

Approaches That Simplify Implementation of Complex Interventions in Healthcare System Change: “Scoping Review”

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Background: The effectiveness of complex interventions in health service systems depends heavily on their implementation, as poor implementation can negatively affect the efficacy of evidence-based practices. To address these characteristics, methods and approaches that facilitate complex interventions implementation for system change in healthcare.

Methods: The ensuing study uses a scoping review to appraise the status of the field while concentrating on methods and perspectives that characterize factors that have been critical in the management of complex interventions.

Results: The analysis of this study included fourteen publications; two qualitative studies, two perspective studies and other types.

Conclusion: Normalization Process Theory, Single-Session intervention programs and mechanisms of action are among methods that hypothesize how innovations are implemented and unified with complex interventions in healthcare. This review provides fundamental concepts and details of complex interventions for system change in healthcare management and health studies.

Keywords: change, complex, implementation, intervention, healthcare, system

Introduction

Interventions' implementation frequently includes highly planned, institutionally approved, and systemically adjusted changes to the structure and delivery of services in the healthcare industry. The complexity of today's healthcare systems is unmatched.^{1,2} This poses difficulties for policymakers who implement the results of researchers who analyze and synthesize interventions aiming to enhance healthcare systems.³

However, the complexity of dynamic care systems continues to provide significant research problems.⁴ Multiple behavioral, technological, and organizational components make up complex interventions, which are prevalent and significant aspects of health care practice and study. Thus, it is frequently challenging to identify the connections between them, they present unique evaluation challenges.⁵

Moreover, evidence-based practice implementation that is effective frequently incorporates multi-level methods which focus on system, organizational, and individual-level determinants of change. Thus, it is necessary to develop theory-driven, generalizable methods that can improve the effectiveness, cost-effectiveness, and flexibility of current implementation techniques.⁶

The theory of implementation and inserting of innovations of the Normalization Process Theory (NPT) and its application to a very complex group of socio-technical practices is presented. The theoretical analysis provided here demonstrates how embedding as a state and implementation as a process can be conceptualized in terms of social mechanisms that affect changes in the behaviors of agents' contributions to normative restructuring, the alternative of relational agreements and group processes and the enactment of practices.⁷

Nonetheless, the healthcare organizational level frequently uses multiple or a combination of interventions that may be complex and multifaceted, including precise contextual adaptations to the implementation, in order to improve

performance and start large-scale changes.^{8,9} The effective implementation of complex changes in healthcare context depends on receptivity to change, which must be addressed prior to the indication of any new intervention.¹⁰

According to studies, the single-session intervention strategy,¹¹ which is often used to increase the scalability of clinical interventions at the patient level, shows an unexplored opportunity to enhance the scalability of implementation strategies targeting certain clinician behaviors.¹²

Researchers stress the significance and difficulties of maintaining behaviors, advantages, and results of complicated interventions.¹³ In the past, implementation science projects were unable to support individual, system change in the absence of pricey and frequently impractical implementation strategies because they are frequently expensive and hard to sustain. When they are used, they are frequently not theoretically generated, which reduces their potential impact¹⁴ and makes it difficult to identify the change mechanisms that have been cited as essential to improve implementation methods at all levels.

Nevertheless, governments and healthcare system stakeholders also highlight a lack of feasible capacity to translate knowledge about the etiology of health inequalities into practices and policy tools, as well as an implementation gap brought on by the complex interventions required to address health inequality.^{15,16} However, lack of intervention feasibility (as current processes, procedures, and resources hampered their implementation) is a significant obstacle to the implementation of healthcare interventions in regional areas.¹⁷ According to several studies, employee attitudes and beliefs have a significant impact on the implementation process. Another obstacle is the absence of such manpower.¹⁸ It is frequently stated that buy-in and leadership support are essential to the implementation's success in regional areas. Some studies also identified the lack of internal support and engaged leaders as a hurdle.¹⁹

High-profile strategies like “securing political commitment” and “health equity in policies”²⁰ are explained in theory but seldom translate into actual action items, and tools.²¹ These gaps show the need for methods that enhance the success of implementation strategies that influence change in terms of efficiency, cost-effectiveness, capacity for mechanism identification, and scalability. Such methods ought to be simple to incorporate into various levels of implementation techniques across a range of contexts and locations. Such techniques should also be generalizable, providing theory-driven suggestions for scaling complex interventions implementation tactics for broadly diverse practice objectives. This study examines implementation, complexity, and intervention for healthcare system change using a scoping review methodology.

Methodology

Design

A “scoping study” or “scoping review”, which is a review of the literature, aims to rapidly determine the key ideas guiding a study issue and the primary sources and types of evidence available, especially when the subject is complex or has not been properly examined before.²²

Instead of focusing on specific study results, a scoping review of this kind draws and depicts the area of knowledge that already endures within the boundaries of the study field.²³ Data were searched and included throughout consequential steps, which is illustrated below. A scoping review was planned and conducted in accordance with the guidelines for conducting systematic reviews, peer reviews, and research articles. Because it does not fall within the scope of the standard review technique, the articles' quality was not assessed, as the primary focus of the review was not on the included studies' findings.

“What are the methods and approaches being used for complexity, implementation, intervention, and system change being used for healthcare?” was the key review question. Using a broad definitional approach is advised by Arksey and O'Malley,²³ who also recommend that search terms can be transformed and condensed later to handle bibliographic references, once the full range of knowledge within a certain topic has been reached. This methodology reveals a “descriptive-analytical” approach to projecting, because it operates a similar analytical framework to all studies, which is perceived as a typical practice in scoping reviews. Both qualitative and quantitative data were gathered for this study from the articles. The focal goal of this investigation was to conceptually define the traits of complex interventions implementation for change in the healthcare system.

Search Methods

Five databases were revised, and an electronic search of challenging, implementation-related healthcare interventions was done. The author looked up information in the EBSCO, PubMed, ScienceDirect, Scopus, and Web of Science databases. The terms “complex, implementation, intervention, and system change” and “healthcare” were searched for in the article titles. It was decided that these words should be used the most, according to the study’s goal. Articles that were duplicated were removed, and articles must have been published in English between January 1, 2010, and January 1, 2023.

Inclusion Criteria

For academic investigation, four primary inclusion criteria were outlined involved a comprehensive search of the peer-reviewed literature (Figure 1):

- Peer-reviewed or research publications that have been issued
- Papers with full access potential,
- English-language studies
- Papers that were published between January 1/2010-January 1/2023

Exclusion Criteria

Studies that failed to meet the aforementioned criteria were excluded. Clinical program management studies were included but systematic and scoping review research, as well as clinical intervention studies, were excluded.

Data Extraction

Studies were evaluated and critically reviewed. Extraction of the main findings from each repossessed study as well as literature screening, was ensured (a three-stage process that involves excluding materials by reviewing the title, abstract, and full text). However, the full-text screening was conducted by the author A. H. three times. Discrepancies at levels of screening were further studied and revised.

Stage 1: From each of the studies that were considered, the following information was obtained (Table 1): author, setting and design, aim, main findings and recommendations.

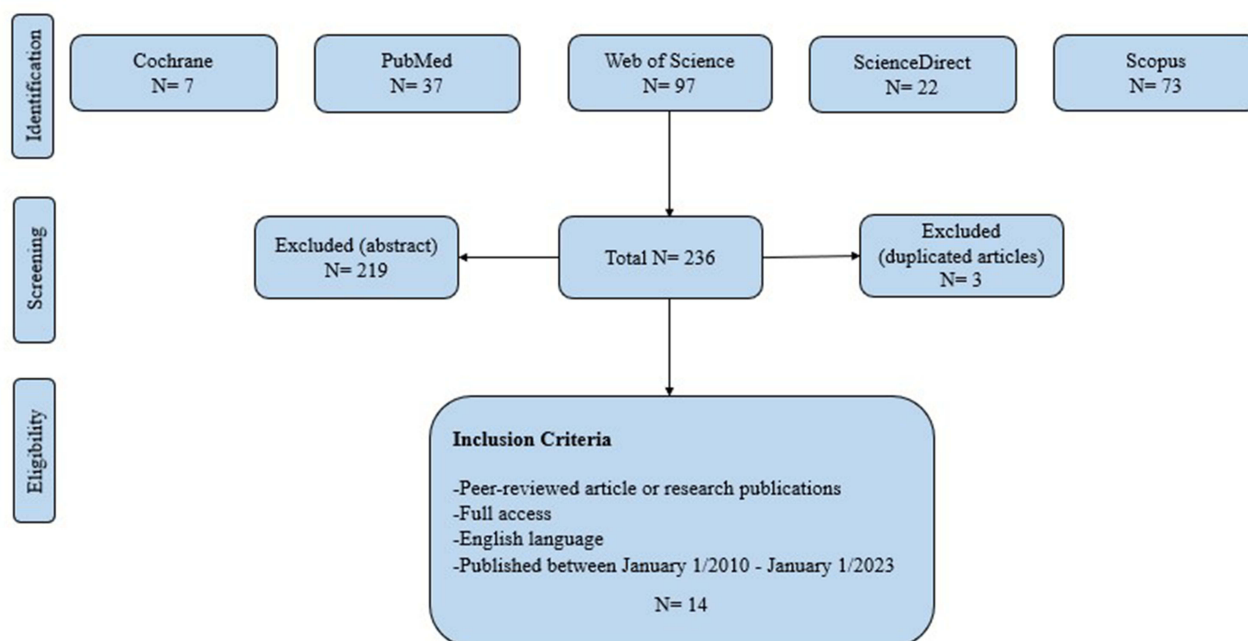


Figure 1 Prisma flow chart of the literature review search.

Table 1 A Summary of Reviewed Studies

Author	Setting/Design	Aim	Main Findings	Recommendations
May C ⁷	Theory of implementation United Kingdom	<ul style="list-style-type: none"> The Normalization Process Theory (NPT) theory of innovation application and embedding is presented. It investigated how clinical shared decision-making, a highly complex collection of socio-technical activities, might be used. 	<ul style="list-style-type: none"> The analysis demonstrates how embedding as a state and implementation as a process can be conceptualized in terms of social mechanisms that change the ways that agents' contributions to normative restructuring, the change of relational conventions and group processes, the enactment of practices, and their extension into the future. 	<ul style="list-style-type: none"> The set of analytical hypotheses presented crystallize NPT in use. This revealed the points where stochastic processes, contingent events, and the agentic contributions of people and groups intersect. Implementation and embedding are not just instrumental and ideological terms; they merit social scientific consideration. NPT might help us illustrate the labor that progresses into the social formation of all types of things in a more fundamental way.
Lan et al ³	An exploratory qualitative approach Malaysia	<ul style="list-style-type: none"> This exploratory study designed to weigh primary healthcare providers' receptiveness towards change preceding implementation of the anticipated complex intervention. 	<ul style="list-style-type: none"> The study found that most primary Healthcare professionals (HCPs) were open to any suggested adjustments or interventions for the improvement of non-communicable diseases care management, as evidenced by strengthened framework for implementation research (CFIR). A number of issues, including perceived implementation barriers, were listed across the CFIR four domains of intervention characteristics, external setting, internal setting, and individual characteristics. The perception of the problems that led to the suggested modifications was a reflection of the current state of affairs, including any facilitating elements that would promote the implementation of any potential future action. It was also mentioned how crucial it is to improve the primary healthcare delivery system. 	<ul style="list-style-type: none"> It is essential to understand the current conditions encountered in the primary healthcare setting before the implementation of any intervention. Challenges or understood barriers among healthcare providers were identified and the openness of healthcare providers to change was also examined. The background, individual behaviors, and external agency variables that directly affect the organization were all outlined by CFIR for the clinics. These are crucial parameters to examine when determining the viability, effectiveness, and sustainability of any intervention.
Parolini et al ²⁴	Multilevel decision juncture models Australia	<ul style="list-style-type: none"> It describes multilevel decision juncture models built on advances in implementation research and causal inference to consider implementation in health service systems. 	<ul style="list-style-type: none"> The multilevel decision junction model is a theory-driven systems approach that combines frameworks for implementation with structural causal models. This integration makes it possible to examine interventions and their application within a single model that takes the causal relationships across different system levels into account. 	<ul style="list-style-type: none"> The advantages of structural causal models for covariate selection are also highlighted by the results of Monte Carlo simulations, as uniform estimation only necessitates the inclusion of a small amount of covariates. These models can be used in real-world contexts with a variety of study designs, including longitudinal analyses that make it easier to look into the sustainability of interventions.
Schleider JL and Beidas RS ⁶	Perspective United States	<ul style="list-style-type: none"> The Single-Session Intervention technique was suggested as an untried route to creating scalable, low-cost implementation strategies, particularly those aimed at changing individual behavior. It makes the case that SSIs implementation techniques, which can simultaneously address a wide range of obstacles to individual behavior change, may support clinicians' adoption and maintenance of EBPs in a way that is small-supply and scalable. 	<ul style="list-style-type: none"> It summarized the body of research supporting the Single-Session intervention strategy for patient-level outcomes and places it in the context of the literature on implementation science by highlighting its intersections with a preeminent framework. It used the theoretical domains framework (TDF) as an example to show how the TDF could instantly influence the creation and assessment of single-session EBP implementation strategies. 	<ul style="list-style-type: none"> Single-session interventions (SSIs) implementation methods provide a promising but unproven method for simplifying and scaling individual-level behavior change initiatives in healthcare settings. To evaluate the potential of this strategy in various clinical and community contexts, future collaborative research is required.
Song et al ¹²	7 care homes Canada	<ul style="list-style-type: none"> It investigates knowledge on the spread, sustainability, and post-implementation sustainment of interventions occurrences in the context of a challenging quality improvement project. Two years after implementation, it reports on the variables driving these phenomena. 	<ul style="list-style-type: none"> In 5 of the 6 participating care homes, the maintenance of essential components and the maintenance of significant advantages were noted. In 3 of the 6 homes, intra-unit intervention spread took place. Factors relating to intervention teams, units and care facilities, and the long-term care system that affect sustainability, and spread. 	<ul style="list-style-type: none"> This research advances knowledge of the significance of micro, meso, and macro-level elements in the maintenance of some fundamental processes and the sustainability of significant benefits. Inter-unit dispersion only pertains to meso-level practice change institutionalization and observability aspects. Interventions should be designed with long-term sustainability in mind, and precautions should be taken to guard against external and internal conflicting demands, unstable workforce conditions, and other potential threats. Design must account for the requirement to modify treatments to increase post-implementation traction.

Horev and Avni ²⁵	Integrative Article Israel	<ul style="list-style-type: none"> The article described Israeli efforts to develop and put into action a national strategic strategy to lessen health disparities. It highlighted the plan's fundamental premise and goals, its key elements, and several examples of implemented interventions 	<ul style="list-style-type: none"> Limitations of the Israeli policy and future challenges are discussed. Based on the Israeli experience, the article outlines a general plan of action at the national level to lessen disparities in health and the healthcare system. The framework recommends four key focal points as well as a list of the key stakeholders that should be considered by a national policy as change agents. 	<ul style="list-style-type: none"> Researchers, decision-makers, and health experts may use the Israeli policy and the general framework described in the article as a case study to illustrate how common approaches to the problem of health inequality can be implemented in policy.
Bull et al ²⁶	A Participatory Research study United Kingdom	<ul style="list-style-type: none"> The purpose of this study was to determine whether it was possible to assist staff teams from healthcare organizations in overcoming psychological resistance to change and implementing new care models. 	<ul style="list-style-type: none"> Four clinical teams from four organizations, including those specializing in pediatrics, midwifery, heart failure, and older adult mental health, joined in the program in an effort to bring care into the community, carry out preventive healthcare duties, or become more integrated. The study of the qualitative data on five topics of feasibility was done. In order to maximize the Behavior Change Wheel (BCW) in a setting of organizational change, it was necessary to collect qualitative rather than quantitative data, to make behavioral science appealing, to co-develop and have a behavioral focus, to have good ongoing, and to have the backing of engaged leaders. Quantitative data from the pre- and post-period revealed some beneficial adjustments in staff practice behaviors. 	<ul style="list-style-type: none"> Teams implementing complicated new care models can be supported by behavioral science approaches like the BCW within health and social care organizations. The effectiveness of this strategy needs to be tested more.
Patey et al ⁴	Theory-informed approaches Canada	<ul style="list-style-type: none"> It emphasized theory-informed methods for describing the actions of HCPs and examining the prevalence of evidence-based care, as well as known correlates and interventions to alter professional practice. 	<ul style="list-style-type: none"> Optimizing behavior modification interventions that address obstacles and facilitators of advised practice is the main difficulty. HCP behaviors can be influenced by a variety of factors, including knowledge, social factors, intention, emotions, and goals. 	<ul style="list-style-type: none"> Addressing HCP behaviors change is essential for ensuring that new developments in health psychology are used to the greatest possible extent.
Nurjono et al ²⁷	Complex adaptive system (CAS) perspective-Policy Paper Singapore	<ul style="list-style-type: none"> Integrated care consists of multicomponent delivery techniques that engage different stakeholders while focusing on different levels of the healthcare system. 	<ul style="list-style-type: none"> The CAS offered a fresh perspective on challenges that arose throughout the development of these integrated care networks. It revealed the lack of homogeneity, conformity, and challenges in creating any optimal system in progress given the many advancing pieces. It also provided comprehension of relationships and needs between various components of the network. 	<ul style="list-style-type: none"> In order to advance integrated care in the Singapore environment and elsewhere, this study emphasizes the importance of effective teamwork based on a shared goal, responsiveness to evolving behaviors, adherence to clear rules, and the capacity to self-organize and change in response to unforeseen circumstances.
Redman-MacLaren et al ²⁸	Primary health care (PHC) Critical review Australia	<ul style="list-style-type: none"> The approach of continuous quality improvement (CQI) has shown to be successful in identifying the most pressing problems in the provision of healthcare and instigating the design, execution, and assessment of improvement initiatives in these contexts. Wide-scale variance in care quality continues in part as a result of the context- and CQI intervention mismatch. 	<ul style="list-style-type: none"> The report identifies nine main frameworks for implementation that have been utilized in PHC contexts to direct interventions at the macro (broader contextual) level, meso (health service) level, and micro (community and interpersonal) level systems. These frameworks and fundamental quality ideas in Aboriginal and Torres Strait Islander PHC shared certain similarities. 	<ul style="list-style-type: none"> To ensure advances in care quality that are practical for their setting, it is crucial to collaborate with communities to develop workforce models that develop a stable, caring workforce.
Prashanth et al ²⁹	A realist evaluation India	<ul style="list-style-type: none"> By using the technique to comprehend organizational change within local health systems, it intended to show how the realist evaluation approach enhances complex systems thinking in healthcare evaluation. 	<ul style="list-style-type: none"> Different Tumkur districts reacted differently to the intervention. The interplay between various individual, institutional, and environmental elements can be used to explain their reactions. The intervention improved performance by coordinating with already-existing opportunities brought about by the decentralization movement. However, devotion to the company was neither essential nor sufficient. 	<ul style="list-style-type: none"> The alignment or reversal of current linkages between organizational internal (person and organizational) and external (policy and socio-political environment) qualities could be used to increase the capacity of local health systems. The intervention planners need to find possibilities for such triggering alignments during the design and implementation stages. The underlying structure of local health systems may vary, therefore capacity building programs need to account for the possibility of change via various channels.

(Continued)

Table I (Continued).

Author	Setting/Design	Aim	Main Findings	Recommendations
Waldron et al ³⁰	Developing a program theory Canada	<ul style="list-style-type: none"> It outlined "In which situations, how, why, and for whom does shared decision-making (SDM) between patients and health care providers contribute to improved decision-making?" 	<ul style="list-style-type: none"> The development of an initial theory, the creation of a search strategy, the selection and evaluation of literature, the selection and evaluation of data, the extraction and analysis of data from the literature, and the creation of a revised program theory are all part of a seven-step iterative process that be discussed. 	<ul style="list-style-type: none"> The objective of the realist review is to develop a program theory for SDM through the identification of factors that influence the circumstances under which, and the reasons why, SDM will or will not, succeed.
Smith et al ³¹	Series of preliminary activities (Implementation Research Logic Model (IRLM) structure and guiding principles) United States	<ul style="list-style-type: none"> To improve the rigor and clarity of outlining the regularly intricate procedures involved in increasing the adoption of evidence-based interventions in healthcare delivery systems, so the IRLM was developed. 	<ul style="list-style-type: none"> The survey's findings showed that the IRLM is highly useful for a variety of tasks, including enhancing project rigor and reproducibility, acting as a "roadmap" for how the project is to be carried out, clearly describing how the project is to be supported, and helping researchers understand the relationships among its components, strategies, mechanisms, and results. 	<ul style="list-style-type: none"> To enhance the condition, rigor, reproducibility, and testable causal pathways involved in implementation research projects, the IRLM is a semi-structured, principle-guided tool. The IRLM can help practice change projects be planned and carried out by implementation researchers and collaborators. To meet the demands of this intricate scientific subject, the IRLM is continually being modified and improved, as well as new tools and applications being created.
Miech et al ³²	Prospectively-Reported Implementation Update and Score (PRIUS) United States	<ul style="list-style-type: none"> To create a productive technique for obtaining a continuous, in-depth, and nuanced assessment of implementation progress from many perspectives that may aid and guide the active implementation of new programs. 	<ul style="list-style-type: none"> Staff from various services indicated radically diverse viewpoints on the execution of the program. Rapid PRIUS data analysis and reporting directly influenced modifications in implementation. 	<ul style="list-style-type: none"> The PRIUS offered a quick, organized way to create a detailed, context-sensitive record of implementation progress. The strategy seems to be quite flexible to a variety of situations and interventions.

Stage 2: The data collection worksheet used for the full-text review was designed by the researcher. The analysis process included problem identification (is it an implementation intervention for healthcare system change or not), literature search, concepts, approaches and models presentation.

Stage 3: After the author's comprehensive analysis of the articles and to illustrate particular concepts that were found in the included articles, a mind map was created. This map does not detail specific findings from studies, but instead visualizes and maps available knowledge within the boundaries of the research area.²³ This method helps the author to define the most significant research questions' themes as conceptual similarities and differences served as a starting point for ultimately settling on the final stage themes. Once the themes (concepts, models and approaches) were well-defined and classified or if exists, any duplication was eliminated. Then the models/approaches described implementation of complex interventions in healthcare were determined as;

NPT,⁷ healthcare providers' receptiveness towards change preceding implementation,³ decision-based causal model of implementation and intervention efficacy, analyzing implementation and intervention effectiveness and multilevel decision juncture models,²⁴ Single-Session intervention approach,⁶ distinguishing influences of micro-level factors, meso-level factors, macro-level factors, distinguishing influences of implementation and post-implementation factors and dynamism of sustainability phenomena,¹² realist evaluation and complex adaptive system,^{27,33} approach of continuous quality improvement (CQI),^{24,29} systems leadership,²⁷ features of the workforce,²⁷ mechanisms of action,²⁹ importance of adaptation,¹² dynamism of sustainability phenomena,¹² embedded co-evolutionary system, non-linearity and emergent behavior,³³ systems thinking,²⁷ determinants of implementation,²⁸ implementation strategies,²⁸ public participation in policy formulation and interventions.³¹

Risk of Bias Assessment

Given that this scoping review has the aim of mapping all available evidence, the author does not conduct any risk of bias assessment or quality appraisal of included studies. The author seeks to establish the breath of evidence of complexity in health system change rather than its rigor. This approach is consistent with the methods manual published by the Joanna Briggs Institute²⁴ as well as a database of scoping reviews on health-related topics.

Results

The analysis of this study included fourteen publications; two qualitative studies, two perspective studies and one study of each; theory of implementation, multilevel decision juncture models, theory-informed approaches, integrative study, realist evaluation study, developing program theory, series of preliminary activities, prospectively-reported implementation, critical review and postimplementation study. Three of the studies were conducted in each of USA and Canada, two studies in UK and Australia and one in each of Singapore, Malaysia, India and Israel.

The most related models and approaches of implementing complex interventions in healthcare system change in the context of the reviewed articles were investigated by the author for more details. In other words; common approaches that can be used by complex interventions or other interventions (not specified only for complex interventions) were not further explored as there are not the scope of this study.

Normalization Process Theory and Implementation

A middle-range sociological theory called NPT conceptualizes how innovations are implemented, embedded, and integrated in healthcare contexts.³⁴ In healthcare and other institutional settings, it offers a collection of sociological instruments to comprehend and elucidate the social processes through which new or altered ways of evaluating, executing, and planning work are operationalized in the healthcare industry.³⁵

However, it promotes examination and understanding of the translational gap between evidence, policy, and practice by highlighting the relations between contexts (encompassing organizational structures), actors (including individuals and groups), and objects (such as clinical practices).³⁵ It focuses specifically on the work; stakeholders must do; to integrate and normalize innovations into everyday practice.³¹

Moreover, in order to facilitate the integration and embedding of complex interventions, researchers³⁶ have argued for a better understanding of how NPT may be utilized to modify implementation processes. May et al (2018) qualitative

systematic study has offered a useful description and investigation of the role that NPT plays in the execution of healthcare interventions across a range of health systems.

A Decision-Based Model and Intervention Effectiveness

Unfortunately, decisions about interventions or policies in the field of health are frequently made solely on the basis of “descriptive” and “modeled” outcomes, without taking into account a causal inference framework based on sound principles. Despite the fact that both “traditional” and “causal inference” methodologies are legitimate for use in examining particular research issues, many health services researchers and students are not familiar with the concepts of causal inference.³⁷ The idea of counterfactuals, a crucial part of a causal inference framework, is used in contemporary causal inference to pinpoint the impacts of interventions.^{38,39} A counterfactual result is one that is “contrary to the fact”, one that is predicted but not realized.⁴⁰

Decision-based implementation systems initiate by outlining how individual alternative scenarios are articulated within a structural causal model in order to convey the fundamental concept of outlining the implementation process as a sequence of decisions. A group of structural equations make up a structural causal model. Each equation depicts the causal connection between a result, or dependent variable, and the relevant explanatory factors, which are frequently referred to as the “parents” of a specific outcome variable.⁴¹ The specific shapes of these causal links are based on theoretical frameworks that come from our perception of reality. These theoretical models in our situation describe how choices are made during the implementation process.

The path of implementation in the system and, in turn, the efficacy of the intervention is exactly determined by a sequence of such decision-making processes. The process must comprehend the behavioral process resulting in decision makers’ reflected decisions in order to incorporate the structural causal approach into a decision framework.⁴² That means, the author requires to know what the system’s drivers and obstacles are at each decision step.

The Single-Session Intervention Programs

“Structured programs that intentionally involve just one visit or encounter with a clinic, provider, or program”¹¹ are known as single-session interventions (SSIs). They have thus far concentrated on clinical interventions at the patient level and related results. They frequently focus on the fundamental processes of longer-term healthcare interventions, such as a course that teaches just one evidence-based depression treatment strategy (cognitive reappraisal; behavioral activation).⁶ However, their quickness and adaptability boost their quick, affordable scalability. The delivery of SSIs can take place in a variety of contexts, including clinics, classrooms, and smartphones. They can be provided as standalone interventions or as supplemental services within larger healthcare systems. SSIs are enhancing individual-level outcomes across an ample scope of themes, including public health, medicine, and education.

Employing a Complex-Adaptive System (CAS) Perspective to the Healthcare Advancement

A linear narrative of cause and effect is rarely able to fully or even seriously gather the implementation experience of such interventions due to the distinctive depth and extent of desires driving each intervention, the complexity of many intervention components, and the participation of plentiful players with distinct viewpoints and outlines within the integrated care context.

In order to provide a deeper understanding of the factors impacting change around dynamic systems like integrated care, a CAS perspective has been extensively promoted for classifying and evaluating information.^{43,44} The CAS is a novel approach to integrated care system design, development, and assessment that emphasizes critical areas for resource allocation to produce the best results.^{44,45}

The Potential of Healthcare in Complex Adaptive Systems

The potential of health systems is centered on people.⁴⁶ A strong human resources management system, which maintains the proper settings to attain and preserve performance of the health staff, including health managers, is one of the traits of a high-performing health system.

Capacity and performance could be seen as evolving properties of a district health system that consists of numerous perpetually self-adaptation and interdependent components.⁴⁷ Realistically, people, not just the execution of programs, are what alter things. A program is anticipated to function by giving fresh supplies to more system performers. One of the most popular methods for enhancing the performance of health workers is capacity building.⁴⁸ Although capacity building is illustrated as being multi-dimensional, covering individual, team, organizational, and health system factors, the relationship between capacity building and performance is not clear-cut. The application of new skills and the introduction of tools, on the other hand, appear to be comparatively less time-consuming and embedded in more specialized domains.

Furthermore, it is anticipated that this “new way of doing things” will lead to improved performance and thus better healthcare. Although programs might be created to alter public’s behavior by introducing new information, abilities, or concepts, researchers observe that in complex adaptive systems, people’s and systems’ reactions are neither simple nor readily predictable.²⁹

Realist Evaluation and Dynamic Context

In order to generate a causal explanation, realist assessments look for the mechanisms underlying changes in results as well as the impact of context. Research on health systems is using it more and more,⁴⁹ but policy implementation research has not yet made much use of it. It might be necessary to thoroughly document important aspects of the policy over an extended period of time in order to apply realist approaches to it. It must concentrate on important elements such as policy actors, policy content, policy context, and policy process.⁵⁰

Since realist evaluation aims to give a more detailed and explicit understanding of what works, for whom, and under what conditions, it is being used more and more in the evaluation of complex healthcare interventions. It has also been suggested for the evaluation of integrated care interventions.⁵¹ In this theory-driven approach, interventions are predicated on theories but are also dynamic, adaptable, and immersed in a social reality that shapes how they are carried out and how different actors react to them.

The evaluation of healthcare interventions may be affected by the conceptualization of province health systems as complex adaptive systems. According to this theory, provinces are susceptible to (dynamic) contextual factors in addition to their original circumstances, which explains why the outcomes of the same policy or program frequently vary. Research designs that permit for the reflection of unexpected properties, approving more flexible designs, capitalizing on outlines and consistencies evolving in the explanations, and adopting an iterative manner of investigation are encouraged by the literature on program appraisal as well as on complex adaptive systems.^{52,53}

Mechanisms of Action

Mechanisms of action are procedures or occurrences that allow an implementation strategy to produce the requested results.⁵⁴ Changes to determinants, proximal implementation results, components of the implementation strategy itself, or a mix of these in a multiple-intervening effect model can all be the mechanism.³¹ In a broad sense, processes that bring change are considered to be mechanisms.

Mechanisms in the context of implementation science describe how or why implementation techniques have an impact on results. Procedures used to support the acceptance, implementation, sustainability, or scale-up of evidence-based practices (EBPs) are referred to as implementation strategies. Although more than 70 implementation strategies have been identified and defined for use in healthcare settings,^{55,56} researchers still do not fully understand the ways in which these strategies bring about change.^{57,58}

Discussion

This scoping review aimed at exploring what are the methods and approaches being used for complexity, intervention, and system change being implemented in healthcare system change.

NPT aids in understanding and putting into perspective the contingency trajectories that run through the processes of implementing and inserting innovations. “Implementation” in the context of NPT also has sociological implication in that it refers to human attempts to execute order and track competing, inconsistent, dependent, and irregularly shaped social action and relational outlines, and their spreading across social time and space.⁷

Moreover, they affect normative relationships between individuals and institutions as well as the performativity of interactional strategies and the artifacts that go along with them. The study may represent what embedding, entails as a collection of agentic roles that can be compared to the social dynamics described by NPT. These methods mediate complex and non-linear relationships between agents—individuals or groups—objects—the physical and digital tools that agents use to achieve their objectives and construct their identities and contexts; the various physical, organizational, normative, and conventional settings in which they act.

Nonetheless, NPT focuses on the particular collection of activities that play a part in representing and inserting groups of practices, sitting beneath these higher-level viewpoints. Even though “implementation” is a provocative political concept that is infused with managerial expectations, realizing such trends was a role of social sciences’ traditional mission.³⁷

However, the key principle of decision-based model and intervention effectiveness strategy is that the implementation process may be organized as a sequence of qualified decision or choice points. A set of causal links between the decision outcome and elements of the inward, outward, and patient environments, as well as the intervention itself, serve to depict these options. Because of this, the implementation, systems, and effectiveness outcomes are viewed as linked and integrated system components.

The author presumes that every person functioning within the implementation system, as previously described is forced to choose from a variety of possibilities, at least one. For instance, a manager at an organization may select from a variety of implementation tactics, and a practitioner may select alternative interventions that would be suitable for a certain patient.

Yet, the models are context-specific and should be supported by data from behavioral theory and implementation research. The widely adopted approach⁵⁹ sees implementation as a four-phase process that includes exploration, adoption decision-making and preparation, active implementation, and sustainment. Additionally, outcomes serve as mediators and moderators on the pathways leading from practitioner uptake decisions to patient outcomes through the selection of implementation strategies.

The researchers realized that the implementation process has the potential to be iterative.⁶⁰ The effect of experiences or learned lessons in one implementation development on subsequent iterations of the same project or separate implementation initiatives is a key idea of the sustainment phase.⁶¹ Some authors see implementation as an unending, iterative process with experiences serving as a form of care’s CQI, with feedback to the system.³³

Moreover, it is important to streamline SSIs created for web-based, embedded contexts in order to increase engagement while preserving the healing effectiveness of healthcare interventions. Digital interventions frequently experience problems with user engagement once they are implemented in the real world (low uptake and low completion).^{62–64} For the development of SSIs integrated on the web, choosing which SSI components to condense and maintain poses a unique design issue.⁶⁵ The usage of web-based SSIs has been proposed to be supported by a number of intervention design principles, which are adjusted from fundamental research in social psychology, education, and marketing.⁶⁶

Furthermore, the complexity of the participation of many players creates ideas on complex adaptive systems that are related to advancements in second-order thinking. The second-order view of systems discusses recursive relations between layers of systems (control loops and feedback); these concepts serve as a roadmap for various systems to accomplish their goals via “the return of information to form a closed loop”.⁶⁷

The concepts of feedback, non-linear causation, and self-regulation signify the transition to a network-based, cooperative realization of domination. Within CAS, complex interactions and interdependencies develop, that are

impossible to comprehend or predict by merely examining the system's constituent parts, so new system behavior develops. Additionally, humans have the ability to reflect, which may lead to different courses of action from those outlined in straightforward rules. As a result of the interacting component units within CAS exerting effect on one another, or what is known as "mutual causation", the system is governed as a whole.⁶⁷

However, capacity and performance are significant indicators of a high-performing health system. Action research experience in various surroundings has demonstrated that the more we ask for strengthening of systemic capacity, the more complex it seems to be and the stiffer it is to accomplish.⁶⁸ The implementation of capacity-building interventions in province health systems is complicated due to the multifaceted character of health worker capacity and performance; increased performance may happen in some situations but not in others. Additionally, realizing the individual capacity of health managers requires consideration of a number of organizational factors, which complicates the transition from individual capacity to organizational capacity.²⁸ Additionally, the context, the performers' views of the intervention and their reactions to it, their collaborations with one another, their organization, and their setting are just a few examples of the many aspects that may contribute to the discrepancy in results.

Variations in the outcomes of the same policy or program in different settings led to approaching social systems as open systems and the realist evaluation approach engages complexity.⁶⁹ A given system has a large number of interdependent agents, elements, and forces that have an impact on individuals and organizations. Realists consider reality as stratified, with multiple levels of descriptions for the empirical facts. This is how they address this complexity. This gives us a chance to hazard and hone our hypotheses about why certain occurrences happen.⁷⁰

Moreover, realists believe that humans have a wide range of behavioral options they can use to their advantage or disadvantage, depending on the situation. Thus, a realist evaluation starts by attempting to explain why a particular outcome appears in some locations but not in others, while keeping in mind that people and their decisions are what make programs work. Programs assist actors by supplying physical or symbolic resources that allow them to make decisions and engage in novel interactions.⁷¹

However, using training and fidelity examining measures to increase delivery agents' knowledge and self-efficacy about the Evidence-Based Interventions (EBI) in reaction to information-related constraints in the service delivery system is an illustration of a causal process. This might increase their acceptance of the EBI, boost adoption chances, enhance delivery fidelity, and result in sustainment.²⁶

Nonetheless, in domains of findings where biological, psychological, social, or behavioral intervention or behavior modification is the focus; defining, testing, and establishing mechanisms is becoming more and more important.⁵⁷ Williams⁵⁸ found comparable methodological flaws in a prior systematic evaluation of nine randomized implementation trials, although no one indicated a hypothesized mediator. Both evaluations cited a number of obstacles preventing the study of mechanisms in implementation, such as conceptual (eg, lack of definition agreement), theoretical, methodological (eg, poor design issues), and practical (eg, difficulty of mediation analyses) obstacles. More research is required to pinpoint obstacles that prevent the identification and examining the mechanisms of actions in implementation science and to suggest specific, doable solutions to these obstacles.⁵⁷

Limitations of the Study

It is important to be aware of the scoping review methodology's limitations. Scoping reviews do not typically have the same level of empirical rigor as such as meta-analyses. However, the methodology suited this exclusive policy study topic. In addition, as only the primary author has accomplished the study in all stages (the screening process of the included articles and the data extraction stage), this has limited the rigor of this study and increased the risk of bias. However, the author repeated the conducted stages 3 times each in different periods to decrease the bias and ensure more reliability and transparency in the work outcomes. Moreover, search criteria such as limiting results to English-language articles, may have restrained the findings of this study. The limitations identified in the literature are in terms of the need for more rigorous research on the implementation of complex interventions in healthcare system change.

Conclusion

Prior to the implementation of any intervention, it is essential to fully comprehend the current conditions in the healthcare setting and its openness to change. Moreover, recognizing the potential consequences of complex interventions in many contexts depends on identifying the obstacles, enablers, and causal mechanisms that determine effective implementation. Frameworks that put these factors into context have been anticipated to make policymakers better realize the implementation process and to aid in implementation planning. Our methodology helps decision-maker examines the net advantages of the available options and weighs the pros and cons of each choice in monetary terms.

In light of these methodological and practical limitations, the author hopes it will empower policymakers, practitioners, and other users of evaluation to carefully assess the value of the evidence of complex interventions that can be provided. In order to facilitate complex intervention research for better health outcomes, it may be possible to improve quality for important health professionals, policymakers, funders (governments), and researchers by having a better understanding of these processes.

For practice, the implementation of complex interventions being discussed in this study serves as a jumping-off point for collecting causal mechanism parameters as an integrated system which can be described to understand how the system makes change. Such a strategy focuses on the systemic routes via which policies and initiatives operate, may hasten the transfer of research findings into practice. Nonetheless, for upcoming implementation research in complex healthcare systems, decision-based structural models may be crucial. Theories and techniques from the behavioral sciences can be used to facilitate system change, and offer reliable and valid tools for tracking progress, assessing and sustaining implementation strategies.

Abbreviations

CAS, Complex-adaptive system; CFIR, Consolidated framework for implementation research; CQI, Approach of continuous quality improvement; HCP, Healthcare professional; NPT, Normalization Process Theory; PHC, Primary healthcare; SSIs, Single-session interventions.

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