, the ICT infrastructure has first been updated to allow gradual implementation of three national electronic services by 2008 (currently in progress): electronic patient health records, electronic procedures booking system, and electronic transfer of prescriptions/electronic prescribing [30]. Although ICT

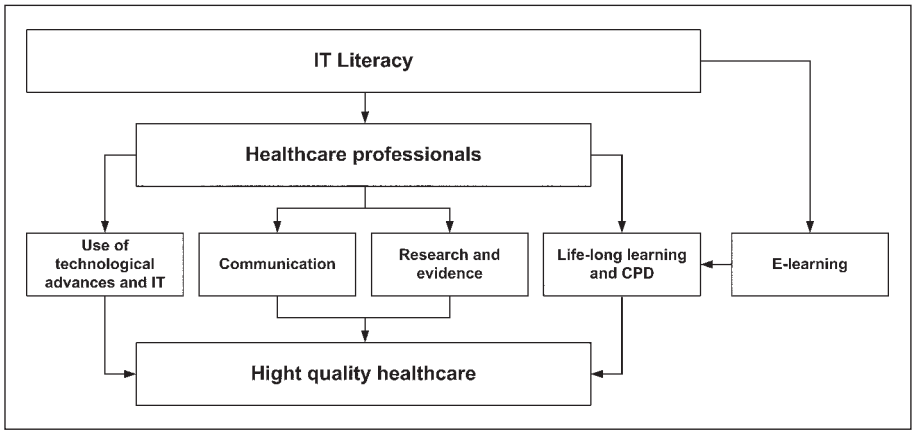

Fig. 1 Associations between computer literacy and quality of healthcare

already has an important place in the NHS staff working lives, the implementation of these services means that the use of ICT will become inherent to everyday practice of the NHS staff of any profession and at any level of experience. The healthcare professionals will need to be able to use ICT efficiently and as a matter of course. Therefore, it has become necessary that the NHS staff have the appropriate level of computer literacy [31]. Nevertheless, in its current document on the implementation of the ICT reform [30], the UK Government concluded that the majority of the NHS staff required "some level of education, training and development" related to ICT. In recognition of this, the UK Government announced its commitment to provide ICT training to the NHS staff. The basic ICT skills training of the NHS staff has been provided through the ECDL scheme [30, 31] in England since 2001 (since 2003 in Wales and Scotland, other schemes are being considered in Northern Ireland). This decision was based on an evaluation of the ECDL by eight pilot sites [32], which concluded that the pilot sites confirmed the need for formal training in basic ICT skills. The ECDL concept was chosen as it offered non-NHS specific training, giving the staff transferable skills relevant to any PC user. The pilot sites also praised that the ECDL was a well-recognized scheme.

The NHS Information Authority conducted a survey in November 2003 to examine the effect of obtaining the ECDL certificate on the work of the NHS staff [34]. A questionnaire was completed by 638 NHS staff (46% response) of whom 69% were support staff, 16% were medical or nursing staff and allied healthcare professionals (AHPs) and 15% were other staff from within the primary care sector. As could be expected, the completion of the ECDL had the most pronounced effect on those who self-identified as having very basic or basic knowledge of IT before completing the ECDL (21% of respondents). All and 98% respectively of these respondents reported feeling more or much more confident using software. The respondents who worked with patients, reported that the newly acquired knowledge and skills helped them in their daily duties, for example when monitoring patient progress, accessing guidance and protocols and record keeping for governance (the proportion of reports varied depending on the self-reported baseline skill level; the proportion of those who worked with patients was not stated). The respondents estimated saving between three minutes (self-reported 'expert') and 41 minutes (self-reported 'very basic' baseline skill level) per day by improving their ICT skills. The mean time saved reported by the nursing disciplines (n = 26) was 39 minutes. The authors also concluded that "all categories of staff saved more time, over a year, than they spent in their learning". The ECDL training was also reported to impact on respondents' attitudes towards the NHS IT reform with the most pronounced effect on those with self-reported 'very basic' or 'basic' baseline skills; 10% and 26% respectively of those with 'very basic' or 'basic' baseline skills reported feeling positive about the new IT service systems before the training, while 86% and 71% respectively reported feeling positive after the training. The composition of the sample (proportions of healthcare and other professionals) seems to suggest that there may be limited uptake of the training by the medical and nursing staff and AHPs, while, according to the preliminary data, these professionals appeared to lack ICT skills and benefit greatly from the training. However, since the subanalyses were conducted on rather small samples, more data are needed to verify these results.

Although the ICT training is a valuable and important undertaking even if the only outcome (very importantly) is a successful implementation of the healthcare and healthcare ICT reforms, such training will also directly facilitate the notion of lifelong personal and professional development [33]. As discussed earlier, the expectation for the NHS staff to continuously professionally develop in the current society implicitly necessitates computer literacy. Most of the healthcare professionals engaging in training and development activities are working full-time. Consequently, flexible and accessible distance electronic and Internet-based learning and teaching are gaining an important position as an approach to their education. However, success in these new modes of learning and teaching is difficult without computer literacy.

Therefore, the positive outcome of offering ICT training and ensuring computer literacy of (the NHS) staff is twofold: it enables the staff to use ICT in their professional practice effectively and efficiently, and it allows the staff to keep high standard of their practice throughout their careers through distance learning and access to information (Fig. 2).

3. Conclusions

The patient benefit, professional competence and service excellence are but a few

1. Access to electronic clinical information and efficient utilization of IT potential in professional practice.
In the UK, the three new national electronic services, the Electronic Patient Records, electronic booking system and electronic prescribing represent this.

2. Communication between health professionals.
All UK NHS personnel are now linked to 'NHSnet', an Internet-based secured communication and directory system. The strategy document Information for Health [36] expected all clinical staff to have access to a desktop computer with email and Internet access by 2002.

3. Access to specialized literature and research
Specialized literature and research can be easily and promptly accessed and considered for application in practice. The UK Government supports the health professionals' access to information by supporting websites dedicated to provision of health-related information and access to full-text journals.

4. Lifelong learning through easier access to information, education and training.

Fig. 2 Reasons for computer literacy among healthcare professionals

of the outcomes facilitated by the achievements of e-age. The technological developments of e-age can only be advantageous if they are applied and used efficiently. Since many of these developments are to a various extent dependent on information and computer technology, computer literacy has become an imperative for all sectors, including healthcare: it opens the doorway to a new type of medical service where healthcare professionals are able to fully utilize the latest technology for the management of people's health, lifelong learning and communication with colleagues and patients.

Computer literacy is the most representative example of a generic skill that has emerged only recently and is to be acquired by people of various age groups in order to enhance their professional practice and assist them in their everyday lives. It can be observed in most sectors of human activities, including healthcare, that simple lack of proficiency in ICT use prevents people from full utilization of resources available to them. Employers and governing bodies are recognizing the need for computer literacy and they have started to support training in this area to enable professionals from various industries to utilize latest technology, as well as to remain competent in their professional area through the use of e-learning and access to information. For the current professionals, computer literacy is a tool to access education as well as a subject of their education.

As soon as computer literacy is defined as a qualification concept, the need arises for a standardized accreditation of ICT skills. Various domain-specific and generic training and certification schemes have been designed. Studies conducted in the UK [34] and Italy [35] indicate that healthcare can benefit from improving staff's computer literacy through such training and certification. Computer literacy creates a reliable and efficient background for everyday activities of healthcare professionals, enables healthcare professionals to enter further domain-specific training modules and prepares for suitable environments for the introduction and acceptance of new technologies such as electronic health records and electronic transfer of prescriptions by positively transforming the attitudes of users towards them.

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Competing Interest Statement
OS is a Chairwoman of the Czech Association for Cybernetics and Informatics (CSKI), the ECDL Foundation licensee supervising usage of ECDL concept in the Czech Republic.

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