Translational Behavioral Medicine, 2024, **XX**, XX–XX
https://doi.org/10.1093/tbm/ibae031
Advance access publication 19 June 2024
Original Research

Adaptation of complex interventions for people with long-term conditions: a scoping review

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Abstract

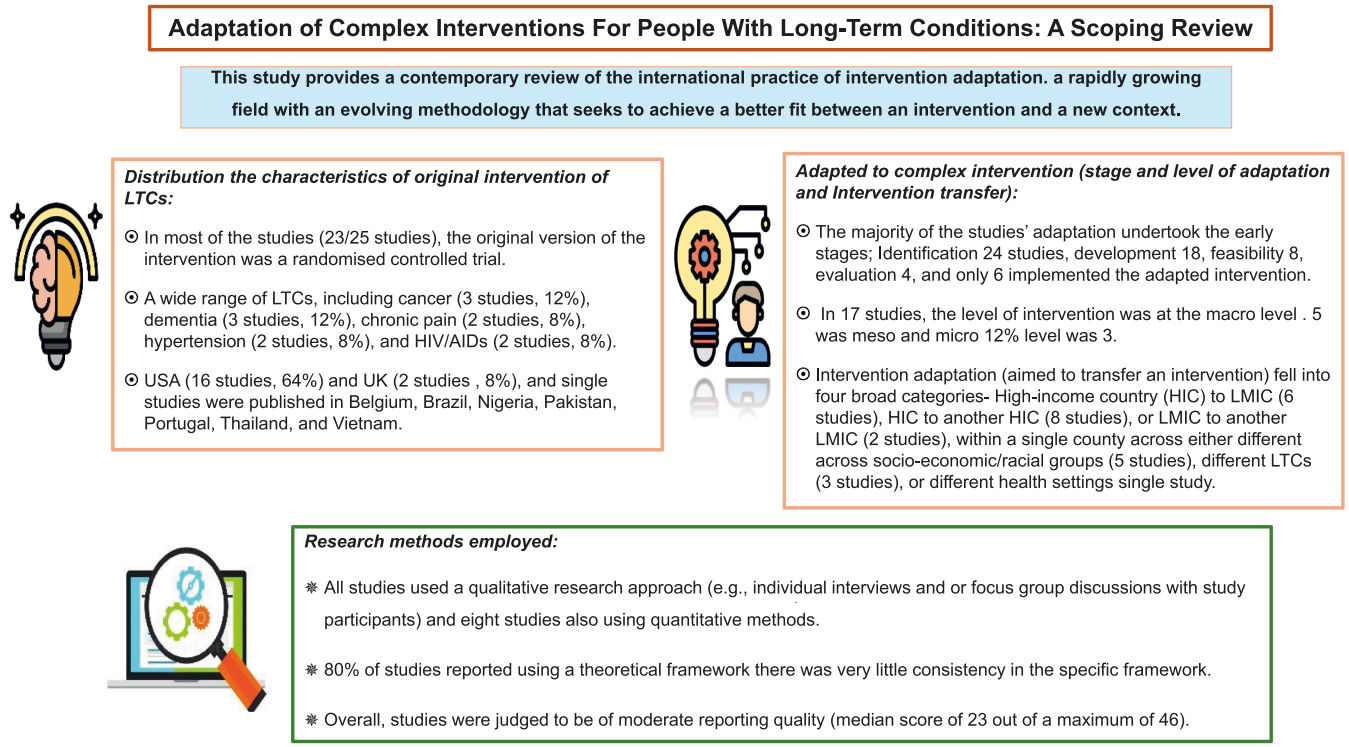
Adaptation seeks to transfer and implement healthcare interventions developed and evaluated in one context to another. The aim of this scoping review was to understand current approaches to the adaptation of complex interventions for people with long-term conditions (LTCs) and to identify issues for studies performed in low- and middle-income countries (LMICs). Bibliographic databases were searched from 2000 to October 2022. This review involved five stages: (i) definition of the research question(s); (ii) identifying relevant studies; (iii) study selection; (iv) data charting; and (v) data synthesis. Extraction included an assessment of the: rationale for adaptation; stages and levels of adaptation; use of theoretical frameworks, and quality of reporting using a checklist based on the 2021 ADAPT guidance. Twenty-five studies were included from across 21 LTCs and a range of complex interventions. The majority (16 studies) focused on macro (national or international) level interventions. The rationale for adaptation included intervention transfer across geographical settings [high-income country (HIC) to LMIC: six studies, one HIC to another: eight studies, one LMIC to another: two studies], or transfer across socio-economic/racial groups (five studies), or transfer between different health settings within a single country (one study). Overall, studies were judged to be of moderate reporting quality (median score 23, maximum 46), and typically focused on early stages of adaptation (identification and development) with limited outcome evaluation or implementation assessment of the adapted version of the intervention. Improved reporting of the adaptation for complex interventions targeted at LTCs is needed. Development of future adaptation methods guidance needs to consider the needs and priorities of the LMIC context.

Lay summary

Limited finance and human capacity may reduce access to new treatments for people with long-term conditions. This is especially true in low- and middle-income countries. One solution is to transfer treatments developed in one place for use in other areas. This paper provides a current summary of international research on adapting treatments. We used a checklist to assess study reporting quality, based on published advice. Our findings showed the need for better conduct and reporting of adaptation. Future guidance should consider the specific needs of low- and middle-income countries.

Keywords: adaptation; complex intervention; long-term conditions; -methodological frameworks; low-and-middle-income countries

Graphical Abstract



Implications

Practice: This scoping review provides a comprehensive and contemporary overview of the practice of adapting complex interventions for people with long-term conditions.
Policy: Our findings provide a resource for researchers, policymakers, and practitioners adapting healthcare interventions to new contexts, particularly between low-, middle-, and high-income countries.
Research: Future development of adaptation methods guidance requires consideration of the needs and priorities of low- and middle-income countries.

Introduction

The provision of effective evidence-based healthcare services for people with long-term conditions (LTCs) is one of the key priorities facing healthcare systems across the world [1, 2]. LTCs, such as diabetes, heart failure, and chronic pain, often require sustained engagement with the healthcare delivery system and support to enable people to manage their condition(s) [3]. It is estimated that LTCs contribute to 60% of deaths and 46% of the global health burden with much of this impact occurring in low- and middle-income countries (LMICs) [4, 5]. Alongside the growing burden of LTCs, is the challenge of constrained finance and human capacity in the development and evaluation of *de novo* interventions and the provision of healthcare services more broadly. One potential solution to these challenges is intervention adaptation, which seeks to transfer and implement healthcare interventions developed and evaluated in one context to another [6, 7]. Adaptation is a process of modification to the original intervention content and/or its delivery to fit an alternative context or study population/disease group [8, 9]. The use of interventions with a previous evidence base in new contexts might be more efficient than developing new interventions and increase the chances of maintaining effectiveness and ensuring success in implementation. Given that LMICs face the combined pressures of a growing burden of LTCs and highly constrained finance and human capacity, the adaptation of the existing intervention approach is likely to be especially important and necessary in this setting [10, 11]. Intervention adaptation has been described as a process that involves '*intentional modification(s) of an evidence-informed intervention, to achieve a better fit between an intervention and a new context. Modification can include planned adaptations (changes made before introducing a new intervention) and responsive adaptations (changes made intentionally but in response to emerging contextual issues occurring during implementation)*' [7, 12].

The science of adaptation of healthcare interventions is a rapidly growing field with an evolving methodology [9, 12–14]. The ADAPT framework published in the British Medical Journal in 2021 is widely recognized as a key source of consensus-informed guidance for adapting and transferring healthcare interventions to new contexts [15]. ADAPT seeks to provide step-by-step guidance for working with stakeholders, selecting suitable interventions, undertaking adaptations, making decisions on evaluation and implementation, and reporting adapted interventions.

Whilst a small number of previous reviews have assessed the reporting and methodology of studies describing the adaptation of healthcare interventions, none to date have focused on LTCs or considered the implications for the conduct of adaptation studies in LMICs [6, 7].

The aim of this scoping review was to understand current approaches to the adaptation of complex healthcare interventions for people with LTCs. Key research questions were: (i) What is the rationale for adaptation of complex interventions for LTCs? (ii) What research methods are used by adaptation studies? (iii) Do adaptation studies use frameworks? (iv) How well do the conduct and reporting of adaptation studies conform to 2021 ADAPT guidance? In addressing these research questions, we sought to identify the specific issues and challenges to conducting adaptation of complex healthcare interventions in the context of the LMIC setting.

Methods

Study design

To address our study aims and research questions, a scoping review was undertaken [16]. We used a methodological framework as initially proposed by Arksey and O'Malley [16] and adapted by Levac *et al.* [17] and Colquhoun *et al.* [18]. The review comprised five stages: (i) definition of the research question(s); (ii) identification of relevant studies; (iii) study selection; (iv) data charting; and (v). data synthesis. The study is reported in accordance with the Preferred Reporting Items for Systematic Reviews for Scoping Reviews (PRISMA-ScR) extension [19].

Identifying relevant studies

The study inclusion and exclusion criteria were adapted from Movsisyan *et al.* [20] and are summarized in Supplementary Table 1. A list of eligible LTCs was compiled by combining conditions listed by the Cambridge Multimorbidity Score and Barnett *et al.* (see Supplementary Table 2) [21, 22]. The following electronic databases were searched: Medline, CINHAL, PsycINFO, and Cochrane Library. The research strategy was designed with an experienced information specialist. The search strategy development followed an iterative piloting process and was modified to ensure that we identified appropriate literature based on a small number of adaptation studies already known to the research team. Details of searches are provided in Supplementary Tables 3a–c. To reflect the recent development of the field of intervention adaptation in healthcare, databases were searched from 1 January 2000 to 3 October 2022. We limited inclusion to studies published in English.

Study selection

Search results were exported into Covidence (Veritas Health Innovation Ltd, Melbourne, Australia) [23], where duplicates were removed. Two reviewers independently undertook study screening based on the inclusion and exclusion criteria; a third reviewer resolved any conflicts.

Data charting

Data were extracted by a single reviewer and checked by a second. Key domain data were extracted in accord with the study research questions. General study characteristics included details of the population and intervention (original and adapted). The level of intervention was assessed as—'micro', i.e., intervening with individuals and their immediate social network and relationships; 'meso', i.e., intervening with medium-level population groups and institutional or cultural change; or 'macro', i.e., operating at the national or global level, such as through regulations, taxation, other government policies, or mass media [24]. In addition, details of the rationale for adaptation, methods of adaptation (use of qualitative/quantitative research; stages of adaptation process addressed; level of evidence for the original intervention), use of theoretical frameworks, and reporting of the adaptation process. Studies were assessed as to whether they undertook the following five stages of the adaptation process: (i) identification (identifying the factors that would need to be addressed to adapt an intervention); (ii) development (the process of developing an adapted version of the intervention); (iii) feasibility (assessment of the acceptability or feasibility of the adapted intervention); (iv) evaluation (assessment of the efficacy/safety of the adapted intervention); and (v) implementation (a scaled roll out of the adaptation into 'real world' practice) [25].

Reporting of the adaptation process and methodology was assessed using a checklist developed by a group of authors based on the 2021 ADAPT guidance [15]. Whilst published in 2021, we used the checklist developed from the ADAPT guidance to retrospectively assess the quality and transparency of reporting of our included studies. This checklist directly maps to the items included in the ADAPT guidance including details of forming an adaptation team (four items); rationale for the intervention adaptation-context fit (six items); methods of intervention adaptation (five items); methods of intervention evaluation (six items) and plans for implementation and maintenance of the adapted intervention (two items). Each checklist item was judged as 'fully met' (score: 2), 'partially met' (score: 1), or 'not reported' (score: 0). Item scores were totalled with a possible total checklist score ranging from 0 to 46. The reporting checklist template is shown in Supplementary Table 4. For each item, where available, details from each individual publication were extracted as evidence to support the scoring decision. The checklist was piloted across three studies by each of the three reviewers. Following this piloting process, we finalized the wording of the checklist items. No formal quantification of checklist scoring agreement between reviewers (e.g., Kappa score) was performed.

Data extraction was undertaken by a single reviewer using a standardized pre-piloted Excel proforma and checked by a second reviewer. Where there were disagreements between the two reviewers, discussion took place until a consensus was reached.

Data synthesis

Given this is a scoping review, the focus of data presentation and synthesis was a descriptive narrative analysis supported by the presentation of tabular and graphical summaries of included studies that directly address the study research questions. Findings are presented using descriptive statistics, including frequency counts (and percentages) and medians.

Results

Study selection

The results of the search and study selection process are presented in a PRISMA flow diagram (see Fig. 1). Of the 1020 titles and abstracts identified, a total of 25 adaptation studies (30 publications) were included. The two main reasons for exclusion

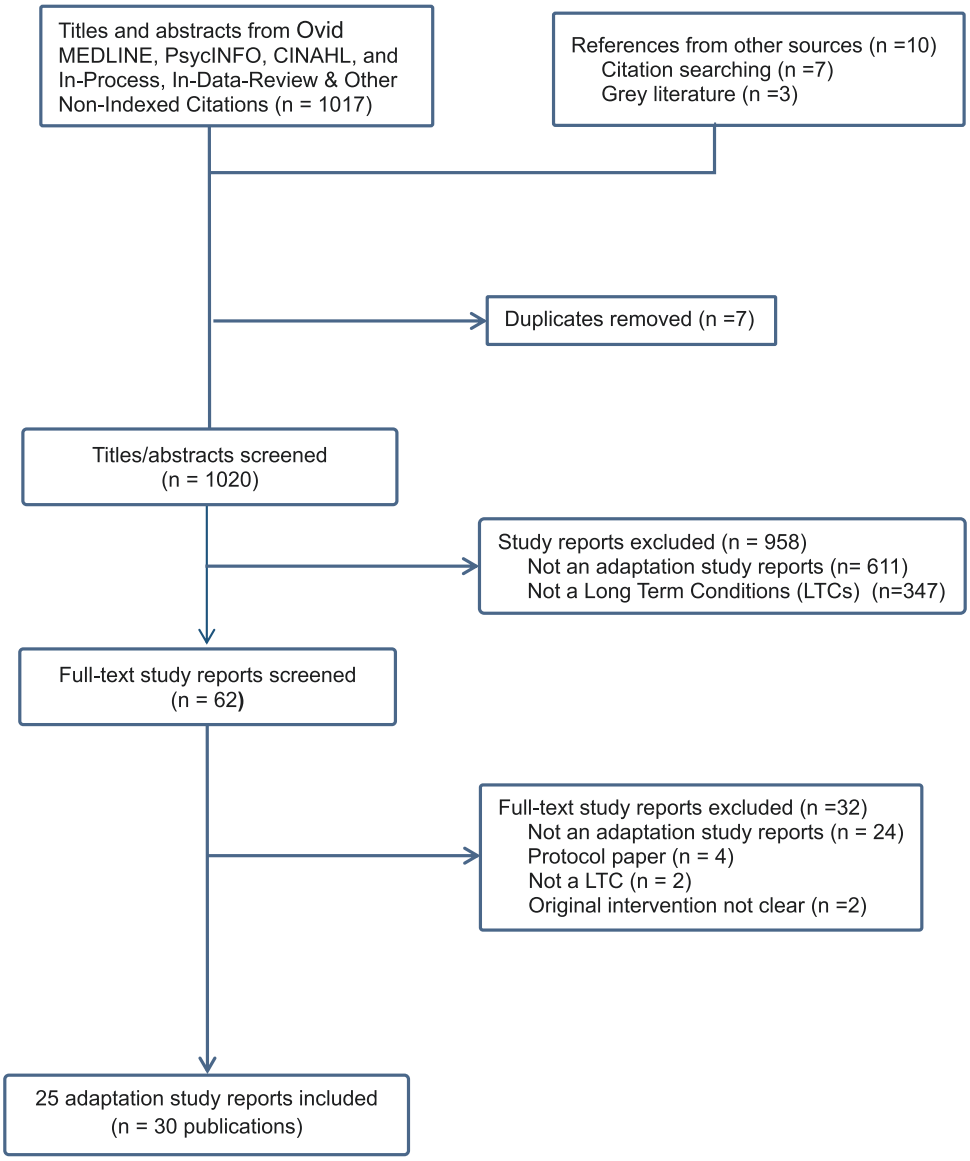


Figure 1 PRISMA flow diagram reporting study selection

were that studies did not focus on a LTC population, or the purpose of the study was not about intervention adaptation.

General characteristics of included studies

The study characteristics of the included studies are detailed in Table 1 [26–55]. Six studies were published up to 2015 and 19 studies between 2016 and 2022. The two main study countries of publication were the USA (16, 64%) and the UK (2, 8%), with one study from Belgium, Brazil, Nigeria, Pakistan, Portugal, Thailand, or Vietnam. Studies included a wide range of LTCs, including cancer (3, 12%), dementia (3, 12%), chronic pain (2, 8%), hypertension (2, 8%), and HIV/AIDs (2, 8%). A wide range of complex interventions were employed across studies that included the promotion of mental health, disease self-management, and medication adherence.

Rationale for adaptation

The rationale for intervention adaptation fell into four broad categories (see Table 1). Most studies (16, 64%) took an intervention developed in one country and adapted the intervention for the same LTC population in another country (or group of countries)—high-income country (HIC) to LMIC (six studies), one HIC to another HIC (eight studies), or one LMIC to another LMIC (two studies). The remaining studies aimed to transfer an intervention within a single county across either different across socio-economic/racial groups (five studies), different LTCs (three studies), or different health settings (one study).

Adaptation study methods

Nature of original intervention evidence

For the majority of studies (23 studies), the evidence base for the original version of the intervention was a randomized controlled trial (see Table 1).

Level of adaptation

For 17 studies, the level of intervention was at the macro level (e.g., Carver *et al.* [37], transfer from Iceland to Scotland), five studies were at the meso level (e.g., Cassel *et al.* [28], different

Table 1 Characteristics of included studies and adaptation methods

Author (year), country of publication	Population	Intervention			Rationale for adaptation	Level of evidence for the original intervention	Intervention level[a]
		Description	Original version name	Adapted version name			
O'Donnell (2022), UK	Heavy alcohol use and depression	Intervention and training programme for the treatment and prevention of comorbid heavy drinking and depression	Scale-up of Prevention and Management of Alcohol Use Disorders and Comorbid Depression in Latin America (SCALA)	Not stated	Different geographic setting (UK to Latin America)	Quasi experimental study	Macro
Atif (2020), Pakistan	Anxiety during pregnancy	Psychosocial intervention based on principles of cognitive behaviour therapy	Thinking Healthy Programme (THP)	Happy Mother, Healthy Baby	Different geographic setting (HICs to Pakistan)	Systematic review	Macro
Bertrand (2019)/ Marinho (2021), Brazil	Dementia	Intervention to improve cognition and quality of life	Cognitive stimulation therapy (CST)	Not stated	Different geographical setting (UK to Brazil)	Randomized controlled trial	Macro
Bornheimer (2022), USA	Schizophrenia spectrum and other Psychosis disorders	Intervention based on cognitive behavioural methods to prevent suicide in community mental health settings	Cognitive Behavioural Suicide Prevention for psychosis	Not stated	Different geographical setting (UK to USA)	Randomized controlled trial (pilot)	Macro
Carver (2021), UK	Substance use	Intervention for preventing substance use among young people	The Icelandic Model (IM)	The Icelandic Model in Scotland	Different geographical setting (Iceland to Scotland)	Randomized controlled trial	Macro
Cassel (2014), USA	Obesity and cancer	Intervention for reducing obesity among cancer patients	Body and Soul	Not stated	Different racial group (African Americans to Samoans population in same country—USA)	Randomized controlled trial	Meso
Chen (2012)/ Parker (2012), USA	Arthritis	Arthritis self-management programme for older adults	Evidence-based interventions of arthritis	Arthritis Self-Help Program for older African American, Hispanic and non-Hispanic white adults	Different racial group (African American, Hispanic and non-Hispanic white adults) in same country—USA)	Randomized controlled trial	Meso
Cho (2020), USA	Prostate cancer and partners	Intervention for cancer survivors' and their partners' potential unmet needs including anxiety/ uncertainty about cancer progression, communication between partners, cultural sensitivity, and of motivation and behaviours between partners	Active Living After Cancer (ALAC)	Watchful Living	Different disease population (different cancers) in same population country (USA)	Randomized controlled trial	Micro

Table 1. Continued

Author (year), country of publication	Population	Intervention			Rationale for adaptation	Level of evidence for the original intervention	Intervention level[a]
		Description	Original version name	Adapted version name			
Fort (2019), USA/ Paniagua-Avila (2020), Guatemala	Hypertension	Programme to control blood pressure	Hypertension Control Program in Argentina by Community Health Worker (CHW)-Led	Not stated	Different geographical setting (Argentina to Guatemala)	Randomized controlled trial	Macro
Gorman (2021), USA	Cancer	Intervention to improve aspects of sexual health, including sexual arousal, desire, satisfaction, and overall sexual functioning	Mindfulness-based interventions (MBIs) of different cancer men and women in USA	Not stated	Different disease group (different cancers) in same country—USA	Randomized controlled trial	Micro
Greenberg (2019), USA	Heterogeneous Chronic Pain	Intervention programme to integrate physical activity with mind-body skills to increase comprehensive physical and emotional functioning of chronic pain	Mind-body interventions	Get Active and Get Active With Fitbit Programs	Different disease group (generic disease to pain) in same country (USA)	Randomized controlled trial	Micro
Alvares Pereira (2022), Portugal	Dementia	Intervention to improve cognitive function and quality of life	Cognitive Stimulation Therapy	Making a Difference	Different geographical setting (UK to Portugal)	Randomized controlled trial	Macro
Hopkins (2022), USA	People at risk of obesity, CVD, and diabetes	Intervention to promote a healthy diet and lifestyle	Celebremos La Salud	Not stated	Different population in a same county (Latino to Alaskan Yup'ik population in USA)	Randomized controlled trial	Meso
Jans (2020), Belgium	Chronic conditions	Intervention to promote self-management in community-setting	Chronic Disease Self-Management Program of Stanford University (CDSMP)	Not stated	Different geographical setting (USA to Belgium)	Randomized controlled trial	Macro
Kangovi (2016), USA	Chronic illness	Intervention to help patients track progress toward their chronic disease management goals to motivate health behaviour change	Community health worker (CHW) programs	IMPaCT program	Different settings in same country (hospital to community-setting -USA)	Randomized controlled trial	Meso
Magidson (2014), USA	HIV/AIDS with depression	Intervention to address improvements in depressive symptoms and adherence	Behavioural activation (BA) and Life-Steps	Act Healthy Group integrated BA and Life-Steps treatment	Different setting (mental health setting to general medical setting in the same country—USA)	Randomized controlled trial	Meso
Muroff (2017), USA	Alcohol and other drug/mental disorders	Programme to assist recovery, continuing their access to resources, case management, and quality information after leaving residential treatment	A smartphone application, Addiction–Comprehensive Health Enhancement Support System (A-CHESS)	CASA-CHESS	Different racial population (English speaking Hispanics to Spanish speaking Latinos) in same country (USA)	Randomized controlled trial	Meso

Table 1. Continued

Author (year), country of publication	Population	Intervention			Rationale for adaptation	Level of evidence for the original intervention	Intervention level[a]
		Description	Original version name	Adapted version name			
Ojo (2020), USA	Stroke prevention	Programme for optimal hypertension management	Discharge Education Strategies for Reduction of Vascular Events (DESERVE)	Not stated	Different geographical settings (USA to Ghana)	Randomized controlled trial	Macro
Okoli (2021), Nigeria	Hypertension	Programme to improve hypertension diagnosis, treatment, and control and reduce deaths from cardiovascular diseases	US Kaiser Permanente Northern California (KPNC) model and (WHO) HEARTS	Not stated	Different geographical settings (USA to Nigeria)	Randomized controlled trial	Macro
Olson (2022), USA	Type 2 Diabetes	Web-Based Self-management education programme to support the management of Type 2 diabetes	Diabetes Education and Self-Management for Ongoing and Newly Diagnosed (My DESMOND)	Not stated	Different geographical settings (UK to Australia)	Randomized controlled trial	Macro
Risendal. (2014, 2015), USA	Cancer	Intervention for chronic disease self-management programme for cancer survivors	Cancer Thriving and Surviving Program (CTS)	Chronic Disease Self-Management Program (CDSMP) for cancer survivors' adaptation	Different geographical setting (UK to USA)	Randomized controlled trial	Macro and micro
Tongsiri (2022)/ Chen (2022), Thailand	Dementia	Intervention for dementia to reduce behavioural and psychological symptoms of dementia	Reducing Disability in Alzheimer's Disease (RDAD)	Thai Reducing Disability in Alzheimer's Disease (Thai-RDAD)	Different geographical settings (USA to Thailand)	Randomized controlled trial	Macro
Tran (2022), Vietnam	HIV and AIDS with depression, anxiety, and/or stress disorder	Programme to improve common mental disorders (CMDs)	Friendship Bench (FB), a problem-solving therapy	Not stated	Different geographical settings (Zimbabwe to Vietnam)	Randomized controlled trial	Macro
Wechsberg (2015), USA	High risk of HIV/ AIDS	Behavioural intervention for couples and the men as partners programme to address the interrelated issues of substance use, sex risk behaviours, gender role expectations, and gender-based violence	Western Cape Women's Health, program	Not stated	Different geographical settings (USA to South Africa)	Randomized controlled trial	Macro
Williams (2013), USA	HIV/AIDS self-reporting poor adherence to antiretroviral drugs	Nursing intervention to improve medication adherence	Adherence Through Home Education and Nursing Assessment (ATHENA)	Not stated	Different geographical settings (USA to China)	Randomized controlled trial	Macro

[a]Level of intervention—Macro: operating at the national or global level, such as through regulations; Meso: intervening with medium-level population groups, institutional or cultural change; Micro: intervening with individuals and their immediate social network and relationships.

racial groups—African American to Samoans population—in the same country—USA), and three studies were at a micro level [e.g., Gorman *et al.* [45], different disease groups (different cancers) in the same country—USA] (see Table 1).

Stages of adaptation process and research methods

Whilst the majority of included studies undertook the early stages of adaptation, i.e., identification (24, 96%) and development (18, 72%), few studies undertook the later stages of either assessment of feasibility (8, 32%) or evaluation (4, 16%), and only 6 (24%) reported proceeding to implement the adapted intervention (see Table 2). None of the studies stated that they had implemented the adapted intervention or reported testing either the feasibility or effectiveness of the adapted version.

Research methods employed

All studies used a qualitative research approach (e.g., individual interviews and or focus group discussions with study participants) and eight studies also using quantitative methods (e.g., randomized and non-randomized pilot trials) (see Table 2). Whilst it was consistently reported that the original intervention had been tested using quantitative methods (e.g., Randomised Controlled Trials (RCTs) none of the studies provided information that the adapted interventions have been formally tested for feasibility, and/or efficacy/effectiveness.

Use of adaptation frameworks

Although twenty (80%) studies reported using a theoretical framework there was very little consistency in the specific framework that was cited across studies (see Table 3).

Quality of reporting and conformance with ADAPT guidance checklist

Figure 2 shows how adaptation studies conformed with the ADAPT 2021 guidance [25]. The median total ADAPT reporting checklist score across studies was 23 (range 11–32) out of a maximum of 46. The three initial domains of the checklist (i.e., 'forming an intervention team'; 'assessment of the rationale for intervention and context fit'; and 'planning and undertaking the adaptation') were generally well reported whilst the latter two domain items ('planning/undertaking an evaluation' or 'implementing/maintaining the intervention at scale') more poorly reported. However, some of the specific checklists within the first three domains were consistently poor or not reported across most studies, i.e., item 1C—working with (original intervention) developers and handling conflicts of interest; item 2F—intellectual property issues around the adapted intervention; item 3C—unintended contexts. There was no evidence of a difference in the quality of reporting of studies according to their publication date. For each of the checklist domain items, examples of good ('fully met') reporting were extracted verbatim

Table 2 Stage of adaptation and research methods employed of included studies

Author (year)	Stage of adaptation					Research methods
	Identification	Development	Feasibility	Evaluation	Implementation	
O'Donnell (2022)	✓	✓	x	x	x	Qualitative
Atif (2020)	x	✓	x	✓	x	Qualitative
Bertrand (2019)/Marinho (2021)	✓	x	x	x	x	Qualitative
Bornheimer (2022)	✓	x	✓	x	✓	Mixed
Carver (2021)	✓	x	x	x	x	Qualitative
Cassel (2014)	✓	x	✓	x	x	Qualitative
Chen (2012)/Parker (2012)	✓	✓	x	x	x	Mixed
Cho (2020)	✓	✓	x	x	x	Qualitative
Fort (2019)/ Paniagua-Avila (2020)	✓	x	x	x	x	Qualitative
Gorman (2021)	✓	✓	✓	x	x	Mixed
Greenberg (2019)	x	✓	✓	x	x	Qualitative
Alvares Pereira (2022)	✓	✓	x	x	x	Qualitative
Hopkins (2022)	✓	✓	x	x	x	Qualitative
Jans (2020)	✓	✓	x	x	x	Qualitative
Kangovi (2016)	✓	X	✓	x	✓	Mixed
Magidson (2014)	✓	✓	✓	x	x	Mixed
Muroff (2017)	✓	✓	x	x	✓	Mixed
Ojo (2020)	✓	X	✓	x	✓	Qualitative
Okoli (2021)	✓	X	x	x	✓	Qualitative
Olson (2022)	✓	✓		✓	x	Qualitative
Risendal (2014 and 2015)/Tongsiri (2022) and Chen (2022)	✓	✓	✓	✓	x	Mixed
Tran (2022)	✓	✓	x	x	✓	Qualitative
Wechsberg (2015)	✓	✓	x	x	x	Qualitative
Williams (2013)	✓	✓	x	x	x	Qualitative

✓: adaptation stage reported; x: adaptation stage not reported.

Table 3 Reference to adaptation framework of included studies

Author (year)	Use of theoretical framework	Frameworks used
O'Donnell (2022)	✓	Community-based developmental approach to adapt CST to different cultures and the Formative Method for Adapting Psychotherapy (FMAP)
Atif (2020)	✓	Medical research Council MRC (UK) framework for development and evaluation of complex interventions
Bertrand (2019)/Marinho (2021)	x	
Bornheimer (2022)	✓	Community-based participatory research (CBPR) methods
Carver (2021)	✓	Consolidated Framework for Implementation Research (CFIR)
Cassel (2014)	✓	Community-based participatory research (CBPR)
Chen (2012)/Parker (2012)	✓	The Method for Program Adaptation through Community Engagement (M-PACE)
Cho (2020)	✓	Intervention Mapping Adapt (IM Adapt) and Typology of Adaptation
Fort (2019)/Paniagua-Avila *et al.* (2020)	✓	RE-AIM (reach, effectiveness, adoption, implementation, maintenance) framework
Gorman (2021)	✓	ADAPT-ITT model and Modifications were tracked and coded according to the Framework for Reporting Adaptations and Modifications expanded (FRAME)
Greenberg (2019)	✓	National Institute of Health (NIH) stage model for behavioural intervention development, National Institute of Complementary and Integrative Health (NCCIH) model for developing and testing mind-body intervention
Alvares Pereira (2022)	✓	Barrera and Castro framework
Hopkins (2022)	✓	Modified versions of Adapted Intervention Mapping (IM) approach
Jans (2020)	✓	Goldstein Framework
Kangovi (2016)	x	
Magidson (2014)	x	
Muroff (2017)	✓	The cultural adaptation stage model
Ojo (2020)	✓	FRAME framework for reporting adaptations to evidence-based interventions
Okoli (2021)	✓	Primary Health Care Performance Initiative (PHCPI) conceptual framework and mapped onto Consolidated Framework for Implementation Research (CFIR) main domains
Olson (2022)	x	
Risendal (2014, 2015)	x	
Tongsiri (2022)/Chen (2022)	✓	Different theoretical frameworks
Tran (2022)	✓	Assessment-Decision-Adaptation-Production-Topical (ADAPT-ITT) framework
Wechsberg (2015)	✓	ADAPT Framework
Williams (2013)	✓	Castro and Barerrera framework

✓: framework reported; x: framework not reported.

from the included studies and are provided in Supplementary Table 5.

Discussion

This scoping review provides a contemporary synthesis of 25 international studies published since 2000 and reports on the adaptation of complex interventions for people with LTCs. Our review included adaptation studies across a wide range of interventions and diseases, typically focusing on a macro (or national) level. The most common rationale for adaptation was transferring an intervention from one geographical setting (e.g., from an HIC to an LMIC) or across ethnic or LTC groups. Although the majority of studies referred to an underpinning theoretical framework, there was no consistency in reporting. Whilst studies addressed all five stages of the adaptation process (i.e., identification, development, feasibility, evaluation, and implementation) [24] we found the focus was often only on the first three stages. Using a checklist developed from the ADAPT 2021 guidance, the overall quality of study reporting was judged to be moderate, and a number of reporting items were consistently omitted. A key strength of the studies identified by our review was the large proportion where the adaptation was based on an original intervention with evidence of efficacy/effectiveness assessed based on a randomized trial design.

Comparison to current knowledge

Our findings have some similarities and differences with the limited number of previous scoping reviews of adaptation studies published to date [7, 12, 20]. Movsisyan reported that 12 of their 28 (43%) included studies described the transfer of a public health intervention from one country to another, the remainder examining adaptations across different population groups within the same country. In contrast to this study, both the ADAPT 2021 guidance publication [12] and Movsisyan [20] found macro (or national)-level interventions to be relatively rare. Similarly, the ADAPT 2021 guidance group noted the reporting of several adaptation frameworks but there was no consensus. Our finding that the majority of

First author (year)	Forming an adaptation team				Assessment of the rationale for the intervention, and consideration of the intervention context fit						Planning and undertaking the adaptation					Planning and undertaking the evaluation						Implementing and maintaining the intervention		Total checklist score
	1A	1B	1C	1D	2A	2B	2C	2D	2E	2F	3A	3B	3C	3D	3E	4A	4B	4C	4D	4E	4F	5A	5B	
Chen (2012)/ Parker (2012)	2	2	2	2	2	0	2	2	1	0	2	2	0	2	1	0	0	0	0	0	0	0	0	22
Williams (2013)	2	2	2	0	2	2	2	2	2	0	2	0	0	1	1	2	1	0	0	0	1	0	0	24
Magidson (2014)	2	1	0	0	2	1	1	2	2	0	1	2	0	0	0	0	1	1	0	0	0	0	0	16
Cassel (2014)	2	2	0	1	2	0	1	2	2	0	1	0	0	1	2	2	1	0	0	0	1	0	0	20
Risendal (2014, 2015)	2	1	1	1	2	1	1	2	2	0	0	2	0	1	2	1	2	0	0	0	0	0	0	21
Wechsberg (2015)	2	2	2	2	2	2	2	2	1	0	2	2	0	0	2	0	1	0	2	0	0	1	0	27
Kangovi (2016)	1	0	0	0	2	0	2	2	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	11
Muroff (2017)	2	2	0	2	2	2	0	0	2	0	2	2	0	1	2	1	0	0	1	1	0	0	0	22
Greenberg (2019)	1	1	0	0	2	1	1	1	0	0	1	2	0	0	1	2	1	0	0	0	1	0	0	15
Fort (2019) / Paniagua (2020)	2	2	2	2	2	0	1	2	2	0	2	2	0	0	0	2	2	2	0	0	0	1	2	28
Bertrand (2019)/Marinho (2021)	1	2	0	1	2	1	2	2	2	0	2	2	0	0	1	2	2	0	1	0	1	0	0	24
Atif (2020)	2	2	0	0	2	2	1	1	2	0	1	1	0	1	1	2	1	1	1	0	2	0	0	23
Cho (2020)	2	1	2	2	2	2	1	2	2	0	2	2	0	1	2	2	0	0	0	0	0	1	0	26
Jans (2020)	2	1	0	1	1	1	1	2	2	0	2	2	0	1	2	2	1	0	2	0	0	1	0	24
Ojo (2020)	2	0	0	0	2	1	2	2	2	0	2	1	0	2	2	0	1	0	0	0	0	0	0	19
Carver (2021)	1	0	0	0	2	1	2	2	2	0	2	2	0	0	1	2	2	0	0	0	0	2	2	23
Gorman (2021)	2	0	0	1	2	1	1	1	2	0	2	2	0	0	0	1	1	0	0	0	0	0	0	16
Okoli (2021)	2	1	0	0	2	1	2	2	1	0	1	1	0	1	2	2	2	0	0	0	2	0	0	22
Olson (2022)	2	2	2	1	2	1	2	1	2	0	2	2	2	1	1	2	2	0	2	0	0	2	0	31
O'Donnell (2022)	2	2	0	1	2	2	2	2	2	0	2	2	0	1	1	0	1	1	0	0	1	0	0	24
Bornheimer (2022)	2	2	2	2	2	2	2	2	2	0	1	1	0	1	1	0	0	1	2	0	1	0	0	26
Alvares Pereira (2022)	2	2	0	0	2	2	1	1	2	0	2	2	0	1	1	1	1	0	2	0	0	1	0	23
Hopkins (2022)	2	0	0	1	1	2	1	0	0	0	1	2	0	0	1	0	0	0	0	0	0	0	0	11
Tongsiri (2022)/Chen H (2022)	2	2	2	1	2	2	1	2	2	0	1	2	0	1	2	2	2	0	1	0	2	1	0	30
Tran (2022)	2	2	2	1	2	2	2	2	2	0	2	2	0	1	2	2	2	0	2	0	2	0	0	32
Number of studies that achieve the highest score 2 (fully reported) of each of the domain items of the ADAPT checklists	21	14	9	6	23	11	12	17	19	0	15	18	1	2	10	13	9	1	6	0	4	2	2	**Median: 23** **Range of all 25 studies: 11-32**

***Score 2: Fully reported, score 1 - Partially reported, and score 0 - Not reported**

Figure 2 A summary of ADAPT checklist assessment of the quality of reporting of included studies. *Score 2: fully reported, score 1—partially reported, and score 0—not reported

included studies focused on the early stages of adaptation of identification and development (24, 96%) is consistent with Movsisyan [20], and the review of adaptation frameworks by Escoffery [7]. Given the 2021 publication date of the ADAPT guidance and that our study included publications from 2000 to 2022, it is perhaps not surprising that none of them directly referenced this guidance. However, this may simply reflect the fact that the guidance was only published in the last 2–3 years and its uptake will be seen in future adaptation studies.

Strengths and limitations

This scoping review has several strengths. It provides a comprehensive and contemporary overview of the international literature on complex intervention adaptation studies for people with LTCs. Second, this study addresses some gaps in the use of theoretical and methodological guidance for intervention adaptation for which there is no current consensus on best practice. Third, we have developed and applied a checklist for describing the quality of reporting based on the ADAPT 2021 guidance [25]. Given the likely growing importance and utilization of intervention adaptation approaches [8, 25, 56], there is a need for the adoption of rigorous methodology approaches across the research community. Our checklist developed based on the ADAPT 2021 guidance provides a potential tool to help assess and quantify the quality of reporting of future intervention adaptation studies. Finally, we provide a listing of examples of good reporting to assist the authors of future adaptation studies. However, our review has some limitations. The assessment of the quality of reporting of adaptation studies is challenging as it involves subjective judgement; The scoring of our ADAPT reporting checklist often required discussion between the review team as to whether the reporting item was adequately met or not. Adaptation studies may be poorly indexed in databases, so there is a risk that potentially includable studies may have been overlooked by literature searches. This was evidenced by the fact that we identified 10 potentially relevant studies from reviewing the references of included studies; two of which were included in our final list of 25 studies [54, 55]. Non-English publication was pre-defined as an exclusion criterion of this review. However, we did not exclude any studies based on language. We acknowledge there was no formal patient or other stakeholder consultation as part of this scoping review.

Implications

Our findings have important implications. We confirm the importance of a systematic methodological approach to intervention adaptation and the need for high-quality reporting to enable healthcare professionals and programme planners to inform their implementation of adapted interventions. This can be particularly relevant in the transfer of healthcare interventions between LMICs and HICs where there are often fundamental differences in context and culture [57]. Without rigorous customization and adaptation, an intervention is likely not fit the context of the adapted intervention and its implementation is likely to be suboptimal. However, such a rigorous methodological approach requires adequate research resources, human capacity expertise, and funding, both of which are often scarce in a low-income country. As we have seen in our review, several studies have been based on global partnerships across academic institutions and research

funding [57]. However, a sustained approach to intervention adaptation requires continued research investment and capacity building in a lower income context. It is also important to recognize the opportunities for bilateral knowledge transfer. With the challenge of exploding global healthcare costs, translating affordable and efficient approaches to interventional delivery from LMICs to HICs is likely to be increasingly important. It is key that future development of adaptation methods guidance considers the needs and priorities of the LMIC to inform high quality but also feasible research, and ultimately improve healthcare, in these regions [58, 59].

Conclusions

This scoping review presents a comprehensive and contemporary identification and synthesis of the international literature of complex intervention adaptation studies for people with LTCs. It provides a resource for researchers, policymakers, and practitioners working to adapt interventions to new contexts. Our review highlights two key developmental issues going forward: (i) the need for better conduct and reporting of all the stages of the adaptation process, including both the evaluation and implementation of an adapted intervention; and (ii) the future development of adaptation methods guidance considers the needs and priorities of LMICs.

Supplementary Material

Supplementary material is available at *Translational Behavioral Medicine* online.

Funding

This manuscript is based on PhD research work of JU which is funded by the University of Glasgow, Glasgow, UK.

Conflicts of interest statement. The authors declare that they have no conflicts of interest.

Human Rights

This article does not contain any studies with human participants performed by any of the authors.

Informed Consent

This study does not involve human participants and informed consent was therefore not required.

Welfare of Animals

This article does not contain any studies with animals performed by any of the authors.

Transparency Statements

Study registration: The protocol for the study was pre-registered on the Open Science Framework website (https://osf.io/vm7j4/). *Analytic plan pre-registration*: The analysis plan was not formally pre-registered.

Data Availability

All data relevant to the study are included in the article or uploaded as supplemental information. The presented research is a literature review of published data; there are no additional unpublished data. *Analytic code availability*: There is no analytic code associated with this study. Materials availability: Materials used to conduct the study are not publicly available.

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