

New ways of seeing: supplementing existing competency framework development guidelines with systems thinking

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AB conceived the paper; gathered, analysed, and interpreted data, and drafted the initial manuscript. BW, MB, ML & WT critically revised the manuscript for important intellectual content, and edited the manuscript. All authors read and approved the final manuscript.

Abstract

Introduction

Competency frameworks provide a link between professional practice, education, training, and assessment. They support and inform downstream processes such as curriculum design, assessment, accreditation and professional accountability. However, existing guidelines are limited in accounting for the complexities of professional practice potentially undermining utility of such guidelines and validity of outcomes. This necessitates additional ways of “seeing” situated and context-specific practice. We highlight what a conceptual framework informed by systems thinking can offer when developing competency frameworks.

A Systems-Thinking Approach

Mirroring shifts towards systems thinking in program evaluation and quality improvement, we suggest that similar approaches that identify and make use of the role and influence of system features and contexts can provide ways of augmenting existing guidelines when developing competency frameworks. We framed a systems thinking approach in two ways. First using an adaptation of Ecological Systems Theory (EST) which offers a realist perspective of the person and environment, and the evolving interaction between the two. Second, by employing complexity thinking, which obligates attention to the relationships and influences of features within the system, we can explore the multiple complex, unique, and context-embedded problems that exist within and have stake in real-world practice settings.

Summary

The ability to represent clinical practice when developing competency frameworks can be improved when features that may be relevant, including their potential interactions, are identified and understood. A conceptual framework informed by systems thinking makes visible features of a practice in context that may otherwise be overlooked when developing competency frameworks using existing guidelines.

Introduction

Competency frameworks provide a link between professional practice, and education, training, and assessment (ten Cate and Carraccio 2019). As a midstream process, they support and inform downstream processes such as professional accountability, standard-setting, assessment strategies, and curriculum design (Norman et al. 2014; Sherbino et al. 2020) (Figure 1). However, how they are developed varies across different health professions, in part due to a lack of rigorous development and reporting guidelines, which leads to some uncertainty regarding their validity or utility (Batt et al. 2020). While some of this uncertainty stems from methodological choices during their development, further uncertainty arises from the absence or limited attempt to account for the complex nature of practice, the contexts in which practice is enacted, and the elements of competence needed to enact it. Multiple and interrelated issues in healthcare that evolve in response to changes within professions, the larger medical field (e.g. policy), and larger societal forces (e.g., changes in public expectations) contribute to the challenge of representing it all (or as much as possible) when developing competency frameworks. These issues suggest that the competency frameworks on which many educational programs and assessment processes are built may incompletely, inaccurately, or inadequately represent practice. The downstream effects of which can include, for example, an unprepared workforce, problematic assessment models, and inadequate accreditation expectations.

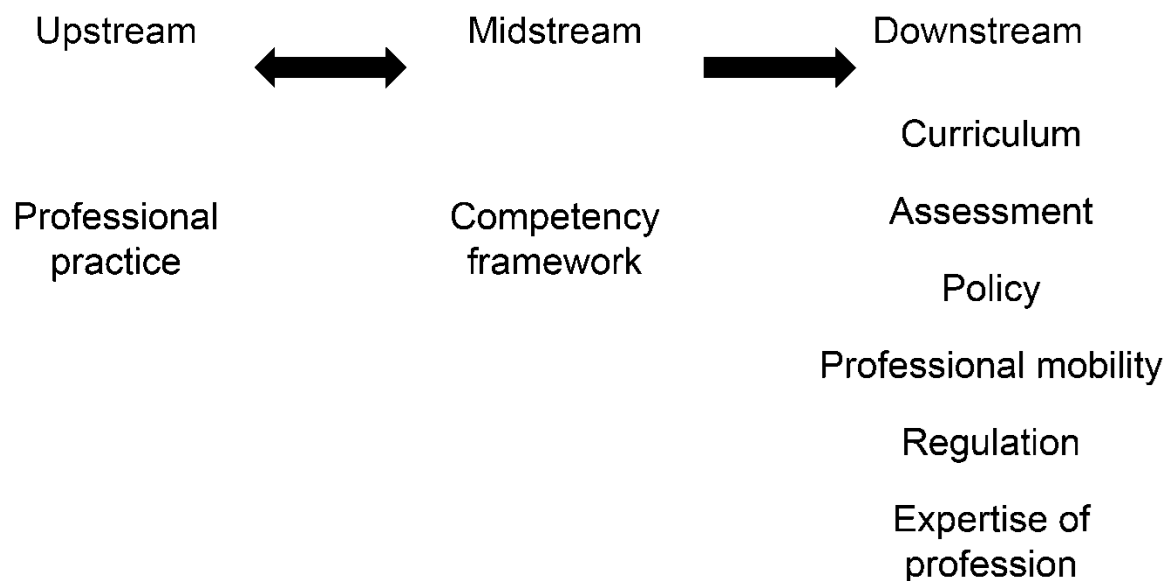


Figure 1. Examples of upstream, midstream and downstream processes related to healthcare professions.

We highlight how despite being the link between practice and downstream processes, competency frameworks often fail to adequately define or describe practice, thus leading to potential for missed details that undermine the final product. Additionally, we will explore how existing guidelines may be limited due to a lack of conceptual or theoretical frameworks to guide thinking when developing competency frameworks. In response, we draw on systems theories to elucidate how a shift in approach can reveal hidden or less commonly attended to issues in competency framework development. We conclude with recommendations for the community to consider as a way forward.

About practice, without including practice, leads to misses

Our recent scoping review revealed that a minority of competency frameworks (only 12% of those reviewed) included an analysis of practice during their development process (Batt et al. 2020). This in spite of existing guidelines which emphasize the need for practice analysis when developing competency frameworks (Lucia and Lepsinger 1999; Roe 2002). This may be due in part to the inherent challenges in accurately representing practice. Perhaps in part due to such challenges, there is emerging evidence that competency frameworks poorly represent contemporary, situated, context-specific healthcare practice (Whitehead et al. 2015). Consider as an example, how contemporary healthcare practice is widely recognized as a “team sport” focused around the needs of the patient (Leasure et al. 2013; Lingard 2012). Authors have discussed the need for the removal of “silos”, and further developing and integrating multi-disciplinary teams. However, existing competency frameworks largely focus on the competence of individual healthcare professionals. Indeed, Lingard argues that competence is viewed as “*a quality that individuals possess*” (Lingard 2012). This focus on individual competence does not, therefore, accurately represent how practice is enacted (Hodges 2013). While competency frameworks may contain generic competencies such as “*Function effectively in a team environment*”, the true essence of team and collective competence is poorly represented in many frameworks.

Merely identifying these roles of individual professionals, such as that of a team-member, may also fail to capture the realities of practice. Accurately representing such roles requires explicitly acknowledging the situated and contextual nature of the roles in practice (Whitehead et al. 2011). For example, recent discourse has shifted towards the concept of “structural competence”, which promotes an understanding of how multiple complex, interrelated forces (such as social determinants of health) influence individual’s access to healthcare, healthcare experiences, and health outcomes (Bell 2010; Salhi et al. 2020). Individual patient care occurs within contexts that are heavily influenced by historical, political, and societal forces, which competency frameworks have historically ignored. It is important to acknowledge that such influences are constantly changing as society and policy acknowledge shortcomings in traditional approaches – which in turn suggests that competency in this area is not a “once-and-for-all mastery of issues of structure” (Salhi et al. 2020), and those developing competency frameworks will need to make choices about which influences are relevant when developing a competency framework.

Further examples where existing competency approaches fail to represent contemporary practice include integrating technology and virtual care models (Hilty et al. 2019; Holmboe et al. 2016) and the focus on patient and provider wellbeing (Bodenheimer and Sinsky 2014; Holmboe et al.

2016; Sargeant et al. 2017). Many have criticized competency frameworks for representing the objective knowledge and skills required for practice without sufficient focus on subjective attributes (e.g., honesty, integrity, self-awareness, emotional intelligence), and non-technical skills (e.g., decision-making, critical thinking, clinical reasoning, self-care, judgment) that are integral to practice (Bodenheimer and Sinsky 2014; Evans and Donnelly 2006; Norman 2005; Talbot 2004; Veen et al. 2020; Weng et al. 2011; Whitehead and Kuper 2015). Further critiques levelled at existing competency-based approaches include being overly reductionist, emphasizing a minimum standard, failing to account for complexities of context-bound practice, and restricting innovation and professional development (Brightwell and Grant 2013; Glass 2014; Hodges 2013; Malone and Supri 2012).

In summary, competency frameworks may fail to fully represent the construct of professional practice. This is due to a number of reasons, including the tendency to approach practice as “doing the work” instead of “doing the work in place”. The many influences on practice differ depending on context, which places an emphasis on developers making choices about relevant influences. To date, such choices seem to be shaped in uncertain ways, or in ways not explicitly reported or included. This leads to potential threats to the validity of framework outcomes (Batt et al. 2020), and fails to provide educators with the tools to approach downstream processes such as curriculum and assessment.

Guidelines, not sufficiently guiding

One reason for this uncertainty may be existing guidelines for developing competency frameworks. While they may be helpful, they also lack theoretical and conceptual guidance (Whitehead et al. 2011). To date, guidelines have mainly focused on practical concerns, and ignored the importance of broader ways of seeing the development process. For example, only one existing guideline mentions theoretical issues (Heywood et al. 1992), and this is related to selecting methods of data collection, and not how to approach or guide the work in the way that conceptual and theoretical frameworks can (Bordage 2009; Varpio et al. 2020). Advice provided by Heywood, Marrelli and others fails to stimulate thinking on how the intended competency framework is situated in, or influenced by, contextual features. Attention to context is instead confined to analyzing the profession (e.g., job or role analysis) (Heywood et al. 1992; Marrelli et al. 2005). Additionally, existing guidelines appear vague in guiding how to identify and include ‘real world’ practice, thus neglecting core concepts and therefore threatening validity claims (Batt et al. 2020).

Although not directly related to competency framework development, researchers elsewhere have utilized a number of theoretically-informed strategies to describe practice, including grounded theory (Shepard et al. 1999), expertise modeling (Evans and Donnelly 2006), phenomenology (Taylor 1993), taxonomies (Weis 2000), and critical ethnography (Street 1992). While these approaches are theoretically-informed, and may capture how healthcare professionals care for patients, they are generally methodological approaches, and may neglect to account for the complex interactions between individuals and the broader healthcare system. When this happens, core features of ‘person-in-environment’ interactions may be lost (e.g. contextually specific influences of social determinants of health, access to healthcare). Social contexts and the

sometimes hidden relationships between elements of practice present challenges when attempting to capture or clarify the complex nature of the system.

Thus, to reduce the risk of uncertain outcomes when developing competency frameworks, there may be a benefit in shifting the focus from proof of completing “competencies” towards understanding how healthcare professionals perform their work in context, and from simplifying and reducing, to exploring and embracing complexity. Doing so will promote a better understanding of the people, elements, and contexts involved when enacting real-world clinical practice (Regehr 2010). While a competency framework can never fully represent the competencies required for professional practice, we suggest that previously highlighted shortcomings of existing guidance could be addressed by supplementing it with ways of stimulating and organizing thinking about the complexities of situated and context-specific practice.

Rethinking Guidance by Embracing the System and Complexity

Shifts towards embracing complexity in medical education have demonstrated value. For example, in program evaluation a growing number of researchers have acknowledged the complex contexts in which programs are enacted, appreciating the messy and unpredictable nature of real-world processes (Frye and Hemmer 2012; Haji et al. 2013; Rojas et al. 2018; Van Melle et al. 2017). Researchers have recognized how simply evaluating programs via methods focused largely on outcomes may be inadequate to generate meaningful understanding of processes, contexts, and how and why programs thrive. As a result, researchers have emphasized the need to acknowledge context, to capture processes, and to report on the messy real-world in which programs exist (Doll Jr and Trueit 2010; Hamza et al. 2020; Horsley and Regehr 2018). In program evaluation, approaches have included systems approaches (Rich et al. 2019; Rojas 2018), contribution analysis (Van Melle et al. 2017), program-theory based approaches (Hamza et al. 2020), and the role of conceptual and theoretical frameworks to guide their work (Haji et al. 2013). For example, Rojas et al. developed a program evaluation framework informed by systems engineering (closely related to systems thinking) (Rojas et al. 2018). This framework enables those evaluating programs to evaluate intended, enacted and absent program elements (processes and outcomes). The ability to capture and evaluate emergent (i.e. unplanned) elements embraces the unique characteristics of every program implementation, and provides evaluators with additional perspectives when evaluating a program. This has provided researchers with means by which to evaluate programs in ways that make better use of the relationships between interventions, processes, and outcomes.

Another area of healthcare that has embraced the interactions between people, processes, and outcomes is quality improvement. The complexity of systems in which patient care is delivered is often at the root of many patient safety and healthcare quality problems (J. K. Johnson et al. 2008; Kohn, L. T.; Corrigan, J. M.; Donaldson 2000). Systems-based practice is being aware of, and responsive to, the larger context and system of health care, and is considered a core competency for high quality and safe patient care (Dyne 2002). In this case, systems thinking (described in more detail below) is the foundational construct of systems-based practice (Plack et al. 2019). The benefits of systems thinking are tangible. Systems thinking as a component of diverse quality

improvement initiatives resulted in improved patient care and outcomes in geriatric emergency medicine (Vollbrecht et al. 2018) (e.g. reduction in revisits), vascular surgery (C. E. Johnson et al. 2019) (e.g. reduction in length of stay), and neonatal intensive care (Carey and Colby 2013) (e.g. reduction in catheter-related blood stream infection). Similarly, Englander demonstrated that when systems concepts were intentionally embedded in practice, this resulted in solutions which led to reductions in hospital costs, and thus more economical healthcare delivery (Englander et al. 2006). Systems-based thinking can enable us to identify influences on patient outcomes – the importance of healthcare professional wellbeing for example, caused researchers to further the original Triple Aim for Healthcare (IHI) into the Quadruple Aim (Bodenheimer and Sinsky 2014). However, others have criticized systems thinking strategies for being too healthcare system centric, while largely ignoring social and structural determinants of health (Castillo et al. 2020) – thus there remains an opportunity to identify means by which to represent these structural influences on health.

These shifts in program evaluation and quality improvement represent efforts to stimulate ways of seeing and thinking that encompass a broader and more holistic understanding of situated and context-specific practice in ways we have yet to observe when developing competency frameworks. Systems thinking helps to identify and make use of the role and influence of system features and contexts in ways that can provide new insights when developing competency frameworks in healthcare professions. Next, we will outline a systems thinking approach intended to supplement existing guidelines that may allow those developing competency frameworks to better understand and represent practice.

Being guided by a systems approach to competency framework development

To better understand the concept of practice in context, we must first have means by which to identify the contexts in which practice is situated and enacted. Practice is enacted within larger societal contexts that when viewed together, comprise a system. Looking at this ‘system’ then offers those developing competency frameworks with a perspective of the dynamics of features and relationships in particular contexts rather than global phenomena (Whitehead et al. 2015). We suggest that considering practice through a systems perspective provides new ways of seeing when developing competency frameworks. Next, we will provide an overview two forms of systems thinking that may provide valuable insights when exploring the concept of practice in context.

Systems thinking

A system can be broadly described as an organized assembly of components that share a special relationship with each other. Each system represents a whole with boundaries that delineate it from other systems, yet allows them to interact (Friedman 1997; Sturmberg 2007a). Components within systems can include people, elements (e.g. policies, equipment, curricula), the roles of people, their needs, concerns, obstacles, conflicts, targets, processes, and more (Armson 2011). Bronfenbrenner’s Ecological Systems Theory [EST], for example, (described in more detail below) offers a realist perspective of the “person, of the environment, and especially of the evolving interaction between the two” (Bronfenbrenner 1979). EST attempts to capture the

complex dynamics within social systems. Outcomes cannot be explained simply by the components of a system; the relationships between components and their environment must also be considered (Kannampallil et al. 2011; Mennin 2010; Sturmberg 2007a; Sweeney and Griffiths 2002). This perspective brings a second and related feature of “systems thinking”, that is the role of complexity. Complexity thinking obligates attention to a large number of heterogeneous elements which are influenced by, and in turn influence other elements within a system, sometimes in unpredictable ways. These features, along with many diverse agents, working autonomously yet connected, combine to make a system complex but meaningful (Kannampallil et al. 2011; Mennin 2010; Sturmberg 2007a; Sweeney and Griffiths 2002). It is these ways of “seeing” (i.e. applying systems thinking) that sheds light on relevant relationships or interactions that have status in shaping what professions must account for in ‘real world’, messy contexts (Doll Jr and Trueit 2010; Manson 2001; P. E. Plsek and Wilson 2001). This may allow us to improve the competency framework development processes in novel ways. Next, we examine EST in more detail, including the rationale for its use, and its limitations, followed by a focus on applied complexity thinking in healthcare.

Ecological Systems Theory

Originally conceived as a theoretical perspective for research in human development, Bronfenbrenner describes EST using the analogy of “a set of nested structures, each inside the next, like a set of Russian dolls” (Bronfenbrenner 1979, p3). It comprises the person situated within four interrelated environmental systems, namely, the (1) micro-, (2) meso-, (3) exo-, and (4) macro-systems, and obligates a focus on the person, processes, context, and time. EST stresses person-context interrelatedness, and the levels describe settings in which people directly interact (micro- and meso-systems) to larger settings that indirectly influence people (exo- and macro-systems) (Bronfenbrenner 1979; Ettekal and Mahoney 2017). All levels of the system are enacted within the chronosystem, which are changes that occur within the system over time (Bronfenbrenner 1979). Bronfenbrenner illustrates his theory with the example of a child learning to read. The reading ability of a child is heavily influenced by a multitude of factors at various system levels: at person level (e.g. home or school setting, how the child is taught); the relationship between settings (e.g. the links between home and school); broader settings where the child is not present (e.g. the employment status of the child’s parents); societal influences (e.g. culture); and the impacts of global events (e.g. economic crises that impact parental employment). EST has since been used to explore the influences on human development in settings such as social care (Friedman 1997).

When EST is adapted to healthcare, the person level reflects a “patient-centred” system. Clinical microsystems are embedded in larger systems and are by their definition “patient-centred” (Nelson et al. 2008). Patients’ health status is influenced by a multitude of social, economic, cultural, and other factors. The microsystem refers to the immediate clinical practice environment, and all components within it (including people, their characteristics, places etc.). Next, the mesosystem represents the interactions that occur between people, and the enactment of policies and procedures (Pask et al. 2018). The exosystem refers to the community level or the service delivery level (e.g. hospitals, clinics, healthcare services). While healthcare services exist at the exosystem level, the delivery of such services takes place via the mesosystem through the complex interactions between

people and policies. National or local level influences such as government policies, culture, religious movements, the economy, and societal issues are examples of macro-system level forces. Broader influences such as global events (e.g. pandemics), and sociopolitical issues such as war, and mass immigration exist at the supra-macro level. Finally, the chronosystem refers to the changes, both within the system, and to the dynamic change to the totality of the system over time.. See Figure 2 for an illustration of EST applied to healthcare.

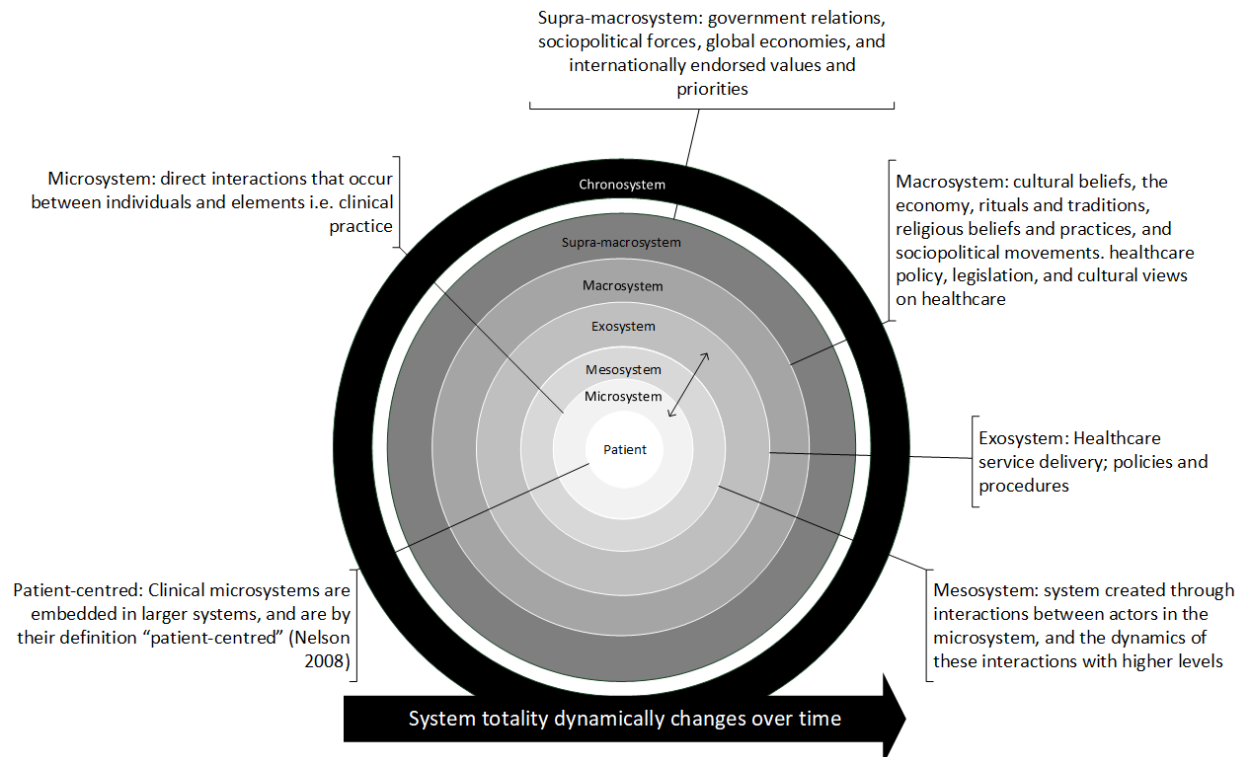


Figure 2. Ecological Systems Theory (EST) applied to healthcare.

This figure briefly outlines each system level when EST is applied to healthcare, and is informed by existing literature. The diagram illustrates that the system is patient-centred, and patient care takes place within clinical microsystems. These levels are in turn influenced by (and can influence) meso-, exo-, macro-, and supra-macro system features and influences. The smaller (black) arrow represents the creation of the mesosystem level (e.g. through the interactions between people, enactment of policies). between the microsystem and exosystem. The chronosystem (outer level with arrow) represents both changes in system features over time, and the dynamic change to the totality of the system over time

Why Ecological Systems Theory?

As previously outlined by Ellaway et al., there are a number of frameworks that we could apply ecological perspectives of systems to medical education with. (Ellaway et al. 2017). Our choice for leveraging Bronfenbrenner's EST was to take advantage of the topological nature of the approach. We suggest that a topographical lens offers an easily understood, and transferable framework by which to gain an overview of the given system. This may hold utility for those who develop and use competency frameworks, as a conceptual model by which to structure their exploration and understanding of the system. In addition, based on our review of various systems and complexity sciences (outlined by Castellani 2018), we propose that EST offers a solution to one of the core criticisms of healthcare-centric systems thinking (Castillo et al. 2020) – it can help us to identify social and structural determinants of health. Additionally, EST has been successfully adapted for use in healthcare contexts, and we are not the first to suggest ecological approaches may hold value in health professions education (Ellaway et al. 2017). Indeed, contemporary research considers features of EST, such as the microsystem, as foundational elements of systems in healthcare (Nelson et al. 2008; Quinn 1992), and acknowledges the importance of understanding and managing features such as the macrosystem and mesosystem in order to improve healthcare performance and quality at the microsystem level (Batalden et al. 2005). Other researchers have successfully adapted EST to identify the features of contemporary healthcare systems in which individuals directly interact (e.g. clinical practice) to larger settings which indirectly influence patient care (e.g. hospitals, healthcare policy) (Dobbs and Burholt 2016; Friedman 1997; Pask et al. 2018). For example, Dobbs adapted EST as a framework to identify which level of system changes needed to be made to improve end-of-life care (EoLC) (Dobbs and Burholt 2016). They identified issues at multiple system levels, in particular the need to refocus aspects of EoLC to be more person- and carer-centred (i.e. microsystem level). Pask et al. adapted EST to explore the complexity of palliative care (Pask et al. 2018). Their research uncovered issues such as the complexity surrounding dissonance between healthcare professionals and families, individual patient needs and characteristics, and the need for multidisciplinary team approaches to care (i.e. micro-, meso-, and exo-system levels). These previous adaptations suggest that patient care, which is enacted in a microsystem of clinical practice (Nelson et al. 2008), cannot be viewed in isolation but must be considered as a person-focused process that occurs in contexts that change over time. As such, we suggest that using EST facilitates a focus on the features of various healthcare system levels to better inform dependent outcomes and provides an opportunity to better understand and represent clinical practice when developing competency frameworks. Our choice of EST is not to suggest this is a superior choice to other ecological or systems perspectives – rather, that the concepts of ecological approaches may hold value for those who seek to better understand the system in which practice is enacted when developing competency frameworks.

Complexity thinking

While EST may allow us to conceptualize the persons, processes and contexts in which clinical practice occurs, it faces a challenge when we attempt to explore how we enact practice in the messy real-world, where multiple complex, unique, and context-embedded problems exist, few of which could be described as simple (Brown 2006; Fraser and Greenhalgh 2001; Kannampallil et al. 2011; Miles 2009; P. Plsek and Greenhalgh 2001). We must remain aware of the 'complexities of place'

– that is, how people and contexts come together to create places, which in turn are complex systems (Castellani et al. 2015). How the features of such places and levels interact creates unique problems that can be so messy and unwieldy that they defy traditional analysis and linear approaches, and may resist definitive resolution (B Castellani et al. 2015; Peters 2017; Varpio et al. 2017). Instead, they require a shift towards acknowledging and embracing complexity, and its underlying logic (Greenhalgh and Papoutsis 2018).

Examples of applied complexity in healthcare can be identified when we consider case-mix, the unpredictable progress of disease, practice variations between professionals, and the concept of adaptive expertise (Mylopoulos et al. 2018; P. Plsek and Greenhalgh 2001; Sweeney and Griffiths 2002) in various contexts such as primary care (Love and Burton 2005; Sturmberg 2007a, 2007b; Wilson et al. 2001), nursing (Chaffee and McNeill 2007), and palliative care (Pask et al. 2018). It is only when ‘problems’ are viewed through these ‘complexity lenses’ – particularly when applied to EST – that we can find new ways of seeing, and follow new paths to solutions. To illustrate this point in a simple manner, we revisit each level of the system outlined earlier via Ecological Systems Theory and suggest a source of complexity evident at each level. At the core, patients themselves, their disease progression, and the influencing factors on their health are complex systems (Pask et al. 2018; Sturmberg 2007a, 2007b). In the microsystem of clinical practice, the tacit knowledge of professional practice, and the unpredictable nature of clinical practice present challenges when we attempt to describe them. At the mesosystem level, interactions between large numbers of heterogeneous agents, the dynamics of these interactions, and the influences on such interactions are numerous. Healthcare system dynamics in the exosystem (i.e. how services are delivered, by which agencies, and how various policies may complement or conflict) can be complex and subject to regular change. The overlapping functions of regulation and education of health professionals at regional or national levels represent an additional source of complexity. On an even larger scale, the impact of forces such as financial crises, work shortages, and pandemics can be unpredictable, expansive, and dynamic. As such, when we fail to acknowledge and capture the complex contexts and places in which healthcare delivery is enacted, we fail to accurately represent clinical practice, and therefore we fail to adapt to future challenges.

Why complexity thinking and EST?

At least three implications are derived when such complexity is considered along with EST when developing competency frameworks. First, applied complexity thinking in healthcare illustrates how systems are not as linear and predictable as EST (and existing guidelines) may suggest. Using EST to explore system levels may suggest (as Bronfenbrenner originally described), that they are ‘nested’ within each other in a linear fashion, rather than ‘networked’ in many complex ways in the real world (Ettekal and Mahoney 2017). To fully understand a system and sufficiently describe it, the relationships, interactions, and dependencies at and between levels need to be explored. Second, neither EST nor complexity thinking alone may be sufficient to conceptualize clinical practice (Pask et al. 2018; Thompson et al. 2016); EST may struggle to illustrate real-world relationships, while complexity thinking can be difficult to understand and approach. Third, combining both as a conceptual framework may enable (but not necessarily directly provide) a more meaningful view of practice, or at least one we better understand, through the ways in which contexts and relationships are connected (Pask et al. 2018).

We suggest that the application of a systems thinking conceptual framework (i.e., EST combined with an applied complexity thinking in healthcare approach) can provide the ability to see the broader influences on patient care, and therefore relevant outcomes that may otherwise remain hidden when developing competency frameworks. Figure 3 provides a conceptual linking of the levels of EST and their relationships and dependencies, with examples of system influences that may be evident. This figure was informed by a process known as influence mapping, whereby the relationships or influences between features of the system were identified through an iterative process (Armson 2011). This resulted in an influence map that allowed us to observe how different context-bounded features potentially interact across levels. Finally, this influence map is used to inform a system mapping process, whereby systems and subsystems that belong together and to each other are grouped and assembled (Armson 2011)

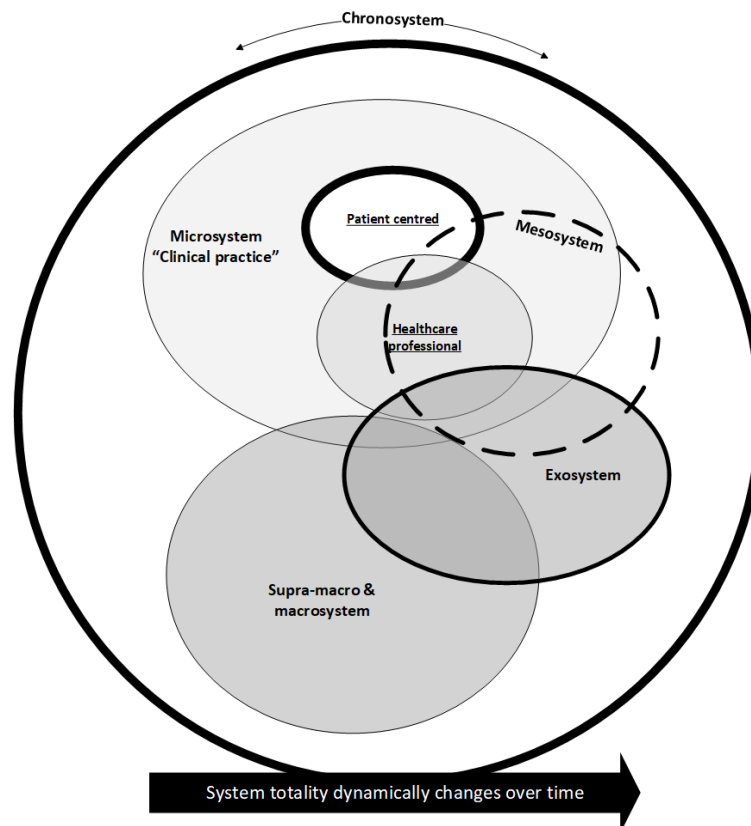


Figure 3. A systems map of healthcare contexts.

This figure illustrates the relationships or interactions between various system levels (as outlined by EST). The system levels outlined by EST have been transposed into a systems map (which was created via a process of influence mapping, whereby the relationships between various features of the system were identified). This figure again places the patient as the central focus of the system. However, this figure challenges the idea that the system levels in which patient care is enacted are “nested” in a simple, linear sense as EST may suggest. Instead, this figure illustrates that there

are multiple areas of influence between system levels (and their features) that may remain hidden or poorly understood until we engage with multiple systems thinking approaches. The chronosystem (outer level with arrow) represents both changes in system features over time, and the dynamic change to the totality of the system over time. Note: (a) size of elements is irrelevant; (b) overlaps do not illustrate significance but rather illustrate influence; (c) model is a partial representation of healthcare systems (as are all models), and does not claim to be a validated map of a healthcare system. For a detailed version of this figure which highlights some of the system features, please see Supplemental File 1.

Considerations

We suggest that considering practice through a systems-thinking conceptual framework provides an improved way of understanding and describing situated and context-specific practice when developing competency frameworks. However, supplementing existing development guidance with a conceptual framework that includes systems thinking and a consideration of inherent complexity, may pose challenges. For instance, no single correct outcome exists for a complex problem; much depends on the specific contexts and relationships. Recognizing that each ‘*way of seeing is also a way of not seeing*’ (Burke 1984), we acknowledge that there may be other approaches that provide insights neglected by the proposed systems thinking conceptual framework. Just as no universal solution exists to a complex problem, there is no single ‘correct’ approach to describing clinical practice or the required competencies to enact it. However, we suggest that the strength of a systems thinking approach lies in its ability to highlight broader structural features that have historically been overlooked when developing competency frameworks. Professional practice is more than “doing the work”.

Saying that, we are not suggesting that all influences and contexts must be accounted for when developing a competency framework; rather, what matters is we remain sensitized to these issues when describing practice, and in turn, when making choices about what to include in a competency framework. The dynamic nature of these forces also suggests that competency frameworks themselves require the ability to adapt to changing influences on practice. How to apply this conceptual approach in practice remains to be elaborated. What we propose with a systems thinking perspective is stimuli for the community to consider the utility of such a proposal to explore situated and context-specific practice.

An additional critique often levelled at competency frameworks as we highlighted earlier is that they emphasize a minimum standard, and are a poor approach to by which to describe ‘expert practice’. Indeed, some researchers would contend that expert practice is not amenable to competency approaches (Norman et al. 2014; O’Connell et al. 2014), and competency frameworks should instead outline minimum competencies, differentiate between low and high-performers, or delineate the competencies developed as expertise progresses. Regardless of the intent of the competency framework, we suggest that using a conceptual framework to identify the competencies required for situated, context-specific practice would support the development of graduated expertise competencies via appropriate pedagogical approaches if this was the intent behind developing the framework.

Finally, a number of critiques could be leveled against systems thinking being too broad, overwhelming, and/or generalist to be useful. However, systems thinking represent merely another tool to use. It does present developers with some challenges, but it can supplement existing guidance, and provide a means by which to test systems thinking across professional practice contexts. Doing so may help developers gain a better understanding of the system they are attempting to represent. While we may never fully capture the complex world of clinical practice, systems thinking can help us to expose features and relationships that further our understanding in meaningful ways (Greenhalgh and Papoutsis 2018).

Ways Forward

As a way forward, we propose the following:

- Test the utility of a supplementing a systems based approach in a variety of contexts and practice settings. This will elaborate how feasible it is to consider geographical, discipline-specific, societal, social, and cultural boundaries for a given competency framework (Whitehead et al. 2015). Implementation will benefit from further consideration, negotiation, alteration, and adaptation by the community (Bordage 2009).
- Conduct further research on how to structure choices related to the various features and relationships that are possible when applying a systems approach to supplement existing guidelines. This includes examining their impact on the validity of outcomes. Competency framework developers and medical educators may need a deeper understanding of systems thinking applied to this context in order to use it as a way of supplementing existing competency framework development guidelines. While we suggest EST and complexity thinking combined offer a logical systems-based approach, there are other conceptual frameworks and approaches that may be more appropriate for given contexts and purposes (Bordage 2009). Additional considerations that may inform ecological approaches are outlined by Ellaway et al. (2017).
- Those developing competency frameworks should clearly articulate the role of a specific theoretical or conceptual framework during the competency framework development process. Doing so can aid in identifying solutions to problems that may arise during the development process, and allow others to build on the work.
- Developers should explicitly outline the choices made regarding which features informed by systems thinking were included (or not), elaborating on how and why they were made. This also includes elaborating on the context in which the choices were made. For example, a framework developed for a specific localized purpose may not require the same in-depth consideration of supra-macro influences as another context. This will help end users determine the suitability of such choices.

Conclusions

Efforts to describe clinical practice for the purpose of developing competency frameworks may be improved by intentionally “seeing” and attending to healthcare features (e.g. influences and relationships) that are made visible when viewed through a conceptual framework shaped by

systems thinking. We suggest that an adaptation of Ecological Systems Theory provides a means to identify and describe the relevant persons, processes, and contexts of the healthcare system. Complexity thinking complements the perspective provided by EST by obligating a focus on the non-linear relationships and dynamics between these features across all levels of the healthcare system. Collectively, and when viewed through this lens, we have highlighted how an opportunity exists to identify how some competency frameworks may be left wanting. That is, competency framework development guidelines supplemented with a conceptual framework informed by systems thinking, illustrates how important features may previously have been overlooked, and how our previous attempts to describe clinical practice may be insufficiently aligned with the realities and complexities of practice. However, we are now afforded the opportunity to integrate situated and context-specific clinical practice features and their potential interactions, toward an improved and more representative competency framework.

Declarations of interest

The authors declare no conflicts of interest.

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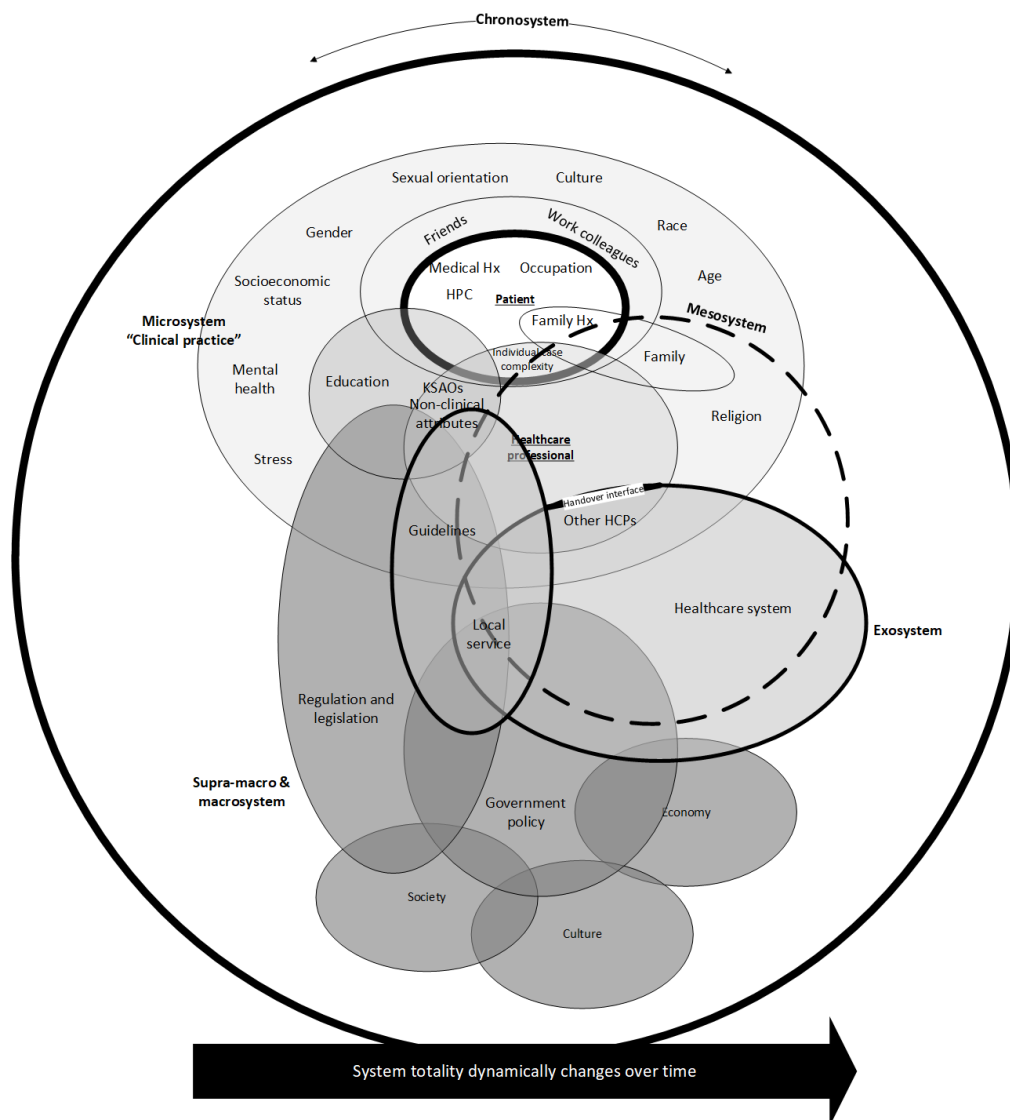
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Supplemental file 1 – A systems map of healthcare contexts



The linear system levels identified via EST in Figure 1 have been transposed into a systems map, designed to illustrate the relationships or interactions between the system levels in a ‘real world’, non-linear sense. Note: (a) size of elements is irrelevant; (b) overlaps do not illustrate

significance but rather illustrate influence; (c) model is a partial representation of healthcare systems (as are all models), and contains examples of the influences that may be evident in the system. HPC = history of presenting complaint; KSAOs = knowledge, skills, attitudinal and other competencies; Hx = history.