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A Systems-Thinking and Person-Centred Approach to Healthcare Communication

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Abstract

Objectives: Healthcare communication occurs within a complex system. Systems-thinking is an aspect of complexity science suited to integrating existing interpersonal, interprofessional, community and technological perspectives on communication, but there is a risk of depersonalising care. We therefore explored the role of systems-thinking and person-centred care in healthcare communication.

Method: We applied a system-thinking "toolbox" to the Institute of Medicines definition of the healthcare system to develop a concept map, and to explore implications on practice and person-centred care of systems-thinking in healthcare communication.

Results: The concept map integrated perspectives on communication and identified the central role of the electronic health record. Systems-thinking promotes a dynamic and interconnected view of communication; focused on improving the quality of care and reflecting important values such as person-centred care. Quality communication requires that outcomes of conversation are captured in a way that is findable, accessible, interoperable, and reusable.

Conclusion: System thinking alters our conceptualisation of healthcare communication and identified neglected communication interactions. Ways of integrating systems-thinking and person-centred care were identified. It is proposed that the clinical encounter be imagined as having three communication functions: exchanging information (task focused), building connections (relationship focused) and curating the medical record (documentation focused).

I INTRODUCTION

Systems-thinking is an influential concept that draws heavily upon the disciplines of engineering, computer science, physics, organisational psychology and an understanding of complex biological systems (Arnold & Wade, 2015). It may be understood as an attempted solution to the problem of complexity and a part of the discipline of complexity science (Rusoja et al., 2018). These inter-related concepts share an understanding of complex-adaptive systems that include human health, health-systems and learning-in-practice. The characteristics of these systems include that they are complex networks of multiple interconnected entities and that no one component of the network can be understood without reference to the others. Complexity is a major challenge to the traditional reductionist scientific model where a problem, like healthcare communication, is broken down into its component parts as interpersonal communication, interprofessional communication or community education. The interconnections and interactions between components are lost.

Systems-thinking has been defined in various ways as a perspective, a language or as a set of tools (Arnold & Wade, 2015). Part of the appeal of applying this perspective to healthcare education is that the systems-thinking literature attempts to provide solutions to the problems of complexity (Plack et al., 2019).

There is an emerging literature about the complexity science and systems-thinking in healthcare (Cristancho et al., 2019). It has focused on promoting the relevance of the concept (Plsek & Greenhalgh, 2001), defining the terms (Cristancho et al., 2019) and application to areas including clinical care (Koné Pefoyo et al., 2015), selection (Cleland et al., 2018), evaluation (Rojas et al., 2018), learning in practice (Fraser & Greenhalgh, 2001; Hase & Kenyon, 2007; Woodruff, 2019), resilience (Cristancho, 2016), leadership (Burns, 2001) and improving quality and safety (Lindberg, 2002; May et al., 2016; Miller et al., 1998). Application to healthcare communication has not been explored.

Previous work has provided the building blocks for applying systems-thinking to healthcare. The Institute of Medicine (IOM) has defined the key components of the health system (Institute of Medicine, 2001). A guide from George Washington University has provided an overview of the field, a guide to teaching systems-thinking and a description of the toolbox that systems-thinking provides (Plack et al., 2019). This work addresses the gap in literature regarding applying this toolbox specifically to healthcare communication.

Healthcare communication is an ideal part of the curriculum for application of systems-thinking. Mental models and educational practices around communication are anchored in interpersonal models. Modern care takes place in a complex system: it is longitudinal, team-based, multi-media, multi-problem and involves multiple healthcare systems (primary, secondary and tertiary) (Morgan et al., 2015; Nicholson et al., 2013). Increasingly, there is a central role for non-human “artefacts” within healthcare communication, initially paper, recently electronic. The electronic health record has become a central part of the system and there is an important literature around the impact of this on healthcare communication. There is an urgent need for the development of new communication frameworks that take a systems approach to healthcare communication.

There is, however, a risk from the focus on the system that the value of person-centred care will be lost as a result of focusing on the system. Values are a key determinant of how choices are made in a complex system and what outcomes emerge (Hall, 2000). We have therefore prioritised quality, safety and person-centred care as key values.

The purpose of this work is to draw on concepts from complexity science and systems-thinking and explore their application to the field of healthcare communication. We specifically wanted to explore three areas that have not been addressed in the literature regarding a systems-thinking approach: how do we imagine the structure of healthcare communication informed by systems-thinking; what are the implications for practice of healthcare communication; and what are the implications for person-centred care?

II METHODS

Promoting person-centred care is taken as a key value. For the purposes of this paper, systems-thinking is defined as a perspective that draws on complexity science and recognises that outcomes derive from systemic structures and mental models. A system is defined as "a set of interacting, interrelated, or interdependent elements that work together in a particular environment to perform the functions that are required to achieve the system's aim" (Khanna et al., 2021; Plack et al., 2019).

The approach taken was an exploratory synthesis of systems-thinking and healthcare communication based on landmark or key definitions of the scope of each concept. This utilised prior systematic reviews and position statements (Alkureishi et al., 2016; Arnold & Wade, 2015; Grover et al., 2021; Institute of Medicine, 2001; Links et al., 2020; McCormack et al., 2010; Noble et al., 2018; National Voices (UK), 2017; Swanson et al., 2012). The intention was to use previous synthesis of scholarship to explore interactions between the concepts. Priority was given to improving the outcomes of care. The landmark report "Crossing the quality chasm" identified a systems approach, improved communication and person-centred care as keys to improving quality and safety (Institute of Medicine, 2001).

We used the IOM definition of the health system. There were three main questions we wanted to explore: (1) How do we think about the structure of healthcare communication with a systems-thinking approach (concept mapping); (2) What are the implications of being a systems-thinker on the practice of healthcare communication; (3) How do we incorporate a person-centred approach to avoid the risks of depersonalising care with a systems perspective.

The identification of interactions, generation of the concept map and exploration of implications was done through an iterative process of consensus and comparison to selected literature by three health care communication experts.

III RESULTS

A *Mapping Healthcare Communication Using a Systems-Thinking Approach*

Mapping healthcare communication using a systems-thinking approach first requires identifying the different levels of the health system. The IOM has identified four levels of a healthcare system: the patient; care team; organisation and environment (Institute of Medicine, 2001). The care team can be divided into an individual practitioner, the professional health care team and the patient's social support network – including family, carers or other supports. Using this framework, an approach to patient communication needs to consider the interaction between a clinician and a patient within this broader system.

A concept map is an important system-thinking tool which maps out the key relationships within the system (Sherborne, 2014; Trochim & Kane, 2005). The primary focus of a person-centred systems approach remains the clinician-patient communication situated within a broader context, including the patient's social network. This is a way of viewing communication that is focused on the task of exchanging information throughout the whole system. Communication between the clinician and the social network or enabling the interaction between the patient and social network, become important communication tasks. Understanding that the patient may wish to maximise their support by disclosing their cancer diagnosis to their social network will potentially change the agenda of the interaction between clinician and patient. Helping patients and their support network navigate through the system becomes a key task (Jirasevijinda, 2015).

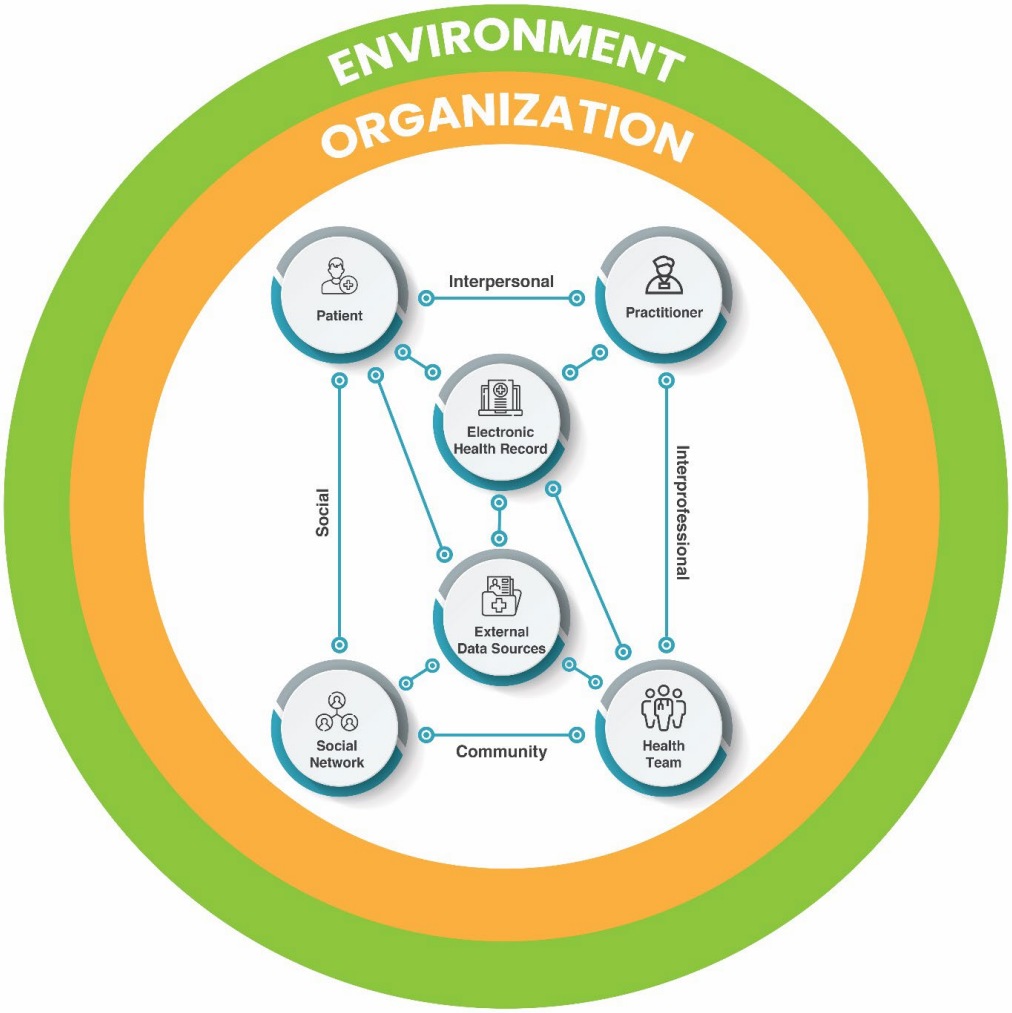
A team-based approach highlights the interactions between the health care team and other participants. The patient, provider, social network and health care team become the four corners of any patient encounter. The team is not a single entity, it is a complex and dynamic structure that requires communication across teams and within them to produce a unique team-complex involved in this patient's care (Pype et al., 2017). Systems-thinking promotes the function of connecting the different components of the system (relationship focused).

The system also includes non-human artefacts that mediate and structure the encounter. The EHR, patient portals and external information systems (such as internet-based health resources) are some macro-level artefacts. Elements of the EHR such as problem lists, patient summaries, care plans and letters are micro-level artefacts that mediate communication (Dalal et al., 2019; Rotenstein et al., 2016; Steichen & Gregg, 2015). Computer decision support prompts, recall and reminder systems influence the agenda in ways that can be helpful or unhelpful. The construction of a problem list within an EHR is a form of communication but it also helps determine the agenda of subsequent conversations (Hodge & Narus, 2018). There is an interdependence between these parts of the system. Systems-thinking highlights the central nature of documentation and communication becomes documentation focused.

The healthcare organisation determines many of the possibilities by providing the infrastructure that shapes and mediates the communication. This includes responsibility for the electronic health record, supporting interactions between the organisation and participants and the structuring and support of teams. The provision of team members such as patient navigators or care-coordinators etc. are key structural elements of the system (S. Kurtz et al., 2003; Navaneethan et al., 2017).

The broader healthcare and cultural environment further shape these interactions. A traditional disease-focused culture will create different conversations than a more person-centred one. Funding systems can directly influence the labelling, frequency, duration, and nature of patient interaction with healthcare providers. The COVID-19 pandemic has highlighted the way that individual encounters are shaped by broader cultural factors such as public health discourse, health literacy and competing epistemologies. A simplified concept map situating the clinician-patient encounter within these levels of the system is demonstrated in Figure 1.

Figure1
A simplified concept map focusing on interactions between the patient, practitioner, health team and social network, electronic health record and external data sources. These interactions are situated within two additional levels of the health system, the organisation and the external environment.



B *Applying Characteristics of a Systems Thinker to Healthcare Communication: Implications for Practice*

The review by Plack et al (Plack et al., 2019) has defined the characteristics of a systems thinker. These include: considers the big picture; considers how mental models influence the system; identifies connections within and between systems; takes a dynamic approach that includes changes over time; and uses the understanding of the system to drive continuous improvement (Plack et al., 2019). Systems-thinking provide a set of tools for understanding and improving systems (Swanson et al., 2012). We therefore explored how each of these characteristics applied to the practice of healthcare communication.

1 *Considers the Big Picture*

Considering the bigger picture requires that we think about the values, priorities and outcomes that are driving system design. If we accept person-centred care is a key value, then this should inform all aspects of our communication: from what data we collect; how it is curated and presented; to how we message our colleagues. A systems approach designs with the desired

outcomes in view. This implies we should be designing communication around the definition of a quality health system; the quadruple aim of patient experience, quality and safety, value and a sustainable workforce (Bodenheimer & Sinsky, 2014). Current models of communication as a purely interpersonal exchange do not prioritise these system issues. The IOM definition of the health systems identifies the different levels that define the system. Increasingly health care is delivery across not only different institutions but different state, national and international jurisdictions.

2 *Considers How Mental Models Influence Current Realities and Possible Futures*

It is a fundamental tenet of systems-thinking that the way we understand the system impacts on its function. Thinking about patient communication as an interpersonal skill will inevitably minimise the impact of the patient's social network, other team members, the healthcare organisation and the overall environment on the patient's care. Patient reported outcomes, checklist and decision aids are currently add-ons to the patient interview. A system approach would see them integrated onto our models and practices of communication.

3 *Identifies Connections Between and Within Systems*

Electronic health records have become the key connector of information within and between systems for modern health care and a critical mediator of communication. The computer has been described as the third "person" in the room for encounters between healthcare providers and patients (Saleem et al., 2014), "paper rounds" have been replaced by "computer rounds" and communications between team members are heavily dependent on the EHR.

Emphasising the connections within the system requires a view of communication as data-exchange. The IOM has defined the "FAIR" principles that data should be findable, accessible, interoperable and reusable (Wilkinson et al., 2016). It becomes a critical team communication competency that the data from clinical encounters is captured in a way that is findable. Making the data from clinical encounters re-usable is critical for the outcome of a sustainable workforce, by increasing efficiency and reducing the demands on staff and patients to elicit the same information again and again. For connections between systems there is a need for information to be captured in an interoperable fashion. Eliciting allergies and then recording them in a way that allows exchange with drug interaction software are both equally important components of a system approach to communication.

Connections within the system are continuously emerging; an example is the use of text messaging and encrypted messaging services to facilitate communication with patients, carers and team members (Lee & Zuercher, 2017). Artefacts such as decision aids can connect shared decision makers in ways that improve quality (Cardona-Morrell et al., 2017). The "OpenNotes" movement has promoted patients having interactions or control over their own health records (Hannan, 2008; Walker et al., 2019). The interaction of patients and professionals with the health record has moved from being an afterthought to being a central part of the communication within the system (Amir et al., 2015; Institute of Medicine, 2001; Rashotte et al., 2016).

Similarly, health information on the internet has become the key connector of health information between the community and the individual (Ramsey et al., 2017). In particular, social media has become a major mediator of the interaction between a patient and their social support network (Zhao & Zhang, 2017). A systems approach to communication includes these non-human artefacts as critical components of patient-communication.

4 *Takes an Approach that Includes Changes Over Time*

The traditional (encounter-based) approach to communication fails to consider the dynamic and longitudinal nature of health-care communication (Carberry et al., 2016). A systems approach acknowledges that any single encounter occurs within a system that extends through time and includes the pre-encounter interactions, which setup the encounter for success (Sinsky et al., 2015) and post-encounter interactions that are critical for translating communication into actions.

5 *Considers Interactions Between System Components*

It is a fundamental tenet of system-thinking that the function of one component affects the function of others. Thus, the interaction between the patient and clinician depends on the interaction of the clinician with the EHR. Interactions occur within an EHR because of role based differences in what team members see. Interactions between different EHR's influence what information is available for communication. The interaction between the clinician, the patient, their social network, and components of the health record all are interdependent and cannot be considered in isolation.

6 *Adopts a Perspective of Evolution Over Time and a Continuing Improvement Mindset*

An important characteristic of complex systems is that they are adaptive. Understanding and exploiting the evolutionary nature of the system is central to improving care. System interactions are learnt behaviours with humans, technologies and organisations learning to adapt. It becomes critical to communicate in a way that enables improvement (e.g. putting adverse events in the correct data field) (Cohen et al., 2019). The EHR moves from being a record of an encounter to an artefact, which is continuously improved over time to improve quality of care.

C *Implications of a person-centred systems approach*

There is a risk that the central role for EHR competes with the priority of person-centred care (Stanhope & Matthews, 2019). There is a need to construct healthcare communication in a way that retains the voice of the patient, their story and their concerns, but acknowledges the reality of multiple other data sources (Asan et al., 2016). The systems approach includes within the network the unique interconnections that constitute that patient's healthcare system and the critical determinants of context that are components of person-centred care.

Weiner and Schwartz have identified 10 domains of context that are required to personalise care (Weiner & Schwartz, 2016). Some of these are captured in a well conducted traditional patient history (social supports; financial situation, living environment and emotional state). Much of the data that is required to communicate with patients is not captured systematically (access to care, competing responsibilities, relationship with healthcare providers, health literacy, cultural perspectives and attitudes to illness). If this data is important for personalised healthcare, then it needs to be captured, incorporated, reused and presented within the information system.

Applying a person-centred systems-thinking approach to patient communication has profound implications for the way we imagine, practice and teach. Rather than imagining communication with patients, carers and teams as separate issues we can explore and maximise the way these inter-connected communication tasks interact, support or undermine each other.

A person-centred approach that addresses interactions with the patient's social network and healthcare team aligns with an increasing focus on the importance, consequences and costs of failing to address context (Weiner & Schwartz, 2016).

Systems-thinking changes the way documentation is understood from a communication afterthought (capturing what was said) to a central pillar that enables communication between different parts of the system: patients, social networks, healthcare teams and the organisation. The Calgary-Cambridge model has identified the two functions of the clinical encounter as exchanging information (task orientated) and building relationship (relationship orientated) (S. Kurtz et al., 2003). Systems-thinking requires curating the system's medical record (documentation orientated) as a third pillar of the encounter. Systems thinking also changes the way that building relationship is constructed. Broadening the perspective beyond individual interactions translates building relationships to building connections. Facilitating connection between the family/support network and the healthcare team or external data sources becomes included as a function of the clinical encounter.

A central consideration within any encounter becomes a longitudinal process of curating the health record to ensure that it captures the context, concerns and connections associated with an individual, as well as their biomedical information. Multiple encounters over time create an opportunity for the system to improve.

Artefacts within the health record that promote quality of care and promote communication become critical outputs of patient encounters. Patient summaries, problem formulations, problem lists, longitudinal integration and representation of results (such as flow sheets) and care plans are both outputs and enablers of communication. They require integration into models of patient communication.

The separation of communication and communication skills, according to the media involved, also requires reimagining. Integration of websites, images, care plans etc. cannot be separated from the verbal communication skills of active listening and person-centred inquiry.

Thinking about communication at the level of the healthcare organisation prioritises the need for capturing and recording information that drives systems improvement. A person-centred systems approach to culturally appropriate care requires that we not only enquire about a person's cultural background but that it is recorded within the system; shared with the entire healthcare team; and available so the organisation can report on its performance in a culturally diverse population. Asking and recording are interdependent communication skills.

The literature around implicit biases and culturally competent care are examples of the interaction between the environment and communication. Inequities in access are a particular concern for digital health. The way that the broader economic and cultural environment shape healthcare communication is a rich direction for future inquiry and advocacy.

There are significant curriculum design implications when systems-thinking for health communication is considered. There have been attempts to enhance the teaching of communication in the context of the EHR (Alkureishi, Lee, Lyons, et al., 2018; Alkureishi, Lee, Webb, et al., 2018). What is required is a rethinking of the communication curriculum so that all aspects of the communication system are integrated. A systems approach to teaching patient communication would move beyond the pretence that a patient encounter starts with a blank "piece of paper". Communication requires combining data from the patient encounter with other data sources to promote quality clinical care and communication within all the elements of the healthcare system.

IV DISCUSSION AND CONCLUSION

Our application of systems-thinking and person-centred care to healthcare communication builds upon previous work by describing the structure, practice and personalisation of healthcare communication. A review of healthcare communication research in the digital age has demonstrated common topics of research, such as online health information, telemedicine, electronic health records etc., have largely focused on how people use a specific technology or on the impact of individual technologies (Hu, 2015). Multiple reviews have investigated the impact on health outcomes of particular interactions: patient provider communication (Zolnierek & Dimatteo, 2009); inter-professional communication (Foy et al., 2010); patient-team-communication (Blum & Blum, 1991); and the impact of the electronic health record on communication (Alkureishi et al., 2016). What is lacking is a whole of system approach. The development of a concept map creates a new way of imaging the structure of the healthcare communication system. This structure helps ensure all aspects of the system are included in the discussion of healthcare communication.

One previous attempt to define a system of chronic care is that of Wagner who has divided chronic care into a model that includes diverse components of the system including information technology, patient and provider education and practice redesign (Wagner et al., 1996) The focus is on improving care. However, Wagner's model of chronic care is not a communication model and does not reflect a systems-thinking approach. Like other reductionist models, the model does not explore interactions between components and the interactions with the healthcare team and the patients support network are under-theorised. This highlights the benefits of identifying the core components of the system and the role that artefacts like electronic health-records play in mediating interactions between components.

This work highlights that some interactions in the system have been relatively neglected, particularly the ways in which a health care team can facilitate the interaction between the patient and their support network. The model also emphasis the interconnectivity between interpersonal communication and the supporting access to quality information in external data sources. Current models of interpersonal communication do not take these interactions into account.

Systems-thinking has implications for the practice of health-care communication by challenging basic assumptions about, for example, the purpose of communication and what constitutes a communication skill. Previous models of communication have identified two pillars of communication; exchange of information and the building of a relationship (S. M. Kurtz & Silverman, 1996). Systems-thinking adds a third pillar, curating the medical record.

This work also challenges our conception of what may be considered a communication skill. Is the ability to type a key communication skill or base competency? From a systems approach curating the medical record in plain language to enable communication between all stakeholders is a key skill. The existing toolbox does not enable all of these skills (Rider & Keefer, 2006).

Systems-thinking does create a risk that by diverting our attention to the whole system we lose sight of the person at the centre. Strategies to promote a dual person-centred and systems-thinking approach include personalising the system by including a patient's own unique support network, and ensuring communication includes and documents the individual circumstances that allow for contextualising care.

This paper's perspective is strongly grounded in quality and safety. Multiple other perspectives are possible. There are extensive, somewhat disconnected literatures on interpersonal communication, interprofessional, technological and community communication. A systematic review of the application of systems-thinking to all these literatures is beyond the scope of this article, but ongoing systematic exploration of the implications is a fertile field of discovery.

There is a need to revisit the existing models of healthcare communication and ask are they fit for purpose? What data informs our communication? What skills are essential for communication in a complex system, and how do we move beyond separate discourses of communication to a more integrated conceptualisation, practice and pedagogy of communication?

Systems-thinking is a tool that accounts for the complexity of modern healthcare communication. A person-centred systems approach is required to avoid losing the person and their context in a complex system. Considering a network of communication across the person, their social network, healthcare providers, healthcare teams, organisations and environment broadens our understanding of what communication is. The role of the electronic health record becomes central as a mediator of these processes and a critical function of communication becomes the creation and curation of these artefacts to promote communication for quality care. Imagining and teaching healthcare communication requires contemporary models that consider systems-thinking. Truly taking a systems approach to healthcare communication requires a radical re-think of the way we imagine, practice and teach healthcare communication. Systems-thinking about communication provides a pathway for ongoing improvement in an increasingly complex world by matching our thinking with the realities of modern practice.

References

Alkureishi, M. A., Lee, W. W., Lyons, M., Press, V. G., Imam, S., Nkansah-Amankra, A., Werner, D., & Arora, V. M. (2016). Impact of Electronic Medical Record Use on the Patient-Doctor Relationship and Communication: A Systematic Review. *Journal of General Internal Medicine*, *31*(5), 548–560. https://doi.org/10.1007/s11606-015-3582-1

Alkureishi, M. A., Lee, W. W., Lyons, M., Wroblewski, K., Farnan, J. M., & Arora, V. M. (2018). Electronic-clinical evaluation exercise (e-CEX): A new patient-centered EHR use tool. *Patient Education and Counseling*, *101*(3), 481–489. https://doi.org/10.1016/j.pec.2017.10.005

Alkureishi, M. A., Lee, W. W., Webb, S., & Arora, V. (2018). Integrating Patient-Centered Electronic Health Record Communication Training into Resident Onboarding: Curriculum Development and Post-Implementation Survey Among Housestaff. *JMIR Medical Education*, *4*(1), e1. https://doi.org/10.2196/mededu.8976

Amir, O., Grosz, B. J., Gajos, K. Z., Swenson, S. M., & Sanders, L. M. (2015). From Care Plans to Care Coordination: Opportunities for Computer Support of Teamwork in Complex Healthcare. *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems*, 1419–1428. https://doi.org/10.1145/2702123.2702320

Arnold, R. D., & Wade, J. P. (2015). A Definition of Systems Thinking: A Systems Approach. *Procedia Computer Science*, *44*, 669–678. https://doi.org/10.1016/j.procs.2015.03.050

Asan, O., Tyszka, J., & Fletcher, K. E. (2016). Capturing the patients' voices: Planning for patient-centered electronic health record use. *International Journal of Medical Informatics*, *95*, 1–7. https://doi.org/10.1016/j.ijmedinf.2016.08.002

Blum, D., & Blum, R. (1991). Patient-Team Communication. *Journal of Psychosocial Oncology*, *9*(3), 81–88. https://doi.org/10.1300/J077v09n03_07

Bodenheimer, T., & Sinsky, C. (2014). From Triple to Quadruple Aim: Care of the Patient Requires Care of the Provider. *The Annals of Family Medicine*, *12*(6), 573–576. https://doi.org/10.1370/afm.1713

Burns, J. P. (2001). Complexity science and leadership in healthcare. *The Journal of Nursing Administration*, *31*(10), 474–482.

Carberry, K., Landman, Z., Xie, M., Feeley, T., Henderson, J., & Fraser, C. J. (2016). Incorporating longitudinal pediatric patient-centered outcome measurement into the clinical workflow using a commercial electronic health record: A step toward increasing value for the patient. *Journal of the American Medical Informatics Association*, *23*(1), 88–93. https://doi.org/10.1093/jamia/ocv125

Cardona-Morrell, M., Benfatti-Olivato, G., Jansen, J., Turner, R. M., Fajardo-Pulido, D., & Hillman, K. (2017). A systematic review of effectiveness of decision aids to assist older patients at the end of life. *Patient Education and Counseling*, *100*(3), 425–435. https://doi.org/10.1016/j.pec.2016.10.007

Cleland, J. A., Patterson, F., & Hanson, M. D. (2018). Thinking of selection and widening access as complex and wicked problems. *Medical Education*, *52*(12), 1228–1239. https://doi.org/10.1111/medu.13670

Cohen, G. R., Friedman, C. P., Ryan, A. M., Richardson, C. R., & Adler-Milstein, J. (2019). Variation in Physicians' Electronic Health Record Documentation and Potential Patient Harm from That Variation. *Journal of General Internal Medicine*, *34*(11), 2355–2367. https://doi.org/10.1007/s11606-019-05025-3

Cristancho, S. (2016). Lessons on resilience: Learning to manage complexity. *Perspectives on Medical Education*, *5*(3), 133–135. https://doi.org/10.1007/s40037-016-0277-1

Cristancho, S., Field, E., & Lingard, L. (2019). What is the state of complexity science in medical education research? *Medical Education*, *53*(1), 95–104. https://doi.org/10.1111/medu.13651

Dalal, A. K., Dykes, P., Samal, L., McNally, K., Mlaver, E., Yoon, C. S., Lipsitz, S. R., & Bates, D. W. (2019). Potential of an Electronic Health Record-Integrated Patient Portal for Improving Care Plan Concordance during Acute Care. *Applied Clinical Informatics*, *10*(3), 358–366. https://doi.org/10.1055/s-0039-1688831

Foy, R., Hempel, S., Rubenstein, L., Suttorp, M., Seelig, M., Shanman, R., & Shekelle, P. G. (2010). Meta-analysis: Effect of Interactive Communication Between Collaborating Primary Care Physicians and Specialists. *Annals of Internal Medicine*, *152*(4), 247–258. https://doi.org/10.7326/0003-4819-152-4-201002160-00010

Fraser, S. W., & Greenhalgh, T. (2001). Coping with complexity: Educating for capability. *British Medical Journal*, *323*(7316), 799–803.

Grover, S., Fitzpatrick, A., Azim, F. T., Ariza-Vega, P., Bellwood, P., Burns, J., Burton, E., Fleig, L., Clemson, L., Hoppmann, C. A., Madden, K. M., Price, M., Langford, D., & Ashe, M. C. (2021). Defining and implementing patient-centered care: An umbrella review. *Patient Education and Counseling*. https://doi.org/10.1016/j.pec.2021.11.004

Hall, M. L. W. (2000). Systems thinking and human values. In F. Parra-Luna (Ed.), *The Performance of Social Systems: Perspectives and Problems*. Springer US. https://doi.org/10.1007/978-1-4615-4251-3_2

Hannan, A. (2008). The paradigm shift in healthcare—Overcoming challenges in giving patients access to their electronic records. *Journal of Communication in Healthcare*, *1*(1), 7–19. https://doi.org/10.1179/cih.2008.1.1.7

Hase, S., & Kenyon, C. (2007). Heutagogy: A Child of Complexity Theory. *Complicity: An International Journal of Complexity and Education*, *4*(1). https://journals.library.ualberta.ca/complicity/index.php/complicity/article/view/8766

Hodge, C. M., & Narus, S. P. (2018). Electronic problem lists: A thematic analysis of a systematic literature review to identify aspects critical to success. *Journal of the American Medical Informatics Association*, *25*(5), 603–613. PubMed. https://doi.org/10.1093/jamia/ocy011

Hu, Y. (2015). Health communication research in the digital age: A systematic review. *Journal of Communication in Healthcare*, *8*(4), 260–288. https://doi.org/10.1080/17538068.2015.1107308

Institute of Medicine. (2001). *Crossing the Quality Chasm: A New Health System for the 21st Century* (p. 10027). National Academies Press. https://doi.org/10.17226/10027

Jirasevijinda, T. (2015). Reaching into our doctor's bag of tricks to help patients navigate health information technology. *Journal of Communication in Healthcare*, *8*(4), 255–257. https://doi.org/10.1080/17538068.2015.1126052

Jirasevijinda, T. (2017). Inside commentary: Perspectives by our editorial board members Trickling up: a call for training on patient engagement and shared decision-making across the educational continuum. *Journal of Communication in Healthcare*, *10*(2), 67–69. https://doi.org/10.1080/17538068.2017.1343998

Khanna, P., Roberts, C., & Lane, A. S. (2021). Designing health professional education curricula using systems thinking perspectives. *BMC Medical Education*, *21*(1), 20. https://doi.org/10.1186/s12909-020-02442-5

Koné Pefoyo, A. J., Bronskill, S. E., Gruneir, A., Calzavara, A., Thavorn, K., Petrosyan, Y., Maxwell, C. J., Bai, Y., & Wodchis, W. P. (2015). The increasing burden and complexity

of multimorbidity. *BMC Public Health*, *15*(1), 415. https://doi.org/10.1186/s12889-015-1733-2

Kurtz, S. M., & Silverman, J. D. (1996). The Calgary-Cambridge Referenced Observation Guides: An aid to defining the curriculum and organizing the teaching in communication training programmes. *Medical Education*, *30*(2), 83–89. https://doi.org/10.1111/j.1365-2923.1996.tb00724.x

Kurtz, S., Silverman, J., Benson, J., & Draper, J. (2003). Marrying content and process in clinical method teaching: Enhancing the Calgary-Cambridge guides. *Academic Medicine: Journal of the Association of American Medical Colleges*, *78*(8), 802–809. https://doi.org/10.1097/00001888-200308000-00011

Lee, S. A., & Zuercher, R. J. (2017). A current review of doctor–patient computer-mediated communication. *Journal of Communication in Healthcare*, *10*(1), 22–30. https://doi.org/10.1080/17538068.2017.1282184

Lindberg, E. (2002). Managing complexity: Acknowledge the attraction patterns by supporting sensemaking and allowing the quality system to serve as the panoptic system. *International Journal of Health Care Quality Assurance*, *15*(5), 213–216. https://doi.org/10.1108/09526860210437430

Links, M. J., Watterson, L., Martin, P., O'Regan, S., & Molloy, E. (2020). Finding common ground: Meta-synthesis of communication frameworks found in patient communication, supervision and simulation literature. *BMC Medical Education*, *20*(1), 45. https://doi.org/10.1186/s12909-019-1922-2

May, C. R., Johnson, M., & Finch, T. (2016). Implementation, context and complexity. *Implementation Science*, *11*, 141. https://doi.org/10.1186/s13012-016-0506-3

McCormack, B., Karlsson, B., Dewing, J., & Lerdal, A. (2010). Exploring person-centredness: A qualitative meta-synthesis of four studies. *Scandinavian Journal of Caring Sciences*, *24*(3), 620–634. https://doi.org/10.1111/j.1471-6712.2010.00814.x

Miller, W. L., Crabtree, B. F., McDaniel, R., & Stange, K. C. (1998). Understanding change in primary care practice using complexity theory. *The Journal of Family Practice*, *46*(5), 369–376.

Morgan, M. A., Coates, M. J., & Dunbar, J. A. (2015). Using care plans to better manage multimorbidity. *The Australasian Medical Journal*, *8*(6), 208–215. https://doi.org/10.4066/AMJ.2015.2377

National Voices (UK). (2017). *Person-centred care in 2017. Evidence from service users*. https://www.nationalvoices.org.uk/sites/default/files/public/publications/person-centred_care_in_2017_-_national_voices.pdf

Navaneethan, S. D., Jolly, S. E., Schold, J. D., Arrigain, S., Nakhoul, G., Konig, V., Hyland, J., Burrucker, Y. K., Dann, P. D., Tucky, B. H., Sharp, J., & Nally, J. V. (2017). Pragmatic Randomized, Controlled Trial of Patient Navigators and Enhanced Personal Health Records in CKD. *Clinical Journal of the American Society of Nephrology : CJASN*, *12*(9), 1418–1427. https://doi.org/10.2215/CJN.02100217

Nicholson, C., Jackson, C., & Marley, J. (2013). A governance model for integrated primary/secondary care for the health-reforming first world—Results of a systematic review. *BMC Health Services Research*, *13*, 528. https://doi.org/10.1186/1472-6963-13-528

Noble, L. M., Scott-Smith, W., O'Neill, B., & Salisbury, H. (2018). Consensus statement on an updated core communication curriculum for UK undergraduate medical education. *Patient Education and Counseling*, *101*(9), 1712–1719. https://doi.org/10.1016/j.pec.2018.04.013

Plack, M., Goldman, E. F., Scott, A. R., & Brundage, S. B. (2019). *Systems Thinking in the Healthcare Professions: A Guide for Educators and Clinicians*.

Plsek, P. E., & Greenhalgh, T. (2001). The challenge of complexity in health care. *British Medical Journal*, *323*(7313), 625–628.

Pype, P., Krystallidou, D., Deveugele, M., Mertens, F., Rubinelli, S., & Devisch, I. (2017). Healthcare teams as complex adaptive systems: Focus on interpersonal interaction. *Patient Education and Counseling*, *100*(11), 2028–2034. https://doi.org/10.1016/j.pec.2017.06.029

Ramsey, I., Corsini, N., Peters, M. D. J., & Eckert, M. (2017). A rapid review of consumer health information needs and preferences. *Patient Education and Counseling*, *100*(9), 1634–1642. https://doi.org/10.1016/j.pec.2017.04.005

Rashotte, J., Varpio, L., Day, K., Kuziemsky, C., Parush, A., Elliott-Miller, P., King, J. W., & Roffey, T. (2016). Mapping communication spaces: The development and use of a tool for analyzing the impact of EHRs on interprofessional collaborative practice. *International Journal of Medical Informatics*, *93*, 2–13. https://doi.org/10.1016/j.ijmedinf.2016.05.003

Rider, E. A., & Keefer, C. H. (2006). Communication skills competencies: Definitions and a teaching toolbox. *Medical Education*, *40*(7), 624–629. https://doi.org/10.1111/j.1365-2929.2006.02500.x

Rojas, D., Grierson, L., Mylopoulos, M., Trbovich, P., Bagli, D., & Brydges, R. (2018). How can systems engineering inform the methods of programme evaluation in health professions education?. *Medical Education*, *52*(4), 364–375. https://doi.org/10.1111/medu.13460

Rotenstein, L., Tucker, S., Kakoza, R., Tishler, L., Zai, A., & Wu, C. (2016). The critical components of an electronic care plan tool for primary care: An exploratory qualitative study. *Journal of Innovation in Health Informatics*, *23*(2), 836. https://doi.org/10.14236/jhi.v23i2.836

Rusoja, E., Haynie, D., Sievers, J., Mustafee, N., Nelson, F., Reynolds, M., Sarriot, E., Swanson, R. C., & Williams, B. (2018). Thinking about complexity in health: A systematic review of the key systems thinking and complexity ideas in health. *Journal of Evaluation in Clinical Practice*, *24*(3), 600–606. https://doi.org/10.1111/jep.12856

Salas, E., Wilson, K. A., Murphy, C. E., King, H., & Salisbury, M. (2008). Communicating, coordinating, and cooperating when lives depend on it: Tips for teamwork. *Joint Commission Journal on Quality and Patient Safety / Joint Commission Resources*, *34*(6), 333–341.

Saleem, J. J., Flanagan, M. E., Russ, A. L., McMullen, C. K., Elli, L., Russell, S. A., Bennett, K. J., Matthias, M. S., Rehman, S. U., Schwartz, M. D., & Frankel, R. M. (2014). You and me and the computer makes three: Variations in exam room use of the electronic health record. *Journal of the American Medical Informatics Association*, *21*(e1), e147–e151. https://doi.org/10.1136/amiajnl-2013-002189

Sherborne, T. (2014). Mapping the Curriculum: How Concept Maps can Improve the Effectiveness of Course Development. In A. Okada, S. J. B. Shum, & T. Sherborne (Eds.), *Knowledge Cartography* (pp. 193–208). Springer London. https://doi.org/10.1007/978-1-4471-6470-8_9

Sinsky, C. A., Sinsky, T. A., & Rajcevich, E. (2015). Putting Pre-Visit Planning Into Practice. *Family Practice Management*, *22*(6), 34–38.

Stanhope, V., & Matthews, E. B. (2019). Delivering person-centered care with an electronic health record. *BMC Medical Informatics and Decision Making*, *19*(1), 168. https://doi.org/10.1186/s12911-019-0897-6

Steichen, O., & Gregg, W. (2015). Health Information Technology Coordination to Support Patient-centered Care Coordination. *Yearbook of Medical Informatics*, *10*(1), 34–37. https://doi.org/10.15265/IY-2015-027

Swanson, R. C., Cattaneo, A., Bradley, E., Chunharas, S., Atun, R., Abbas, K. M., Katsaliaki, K., Mustafee, N., Mason Meier, B., & Best, A. (2012). Rethinking health systems strengthening: Key systems thinking tools and strategies for transformational change. *Health Policy and Planning*, *27*(suppl_4), iv54–iv61. https://doi.org/10.1093/heapol/czs090

Trochim, W., & Kane, M. (2005). Concept mapping: An introduction to structured conceptualization in health care. *International Journal for Quality in Health Care*, *17*(3), 187–191. https://doi.org/10.1093/intqhc/mzi038

Wagner, E. H., Austin, B. T., & Von Korff, M. (1996). Organizing care for patients with chronic illness. *The Milbank Quarterly*, *74*(4), 511–544.

Walker, J., Leveille, S., Bell, S., Chimowitz, H., Dong, Z., Elmore, J. G., Fernandez, L., Fossa, A., Gerard, M., Fitzgerald, P., Harcourt, K., Jackson, S., Payne, T. H., Perez, J., Shucard, H., Stametz, R., DesRoches, C., & Delbanco, T. (2019). OpenNotes After 7 Years: Patient Experiences With Ongoing Access to Their Clinicians' Outpatient Visit Notes. *Journal of Medical Internet Research*, *21*(5), e13876. https://doi.org/10.2196/13876

Weiner, S. J., & Schwartz, A. (2016). *Listening for what matters: Avoiding contextual errors in health care*. Oxford University Press.

Wilkinson, M. D., Dumontier, M., Aalbersberg, Ij. J., Appleton, G., Axton, M., Baak, A., Blomberg, N., Boiten, J.-W., da Silva Santos, L. B., Bourne, P. E., Bouwman, J., Brookes, A. J., Clark, T., Crosas, M., Dillo, I., Dumon, O., Edmunds, S., Evelo, C. T., Finkers, R., … Mons, B. (2016). The FAIR Guiding Principles for scientific data management and stewardship. *Scientific Data*, *3*(1), 160018. https://doi.org/10.1038/sdata.2016.18

Woodruff, J. N. (2019). Accounting for complexity in medical education: A model of adaptive behaviour in medicine. *Medical Education*, *53*(9), 861–873. https://doi.org/10.1111/medu.13905

Zhao, Y., & Zhang, J. (2017). Consumer health information seeking in social media: A literature review. *Health Information & Libraries Journal*, *34*(4), 268–283. https://doi.org/10.1111/hir.12192

Zolnierek, K. B. H., & Dimatteo, M. R. (2009). Physician communication and patient adherence to treatment: A meta-analysis. *Medical Care*, *47*(8), 826–834. https://doi.org/10.1097/MLR.0b013e31819a5acc