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Application of complexity theory in health and social care research: a scoping review

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ABSTRACT

Background Complexity theory has been chosen by many authors as a suitable lens through which to examine health and social care. Despite its potential value, many empirical investigations apply the theory in a tokenistic manner without engaging with its underlying concepts and underpinnings.

Objectives The aim of this scoping review is to synthesise the literature on empirical studies that have centred on the application of complexity theory to understand health and social care provision.

Methods This scoping review considered primary research using complexity theory-informed approaches, published in English between 2012 and 2021. Cochrane Database of Systematic Reviews, MEDLINE, CINAHL, EMBASE, Web of Science, PSYCHINFO, the NHS Economic Evaluation Database, and the Health Economic Evaluations Database were searched. In addition, a manual search of the reference lists of relevant articles was conducted. Data extraction was conducted using Covidence software and a data extraction form was created to produce a descriptive summary of the results, addressing the objectives and research question. The review used the revised Arksey and O'Malley framework and adhered to the Preferred Reporting Items for Systematic Reviews and Meta-analysis Extension for Scoping Reviews (PRISMA-ScR).

Results 2021 studies were initially identified with a total of 61 articles included for extraction. Complexity theory in health and social care research is poorly defined and described and was most commonly applied as a theoretical and analytical framework. The full breadth of the health and social care continuum was not represented in the identified articles, with the majority being healthcare focused.

Discussion Complexity theory is being increasingly embraced in health and care research. The heterogeneity of the literature regarding the application of complexity theory made synthesis challenging. However, this scoping review has synthesised the most recent evidence and contributes to translational systems research by providing guidance for future studies.

Conclusion The study of complex health and care systems necessitates methods of interpreting dynamic prcesses which requires qualitative and longitudinal studies with abductive reasoning. The authors provide guidance on conducting complexity-informed primary research that seeks to promote rigor and transparency in the area.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ This study builds on previous evidence syntheses and synthesises the literature on empirical studies that have centred on the application of complexity theory to understand health and social care provision.
⇒ This review applies the latest guidance for the performance of scoping reviews.
⇒ The review covers the years 2012–2021 and includes English language papers only.
⇒ The review excluded educational settings.

BACKGROUND

Health and care systems around the globe are struggling to cope with the imbalance between increasing demands and system constraints. These challenges have been amplified with the advent of the COVID-19 pandemic. Traditional approaches to tackling these challenges have typically taken a positivistic approach using mechanistic linear reductionist methods more suited to physical systems than complex adaptive human systems and have failed to produce the necessary system transformation. These positivist views have been challenged as simplistic by various key complexity philosophers and scientists over the years.[1–5] Complexity theory and science have received increasing academic and health system attention in recent years as appreciation has grown that, to address increasingly complex and systemic issues, there is a need for collaborative, cross-sectoral, multidisciplinary working. However, how best to study complex social systems is unclear. What is acknowledged is that complex systems share certain characteristics; they consist of elements that interact dynamically in a non-linear manner with feedback

loops in systems that are open and operate in conditions far from equilibrium. Each complex system has a history, which influences the behaviour of the system which is determined by the nature of the interactions between the elements. These interactions are adaptive and dynamic with unpredictable outcomes.[1 2 6] Preiser and colleagues in 2018 completed an evidence synthesis of prominent authors' classifications of complex adaptive systems (CAS) features and characteristics and proposed a typology of six organising principles to inform practical implications and methods for studying and understanding complex systems.[6] These are the following: (1) it is constituted relationally; (2) it has adaptive capacities; (3) patterns of behaviour are a consequence of dynamic processes; (4) it is radically open; (5) it is determined contextually and (6) novel qualities emerge through complex causality. While there is an absence of a unifying theory of complexity, it is generally accepted that engaging with complex systems requires an entanglement of theories and methods.

While the increasing adoption of complexity-informed methods to empirically investigate health and social care settings is welcome, the literature to date has been critiqued for engaging with complexity in name only and lacking the required appreciation and engagement with the logic that underpins it. A scoping review performed by Thompson and colleagues in 2016 investigated complexity theory in health services research and found that, although complexity theory in healthcare was potentially useful, conceptual vagueness and variable theoretical application impeded its practical application.[7] In 2017, Rusoja and colleagues performed a systematic literature review examining health-related systems thinking and complexity ideas.[8] Similar to Thompson and colleagues, they also found that the literature was largely theoretical, suggesting the need for additional research involving practical application. These reviews are now somewhat outdated given the dynamic ever-changing flux of healthcare in the time that has passed since the reviews were published. In addition, these reviews focused on healthcare provision while omitting social care which is an integral component of the continuum of integrated care. Furthermore, the authors did not seek to characterise the components of complexity which were being used nor the theoretical underpinning of the research reviewed. Theory is important to research in that good theory informs the performance of high-quality research (qualitative or quantitative) about important issues that advance knowledge in the phenomenon of interest[9] and the Medical Research Council (MRC) guidance on the development and evaluation of complex interventions recommended that interventions should be developed systematically 'using the best available evidence and appropriate theory'[10] (p2). They also suggest that qualitative and mixed-methods approaches may be required to answer questions beyond effectiveness. When theory is used inappropriately, the benefit of using theory to inform high-quality research is negatively impacted. If used correctly, complexity theory offers a potentially useful perspective for the conceptualisation and resolution of problems in healthcare. Therefore, we identified a gap in the evidence regarding how complexity theory has been applied in health and social care research which warranted further examination and synthesis of the evidence to date. Evidence to date suggests limited description, features and attributes which may suggest a lack of appreciation of the underlying principles of a complex system when studying phenomena, which will be explored in this review.

The aim of this review is to map and describe the available research which has used complexity theory in health and social care settings. The authors seek to additionally expand on the previous evidence by providing a comprehensive understanding of the literature to date and offer guidance on how to apply complexity theory to research in health and social care in the future.

Ethical approval was not required, and this manuscript is an honest, accurate and transparent account of the study and no important aspects of the study have been omitted.

METHODS
Guided by Munn and colleagues,[11] the authors determined that a scoping review was the most appropriate approach to systematically explore how complexity theory has been applied in health and social care research. The scoping review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) statement.[12] The initial exploratory search of the literature highlighted significant gaps in current knowledge regarding how and why complexity theory has been applied in health and social care settings. In accordance with best practice for scoping reviews, an a priori protocol was developed and published.[13] The framework for scoping reviews developed by Arksey and O'Malley (2005) and refinements made by subsequent authors[11 14–16] guided the methodology for the current review. This framework consists of six stages: specifying the research question; identifying relevant studies; study selection; charting the data and reporting the results; collating, summarising and reporting the findings; and consultation exercise.

Stage 1: specifying the research question
Following an initial search of the literature (MEDLINE, CINAHL) and consultation with authors of previously published systematic reviews in the area,[7 8 17 18] the scoping review research question was developed: 'How has complexity theory been applied in health and social care research?'. The scoping review had the following objectives:
1. To map definitions and descriptions of complexity theory used in research regarding health and social care.
2. To describe the purpose of studies using the lens of complexity theory and phenomena of interest.
3. To investigate the methodologies used and the extent to which complexity theory has been employed in health and social care research.
4. To consider the settings and professions examined in these studies.

5. To assess the implications and outcomes of the application of complexity theory in health and social care research.
6. To identify gaps in the evidence base and make recommendations for future research.
7. To determine guidance for future researchers when applying complexity theory in research regarding health and social care.

Stage 2: identifying relevant studies

Relevant studies were identified according to the inclusion criteria and the Population, Concept and Context (PCC).[16]

Population: Health and social care professionals.

Concept: Application of complexity theory in empirical research in health and/or social care.

Context: Health and social care settings.

Building on the evidence produced in the previous evidence syntheses, this scoping review considered qualitative and quantitative primary research using complexity theory–informed approaches, published in the English language between the years 2012 and 2021.

The following types of publications were excluded from the review: retrospective reviews, secondary analysis research, conference abstracts, book reviews, commentaries or editorial articles, opinion papers, letters and non-English articles.

Acknowledging that the review focused on the application of complexity theory regarding the provision of health and social care rather than the experience of receiving care, publications containing patient-only samples were excluded from the screening process.

An initial exploratory search strategy was developed in MEDLINE by three of the authors, including a university librarian experienced in the conduct of systematic reviews, using Medical Subjects Headings and text words (online supplemental file 1). The search was adapted for each subsequent database and any additional key terms were added to all other database search strategies before conducting the searches within all included databases: Cochrane Database of Systematic Reviews, MEDLINE, CINAHL, EMBASE, Web of Science, PSYCHINFO, The NHS Economic Evaluation Database and The Health Economic Evaluations Database. In addition, a manual search of the reference lists of relevant articles was conducted. No quality appraisal was performed as the authors sought to describe, not evaluate, the available evidence on the topic.

Stage 3: source of evidence selection

Based on the inclusion and exclusion criteria, the authors independently screened titles, abstracts and full-text papers using the systematic review software tool, Covidence.[19] Each stage involved two reviewers who were independent and blinded to the fellow reviewer decision outcomes to reduce potential bias. Any disagreements were resolved through discussion and a third reviewer was not required. To ensure consistent application of the

Table 1	Data extraction form for included studies
Component	**Data**
Study descriptives	Author(s)
	Title
	Year of publication
	Location (country in which research was conducted)
	Author bibliometrics
Research purpose	Aim of the research
Methodological characteristics	Research design methodology (e.g., quantitative, qualitative, mixed methods)
	Application of complexity theory
	Research setting
	Participants (i.e., health or social care professionals)
	Interprofessional focus
	Data collection
	Data analysis
	Ethical considerations in the study
	Study limitations
Application of complexity theory	How complexity was used? (e.g., theoretical framework, data analysis)
	Definition/description of complexity theory used
	Author(s) referenced in definition/ description of complexity theory
	Characteristics of complexity theory used
Study outcomes	Key findings related to scoping review question
	Impact of research
	Knowledge mobilisation (i.e., activities undertaken to disseminate findings)

screening criteria, a pilot test of the screening process was undertaken by the two reviewers using a small, random sample (n=25) of the identified articles based on their titles and abstracts. Relevant articles were retrieved from each database separately and imported into the bibliographic manager, and EndNote and the Bramer method were used for deduplication.[20]

Stage 4: data extraction

Data extraction was conducted using the Covidence software. The data extraction form (Table 1) was tested on a small sample of studies (n=10) by two reviewers to ensure consistency and was modified to include further criteria to answer the research question and objections. The results of the data extraction were compared and discussed. No discrepancies occurred during this stage and did not require a third reviewer.

Stage 5: Collating, summarising and reporting the results

Using the information contained in the data extraction form, this step involved a descriptive and numerical summary of the information within the identified publications as they related to the objectives of the review. Full-text publications were referred to if further information was needed from a particular study. The terminology used to describe complex systems was extracted and synthesised using the features and attributes in the Preiser framework.[6] Research purpose(s) were extracted verbatim based on the verbs used in the purpose statement as described in the abstract and/or main body and the authors documented where more than one research purpose was mentioned. The implications were analysed regarding their relevance to practice, policy and research, whereas outcomes pertained to direct impact on the phenomena or tools developed as a result of the research which applied complexity theory.

Stage 6: Patient and public involvement

The hospital patient forum, a platform for dialogue and exchange of information relevant to patients regarding the hospital, participated in the design and interpretation of the results of the scoping review.

RESULTS

A total of 2021 articles were identified. Of these, 676 were duplicates. The titles and abstracts of 1345 articles were screened and 1108 did not meet the inclusion criteria and were therefore excluded. The remaining 237 articles were full-text screened. Full-text screening of the final 237 resulted in the final inclusion of 61 articles. There were 9 systematic reviews identified which were subsequently hand-searched for further relevant articles. The PRISMA flow chart is shown below in Figure 1.

Descriptive summary

The key characteristics of the included studies are described in online supplemental file 2.

Year of publication

Figure 2 shows the distribution of the year of publication of the papers considered.

The most publications were in 2018, 2019 and 2020 (eight publications). The fewest were in 2015 (2) followed by 2021 (3). The trendline is quite flat.

Journal of publication

As shown in Figure 3, there were 43 different journals in which papers were published across a broad range of journal types. The most common journals for publication were *Social Science and Medicine* (n=7) and *BMC Health Service Research* (n=4). All other journals published between 1 and 2 papers.

Geographical location of study

Of the 61 publications, 17 studies were set in the USA and 11 in Canada and 8 in the UK. The complete geographical locations for the studies are shown in Figure 4.
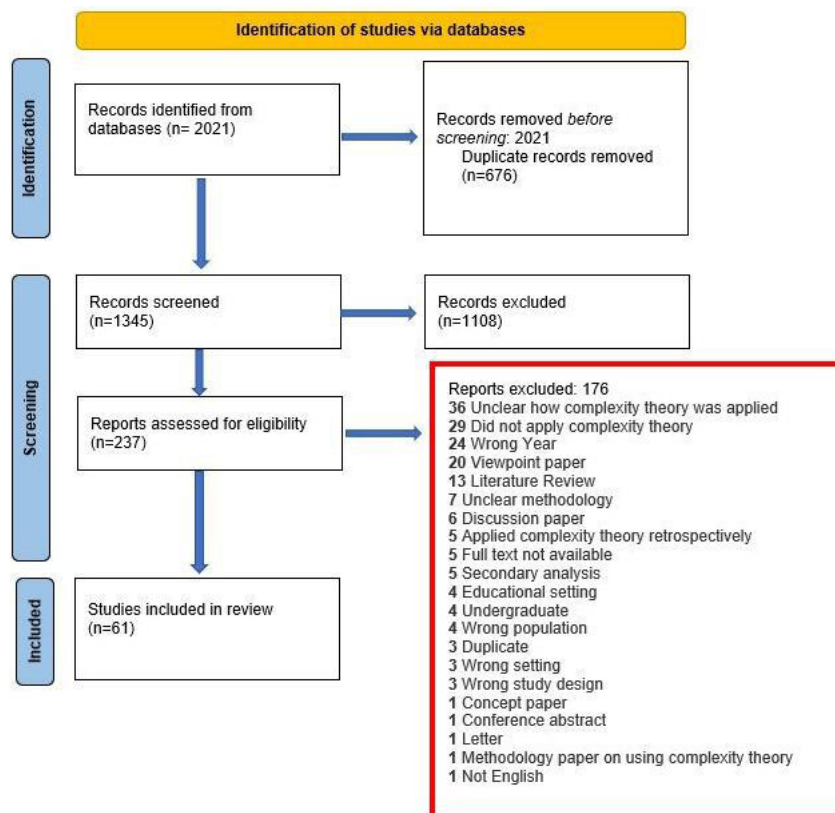

Figure 1 PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow chart.
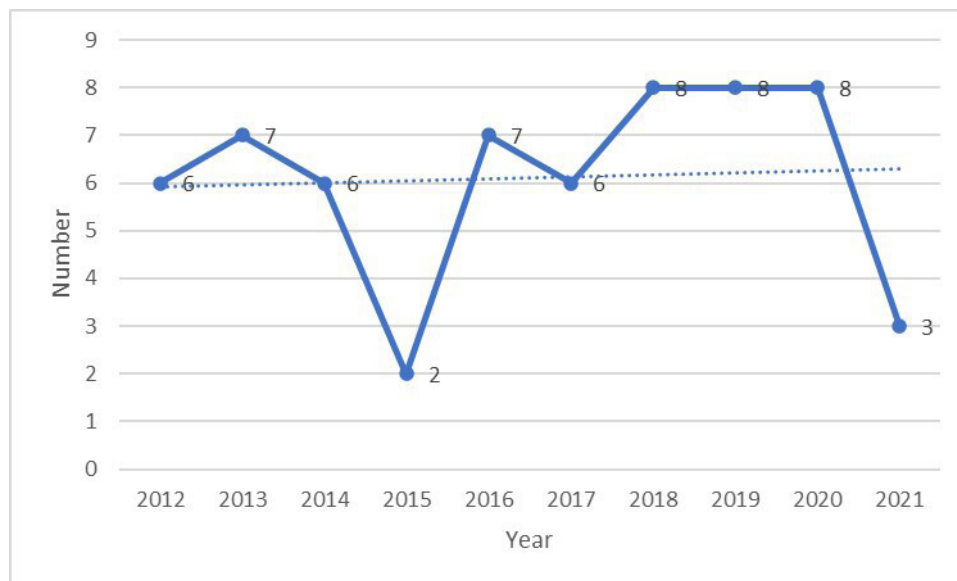
Figure 2 Year of publication.

Ethical considerations

Complexity studies present distinct ethical challenges for researchers, as unpredictability means research will be performed and decisions taken based on an imperfect understanding. Therefore, researchers need to be open and honest about the uncertainty and reflect critically on the decision-making processes.[21] In our scoping review, studies only reported standard research ethics committee approval procedures.

Objective 1: definitions and descriptions of complexity theory

36 papers (59%) provided a definition of complexity theory. In 23 (38%), no definition or description was given. 2 papers provided descriptions of complexity and 3 provided a definition of CAS. There was great variability in the definitions used.

Characteristics and features

Many different terms were used to describe complex systems. 10 papers used the term characteristics, 9 used concepts, 8 used the term principles and 20 papers were unclear. No papers cited Preiser's typology.[6] The terms were mapped against the Preiser framework (Table 2) with synonyms grouped against the most aligned principle.

The most reported terms were self-organisation (n=23), non-linearity (n=22) and emergence (n=18). The least reported features were radically open (n=3) and contextually determined (n=5).

Objective 2: research purpose and phenomenon of interest

Guided by Thompson and colleagues' synthesis, the articles were analysed for their purpose and the phenomenon investigated. The majority of studies mentioned two or more research purposes (47.5%) across a variety of health and social care phenomena. These research purposes included assess, build, determine, develop, discuss, draw, elucidate, gain, generate, increase, inform, outline, present and unravel. The most common research

phenomena with multiple purposes were working environment/context, implementation and change. Following studies with two or more research purposes, the most common research purposes sought to explore (9.8%) and describe (9.8%) the phenomenon. Research purposes aimed at exploring a wide variety of phenomena featured investigations of the role of physician assistants within a CAS,[22] the impact of workplace huddles in clinical practice,[23] the adoption of leadership at a microlevel through the influential acts of organising,[24] responses to intimate partner violence[25] and the naming or classification of physical assaults within relationship in the context of emergency departments.[26]

Studies that sought to describe phenomena related to working environment/context included the processes and development of a dementia network,[27] decision-making processes within an intensive care setting [30] and the context of telenursing as a CAS [20]. Other studies sought to describe the clinical implications of non-linear dynamics within intimate partner violence,[28] physician leadership within healthcare organisations[29] and regional sustainability in healthcare improvement.[30]

Thus, studies with two or more research purposes represent the most common application of complexity theory in health and social care research. Our analysis shows that the most common phenomena studied were implementation and working environment/context within health and social care respectively with 16 studies each within the identified articles.

Objective 3: research methodologies and application of complexity theory

28 studies (46%) had a qualitative research design. 17 studies (28%) were case studies and 9 studies (15%) used mixed methods. The most common application of complexity theory (52.5%) was as a theoretical framework to understand a phenomenon and conduct data analysis.
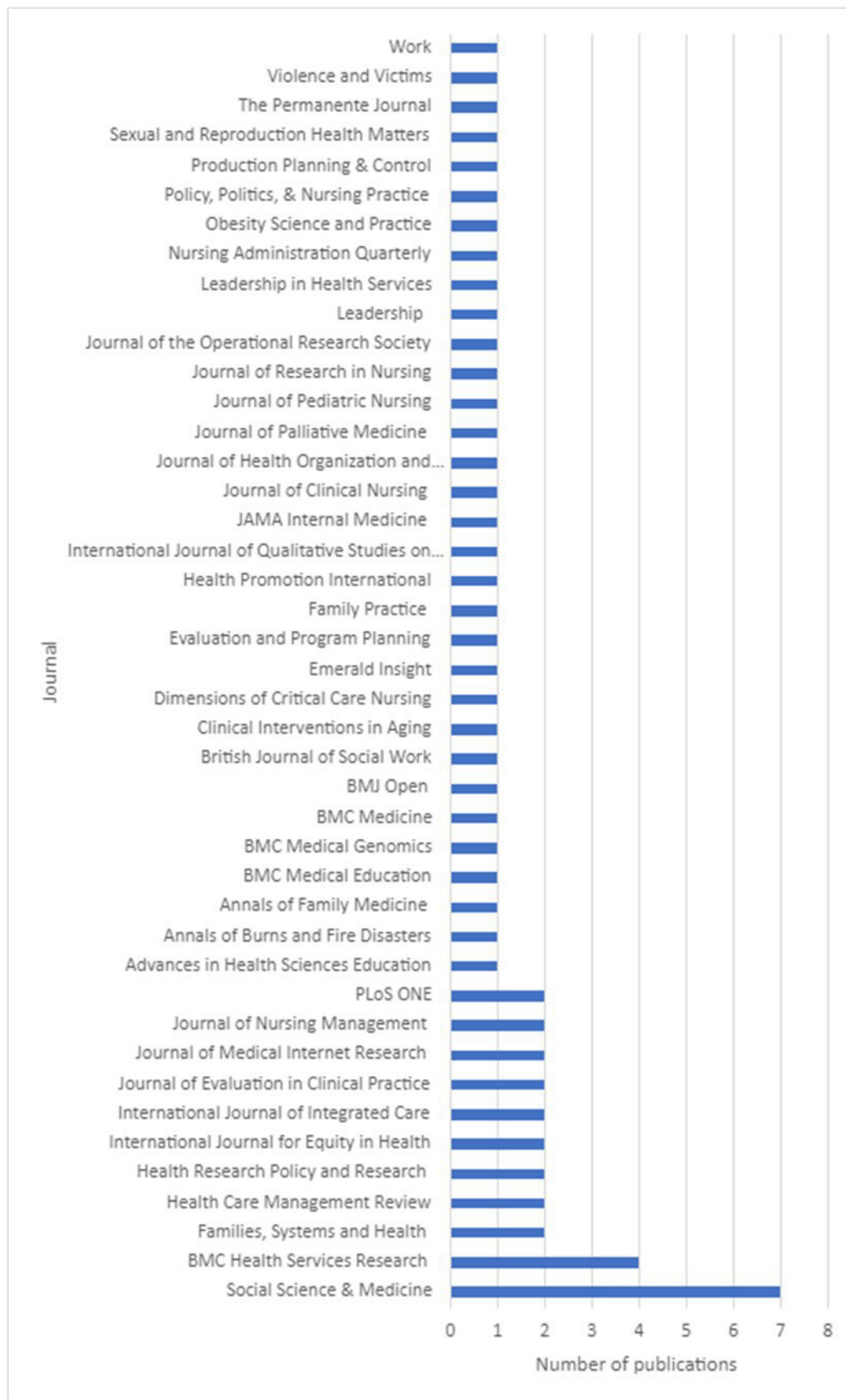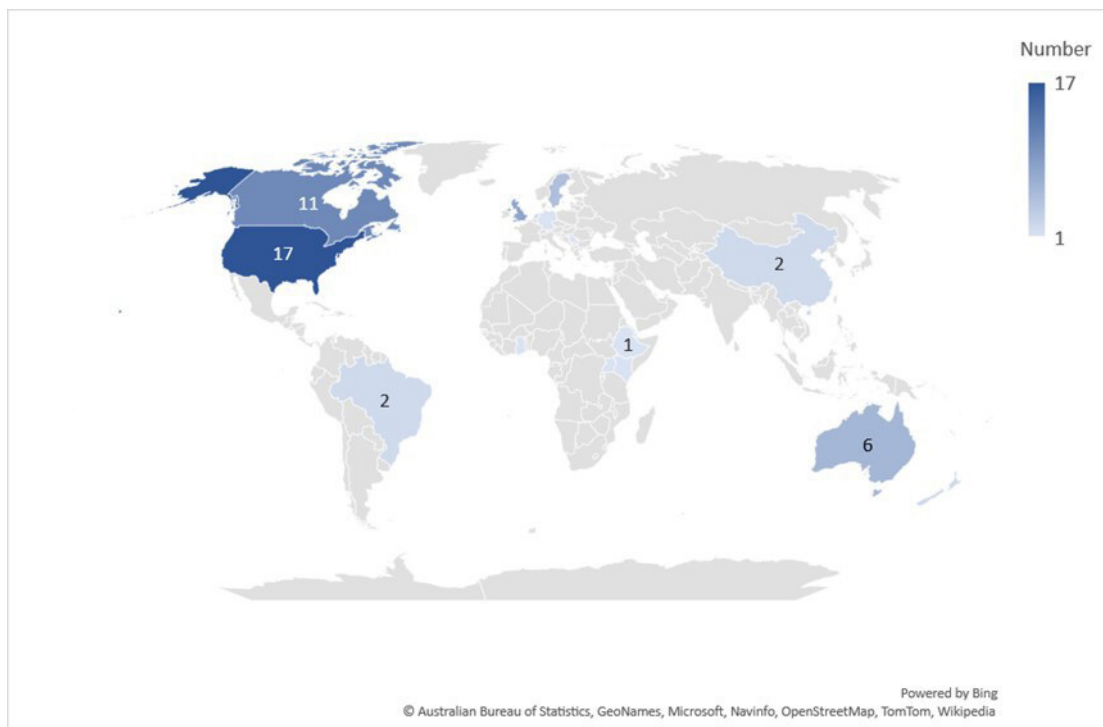
Figure 3 Journal of publication.

Figure 4 Geographical location of study.

Table 2 Terms mapped against the features and attributes in the Preiser framework

Organising principles of complex systems	Key features and attributes (as described by Preiser *et al*[6])	Features and attributes extracted from papers
Constituted relationally	Process-dependent interactions on multiple scales result in networks of interactive relations. CAS are defined more by the interactions among their constituent components than by the components themselves.	Interactive components [22 25 31 32 51 52 64] Interdependencies [23 27 29 33–35 65] Interconnections [24 29 36 37 56 66 67]
Radically open	All systems exhibit hierarchy in that every system is part of a wider system and is made up of subsystems. How we describe (or identify) system is a function of our individual points of view. Systemic interactions generate effects that have impacts across scales and domains.	Open system [32 68] Boundary permeability [38]
Contextually determined	The identity and functions of CAS are defined by the context in which they exist.	Contextuality [39 69] History [27 32 68]
Adaptive capacities	CAS have self-organising capacities and can adjust their behaviour as a response to changes in their environments.	Self-organisation [25 28 30 31 34–36 38–40 45 48 51 53 56 64 65 70–75] Adaptive [25 38 39 53 54 56 66 75 76]
Dynamic processes	Non-linear dynamic processes bring about the behavioural patterns of CAS. As a result of non-linear feedback loops that can dampen or amplify perturbations, small changes can have significant, cascading effects resulting in multiple modes of system-wide reorganisation or regime shifts.	Dynamic [41 49 51 54 71 75 77] Non-linear [22–24 27 28 32 34 38 40 41 46 49 51 64–66 68 72 74 75 78–82] Feedback loops [27 28 33 34 54 64 66 73 78] Unpredictability and uncertainty [27 28 32 33 54 64]
Emergent phenomena are the result of complex causality	Through the interaction of the individual components, novel qualities and phenomena emerge. Hence, the whole is more than the sum of its parts, meaning that systems cannot be understood, nor their behaviour predicted based solely on information relating to the individual parts.	Emergence [27 31 34 36–40 49 54 64–66 68 72 74 78 79] Co-evolution [25 29 37 54 65 67 79]

CAS, complex adaptive systems.

A further 10 studies used complexity theory exclusively for the purpose of data analysis, whereas 8 studies primarily applied the theory as a theoretical framework. Where complexity theory was used as a theoretical underpinning, it was used to describe the setting or context they were studying as a CAS, to focus on a particular characteristic of complexity or to formulate research questions.

Complexity theory was frequently adopted in qualitative methods of inquiry. Qualitative methods or mixed-method studies (included a qualitative component) were based on case studies or studies which used grounded theory as an analytical method, content analysis and thematic analysis. These studies focused on particular characteristics of complexity theory to interpret their findings or as the foundation of a coding framework. However, some authors defined the exact characteristics of complexity that they were focusing on in their analysis,[29 31–41] whereas other studies broadly described conducting analysis with the lens of complexity theory[26 42–44] or not clearly stated.[45–47]

A number of studies featured interventions or programmes that were founded on or informed by complexity theory.[48–50] Two studies featured an assessment framework or tool.[51 52] Tang and colleagues[53] applied complexity as a theoretical framework and data analysis, as well as to develop a model of policy implementation. In a similar fashion, Sawyer and colleagues[49] applied complexity in the development of a logic framework in the context of obesity prevention. One study used complexity theory to develop a conceptual model to help in the design and conduct of community-based health promotion evaluation.[54]

Objective 4: settings, disciplines and professions

Of the 61 publications, 10 studies were hospital-based, 10 were based in a health system and 9 in a primary care setting. 2 studies were based in a rehabilitation setting.

A variety of disciplines and professions were reflected in the literature reviewed. We used the term multidisciplinary team (MDT) to describe a range of health service workers, both professionals and non-professionals described in the studies when more than two types of professionals were stated. Where patients were specifically mentioned as part of the MDT, we included that as a separate category, and also where non-traditional MDT members were specifically mentioned.

Of the 61 studies, 22 (34%) involved MDTs. Six (9%) involved nurses and 4 (6%) MDTs including patients. In 2 papers, there were no participants as the study involved documentary analysis and in 2, the participants were not specified.

Objective 5: Implications and outcomes of applying complexity theory

The most frequent implication was exclusively practice-related (44%). A full breakdown of imications and utcomes is provided in online supplemental file 2. A significant proportion of studies had multiple implications.

21% of the studies contained implications for both practice and research, while 11.5% had implications in all three dimensions. Implications encompassed changes in clinical practice delivery such as huddles,[23] recommendations for motivational interviewing[45] and social work practice guidelines for dealing with families with complex needs.[55] From a policy perspective, recommendations included complexity-informed processes for the implementation of local drugs policy[35] and complexity-compatible policies regarding integrated healthcare.[37] Implications for future research were typically in relation to the phenomenon being investigated and reflection on their own methodological limitations, for example, Gear and colleagues[25] note the need for more diversity in the samples regarding intimate partner violence in a primary care setting while another study promoted the use of social network analysis and ethnographic approaches to explore the shifts in interactions following the implementation of a simulation tool within a healthcare CAS.[34] One study was unclear in their implications, while one study did not explicitly state any implications in the discussion of their findings.

Some studies contained pragmatic outcomes as a result of applying complexity theory. Reed and colleagues[43] developed 12 'Simple Rules' intended to provide actionable guidance to support evidence translation and improvement in complex systems. Hodiamont et al[39] created a conceptual framework that can be used as a basis for the development of a classification of complexity in palliative care, with an understanding of the variance in patients according to their care needs. One study developed seven action recommendations to promote community resilience and population health.[56] Albers Mohrman et al[30] provided organising principles to facilitate change within a CAS, while Sawyer et al[49] developed a logic framework intended to inform sustainable systems change from a whole-systems approach. To identify the extent to which the identified publications were used in subsequent research, we assessed the number of citations of the 61 papers included in our review. As of 1 October 2022, the most cited papers were O'Sullivan et al (41) (219), Ssengooba et al (68) (171) and Tsasis et al (34) (151). Review objectives 6 and 7 will be addressed in the Discussion section.

DISCUSSION

To the best of the authors' knowledge, this is the first scoping review to synthesise the literature on the application of complexity theory in health and social care research. Although earlier reviews examining complexity in healthcare literature are available,[7 8] the current review has identified that in the time since their publication, subsequent research has remained largely theoretical, with little progress in terms of the practical application of complexity theory. In addition, although research has occurred within what is described as health systems, none of the final papers had a social care context. Adult social

care refers to services that provide support to people with physical disabilities, learning disabilities or physical and mental illnesses. Over a third of publications failed to provide a clear definition of complexity or provide the theoretical context for the research. What was meant by a complex system was ambiguous, heterogeneous and often ill-defined. The limited description, features and attributes used in many papers suggest a lack of appreciation for the principles of a complex system which the current authors believe is a basic requirement before appropriate methods and approaches can be selected for studying phenomena in a complex system. However, we acknowledge that as there is no unifying theory or agreed-upon definition of complexity,[57 58] it is unclear how many features and attributes of a complex system need to be considered when contemplating appropriate approaches, which may explain the lack of detail in the identified studies. Many studies referred to primary studies or discussion papers in the definition or description of complexity theory without citing the founding key theorists. This may be due to the complexities within the theory itself and later authors in the area present accessible literature to help researchers understand its underlying logic. Nonetheless, we would argue that an explicit explanation regarding the researchers' understanding of and approach to complexity is vital to orientate the reader and highlight whether meaningful engagement with the phenomenon of interest has occurred.

Regarding methodologies employed, our findings indicate that since the Thompson and Rusoja reviews, empirical research has remained primarily qualitative and case study orientated, with most publications in the USA and Canada. Most studies applied complexity as both a theoretical framework and for data analysis. Several studies used complexity theory within qualitative research to analyse and code their data. The review also identified several case studies in which authors sought to understand a setting or service using a complexity-informed lens. This may be because the case study approach seeks to capture the richness of a phenomenon rather than simple cause and effect. To perform research into complex systems in which power law distributions are in operation, there is a need to interpret the processes of dynamicity and that requires qualitative and longitudinal studies.[59] There is also value in an abductive logic of inquiry, which allows for the weaving and entanglement of previous evidence into the greater understanding of the whole complex adaptive system.[60]

Health and social care systems deal with many interconnected and entangled issues that require researchers in the field to take a participatory, inclusive, integrated and multidisciplinary approach to research and that requires theoretical and methodological pluralism. Researchers should embrace a rich tapestry of approaches to develop a deep understanding of the complex health and care systems in which we work and go forth with epistemic humility. In the application of complexity theory, there is great variance regarding the detail of how it is used. Some authors explicitly state the characteristics they focus on during data analysis, whereas other studies broadly stated they used the lens of complexity, and some did not clearly state what characteristics they used.

Complexity in health and social care empirical research remains predominantly hospital or health system focused and does not encompass the full continuum of care at this point. However, it does tend to be applied in contexts where multidisciplinary teams are involved, which has implications for managing the complexity of the context.

As nearly half of the studies contained implications for practice, it can be inferred that complexity theory has been empirically applied with the intention of improving health or social care practice. Limited evidence was found within the studies regarding how the knowledge from empirical findings was used to inform or improve the setting or phenomena being studied. However, a number of studies produced pragmatic tools or guides that were informed by complexity theory and for future engagement using a complexity lens. The heterogeneity of empirical studies is perhaps not unsurprising as it is still early days in the application of complexity theory to health and social care. Given Ashby's law of requisite variety as operationalised in the Ashby space as described by Boisot and McKelvey,[59] this makes it hard to initially establish any consistency in the domain. We therefore propose guidance that could provide more comparability in evidence-based studies going forward.

Guidance for reporting complexity in health and social care research

As there is currently no definitive procedure for reporting such studies, we propose the following items for inclusion. These are not intended to be a rigid checklist but rather flexible guidance to be interpreted and adapted to support the reporting of theoretically and methodologically divergent research.

1. Provide a clear definition of complexity with an explanation of the theoretical underpinnings of your research so the reader can understand your ontological and epistemological stance.[61 62]
2. Explain why complexity theory is relevant to the phenomenon being studied.
3. Identify the principles and characteristics of complexity theory that were explored.
4. Explicitly state how complexity is applied regarding the various stages of the research process, that is, theoretical underpinning, data collection and data analysis.
5. Describe the outcome or impact of the study in terms of direct change in health and social care setting, practice, policy or research.
6. Discuss ethical components of applying complexity theory and reflexivity to the specific phenomenon.
7. Include a statement on what the research is to inform or improve from the outset.

Limitations

The authors adapted their inclusion criteria to include articles from the past 10 years (2012–2021) due to project and time resources. Inclusion of previous years may have facilitated a fuller historical understanding. Health and social care educational settings were excluded and probably merit its own review in the future. Additionally, the search string and screening criteria focused on health and social care professionals and managers as the population in the study. Further evidence synthesis could be conducted in the future regarding patients and how complexity theory has been used to understand their experience. Additionally, future evidence synthesis could include publications that feature studies that include secondary analysis, as it was not the scope of the current study but may yield further insights into the application of complexity theory.

CONCLUSION

Complexity theory has been increasingly adopted to conduct research in the areas of health and social care. Despite ample application in the context, huge divergence exists in the evidence base regarding how it can be applied and what constitutes its application. For the field to progress and establish transparency in empirical findings, the output of this current review are principles that should be considered and applied, where necessary, in the conduct of research methodologies which involve the various versions of complexity theory. This scoping review builds on the growing field of 'translational systems research'[63] that seeks to translate the theoretical concepts of CAS science into practical applications. Although the guidance offered in the current review is based on the synthesis of studies in health and social care, the principles may be applied to other fields, such as business, technology or educational phenomenon. The principles resulting from this scoping review are intended to support the rigorous application of complexity theory in empirical research and contribute to future transparent evidence going forward. The authors believe that the findings and guidance detailed in this review will be of benefit to health and social care professionals, managers and researchers in their commitment to developing services for the people they intend to care for.

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