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Physician leadership in e-health? A systematic literature review

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Physician leadership in e-health? A systematic literature review

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Abstract

Purpose – This paper aims to systematically review the literature on roles of physicians in virtual teams (VTs) delivering healthcare for effective "physician e-leadership" (PeL) and implementation of e-health.

Design/methodology/approach – The analyzed studies were retrieved with explicit keywords and criteria, including snowball sampling. They were synthesized with existing theoretical models on VT research, healthcare team competencies and medical leadership.

Findings – Six domains for further PeL inquiry are delineated: resources, task processes, socio-emotional processes, leadership in VTs, virtual physician-patient relationship and change management. We show that, to date, PeL studies on socio-technical dynamics and their consequences on e-health are found underrepresented in the health literature; i.e. no single empirical, theoretic or conceptual study with a focus on PeL in virtual healthcare work was identified.

Research limitations/implications – E-health practices could benefit from organization-behavioral type of research for discerning effective physicians' roles and inter-professional relations and their (so far) seemingly modest but potent impact on e-health developments.

Practical implications – Although best practices in e-health care have already been identified, this paper shows that physicians' roles in e-health initiatives have not yet received any in-depth study. This raises questions such as are physicians not yet sufficiently involved in e-health? If so, what (dis)advantages may this have for current e-health investments and how can they best become involved in (leading) e-health applications' design and implementation in the field?

Originality/value – If effective medical leadership is being deployed, e-health effectiveness may be enhanced; this new proposition needs urgent empirical scrutiny.

Keywords E-health, Interdisciplinary collaboration, Implementation, Medical leadership, Human factor, Virtual teamwork

Paper type Literature review

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Introduction

The relevance and potential of health information technology (HIT) in healthcare delivery are widely acknowledged, and positive effects of e-health initiatives are reported over the past two decades (May *et al.*, 2011; Institute of Medicine, 2012). HIT can significantly improve communication and sharing of information, hence improving effective collaboration between often geographically and disciplinary dispersed (silos of) healthcare professionals (Eikey *et al.*, 2015; Dickson, 2009). Patients and their informal caregivers who increasingly participate as members of integrated care teams also benefit from the positive effects of HIT (Koch, 2013). Reports on virtually collaborating multidisciplinary teams describe the advantages of HIT as reduced time, effort and costs, while also providing patients and informal caregivers unique benefits (Rothschild and Lapidos, 2003; Emery *et al.*, 2012). In the face of healthcare's increasing complexity, there is a demand for effective HIT solutions and for their sustainable implementation to facilitate interdisciplinary team collaboration for better patient outcomes.

Like most innovations, implementing HIT entails a myriad of factors that can facilitate or block deployment; in the past decade, the enigmas of successful HIT adoption have been the object for many researchers (Mair *et al.*, 2009). Health professionals often swiftly acknowledge the advantages of HIT but act more hesitantly during actual implementation when changes in their roles, responsibilities and routines must emerge. Habitually, unintended consequences can occur when HIT is not appropriately aligned with collaborative processes, resulting in underestimated impact on daily routines often leading to ambiguity and undue stress (Melby and Hellesø, 2014; Ozbolt *et al.*, 2012; Park, 2006). HIT research has mainly focused on technological aspects and sustainable integration within clinical workflow, but its effect on people and effective collaboration between healthcare professionals and others have received little attention (Eikey *et al.*, 2015; Sittig and Singh, 2010). Not until recently have researchers shifted from a mere technological and organizational orientation toward attention to socio-technical and human-factor dynamics and, in particular, to focus on how effective day-to-day work processes and collaboration between people and in teams is affected by HIT (Callen *et al.*, 2008; Mair *et al.*, 2012). Clearly, research on how health professionals' roles may change (including the required specific skills for effective virtual teamwork in healthcare) is still in its infancy (Park, 2006).

Because numerous e-health initiatives have underperformed or failed, more scientific insights into factors that facilitate or inhibit user engagement and participation could be beneficial (Mair *et al.*, 2012). It is in this light that the relevance of medical leadership competencies may emerge, especially relating to change management, healthcare system innovation and HIT use. There is an increasing evidence on the importance of leadership and, in particular, physician leadership on healthcare quality and innovation (West *et al.*, 2015; Ingebrigtsen *et al.*, 2014). Moreover, currently all major leadership competency frameworks in Europe and North America foresee or reflect a role for physicians in HIT and its implementation (Dickson, 2009; FMLM, 2015; Keijser *et al.*, 2015). Fundamentally, transformation in healthcare entails imperative changes in group norms and behavior (Johnson and May, 2015). Based on recent experiences and current literature, one would assume that physicians play crucial roles in successful HIT-facilitated healthcare transformation. Our aim was to examine the extent to which knowledge on leadership related to virtual teamwork (hereafter, VT-work) had permeated into the field of healthcare and, in particular, related to physicians. Therefore,

the current review study addresses the question – what kinds of leadership roles do physicians play in VTs in healthcare settings? Before we consider leadership issues in this paper, we include in this review the VT context in which more and more physicians operate. Before we synthesize the content of what we know thus far, we delineate the way in which the 44 included papers that we review were being targeted.

Methods

The aim of this systematic review was to provide an overview of recent literature on physician leadership related to VT-work in healthcare by identifying and synthesizing currently available studies in this particular area. The method of this systematic review follows the grounded theory literature review approach of Wolfswinkel *et al.* (2013), building on what these authors describe as the iterative stages of systematic reviewing: define, search, select, analyze and synthesize.

Define

The first review step involved carving out the review's scope before the actual search was performed; based on iterative discussions between the authors, it was revisited and reformulated during the search for studies. Defining includes identifying relevant databases, determining appropriate outlets and deciding on specific search terms and queries per selected database. Based on initial exploratory searches, PubMed, Scopus, Web of Science, PsycINFO and ScienceDirect were selected as electronic databases. Choice of specific search terms was based on main constructs within the research question (i.e. physician e-leadership, telemedicine, e-health implementation, VT-work and interdisciplinary collaboration) and on an examination of a sample of articles ($n = 20$) fitting very well in the research area of interest. Synonyms for these terms were extracted from other published work, until saturation was reached.

Search

Comprehensive electronic searches were conducted between September and October 2015 and were repeated in March 2016 to include the latest publications. Database limitations were set to articles published between 1995 and 2016 and to papers in the English language. As part of an extended search strategy, reference lists of eligible records were screened for an additional literature based on forward citation screening, backward citation screening and hand searching. Lastly, the authors hand-searched the internet for additional records, such as databases of Institute for Healthcare Improvement and Agency for Healthcare Research and Quality. All references found were exported to Endnote software version X7.4, including information about title, authors, outlet, key words and abstract; duplicate results were removed.

Select

Titles, abstracts and keywords of all records identified by the search were independently double-screened by two authors (LP and JS) to ensure consistency and agreement. Eligible studies had to refer to:

- healthcare setting;
- virtual collaboration between actors (including, but not limited to, physicians, allied healthcare professionals, informal carers and patients); and
- aspects of leadership (e.g. characteristics or attributes).

Papers were excluded if reflecting (medical) leadership but not generalizable to a physician's workplace; virtual leadership in non-healthcare settings; education, (virtual) simulation or training curriculums; solely patient-patient interaction (not including any healthcare professional).

During the abstract-screening process, an average inter-rater reliability of 98.1 per cent (Kappa = 0.88) was established, which can be considered as a good agreement between the two reviewers (Landis and Koch, 1977). Any variation between the reviewers was resolved through discussion and a third reviewer (WK). Full-texts were retrieved for articles deemed eligible for further analysis. Retrieval rate was augmented by requesting articles from original authors, only when a text could not be immediately retrieved electronically. In addition, the help of a librarian was sought to obtain the few remaining missing records.

Analyze

Retrieved full-text articles were divided equally between three reviewers (LP, JS and WK), who successively analyzed their assigned papers independently, using the process of open coding, meaning that each finding, insight or concept deemed relevant to the scope of the review and research question was marked.

Synthesize

One author (WK) synthesized the data into higher-order themes and categories, using a combination of axial coding (i.e. further developing categories and sub-categories) and selective coding processes (i.e. integration and refinement of concepts and themes) (Wolfswinkel *et al.*, 2013). Additionally, WK consulted original articles in case more contextual information was needed to interpret the extracted data.

Following Sadoughi *et al.* (2013), no assessment was made of the quality of the selected articles; given that the data analysis was done on words and phrases, valuable insights from methodologically "weaker" but conceptually sound articles would otherwise have been lost.

Results

Based on titles and abstracts, the initial search resulted in 917 records; full-text assessment of their eligibility came to 80 publications, out of which 44 papers were included for data analysis (Figure 1).

The final search results yielded a wide range of text types (e.g. empirical studies, literature reviews, case studies, conference reports, dissertations, book chapters). Included papers reflected VT-work in a variety of healthcare settings, including integrated healthcare (e.g. chronic disease management; home telecare programs; multidisciplinary team consultations; virtual integrated practice), thematic collaborations (e.g. healthcare quality improvement initiatives; communities or practice) and patient-centered online programs.

All abstracted data from included (initial, snowball and hand searched) records were thematically synthesized, resulting in six themes described below. The thematic synthesis was based on three themes proposed earlier by Powell *et al.* (2004): Theme 1: resources, Theme 2: task processes and Theme 3: socio-emotional processes. All included papers were also screened for any specific leadership content (Theme 4: physician VT leadership). Additionally to these four themes, two new themes emerged – Theme 5: virtual physician-patient relationship and Theme 6: change management.

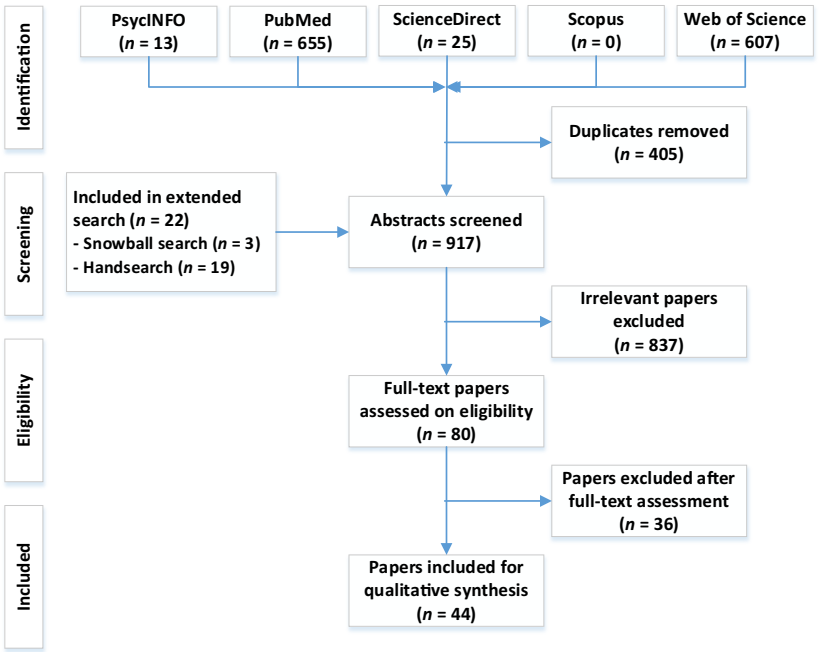

Figure 1.
Flow diagram of systematic review steps

Theme 1: resources

In the studied papers, several authors report that clearly outlined roles and responsibilities and the use of standardized work processes and (quality) procedures are essential "resources" for VTs in healthcare (Table I). These pre-set resources are vital for a shared mental model, facilitating day-to-day team operations, effective information sharing and team dynamics. Additionally, internal and external resources are fundamental for team members' embracing of each other's roles and responsibilities and consequential needs related to tasks and actions, including effective task delegation (Rothschild and Lapidos, 2003).

Moreover, several papers depict training as an important resource for team members. Adequate training is preferably organized during early phases of team development, should be based on real-life situations and address technical tasks (e.g. efficient e-mail use). Also, training should be organized jointly for all members of an interdisciplinary VT (e.g. physicians, allied healthcare and social care professionals) (Prahl *et al.*, 2015).

Theme 2: task processes

Technology used for communication and information sharing should be well fitted to the task, and clear procedures must be set and upheld about the conditions under which team members communicate synchronously or asynchronously ("planned communication") (Rothschild *et al.*, 2004). Additionally, all team members must know of and adhere to clear team norms, roles and responsibilities, and consensus on task divisions and job sharing in VTs helps to establish the balance between (shared) tasks and team goals (Kvamme *et al.*, 2001).

Sub-themes	Items	Papers
Theme 1: Resources		
Design, technical expertise and training	Standards and guidelines on e.g. processes, quality, problem-solving	(Cowan, 2014) (Kvamme *et al.*, 2001) (Rothschild and Lapidos, 2003) (Rothschild *et al.*, 2004)
	Training targeting necessary skills, based on real-world conditions	(Bhandari *et al.*, 2011) (Butler *et al.*, 2014) (Cook and Whitten, 2002) (Jarvis-Selinger *et al.*, 2008) (Prahl *et al.*, 2015) (Kildea *et al.*, 2006) (Saliba *et al.*, 2012)
	Strategies and creative adaptations for team and resources constraints	(Butler *et al.*, 2014)
Theme 2: Task processes		
Communication, coordination and "task-tech-fit"	Standardized pre-selection of communication modality	(Rothschild *et al.*, 2004)
	Clear roles and responsibilities	(Kvamme *et al.*, 2001) (Rothschild and Lapidos, 2003)
	Skills, norms and regulations	(Bartz, 2014) (Fielding *et al.*, 2005) (Kane and Luz, 2006)
	Communication device-specific skills	(Bartz, 2014) (Lankshear *et al.*, 2010) (Ozbolt *et al.*, 2012)
	Effective information exchange	(Cowan, 2014)
	Synchronization of work routines and rhythm	(Bartz, 2014) (Kane and Luz, 2006) (Jarvis-Selinger *et al.*, 2008)
	Preparing, chairing and attending teleconferences	(Jarvis-Selinger *et al.*, 2008) (Kerfoot, 2010) (Kane and Luz, 2006) (Bartz, 2014) (Probst and Borzillo, 2008) (Barnett *et al.*, 2012)
Theme 3: Socio-emotional processes		
Relationship building, cohesion and trust	Relationship between members	(Cowan, 2014) (Minnick *et al.*, 2008) (Holland *et al.*, 2009)
	Investing in team trust	(Bhandari *et al.*, 2011) (Rothschild and Lapidos, 2003) (Kvamme *et al.*, 2001) (Kane and Luz, 2006) (Bartz, 2014) (Chopard *et al.*, 2012)

Table I.
Themes 1, 2 and 3: characteristics of VTs in healthcare (based on Powell *et al.*, 2004)

Several authors stress efficient technical communication skills for VT-work in healthcare, including use of phone, text messaging, e-mail and teleconferencing (Lankshear *et al.*, 2010; Bartz, 2014; Ozbolt *et al.*, 2012; Prahl *et al.*, 2015). Authors describe the technology-related aspects of VT-work in healthcare that contribute to a variety of dissimilarities with conventional teamwork in healthcare. In daily practice, mainly temporal and coordinative types of concerns seem to challenge effective VT-work. Both asynchronous and synchronous virtual communication and information sharing require timely response on electronic enquiries (Ozbolt *et al.*, 2012), effective use of information exchange methods (Cowan, 2014), effective VT-meeting skills and attitudes, as well as adherence to norms and regulations for virtual meetings (e.g. turns

to talk; silences; adherence to starting time) (Kane and Luz, 2006; Bartz, 2014; Fielding *et al.*, 2005). For instance, basic HIT solutions, such as e-mail, facilitate low-cost and easily accessible, asynchronous communication (Prahl *et al.*, 2015). Nevertheless, e-mail can generate friction between sender and receiver, in case of unmet expectations relating to response times. Likewise, increasingly used teleconferencing applications hold many advantages for multidisciplinary collaborating over geographical distances. Being a synchronous communication method, work rhythms across all participating entities must be synchronized to the designated time of such a virtual session. Teleconferencing also presents practical challenges inhibiting multidisciplinary care provision, e.g. planning of synchronous presence of participants (Kane and Luz, 2006; Jarvis-Selinger *et al.*, 2008). Moreover, experience has shown that lack of pre-meeting preparations often detract significantly from teleconferencing efficiency (Kerfoot, 2010). For effectiveness of multidisciplinary teleconferencing, authors emphasize the importance of optimal preparation (Jarvis-Selinger *et al.*, 2008; Kerfoot, 2010; Kane and Luz, 2006; Bartz, 2014), efficient chairing (Probst and Borzillo, 2008; Barnett *et al.*, 2012) and synchronization of work routines and rhythms (Bartz, 2014; Jarvis-Selinger *et al.*, 2008; Kane and Luz, 2006).

Theme 3: socio-emotional processes

Working relationships in VTs are disposed to be weaker than those in conventional teams because of the lack of non-verbal clues and (informal) contact frequencies that can foster relation building. Lack of close interpersonal contact potentially destabilizes the team through misunderstandings in communication between team members, consequently causing problems in task performance and confusion between and isolation of team members (Cowan, 2014). Some authors suggest regular face-to-face encounters between VT members to sustain optimal relationship. Alternatively, "socializing moments" during virtual interactions, whether *ad hoc* or more structured, often initiated and facilitated by team leaders, can support development and maintenance of team trust (Rothschild and Lapidos, 2003).

Theme 4: physician VT leadership

None of the set of papers described specific (leadership) roles of physicians in VTs. Several authors do list characteristics and required attributes (i.e. knowledge, skills and attributes) of persons leading VTs (Kerfoot, 2010; Lankshear *et al.*, 2010; Park, 2006), but none specify roles or responsibilities of physicians. Leaders of VTs are seen to be responsible for establishing and maintaining communication and team norms; they must be able to virtually establish their "presence" for team members, so that the latter can perceive a sense of leadership (Cowan, 2014).

Some authors reflect on leadership during the implementation of HIT and identified effective leadership as knowledgeable about the HIT potential and capable of enthusiastically communicating a vision on e-health as an aid to healthcare transformation (Cook and Whitten, 2002; Ingebrigtsen *et al.*, 2014). From the studies, five physician VT-leadership sub-themes emerged (Table II).

Theme 5: virtual physician-patient relationship

Increasingly, HIT applications are also used by patients and informal caregivers to communicate with each other, as well as with their physicians and other care professionals. Modern integrated care teams often comprise active roles for informal care and self-care, making patients and their families and caregivers participate in the

Sub-themes	Items	Papers
Knowledge	Human resource management, service delivery processes, team culture development and coaching	(Park, 2006) (Kerfoot, 2010) (Cowan, 2014) (Lankshear *et al.*, 2010)
Skills	(Virtual) communication, technology use, conflict management, providing constructive feedback, team spirit, planning, risk and time management	(Park, 2006) (Kerfoot, 2010) (Cowan, 2014) (Lankshear *et al.*, 2010)
Attributes	Adaptable, flexible, enthusiastic, emotional intelligence, sense of humor, follow-up/follow-through, honestly, engaged, consistent, courageous	(Park, 2006) (Kerfoot, 2010) (Cowan, 2014) (Lankshear *et al.*, 2010)
Virtual presence	Realize perceived-leadership presence in team	(Cowan, 2014)
Transformation	Knowledgeable of and enthusiastic about the transformative potential of e-health	(Cook and Whitten, 2002) (Ingebrigtsen *et al.*, 2014)

Table II.
Theme 4: physician VT leadership

grander multidisciplinary healthcare team and in shared decision-making (Catan *et al.*, 2015; Ozbolt *et al.*, 2012; Rothschild and Lapidos, 2003). Our study found several reports describing four sub-themes relating to this new domain of patient-centered healthcare because it also exposes new issues and concerns for physicians (Table III).

Information sharing. Although online healthcare related information potentially empowers patients, e.g. in shared decision-making, it can also lead to information overload (Catan *et al.*, 2015). Shared access to individual, patient-related information (e.g. personal electronic health records) could cause uncertainties for patients according to some clinicians because of the possible absence of adequate interpretation (Ancker *et al.*, 2014; de Lusignan *et al.*, 2014; Ozbolt *et al.*, 2012).

Effective planning and coordination. Patients who are actively involved in virtual communication and planning are at risk of encountering unexpected delays (e.g. tardy e-mail response from their physician) leading to much frustration (Beard *et al.*, 2012).

Sub-themes	Items	Papers
Information sharing	Effects and adequateness of lay public online healthcare information	(Catan *et al.*, 2015) (Townsend *et al.*, 2013) (Dedding *et al.*, 2011)
	Adequate level of information sharing	(De Lusignan *et al.*, 2014) (Ancker *et al.*, 2014) (Ozbolt *et al.*, 2012)
Effective planning and coordination	Adherence to standardized response times	(Beard *et al.*, 2012)
	Response back-up protocols	(Caligtan *et al.*, 2012)
Choice of modality	Patient and situation "task-tech-fit"	(Catan *et al.*, 2015) (Dedding *et al.*, 2011) (Ozbolt *et al.*, 2012)
Quality and risks	HIT limitations	(Jarvis-Selinger *et al.*, 2008) (Saliba *et al.*, 2012) (Chopard *et al.*, 2012)

Table III.
Theme 5: virtual physician-patient relationship

Mishaps in online planned or scheduled (clinical) activities could also frustrate patients' expectations of their care team's performance because patients are often unaware of the many events and uncertainties that may cause delays or deviations to plans (Caligtan *et al.*, 2012).

Choice of modality. Well-balanced "task-tech-fit" seems to apply also in the patient–physician relationship. From the perspective of a patient's feelings and comfort, face-to-face meetings remain fundamental to patient–physician relationship but also because of medical procedures and quality (e.g. physical exam) (Catan *et al.*, 2015; Dedding *et al.*, 2011). It is argued that physicians must be able to judge for each patient and situation the appropriateness of the use of virtual communication (Ozbolt *et al.*, 2012).

Quality and risks. Bearing the final responsibility, physicians must also ensure healthcare quality in both virtual and face-to-face consultation with patients. It is suggested that they must also become well-trained in HIT-related limitations, such as confidentiality, and be knowledgeable about the great variety of relevant regulations (Chopard *et al.*, 2012; Jarvis-Selinger *et al.*, 2008; Saliba *et al.*, 2012).

Theme 6: change management

Papers studied reveal a significant relation between successful HIT implementation and the role of physicians, in particular, within the domain of change management. Furthermore, many authors reflect the unambiguous tension between innovations and physicians, and physicians are frequently being seen as either facilitator or impediment to implementation efforts. Experiences are reported of physicians who are slow to accept changes, are not used to HIT, have unrealistic or suboptimal expectation of HIT and who criticize HIT quality (Catan *et al.*, 2015; Kvamme *et al.*, 2001; Mair *et al.*, 2009; Emery *et al.*, 2011). Furthermore, HIT leadership on different organizational levels seems to be associated with successful implementation outcomes throughout different implementation phases (Ingebrigtsen *et al.*, 2014). Implementation topics in relation to physician e-leadership (PeL) resulted in the four sub-themes (Table IV).

Sub-themes	Items	Papers
Physician champion	Encouraging others in HIT use	(Kvamme *et al.*, 2001) (Greenhalgh *et al.*, 2010) (Rufo, 2012) (Mair *et al.*, 2012)
	Facilitating complex clinical pathways redesign	(Nasir *et al.*, 2013) (Horton, 2008) (Rufo, 2012)
Implementation training	Skilled in implementation-related leadership	(Cook and Whitten, 2002)
	Knowledgeable about change management strategies	(Rufo, 2012)
Optimal support	Executive sponsorship	(Catan *et al.*, 2015)
	Dedicated and protected time	(Butler *et al.*, 2014) (Cranley *et al.*, 2011) (Rogers *et al.*, 2014) (Emery *et al.*, 2012) (Barnett *et al.*, 2014) (Boushon *et al.*, 2006) (Calciolari, 2011)
End-user-based design	Involvement in design, implementation and evaluation	(Butler *et al.*, 2014) (Bhandari *et al.*, 2011) (Rufo, 2012)

Table IV. Theme 6: change management

Discussion

To the best of our knowledge, this paper is the first that systematically reviews the literature on the role of physician leadership in virtual collaboration in healthcare contexts; we did so with the aid of a systematic review method.

Most prominent in this study is the lack of insightful academic writing on physician e-leadership. To date, no single empirical, theoretic or conceptual study with a focus on physicians in VT-work was identified. Even though the literature reveals meaningful similarities and differences between conventional and VT-work in healthcare, little serious attention is paid so far to the entirely different roles physicians are likely to play within the various, rapidly emerging digitalized team contexts.

Our study reveals many similarities of healthcare VTs and characteristics depicted in the literature on general VT-work as described earlier by Powell *et al.* (2004) and several other authors. All three themes, fundamental to VT-work in general, were substantially represented in the literature scrutinized in the current study. The authors therefore argue that from a research perspective (Powell *et al.*, 2004), VTs in healthcare are similar compared with VTs outside the healthcare domain. However, building further on the primary question of this study – what kinds of leadership roles do physicians play in VTs in healthcare settings? – our synthesis of data reveals three new themes.

"Physician VT Leadership" (Theme 4) describes a series of knowledge, skills and attitudes necessary for persons leading VTs in healthcare. Nonetheless, without exception, the described leaders in healthcare VTs had primarily nursing backgrounds. Although most physicians do not have coordinating HIT tasks, such as nurse-managers (Cowan, 2014), one may assume that some (similar and different) leadership tasks identified herein are generalizable to physicians in their roles as VT members. In some VT settings, it might even be beneficial for those who take on the leadership role to have had medical training.

A fifth, new, theme "Virtual physician-patient relationship" emerged based on several authors reporting on the effects of HIT on physician-patient relationship. Not only are some physicians less information technology savvy than their patients, many show a reluctance to share information or use electronic messaging because of the risks, such as inadequate interpretation (Ancker *et al.*, 2014; de Lusignan *et al.*, 2014; Ozbolt *et al.*, 2012). Besides the beneficial role of online healthcare related information to patients (e.g. in shared decision-making), some authors describe concerns about the extra time needed to explain internet information that patients looked up, shared decision-making procedures or other HIT-related impacts on their traditional levels and mechanisms of power and authority (Catan *et al.*, 2015; Mold *et al.*, 2015; Townsend *et al.*, 2013; Walker *et al.*, 2009; Dedding *et al.*, 2011; Kurki *et al.*, 2011). In contrast to probably all VTs in general, the uniqueness of the physician-patient relationship brings about several specific sub-themes that have to be taken into account in healthcare VT-work. Some papers describe a change in liabilities and responsibilities of physicians using HIT in their patient encounters. For example, for each patient and situation, physicians should be able to judge the appropriateness of the use of HIT ("task-tech-fit") (Catan *et al.*, 2015; Ozbolt *et al.*, 2012; Dedding *et al.*, 2011). These new issues and concerns for physicians and their organizations call for consideration when (contemplating) using HIT for communication or information sharing with patients.

We identified a sixth theme, "Change management", presenting several new competencies and skills and prerequisites applicable to physician's leadership role in HIT development, implementation and sustainment. Studies describe "champion" physicians leading HIT implementation and promoting its use to colleagues (Kvamme *et al.*, 2001; Rufo, 2012; Greenhalgh *et al.*, 2010; Mair *et al.*, 2012). Physicians sometimes experience deficient organizational support and "top-down" executive leadership. Furthermore, distrust or (cultural) conflict between physicians and their healthcare organizations can hinder HIT adoption (Catan *et al.*, 2015). Organizations must invest in dedicated and protected time for clinicians to engage in and move forward with practice improvement work, also to prevent staff burnout and "innovation fatigue" (Butler *et al.*, 2014; Cranley *et al.*, 2011; Rogers *et al.*, 2014; Boushon *et al.*, 2006; Calciolari, 2011; Emery *et al.*, 2012; Barnett *et al.*, 2014). Active analysis by and input from front-line professionals, such as physicians, is highly needed. Their expertise is deemed essential for optimal design and evaluation of HIT and not least its implementation strategies (Bhandari *et al.*, 2011; Butler *et al.*, 2014; Rufo, 2012).

Practical implications

The deeply inborn physicians' motto "*primum no nocere*" ("first, do no harm"), cultured all along medical training and practice, is the foundation for safe healing but can also prompt physicians' defensive attitudes toward the impact of HIT in their entrusted relationship with patients. Bearing an end-responsibility for their patient's well-being, physicians must be able to ensure healthcare quality in both virtual and traditional teamwork with colleagues and other disciplines, as well as in face-to-face and virtual interactions with patients. Regarding the swift pace of HIT developments, the current generation of physicians might be inadequately prepared for a leadership role in VT-work, using HIT in virtual patient interactions and for managing the changes that HIT implementation requires.

Our study suggests a triple aim in educating and training the current physician workforce:

- VTs in healthcare resemble "networked teams", in which membership is frequently diffuse and fluid (Kaboli *et al.*, 2006). Because patients' status can change at any moment, healthcare teams often work like adaptive networked systems. This type of collaboration requires leadership skills that support a constant possibility of shifts in complexity of tasks and collaboration (Bohmer, 2012; Sittig and Singh, 2010). It may well be that the relative centrality of the physicians in traditional healthcare settings may go overboard in the increasingly VT settings. Hence, the degree to which or how physicians are effective in shifting to different *modus operandi*, along with the increasing digitalization of their work-team settings, must be a topic for new research and practical experimentation.
- Physicians must be trained in HIT usage and be facilitated in adequately responding to the potential disruptive effect of HIT on daily clinical work. Moreover, their training should comprise effective handling of HIT-related limitations, such as confidentiality, and being knowledgeable about the great variety of relevant regulations, policies and procedures, e.g. related provider agencies and health insurance plans, that could conflict with HIT use (Chopard

et al., 2012; Gantert and McWilliam, 2004; Jarvis-Selinger *et al.*, 2008; Saliba *et al.*, 2012).

- Historically, having acquired a leadership role, with adequate competencies, physicians should be able to provide guidance to others on how HIT systems should best be designed and deployed. In such a coaching role ("broker" or "boundary spanner"), physicians are potential champions and facilitators in HIT implementation (Page, 2003). These developments often necessitate delicate trade-offs at individual (micro-), team (meso-) and at organizational (macro-) levels (Kuziemsky, 2015). If empowered with the necessary understanding of change management theories and in influencing socio-technological dynamics (Rufo, 2012), physicians can bridge a multiplicity of interests within and between disciplines, facilitating the demanding dynamics related to process redesign and transformation of roles and responsibilities during HIT implementation.

Future research

Research on socio-technical aspects in HIT, including the effective roles that physicians may play, is clearly in its infancy (Saliba *et al.*, 2012; Mair *et al.*, 2012; Ozbolt *et al.*, 2012). There is a need for systematic study of physicians' experiences, their (possibly shifting) roles and responsibility and of the dynamics of the various types of VT-work in healthcare. Much needed, in our view, are studies aiming to chart the potential constraints and facilitators of involving and educating physicians in HIT design and implementation, so that we come to better understand HIT user experiences; potential harm to patients; impact on workflow, roles and responsibilities; best practices in change management and content and conditions of effective training in HIT use (Bartz, 2014; Guise *et al.*, 2014; Hsiung, 2000; Weppner *et al.*, 2010; Mair *et al.*, 2009).

Based on current insights gained from reviewing the intra-team dynamics of virtual healthcare work, we foresee a new term: "physician e-leadership", depicting the physician's roles as formal team member, balancing medical content leadership and process-type-of-followership. Such dual practices and research will need to be translated to contemporary training and (continuing medical) education. This is also imperative to prevent unnecessary "expensive administrative, commercially driven and government-led implementation disasters" (Hannan and Celia, 2013, p. 1160).

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