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Published

2013

Journal Title

Focus on Health Professional Education

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Complexity in healthcare: Implications for clinical education

P. Kuipers^{1, 2}, E. Kendall¹, C. Ehrlich¹, M. McIntyre¹, L. Barber¹, D. Amsters², M. Kendall^{1, 2}, K. Kuipers² & S. Brownie³

Abstract

Aim: This descriptive article considers aspects of healthcare complexity and clinical education through the World Health Organisation's International Classification of Functioning, Disability and Health (ICF). The relevance of the ICF for informing healthcare for people with complex health needs is considered and implications for clinical education are suggested.

Method: The 'core sets' of 22 complex health conditions were extracted from the official ICF internet research database. These core sets, which have been developed with almost 6000 patients and experts globally, define the key dimensions and implications of these complex health conditions

using standardised descriptors. Relevant descriptors were summarised as tallies of all categories across the 22 core sets.

Results: The categorised tallies indicated that across 22 complex conditions, the ICF domains of 'activities and participation', 'environment' and 'body function' were used more frequently in core set inventories documenting complex conditions than descriptors from the 'body structures' domain. That is, personal, social and environmental dimensions were highlighted more frequently than medical aspects of complex conditions.

Conclusion: The ICF 'core sets' for complex health conditions provide a useful, research-based perspective on healthcare complexity. The current study suggests that clinical education for complexity should likewise be broad in scope and include the multiple personal, social and environmental dimensions of complexity.

Keywords: clinical education, ICF, complexity, health services research.

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Introduction

Complexity

Complexity has been identified as a highly important construct in healthcare that lacks clear conceptualisation (Safford, Allison, & Kiefe, 2007)

and that must be more clearly understood and defined (Grant et al., 2011). Complexity has been linked with multiple co-occurring medical conditions (Nardi et al., 2007), patient factors (e.g., personal, cultural, socioeconomic) (Safford et al., 2007), health-related characteristics (age, frailty) and psychosocial issues (Grant et al., 2011) as well as socioeconomic, cultural, environmental factors and patient behaviour (Valderas, Starfield, Sibbald, Salisbury, & Roland, 2009). Complexity has also been recognised as arising from healthcare practitioner factors (e.g., training and expertise) (Stiefel et al., 2006) and task- and team-related factors (the nature of the healthcare task, workflow, available time, technology, communication, roles and leadership) (Maslin-Prothero & Bennion, 2010). Even more broadly, complexity has been associated with organisational factors (organisational structure, culture, policies and procedures) (Epping-Jordan, Pruitt, Bengoa, & Wagner, 2004), systems and administrative structures (Taylor & Swerissen, 2010) as well as environmental factors (physical and social environment) (Jeon et al., 2010). Indeed, healthcare complexity has been related to population health (Huynen, Martens, & Hilderink, 2005) and population health interventions (Jayasinghe, 2011).

Healthcare complexity is the result of interaction between a number of dimensions (medical, situational and systemic) and comprises “multiple, dynamic components interacting in non-linear, unpredictable ways” (Katerndahl, Parchman, & Wood, 2010, p. 1003) Closely linked with the growth of co-morbid conditions, the

escalation of healthcare complexity has been implicated in increasing healthcare costs (Valderas et al., 2009; Wade, 2011), greater service usage and the need for more high-cost procedures (Grant et al., 2011). Complexity may also be linked with perceived inequity in healthcare, for example, in specific service responses to needs of ethnic or other minority groups (Sturmberg & Martin, 2009). Importantly, healthcare complexity has been associated with decreased practitioner satisfaction (Katerndahl, Parchman, & Wood, 2009), diagnostic dilemmas (Gask, Klinkman, Fortes, & Dowrick, 2008) and poorer quality and outcomes of care (de Jonge, Huysse, & Stiefel, 2006).

Health services and complexity

People with complex healthcare needs require continuous care from consistent providers who are skilled and experienced practitioners (Grant et al., 2011). Recognising that system design is pivotal to achieving such continuity (Duckett, 2008), redesign that acknowledges the reality of complexity will be integral to optimal healthcare services. While recent Commonwealth Government reforms seek to achieve such continuity by redesigning and improving public hospital and primary healthcare services (Australian Government, 2010), they are also influenced by fiscal constraints and workforce shortages. The reforms coincide with activity-based funding and diagnostic-related pricing that are important strategic developments but which may penalise the provision of care for those patients with complex conditions who require longer lengths of stay, multiple treatments or may be vulnerable to complications (Beaty,

2005). The current emphases on clinical care standards in Australia and elsewhere (ACSQHC, 2011) are also important strategic advances in addressing service continuity and consistency. While such advances can reduce costs, improve efficiency and deliver high quality care (van de Klundert, Gorissen, & Zeemering, 2010), they may not fully address the needs of people with complex and co-morbid conditions (Lugtenberg, Burgers, Clancy, Westert, & Schneider, 2011). The pressing issue facing healthcare professionals is how to meet complex care needs within a fragmented and siloed system.

Clinical education in response to complexity

Complexity raises significant challenges for the design and delivery of care, for the range of capabilities and competencies required of the healthcare workforce, and for the provision of education which underpins that care (Fraser & Greenhalgh, 2001; Grant et al., 2011). Clinical education may be an important strategy to equip existing healthcare practitioners to more effectively address complexity (Fraser & Greenhalgh, 2001). In this regard, clinical education has been used to address the fragmented nature of healthcare (Hirsh, Ogur, Thibault, & Cox, 2007) and to influence the single-disease paradigm (Fortin, Soubhi, Hudon, Bayliss, & Akker, 2007), both of which exacerbate complexity (Jowsey et al., 2009; Safford et al., 2007). Indeed, the World Health Organisation (2009) has recommended that developing an understanding of the systems and impact of complexity on patient care should be integral to medical curricula.

In light of complexity, departments of health as well as clinical education providers may require greater information to plan systems and deliver training which will assist practitioners to work in complex situations (accurately assessing patient need, coordinating multiple services and providers, ensuring continuity of care, responding to crises and supporting family and carers) (Kodner & Spreeuwenberg, 2002). Further, attaining a more adaptive healthcare workforce, with greater capacity for collaboration at many levels (Frenk et al., 2010; Queensland Health, 2009), will also in part depend on clinical education.

A framework to guide clinical education for complexity: The ICF

A key challenge in developing clinical education resources and methods to address complexity is that conventional approaches to acquiring and sharing knowledge typically rely on reductionism and compartmentalisation (Cooper, Braye, & Geyer, 2004), which are potentially counterproductive in responding to complexity (Martin & Sturmberg, 2009). In our initial exploration of complexity in healthcare (Kuipers et al., 2012), the need for a comprehensive framework was identified. It was also noted that a suitable framework may allow clinicians to conceptualise, describe and depict the breadth and dimensions of complexity.

A useful framework that assists in portraying inter-related constructs of health conditions is the World Health Organisation's international classification of functioning, disability and health (ICF), published in 2001. The ICF (in its full form) is a comprehensive coding system that provides a standard language

for describing human functioning, disability and health. It comprises classifications for body functions, body structures, activities and participation as well as environmental factors (such as the physical, social and service environment). In addition, it outlines personal factors (such as personality, age, culture and coping strategies).

In the model overview (Figure 1), the ICF depicts a *comprehensive* bio-psycho-social model of health and functioning that can be used to conceptualise issues (Cerniauskaite et al., 2011) and elucidate interactions that are influential in healthcare complexity at individual and system levels. The ICF can also be used to inform professional practice and facilitate research (Cerniauskaite et al., 2011). Consequently, the ICF is being considered as a model to provide a “handle” on complexity in healthcare which will inform

clinical education in Queensland Health (Kuipers et al., 2012).

While the ICF emerged in a rehabilitation context, it clearly has substantial legitimacy in many areas of healthcare (Cerniauskaite et al., 2011) and along with the International Classification of Diseases, Tenth Revision (ICD-10) is endorsed by WHO to enhance understanding of complex connections between health, disease and functional outcome (Allan, Campbell, Guptill, Stephenson, & Campbell, 2006). The ICF appears to be a useful tool for conceptualising and targeting interventions for patients with complex health conditions (Allan et al., 2006; Allet et al., 2007), assisting clinicians to think in a broader, less reductionist way (Josephson, Bulow, & Hedberg, 2011). However, its direct application to clinical education and training for complexity requires further research.

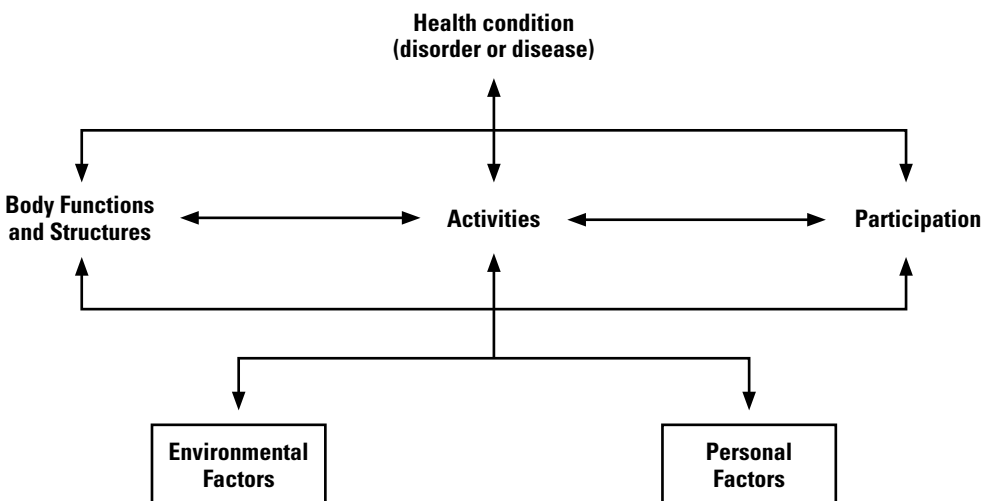


Figure 1: The International Classification of Functioning, Disability and Health (ICF) model which depicts factors associated with health conditions

Having acknowledged the potential of the ICF to inform a response to healthcare complexity in a general sense, the current study sought to explore how it might inform a clinical education curriculum. Recognising that the ICF model does not depict the relative importance of factors contributing to health, and was not developed as a model of complexity, we sought evidence to inform whether the ICF is actually a useful model for reflecting complexity. Our aim was to indicate the relevance of the ICF to healthcare for people with complex needs. We posed the question, “How might the ICF inform priorities for a clinical education curriculum to address complexity in healthcare?”

Method

In response to the research question, we sought available information based on actual healthcare investigations, rather than focusing on opinion (which forms a large part of the complexity literature). Further, given that our interest was not to inform specific training content on any one complex condition or complex circumstance, we sought information on how a curriculum on complexity in general might be oriented.

First, the authors noted that there has been substantial investment by the ICF community in defining “core sets” of chronic and complex conditions. These internationally agreed lists of ICF domains pertaining to specific conditions comprise the least number of practically relevant ICF domains required to comprehensively describe the prototypical dimensions of limitations in functioning and health encountered in a specific condition (Stucki et al., 2002). Their development involves a

formal decision-making and consensus process integrating evidence gathered from preliminary studies and expert opinion (Cieza et al., 2004). Specifically, the core set development process as implemented by collaborating centres usually involves a stringent large-scale international research process over two years. It comprises: an empirical multicentre study of the condition across a substantial number of patients (over 100) to identify problems commonly experienced, a systematic literature review of research and an in-depth, large scale qualitative study of patients (and carers) experience of this condition. These findings are then integrated with a major email Delphi study of around 100 experts, an international consensus conference held with approximately 20 key international experts to analyse outcomes of the studies and determine a first version of the core set, and then a period of testing and validation of the core set.

While there are well over 50 core sets published (Cerniauskaite et al., 2011), as of January, 2012, a total of 22 established core sets of complex conditions were listed on the official website of the ICF Research Branch, part of the WHO Collaborating Centre for the Family of International Classifications (WHO-FIC) in Germany, which develops, evaluates and disseminates tools and models of functioning and health for different groups of patients and settings (ICF Research Branch, 2012). These core sets pertain to: neurological conditions (multiple sclerosis, early spinal cord injury, chronic spinal cord injury, traumatic brain injury), cardiovascular and respiratory conditions (chronic

obstructive pulmonary diseases, obesity, diabetes mellitus, stroke, chronic ischaemic heart disease), cancer (head and neck cancer, breast cancer), mental health (depression, bipolar disorders), musculoskeletal conditions (ankylosing spondylitis, chronic widespread pain, osteoporosis, osteoarthritis, low back pain, rheumatoid arthritis) and other health conditions (inflammatory bowel diseases, sleep disorders, hand conditions).

Second, to address our question as to how the ICF might inform clinical education for healthcare complexity, we sought to determine the relative proportions of the ICF domains which are used to describe these 22 complex health conditions. We reasoned that the relative proportions of the key issues identified by over 2,500 patients with complex conditions and almost 3,000 of the world's key experts on these 22 conditions would be useful general indicators as to what a curriculum to address complex health conditions might include. That is, to reflect complexity as a general entity, an overview of the official core sets on 22 complex health conditions would provide an indication of how a clinical education curriculum might be oriented.

In response, we tallied all of the descriptors used in all 22 comprehensive core sets. For uniformity, we focused our tally on second-level descriptors only, since this is the level at which aspects of the main domains are distinguished. In summary, our method comprised:

1. Twenty-two established core sets identified and extracted (ICF Research Branch, 2012).
2. All 1,911 second-level descriptors extracted across 22 core sets.
3. Second-level descriptors tallied according to ICF domains (Figure 1).
4. Tallies and means presented in table and figure formats.

Analysis of these questions through review of existing data did not require ethics committee approval.

Results

The result of our summary analysis, comprising tallies and percentages of descriptors from expert core sets is depicted in Table 1. This table indicates that across all 22 complex conditions, descriptors from the 'activities and participation', 'environment' and 'body function' domains were used much more often than descriptors from the 'body structures' domain in the international definitions of core sets of complex conditions.

Figure 2 depicts this information as relative proportions of tallies. It indicates that the most frequent items used by experts across these 22 complex condition core sets were:

- activities and participation (a person's execution of a task or action and the nature of their involvement in any activity or situation) (WHO, 2001),
- environmental factors (the physical, social and attitudinal environment in which people live and conduct their lives) (WHO, 2001) and
- body functions (physiological and psychological functions of body systems) (WHO, 2001).

Results also show that 'body structures' (anatomical parts of the body, such as

organs, limbs and their components) (WHO, 2001) were included less often as descriptors in the 22 complex condition core sets.

Discussion

This commentary and interpretation of secondary data has sought to highlight the issue of complexity in healthcare. Specifically, the study has sought to use the ICF for informing a potential

clinical education curriculum within a state health department. First, it was noted that the existence of numerous ICF core sets pertaining to complex health conditions indicates the potential relevance of the ICF framework to conceptualising and depicting key dimensions of complexity in healthcare. Studies increasingly note the importance of responding to complexity in healthcare improvement and workforce

Table 1: Tally of second-level ICF codes across 22 complex conditions

	Body functions	Body structures	Activities & participation	Environment
Neurological conditions				
· Multiple sclerosis (MS)	33	7	53	35
· Spinal cord injury (Early)	42	10	34	32
· Spinal cord injury (Chronic)	34	8	45	41
· Traumatic brain injury (TBI)	37	2	63	37
Cardiovascular and respiratory conditions				
· Chronic obstructive pulmonary diseases	17	5	23	22
· Obesity	29	18	28	33
· Diabetes mellitus	31	10	15	29
· Stroke	41	5	51	33
· Chronic ischaemic heart disease	14	1	17	29
Cancer				
· Head and neck cancer	25	15	26	18
· Breast cancer	22	6	22	23
Mental health				
· Depression	17	0	45	28
· Bipolar disorders	14	0	14	10
Musculoskeletal conditions				
· Ankylosing spondylitis	12	7	24	13
· Chronic widespread pain	23	1	27	16
· Osteoporosis	15	7	21	26
· Osteoarthritis	13	6	19	17
· Low back pain	19	5	29	25
· Rheumatoid arthritis	15	8	32	21
Other health conditions				
· Inflammatory bowel diseases	15	2	20	11
· Sleep disorders	34	8	29	29
· Hand conditions	22	8	41	42
Total (percent) n = 1,911	524 (27.4)	139 (7.3)	678 (35.5)	570 (29.8)

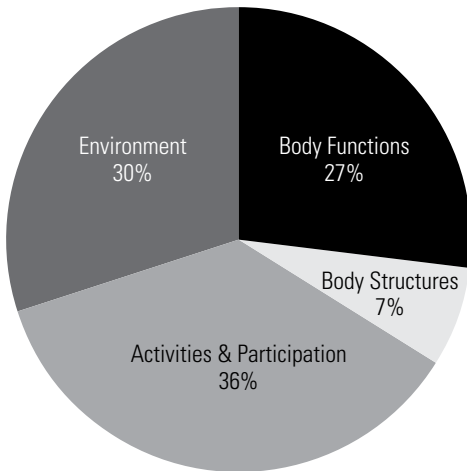


Figure 2: Proportions of ICF domains across 22 complex condition core sets

training settings (Aylward, 2012), and the ICF may be a useful tool to help address current gaps in this area.

Second, the current tally of ICF core sets across 22 complex health conditions noted that almost 6,000 experts and patients predominantly used ‘activities and participation’, ‘environment’ and ‘body function’ factors to define the most important dimensions of complex conditions. They used fewer descriptors of ‘body structures’ in their definitions of core elements of these conditions. While care must be taken not to overemphasise these data, findings are consistent with other studies, such as those seeking to define complexity from the perspective of physicians (Grant et al., 2011). The findings suggest that complex conditions should be understood broadly, and that the ramifications of complex health conditions should be recognised well beyond medical complexity.

The implications for curriculum development in clinical education include the importance of advocating holistic approaches to service delivery (Durney-Crowley, Heller, & Oros, 2000). As reflected in the ICF (Figure 1), the interconnectedness of dimensions of a person suggests that educators should train staff to address health complexity holistically, acknowledging all dimensions of a person’s life and health. This is consistent with the literature which calls for such breadth of conceptualisation in the face of complexity (Cooper et al., 2004; de Jonge et al., 2006; Grant et al., 2011; Woods, Patterson, & Cook, 2007).

In this regard, the inclusion of critical thinking and reflective practice in clinical education have been proposed to maximise holistic care and respond to complexity in healthcare (Durney-Crowley, et al., 2000; Mann, Gordon, & MacLeod, 2009). In terms of the process of clinical education, case presentations and role plays are useful in aiding understanding (Fraser & Greenhalgh, 2001). Exposure to appropriately complex case histories with multiple acceptable solutions (Cook, Beckman, Thomas, & Thompson, 2008) builds the capacity of healthcare practitioners to respond to complex situations in the future. Further, it would seem that opportunities for healthcare practitioners to learn from each other and collectively solve complex problems is beneficial (Soubhi et al., 2010).

There are numerous limitations to this study. First, the findings are based on secondary data, not specifically intended for this purpose; consequently, a degree of caution should be exercised in interpreting

these findings. Detailed interpretations beyond roughly indicative suggestions (which was the stated purpose of this work) are not warranted.

Second, the analysis assumes a link between the number of times a descriptor is used in an ICF core set and its importance in that complex condition. This is not necessarily the case. While the tallies are likely to be generally reflective of importance, some domains will be much more significant in a person's experience of a complex condition than others. Simply because a particular body structure is only mentioned a limited number of times does not mean it is not vitally important in a complex health condition. Again, the aim of the current project was not to restrict curriculum planning to frequently mentioned domains, but rather to suggest a balance to a possible reliance on reductionism and compartmentalisation (Cooper et al., 2004).

Third, while the application of the ICF in this way has been informative and consistent with quantitative studies (Grant et al., 2011), it is important to realise that the scope of the ICF is the 'person' and as such focuses on more immediate person-related factors. Situational and systemic factors are only dealt with generally in the environment dimension. By comparison, the INTERMED assessment framework (an action-oriented decision-support tool for clinicians to facilitate integrated patient-oriented healthcare for complex patients) highlights issues such as: access to care, treatment experience, organisation and coordination of care, and health system factors as key dimensions of complexity (Stiefel et

al., 1999; Stiefel et al., 2006). Future research in this area may benefit from more specific emphasis on such social, situational and systemic determinants of complexity in healthcare.

Likewise, further research in this area should explore patient and practitioner perspectives of healthcare complexity. It may focus on the optimal or 'best practice' model/s of delivery for complexity and identify how specific elements of curricula should be developed. This would further the challenge to more effectively support, build capacity and enhance practice within the current workforce to best meet the needs of individuals with complex healthcare needs.

Conclusion

The aim of the current paper was to explore how the ICF might inform priorities in clinical education for complexity in healthcare. The findings acknowledge the breadth and extent of issues associated with complex health conditions. The results suggest that clinical education that is responsive and relevant to the key issue of healthcare complexity should be broad in scope and holistic, addressing numerous dimensions, particularly those beyond the immediate medical aspects. As a result, clinical education might emphasise critical reflection and case-based approaches.

Acknowledgements

This project was supported by Clinical Education Queensland (ClinEdQ), Queensland Health and the Population and Social Health Research Program, Griffith University.

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