ICT and Learning Usability at Work

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Challenges and Opportunities for Physicians in Everyday Practice

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Abstract. The medical profession demands training and lifelong learning to ensure patient safety and quality of treatment. Main barriers are lack of time and resources. Information and communication technology (ICT) has proven to be useful to support e-learning, but less focus has been placed on the potential role of ICT as support for continuous learning in everyday practice. The aim of this qualitative interview study was to explore physicians' perspective of learning and how ICT in various ways can support learning at work. The findings indicate that continuous learning to a large extent is case driven, and that ICT may play an important role and support reflection and learning for individual physicians and for the collective as well. We argue that such ICT solutions must be adopted to and integrated in the everyday work, save time and include learning usability.

Keywords: ICT · Information and Communication Technology · Informal learning · Information seeking · Physicians · Workplace learning

1 Introduction

The medical profession demands training and lifelong learning to ensure patient safety and quality of treatment. Patients who are more aware of their treatment options, the rapidly growing amount of accessible knowledge and new information and communication technology (ICT) poses challenges but also opportunities in terms of information, communication and learning.

The deficiencies of continued training for medical specialists, mainly due to lack of time and resources, is one challenge that has gained increased attention [1, 2]. Recommendation regarding physicians professional development emphasize that it should cover both clinical and non-clinical aspects and that continuous training needs to focus on daily practice [1]. Furthermore informal learning through i.e. collegial communication, learning by doing and peer-learning is considered an important part of lifelong learning [3, 4]. Despite the recognized importance of training and lifelong

learning for health professionals, less attention has been paid to how physicians learn in the workplace [5, 6].

Along with keeping up with the latest medical knowledge, physicians have to face an increasingly digitalized workplace. Tablets and smartphones provide quick and easy access to up-to date information and are used in a variety of ways, including information management, decision support and medical education [7-10]. Rapid advances in medicine and technology also provide for innovative health services, such as use of mobile technology for patient information and new technologies for self-care. This has led to an increase of health related ICT (eHealth/mHealth) research [11-14] and practice [15-17]. Despite of documented benefits, many eHealth initiatives have failed to realize predicted benefits in practice, and as a result health professionals are often sceptical and less supportive of eHealth technologies [14].

Research show that use of ICT also has an important role and potential to support continuous training and learning [18, 19] especially on informal learning activities [18, 20, 21]. While social media is well established and used in the external communication, it is only in recent years that focus has been on the use of social technologies for informal communication, collaboration and learning within organizations [22-25]. Current research highlight that engagement in social media and use of online tools for knowledge sharing and collaboration can be a key way for health professionals to continuously learn and incorporate lifelong learning principles in daily work [26-28].

Successful design and implementation of ICT in health care demands an understanding of the context, both on an organizational level but also on an individual level [13, 14, 29]. Practical experiences point out that many IT systems are perceived as time-consuming, non-user friendly, poorly integrated in medical practice and incompatible with each other [25, 26]. As a consequence it is fundamental to examine individual physicians' perception and experience of ICT, its use and potential in practice.

The aim of this study is to gain a better understanding of physicians' perception of learning in the workplace, and to explore how ICT in various ways can support and contribute to information related activities such as collegial communication, collaboration, knowledge sharing and keeping up to date. The research question is: *How do resident physicians' experience everyday learning in connection to information related activities and ICT, both as individual specialists and as members of a community?*

2 Theoretical background

Learning in the workplace may occur in different forms and takes place in different settings. It is common to distinguish between formal, non-formal and informal learning. Formal learning usually refers to learning that is organized and structured, leading to certification. Non-formal learning is structured but occurs outside the formal education system, for example courses organized by workplaces. Informal learning refers to learning acquired through every day work, not organized or structured in terms of objectives, time or learning support [3, 30, 31].

A review of the literature on informal learning in the workplace by Le Clus [32] showed that informal learning is often spur-of-the-moment learning and self-directed,

highlighting the importance of social context for the learning and concludes that if informal learning emerges during everyday activities in the workplace, there is potential for this type of learning to occur more often than formal learning. According to Eraut [33, 34] most learning in the workplace is informal and consists of both learning from others and from personal experience, and although informal learning contributes to most of the learning in workplaces (70-90 %) it is often not looked upon as learning but instead occurs as a by-product of engaging in work activities.

The notion that learning is a social process embedded in everyday life and work, as opposed to merely the acquisition of knowledge and skills, is central for theories of situated learning and communities of practice [35, 36]. According to this perspective learning and knowing is related to engagement in practice through participation and interaction with others, and the informal learning that comes with it [37]. More recent work by Wenger et al. [38] introduce the concept of knowledgeability as an outcome of learning with respect to a landscape of practice rather than focusing on a single community of practice, referring to social learning capability and professional knowledge as something not only associated with competence in specific practices but a negotiation of identity and claim of competence in and across an increasingly complex landscape of practice.

Research on physicians learning has shown that traditional education focus on formal learning and medical or scientific knowledge, which might not provide the students with other skills necessary needed throughout their working life [39], such as evidence based practice and lifelong learning [40] or ICT skills [13, 41]. Hansson and Marklund [42] highlights in a Swedish study that resident doctors believe it is important to acquire a scientific and critical way of thinking in order to be able to examine their own practice and to respond adequately to the patients' questions and that the education should relate more to their own everyday practice. Reflection and reflective practice has long been recognized as an important part of continuous professional development in healthcare [43, 44]. According to Schön [45] there is a difference between reflection in action (during the experience, at point of care when treating patients in clinical practice) and reflection on action (in retrospective, after an experience or particular situation has happened, consulting colleagues or the literature). Although the original focus of this distinction was on individual reflection, as shown by Prilla et al. [46] it also applies to collaborative reflection.

Within research on information behaviour, there has been an increasing interest in health professionals' information seeking as a result of rapid growth of medical information [47]. Earlier studies have mainly focused on physicians' information needs and use, with emphasis on formal information sources related to either keeping up to date or clinical treatment and patient care [48, 49]. More recent studies have focused on information seeking in context, highlighting information access, usability issues and information overload [50, 51]. Also access to online health information is challenging the professional identity and redefining roles of physician and patient [52].

Many studies on ICT and information seeking in health care focus on how the new technology can help increase efficiency, patient safety and quality of care (from the individual doctor's point of view), and do not have learning as their focus. They do emphasize on the benefits of ICT for education purposes and training, but do not look

at learning as such. Although not explicit, the new technology is seen as useful for learning purposes such as: search for information and answers to questions in everyday clinical practice (individual learning); communication, collaboration and peer-to-peer learning (collective learning); the introduction of standards, best practices, guidelines and recommendations (organizational learning).

3 Methodology

This study is based on 15 individual semi-structured interviews with Swedish resident physicians. The research approach is qualitative, which is appropriate since the purpose of the research is explorative, aiming at gaining deeper understanding of the meanings, experiences, and views of the physicians [cf.53]. The interviews were transcribed and analysed first manually and later with the qualitative data analysis software NVivo 10 [e.g.54]

3.1 Setting and Participants

Resident physicians are a typical specialized profession, which has long been committed to lifelong learning. They practice as physicians but are also engaged in a minimum of five years continued clinical training towards specialist competence. In Sweden this is the responsibility of the public health authorities, not the higher education [55].

There are a number of different documents and frameworks that directly or indirectly control and imposes on physicians to keep up to date and continuously learn in professional practice. All members of the health care staff are to carry out their work in accordance with science and proven experience, and the patient shall be given competent and attentive health care that meets these requirements [56]. Working with Evidence Based Medicine (EBM) means integrating individual clinical expertise with the best available external clinical evidence from systematic research [57].

3.2 Data Collection and Analysis

Semi-structured interviews were conducted with individual physicians, attending a course on scientific approach during the spring semester 2015, as part of their specialist medical training[1]. The research project was introduced to the physicians at the beginning of the course. Thereafter an invitation to participate was sent by email to all attendees. The invitation email was explaining the purpose and objectives of the study, also emphasizing that although the study was carried out in connection with the course, the intention was not to evaluate the course or knowledge level of participants.

[1] The regulations and general guidelines for doctors' specialist medical training by the Swedish National Board of Health and Welfare (2008), stipulate that the trainee should acquire a scientific approach, by attending a course and by carrying out an individual written work.

There were totally 24 course attendants, 18 agreed to participate in the study and a total of 15 interviews were completed. Each interview lasted for about 1 hour and was recorded on tape. Prior to the study two pilot interviews were carried out to test the interview guide, resulting in minor adjustments. Informed consent was obtained according to Codex Rules & Guidelines [58].

The interview guide was developed by the researchers, with expertise in scientific methods and workplace learning, together with a senior physician experienced in qualitative methods in the selected population. It was structured around three key themes, as shown in Table 1, with open, explorative questions, aiming to encourage the respondents to talk freely on the subjects.

Table 1. Semi-structured interview guide

Question themes	**Aim/purpose**
Continuous professional development (CPD) and learning in the workplace	Gain a deeper understanding on information seeking in relation to continuous learning, and to identify formal and informal networks for knowledge sharing and exchange of experiences.
Information use and needs in the clinical practice	Obtain an understanding of problem solving in the clinical work, including the physician-patient relation, with regard to communication and information aspects.
Information and communication technology (ICT) and views on the future	Identify what challenges and opportunities resident physicians relate with use of ICT, and explore their views on digitalization and use of mobile technology (for learning and information seeking) in the working life of today and in the future.

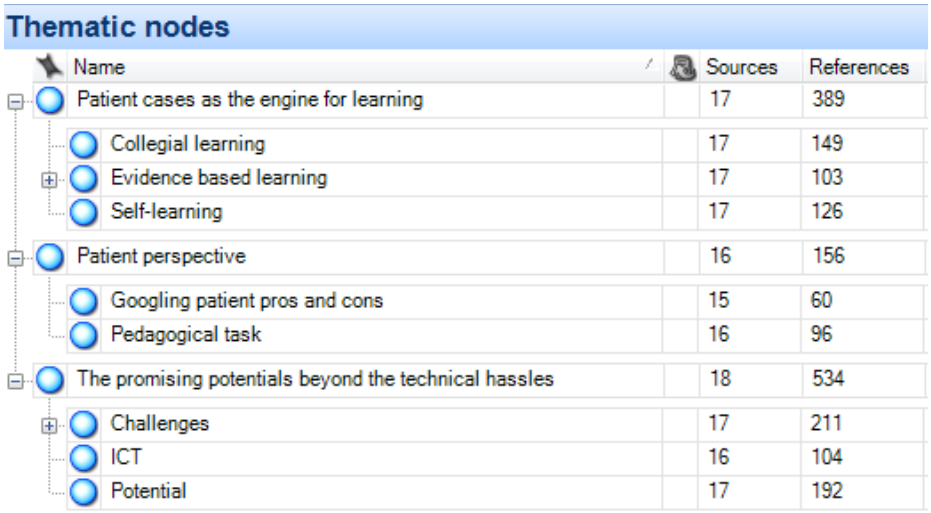
Initial analysis was conducted manually by the interviewing researcher. All interviews were transcribed and read through multiple times with the purpose to obtain a sense of the whole material. Key words and interesting aspects were highlighted, and reflections, impressions and observations from the interviews were written down as field notes. All interview transcripts and field notes were formatted and imported into NVivo. Interview data were read and coded iteratively, followed by a process including multiple coding to different nodes and recoding nodes into broader/narrower themes during analysis. A basic coding scheme with was developed with descriptions of each node and secondary analysis were conducted by a second researcher.

4 Findings and Analysis

The results are presented according to the themes, as shown in fig. 1: *patient cases as the engine for learning* (self-learning, collegial learning and evidence based learn-

ing), *Patient perspective* (googling patients pros and cons, pedagogical task) and *the promising potentials beyond the technical hassles.*

Fig. 1. Thematic nodes, sources and references coded



4.1 Patient Cases as the Engine for Learning

Self-learning. The participating physicians had a strong focus on their own responsibility for learning. Many of them expressed this as a matter of professional identity, being a doctor is about being reflective, analytic and continuously keeping up to date:*"...but it is also a part of work, to always trying to learn and keep updated and work from the best knowledge available"*. Also relating this to patient responsibility, as a doctor you need to make important and well informed decisions about your patients every day: "*And you want to sleep well at night, knowing you have treated your patient the best way possible, so you read, you search, you learn*". Thus, underpinning this focus, and related to all patient cases were continuous ongoing learning activities, to prepare and study, consulting colleagues and experts, follow up etc. Related to self-learning the physicians also talked about the responsibility of always to be prepared to back up decisions with liable arguments based on evidence, not on personal opinion. On the one hand a critical approach is essential for making decisions based on individual experience and judgement, as well as listening to and learning from colleagues and experts, and on the other hand following procedure and recommendations for treatment and common best practice. Throughout the interviews the physicians expressed this as being a balance in the progression of becoming a specialist: "*it used to be that I had to search because I didn't know, but now I have more experience and searching is more for confirmation*" But with experience comes also a

risk to lose motivation for learning "*and you think you know because you learned it a long time ago, but now to take the time to search and keep updated on things you know, you just don't have that time*". Several commented on reading medical news in trade press and journal articles at evenings or on the bus to work, but explicit or implicit not defining it as "real" work. Much the same as with patient administration which is a lot about self-learning, but were often not looked upon as learning as such.

Collegial learning. The physicians talked also about how they participate in everyday collegial exchange with supervisors, colleagues and experts or consultants. They described how they learn in supervision, but also function as a source for new and updated knowledge for the supervisor: "*there is a desire from the supervisor, and also a stress I think, to learn from me, because I have the new updated knowledge*" Learning from and with colleagues were highlighted by many as an important part of day to day learning, also to a great extent driven by patient cases creating a learning situation: "*We have weakly staff meetings where we discuss patient cases, but we also have open doors and a lot of discussions during the day, and I think this is really how I learn the most*". Informal learning in the workplace was often addressed from the individual physician's point of view, described in relation to solving problems or asking or questions ad hoc, as they occur in the daily work. From an ICT perspective it is interesting to note that the physicians also called for better structure and more systematic and organized forms for collegial exchange of experiences. They saw the need for collegial learning, confirming it as an important way of learning at work, but hard to maintain "*when the responsibility is imposed upon individual physicians"*.

Evidence Based Learning. The physicians expressed high awareness of the EBM approach to summarize and give recommendation for treatment, based on the best available research evidence: "*As a physician you are trained in critical thinking […] and pretty used to stand upon summarized regulations and guidelines.* Many expressed feelings of concern and anxiety as well as to frequently have bad conscience not doing or being enough when it comes to learning and information seeking: "*you don't have time to search for evidence based research, so you just have to go on your own knowledge, and be confident in yourself that you can stand for your decision*"

Condensed Information Site. All of the respondents described that they use the internet daily for seeking work related information, to check for facts or specific documents, or for confirmation: "*So I Google a lot, but it's not like I learn new things, It's more of relearning or refreshing of knowledge that I already have but have forgotten at the time"*. It was also common to use Google as an alternative to bookmarks in the web browser, i.e. to google things you use often both out of convenience and on purpose not to miss out on new search results. The physicians' information seeking and choice of sources had a lot to do with what type of information that was needed at the time which was mostly short and fast answers to specific questions related to the patients or work task at hand. Besides confirmation and fact-checking, Google was used for image seeking (e.g. dermatological) and for finding clips on YouTube. These were regarded as being useful for instructions on how to perform certain procedures, either

as information for the doctor or to show to a patient. Systematic information seeking using scientific databases was less common in clinical practices. It was judged as important but was more for specialisation and something done separate from the day to day work. In the everyday working with patients the physicians in general preferred local information and information written in Swedish: ”*It's not so advanced the daily work, I don't need PubMed for that, and in case it's more complicated, then there is always national guidelines or recommendation that I can trust*”.

Sources of Authority. Altogether the interviews present a similar picture with respect to online information seeking. The Swedish medical information sites internetmedicin.se and praktiskmedicin.se (practical medicine) were mentioned as the most important sources for information, often referred to as ”sources of authority”, and were commonly used for case related information seeking. Furthermore, trustworthiness and user-friendliness were highlighted by many of the physicians as important aspects, exemplified by Internetmedicin.se as having both reliable content and an information structure organized according to physicians working methods. Another common remark about internetmedicin.se was that the authors were selected as specialists and authorities in their field of expertise: “*Internetmedicin you can trust, because it's written by experts and then reviewed by other experts so you feel confident that you can go on those recommendations*”. Because of that, and since it is such a common information source among doctors, with many professionals reading and using it every day, it ought to be self-correcting (someone would react on incorrect or controversial information). In general the respondents claimed to trust their own judgement and ability to have a critical approach and way of telling if an information needed is trustworthy and correct: “*I can also tell my own opinion based on experience and regulations*” Although collegial learning was highlighted as important, there was also the opinion that turning to trustworthy internet based sources, representing ‘the common professional knowledge’, may in fact be a better option than getting a subjective opinion from a colleague or specialist at work.

4.2 Patient perspective

The physicians' major focus was on patient care, which is where and how you learn to be a doctor. Even though the subject was on ICT and physicians learning, it was significant how the patient perspective occurred as a cross-cutting theme throughout the interviews.

Googling Patient Pros and Cons. Patients who google their symptoms were pretty much seen as a common part of the daily clinical practice, and not perceived upon as particularly problematic. Several of the physicians commented from a patient perspective that it may cause unnecessary anxiety and worries for patients who misinterpret googled biased or incorrect information. Other than that most of them emphasized on the positive effects: ”*I think it's better when they have searched, because then I don't have to explain everything and that saves time*” and “*you may even learn, and sometimes it might even be helpful with ideas for diagnoses*”. Furthermore, when it comes

to more unusual diseases, the patient always knows best and contributes with knowledge: "*and in those cases it is obvious that the patient knows more than me so I don't think that is an issue at all*". It was less common among the physicians to search together with patients, but yet something they seemed to do on a regular basis, for example searching for drug related side effects, or looking up something the patient referred to in consultation. Very few commented at all on experiences of quantified self, that is patient generated data i.e. activity bracelets or patient apps for self-care.

Pedagogical Task. Several of the physicians reflected on the doctor-patient relationship and commented on an ongoing change in the medical profession leading them to take on a more pedagogical or consultative role: "*a challenge is to help the patient to reach an understanding, to explain in a pedagogical way so there is no unnecessary worry, and to obtain compliance*". This was described for example by how taking on responsibility and explain for patients is becoming an important part of the clinical practice. Also by comments that referred to patient information leaflets (1177, patientinformation.se) as a great way to inform the patient. They were aware that patients do not take in information during a consultation but now can go home and read and remember and come to a better understanding. Some of the respondents also commented on how patients may feel about the doctor using Google, that it might look unprofessional. But that neither was seen as a problem nowadays: "*you just explain that this is how we work now, we are modern doctors and have digital access to all this information, and everything is right here in the computer and as a patient you should worry more if we did not use it*".

4.3 The Promising Potentials Beyond the Technical Hassles

Lack of time and IT-related problems are well known challenges among health professionals as well as in modern work life in general, and was confirmed by this study. In particular the physicians expressed concern about the future and how to find time for learning and reflection as a completed specialist, considering there is little time to study even when it is scheduled as part of the specialist medical training.

The physicians emphasized heavy on ICT related problems at work and information overload, but were at the same time positive towards the possibilities with modern technology. They shared feelings of frustration due to overall outdated IT-systems and information environment: *"I just think that we are so far behind that it's embarrassing, patients take for granted that I know, if they've been in the hospital to where I have sent them, but I don't until I get a letter three weeks later, if I don't ask them to fax, so it's not really the 2000s"*. Also because there is much potential in the systems but it is not being put into practice. It was noticeable during the interviews a very separate view on private vs work, almost as if they take off their digital clothes, while change into work clothes, and also between "real" work as in patient care and health related ICT, and administration, such as intranet or reading e-mails. Something that also signals that caring and information work is very separate. They seldom mentioned social media or digital tools for collegial collaboration or patient communication spontaneously. But even so it was apparent that many of them did read and seek

for information, as well as having work related discussion outside of work. They expressed a similar approach to social media as something private and not work related: "*well, a barrier is that it is, that I want it to be private, I don't want anything work related here*" several stressed the importance of patient confidentiality especially in digital media: "*Facebook? No no, that's only private, no patient discussions*" But then there is the fact that the physicians' social networks, although viewed upon as private, are built up by student contacts from medical school and colleagues, which means there are a lot of doctor's talking informally. It was also common to read and follow discussions online, not make any comments in social media but bringing it up with colleagues at work for discussion. When it comes to apps and mobile technology, a few of them mentioned patient apps they knew of but had not really used any work related apps. There were some mentions of initiatives for seminars using skype and webcasting, as well as podcasts on specific subjects. In general the physicians showed little experience or interest in use of mobile technology, mostly explained because there was not something they needed in the workroom where there is always a computer available. When commenting on ICT they related this to technological advances in patient care, such as tablets for visualizing anatomy or sending images for direct expert opinion. Some of the physicians also commented on technology itself as an obstacle: "*it's not possible to fully concentrate on the patient and at the same time looking at a computer screen*". But on the other hand there were also examples described when the doctor and patient search and talk about what they read and learn together.

5 Discussion

It was evident that the physicians are well aware of that their occupation is highly specialized and undergoes rapid development. Consequently, lifelong learning and keeping up to date are regarded as a natural part of the profession. Professional development in terms of participation in formal training and acquisition of medical knowledge seems to almost go without saying. However, learning on the job was stressed as the most important form of professional development (i.e. clinical experience, treating the patient and informal collegial communication). This is in line with earlier research on informal workplace learning [cf. 34] and further underline the importance of finding ways to better incorporate work and learning and bring awareness of informal learning as part of physicians continuous training.

Findings from this study illustrate a shift that has taken place in recent years towards a more evidence based practice. An approach which now seems to be well integrated in the clinical work. Before EBM medical decisions were to a large extent left to the individual physician, who had to judge necessity of research evidence, and merge this with previous experience and beliefs, possibly with nearby colleagues as counsellors. It is clear that this process nowadays is done on a higher gear, where evidence is essential and collegial advice is available not only among local peers but also in a global collegial community, due to the Internet.

This study has shown that workplace learning activities prompted by handling patient cases were considered as a major aspect of all learning. The physicians clearly expressed that learning is strongly related to the frequency of patient cases. Patient cases can be regarded as an engine which demands that the physician merge EBM, own and collegial experience into a decision which takes account to the characteristics of the individual patient. This was described both as a blessing and a burden. The physicians seemed to find it difficult to navigate and relate between their own knowledge (practical and theoretical), patient preferences and collegial learning. Thus, the challenges are not caused by time and resources only, but also by a concern and anxiety about corresponding to the diverse aspects in a holistic manner, and that in turn is the engine for activating the learning.

Regarding ICT, there was a duality of views. Although the physicians brought up a lot of IT-related problems in the interviews, ICT was accepted as a central part of the information society, and there was a positive attitude towards the possibilities, especially in relation to access information. The dominant role of ICT for the medical practice is highlighted by the physicians' reflections over the technical development and how they had hard to understand how doctors used to work before, when there were no computers and no internet. There were also many suggestions for improvements, both with regard to the "personal working environment", where better use of ICT could facilitate access to patient related information as well as, and integrated with, easy access to decision support systems, evidence based information and more practical information for learning purposes and documentation of experiences.

Given this, one may wonder how ICT could support physicians in their profession and continuous learning. Obviously patient cases are the main core of the physicians' everyday work, and it is also the engine for a number of learning activities. From a workplace learning perspective it is easy to make a parallel to the use of case methodology in teaching. One final ingredient in working with a case in education is to review and reflect over the learning process [59, 60]. This also goes hand in hand with the concept of "reflective practice", which implies that the experience alone is no guarantee for learning, it must be complemented with reflection [45]. Some of the physicians mentioned the importance of collegial discussions regarding guidelines, regulations and also "ungoogleable" questions, i.e. questions that are more a matter of judgment than searching for facts or confirmation. However, beyond these comments most of the collegial discussions seem to be focused on finding the best decision for a specific patient. Perhaps a more reflective approach and reviewing of how decisions are reached could constitute an important part of the continuous learning for both the individual physician and the collective. Considering that ICT and use of social media have been identified as a way to support workplace learning [26] our findings suggest that there is potential for information systems that facilitate i.e. saving anonymised patient cases for learning purposes and integrate functions for sharing and storing experiences and knowledge in everyday work.

6 Conclusion and implications

"Medical care is often said to be the art of making decisions without adequate information" [61]. This study has illustrated how evidence based practice, health related ICT and digitalization of working life and learning is changing the healthcare landscape and the role of the physician. Thereby, making modern medical care the art of knowing how to best navigate the vast amount of adequate information available; own experiences with recommendations, regulations and the collected knowledge of collegial expertise and the Internet, and then balance this with the new emerging role of patients as co-creators and partners in care.

Overall this study has contributed to a better understanding of how physicians engage in information activities related to learning at work, and the role and potential of ICT as support for learning in the working life of health professionals. Findings confirm some already known problems regarding lack of time and resources and IT-problems as well, highlighting the need for better integration of continuous learning in physicians' everyday practice and information systems more adopted to physicians working methods. Moreover though, this study have shed some light on the complexity of digitalization and how it's affecting this group of young/newly trained resident physicians, who as it seems are facing day-to-day challenges, a new professional role and a changing healthcare landscape with confidence and careful optimism.

Due to the fact that there is an existing culture of mistrust regarding some of the old systems, it is important that the new era of supporting ICT must be based on the work and learning situation in daily clinical practice. Solving the problems with technical hassles and incompatible systems not adopted to daily work will save time and reduce a lot of stress, frustration and irritation. This has implications both for research and practice: How could we find more user friendly tools for supporting informal learning at work? In which ways can ICT contribute to information seeking, knowledge sharing and keeping up to date in clinical practice?

Even though new technologies and systems require more learning, they might actually be a part of the solution as well. We believe that ICT and social media technologies could play an important role for enabling new ways of learning and supporting continuous learning for physicians. Better integration of both health related and administrative ICT as well as learning in everyday work is an important aspect. Designing personal working environment (PWE) could be helpful for sorting and filtering information. Finally, we believe that ICT support for more reflective practice regarding patient cases, may increase the learning usability of the systems substantially.

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