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Development of a core outcome set for multimorbidity trials in low- and middle-income countries (COSMOS): Study Protocol

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Najma Siddiqi and Jan Boehnke conceived the study. Jan Boehnke, Jamie Kirkham, Rusham Rana, Louise Rose and Najma Siddiqi led the design of the research. Jan Boehnke, Najma Siddiqi and Rusham Rana drafted the manuscript. All authors contributed to critiquing and revising the manuscript for important intellectual content.

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Abstract

Introduction

'Multimorbidity' describes the presence of two or more long-term conditions, which can include communicable and non-communicable diseases, and mental disorders. The rising global burden from multimorbidity is well-documented, but trial evidence for effective interventions in low- and middle-income countries (LMICs) is limited. Selection of appropriate outcomes is fundamental to trial design to ensure cross-study comparability, but there is currently no agreement on a core outcome set (COS) to include in trials investigating multimorbidity specifically in LMIC. Our aim is to develop international consensus on two COS for trials of interventions to prevent and treat multimorbidity in LMIC settings.

Methods and Analysis

Following methods recommended by the Core Outcome Measures in Effectiveness Trials (COMET initiative), the development of these two COS will occur in three stages: (1) generation of a long list of potential outcomes for inclusion; (2) two-round online Delphi surveys; and (3) consensus meetings. First, to generate an initial list of outcomes, we will conduct a systematic review of multimorbidity intervention and prevention trials and interviews with people living with multimorbidity and their caregivers in LMICs. Outcomes will be classified using an outcome taxonomy. Two-round Delphi surveys will be used to elicit importance scores for these outcomes from people living with multimorbidity, caregivers, healthcare professionals, policy makers, and researchers in LMICs. Finally, consensus meetings will be held to discuss the Delphi survey results and agree outcomes for inclusion in the two COS.

Ethics and dissemination

The study has been approved by the Research Governance Committee of the Department of Health Sciences, University of York, UK [HSRGC/2020/409/D:COSMOS]. Each participating country/research group will obtain local ethics board approval. Informed consent will be obtained from all participants. We will disseminate findings through peer-reviewed open access publications, and presentations at global conferences selected to reach a wide range of LMIC stakeholders.

Trial registration:

PROSPERO ID CRD42020197293

COMET https://www.comet-initiative.org/Studies/Details/1580

Keywords: Core Outcome Set, Comorbidity, Multimorbidity, Low- and Middle-Income Countries, Delphi, Consensus

Strengths and limitations of this study

- The development process follows guidelines and best practice recommendations for developing core outcome sets and integrates four sources of information.
- Interviews with people living with multimorbidity and caregivers are conducted in several LMICs (in South Asia, Africa and Latin America), by local teams, and in local languages to identify outcomes relevant to them.
- The Delphi survey and consensus meetings are conducted in English which limits the breadth of participation in these stages of the process.
- Despite involvement of a wide range of LMIC stakeholders in the process, there may be some limitations to the generalisability of the final core outcome sets due to the heterogeneity of target conditions and the diversity of countries, cultures and experiences.

INTRODUCTION

The rising global burden from chronic diseases is widely recognised and its detrimental impact on individuals as well as on societies is well-documented(1,2). Chronic diseases often co-occur in individuals and this 'multimorbidity' is associated with more frequent health care consultations(3), longer hospital stays(4), worse health-related quality of life(5–7), increased health care costs(8), higher out-of-pocket expenditure for health care(8), and higher mortality(9). These factors make multimorbidity a pressing challenge for health care systems as well as for patients, families and caregivers(2,8,10). We define multimorbidity as the presence of two or more chronic (or long term) health conditions(11) encompassing communicable and non-communicable diseases and mental disorders e.g. depression and diabetes occurring together. Chronic communicable diseases are those that affect people over a number of months or years e.g. HIV or tuberculosis.

Estimates of the prevalence of multimorbidity in high-income countries (HIC) vary from 25% to 60% in health care and community settings(12–14). The prevalence of multimorbidity in low- and middle-income countries (LMICs) appears to be lower(15,16) but is set to rise rapidly due to demographic and lifestyle changes. A Cochrane review on the effectiveness of health service or patient-oriented interventions to improve outcomes in people with multimorbidity in primary care and community settings found most evidence was from HICs(17). This evidence cannot readily be applied to LMICs where differing patterns of disease, health care systems, resources and cultural considerations will affect the acceptability and effectiveness of interventions. Trials of interventions to tackle multimorbidity specifically in LMICs are urgently needed.

To generate a robust evidence-base, results from individual trials will need to be compared and synthesised. This requires studies to use a 'core outcome set' (COS), i.e. an agreed minimum set of outcomes to be measured in all trials of a specific intervention for a health condition(18). A COS for multimorbidity research has been previously developed(19); it includes three outcomes: health-related quality of life, mental health, and mortality. However, a limitation of this COS is that it was largely based on the evidence and expert opinions from HICs(20,21), with no involvement of LMIC stakeholders in reaching consensus. A recent review discussed outcome measures across eight domains that may be suitable for multimorbidity research in LMICs. However, it did not systematically review the literature, patients and caregivers were not involved, and outcomes were not prioritised using established consensus methods.(22) The authors concluded that development of a COS for LMICs would be an important contribution to the field.

Whilst some research outcomes may be applicable to both LMICs and HICs, there are important differences in disease patterns and health care systems that need to be considered. In a recent trials methodology research priority setting exercise for LMIC settings, the choice of outcomes to measure was identified as the number one most important topic (23). This protocol outlines a plan to bridge the gap and develop two COS for research on the prevention and treatment of multimorbidity in an LMIC setting, using the minimum standards approach for developing COS (24).

Aims and objectives

We aim to develop two COS for trials of interventions designed to (1) prevent and (2) treat multimorbidity in LMIC settings. The scope includes all types of interventions for multimorbidity – pharmacological, non-pharmacological, simple and complex in adults (aged 18 years and over) at risk of, or living with multimorbidity, in community, primary care and hospital settings in LMIC.

METHODS

We will follow approaches recommended by the Core Outcome Measures in Effectiveness Trials (COMET) initiative(25) and Outcome Measures in Rheumatoid Arthritis Clinical Trials (OMERACT(26)). The COS development has been registered with COMET (https://www.comet-initiative.org/Studies/Details/1580). The process will follow the minimum standards for the design of a COS study (COS-STAD(24)), which includes the careful consideration of the scope, stakeholders, and the consensus process. This protocol is structured according to the COS-STAP statement(27).

Our research team has broad global LMIC representation as well as experience of working in LMICs. The COSMOS working group supporting the study draws on a network of 38 research teams in LMICs that will be actively involved in different stages of COS development. We will ensure patient, community and public involvement throughout the development and delivery of the project, and include people with lived experience and their caregivers as members in the core research team.

COS development will involve three stages: (1) generation of a long list of outcomes, (2) two-round online Delphi consensus-building surveys and (3) online consensus meetings.

1. Outcome list generation

A long-list of outcomes will be generated from two sources: first, a systematic review of outcomes reported in trials of interventions conducted in LMICs for the prevention and treatment

of multimorbidity, and second, using interviews with people living with multimorbidity and their caregivers from LMICs.

(1A) Systematic review

We will conduct a systematic review to identify an initial list of potential outcomes from trials of multimorbidity interventions conducted in adults living in LMICs. The systematic review protocol has been registered, and full details are available on PROSPERO (CRD42020197293).

Search methods:

We will search electronic databases (e.g. MEDLINE, Embase, PsycINFO) from 1990 to present. We will also search for relevant systematic reviews in The Cochrane Library, the Database of Abstracts of Reviews of Effects (DARE), PROSPERO and Joanna Briggs; and unpublished ongoing trials in ClinicalTrials.gov, ISRCTN registry and in the International Clinical Trials Registry Platform (http://apps.who.int/trialsearch). We will apply a study design filter to identify interventional studies. We will not limit inclusion by language.

Selection criteria

We will include randomised (individual, cluster, and cross-over randomisation) intervention studies published in either protocols or definitive reports. Studies of adults aged 18 years and above, living in low- and middle-income countries, with multimorbidity, or at risk of multimorbidity will be eligible. Low- and middle-income countries will be defined using the 2019 World Bank definitions. Studies of all interventions, whether pharmacological, non-pharmacological, simple or complex, for the prevention or treatment of multimorbidity (or both) and any comparators will be included.

Study selection

Two reviewers will independently screen titles/ abstracts with any discrepancies resolved through consensus or if needed, by a third reviewer. Full texts will also be reviewed following a similar process.

Data collection

Data will be extracted from eligible studies on publication date, years when the trial was conducted, country, clinical setting (e.g., primary care, specialised services), type of intervention, target conditions, and outcomes, by a single reviewer, with 10% of extraction records also reviewed by a second senior reviewer.

Quality assessment

Risk of bias will not be assessed, as the purpose is only to assemble a list of outcomes that have been used in previous studies.

Data synthesis

Outcomes will be grouped based on whether they were used to evaluate prevention or treatment of multimorbidity. For both groups of outcomes, we will construct matrices to identify the outcomes, whether primary or secondary, their definitions and measures used in each study. We will tabulate the proportion of included studies that report on each outcome (incl. primary versus other outcome) and rank-order the outcomes accordingly. In a second step, to organise the outcomes we will use an outcome taxonomy.

The outcomes will be presented by intervention type (prevention, treatment), by combination of conditions and by region of the world (World Bank regions of LMICs) in which the study was conducted.

(1B) Interviews

To identify outcomes of importance to people from LMICs living with multimorbidity and their families or caregivers, we will conduct semi-structured interviews. Participants will be approached by local research teams either in-person or via phone, post or on-line (based on the local research site resources and COVID-19 restrictions).

Inclusion criteria for interviews comprise: people living with (or caring for someone living with) two or more health conditions; at least 18 years of age; being able to visit the local partner organisation's site or access to telephone/Internet; and consenting to participate. Participants will be identified through contact with relevant health care services, support and advocacy groups, charities and use of social media including Twitter, adverts placed on public and patient involvement websites, snowballing techniques, and personal contacts. We will use purposive sampling (28) based on the following characteristics: age (over/under 65 years); sex (male/female); using community or primary care versus secondary/specialist healthcare services; and region (World Bank income groups: low, lower middle, upper middle(29)). We will include a range of LMICs in diverse geographic locations. We anticipate 15 to 20 participants from each group (45-60 interviews), which should be sufficient to achieve diversity of viewpoints and data saturation(30).

We will collect demographic information (age, sex, marital status, highest level of education, socioeconomic status, occupation and disability. We have developed a semi-structured interview guide (see Appendix 1(31)), which will be translated and back-translated by local teams in the

local language. All interviews will be audio recorded or if not possible (because of technology limitations or the participant withholding consent) will be recorded in contemporaneous notes.

The local research teams will be asked to transcribe and translate into English two sections of the interview, (i) participants' consent and (ii) content relevant to study outcomes. Interview transcripts will be reviewed to confirm health outcomes to put forward for the Delphi.

Outcomes identified in the interviews will be integrated with findings from the systematic review. All unique outcomes identified from the systematic review and interviews will be categorised into domains for presentation in the Delphi survey using Dodd's outcome taxonomy(32).

2. Delphi surveys with stakeholders

We will conduct separate Delphi surveys for the prevention and treatment COS; however, survey participants will be common to both.

We will recruit a range of stakeholders living or working in LMICs including the following groups: i) people living with multimorbidity and their family caregivers, ii) healthcare professionals; iii) policy makers and managers; and iv) researchers interested in multimorbidity with experience in LMIC contexts. Participants will be identified using connected networks (e.g. NIHR Global Health Research Groups/Units, Global Alliance for Chronic Diseases, World Psychiatric Association, NCD Alliance) and our project network across 38 countries to distribute information about the study, including professional societies and non-government organisations relevant to multimorbidity and government ministries. For recruitment to the researcher stakeholder group, we will send personalised emails to corresponding authors living or working in LMICs identified via our systematic review and request them to snowball to co-authors and other relevant contacts.

We will aim to maintain a minimum of approximately 20 participants representing each stakeholder group (total approximately 80 participants) throughout Delphi rounds, with representation across the World Bank LMIC income groups. We will oversample for the first round based on an estimated attrition of 30% across rounds. In both rounds we will send three reminders across three weeks to participants to complete the surveys and keep the surveys open for longer if needed to reduce attrition and improve the response rate.

(2A) Round one

We will include all outcomes identified through our systematic review and interviews, seeking advice from our community and public representatives to describe outcomes in lay terms. We will use an online survey tool (DelphiManager) to administer the surveys. We will pilot the

questionnaire with eight individuals (two from each stakeholder group) to assess content validity and understanding.

We will list outcomes in domains according to the taxonomy classification. Since we are interested in assessing the importance of each outcome, we will ask participants to score each outcome (separately for prevention and for treatment) on a scale from 1 to 9 (1 to 3 = not important for inclusion; 4 to 6 = important but not critical; 7 to 9 = critical for inclusion(33)), considering relevance for and feasibility of the outcome in LMIC settings. There will also be an option for 'unable to score'. We will provide the opportunity for participants to add additional outcomes and other comments. We will collect demographic information to describe our study sample (Table 1).

INSERT TABLE 1 ABOUT HERE

(2B) Round two

The research team will review any additional outcomes suggested in round one for inclusion. Any newly suggested outcomes will be taken forward if they are (i) relevant to the scope of the COS and (ii) not yet represented in the list of outcomes. All outcomes from round 1 and any new outcomes will be included in round 2.

In round two, we will provide participants with their own round one response; summarised responses of the whole group; and responses summarised by each stakeholder group. We will ask them to re-score the importance of each outcome in light of the extra information received, again separately for prevention and treatment. New outcomes from round one will be provided for scoring on the same 1 to 9 importance scale.

We will summarise round 2 responses separately for prevention and treatment using descriptive statistics, noting for each outcome the number and percentage of responses in each of the following categories:

- 1 to 3 = not important for inclusion
- 4 to 6 = important but not critical
- 7 to 9 = critical for inclusion

We will categorise outcomes according to the predefined consensus definition described in Table 2(34–36). All responses, including from partially completed questionnaires will be used in analyses.

We will also examine the percentage distribution of scores for each outcome by stakeholder group, geographic region and World Bank income group and present these graphically for the consensus meeting.

At the end of the second round of Delphi surveys participants will be sent information about the consensus meeting and requested to contact the team if they are interested in participating.

3. Outcome consensus meetings

Due to the wide geographic distribution of participants, the final step in the consensus process will be two online consensus meetings: one to agree the COS for prevention of multimorbidity and one for the COS for treatment of multimorbidity.

Participants of the Delphi surveys who complete both rounds and who express an interest in attending the consensus meeting will be purposively selected to ensure similar numbers from each stakeholder group, geographical spread and representation from target World Bank income groups. The meetings will be chaired by a facilitator, experienced in COS development. Results of the two-round Delphi surveys will be presented. Outcomes that have reached consensus ‘in’ or ‘no consensus’ (see Table 2) will be discussed further.

We will use a modified nominal group technique to achieve consensus. This will involve iterative small and whole group discussions and ranking of outcomes in order to agree which should be included in the two COS. To avoid duplication or overlap, the selected outcomes will also be discussed to ensure each relates to a distinct construct.

For people living with multimorbidity and their caregivers, we will provide additional support before the consensus meetings to explain the process and enable them to participate more fully in the discussions and ranking.

INSERT TABLE 2 ABOUT HERE

PATIENT AND PUBLIC INVOLVEMENT

There were no people living with the condition nor their caregivers involved in the planning of the study. Both will be involved in the project management group overseeing the Delphi surveys and consensus meeting. Both will participate in both Delphi surveys and consensus meeting.

ETHICS

The Ethics committee of the University of York has approved the study [HSRGC/2020/409/D: COSMOS]. Approvals will also be sought from relevant local ethics committees for all participating sites.

We will obtain written consent from participants in interviews and consensus meetings (or where conducted online, verbal consent will be recorded). For the Delphi surveys, we will seek consent for participation as part of the online questionnaire and consent to store contact data for completion of the next Delphi round and for invitation to consensus meetings. We will emphasise that participation is voluntary, participants are free to withdraw at any stage, and survey responses will be anonymized.

Data management

Interview data as well as anonymized Delphi data after secure download will be stored on a secure and encrypted database on a secure password protected server (the University of York, Department of Health Sciences File store Area). The access, use and storage of sensitive or confidential data will be conducted in accordance with the University of York Data Security Policy and Handling Sensitive Data Guidance.

DISSEMINATION

We will disseminate our findings through peer-reviewed and open access publications, and presentations at global conferences, selected to reach a wide range of LMIC stakeholders including health professionals and researchers and taking into account geographic locations. We will also provide lay summaries including infographics in relevant languages for community and public audiences and share these with interview and Delphi participants. Such summaries and short briefing papers will be made available freely on the COSMOS web page (https://www.impactsouthasia.com/) and in formats which are at the moment being successfully developed and trialled in the associated research networks (Global Alliance for Chronic Diseases website, World Psychiatric Association). In the longer term, success of dissemination will be assessed by how frequently the Multimorbidity COS is used in trials and cited in manuscripts(27).

DISCUSSION

We aim to develop and report two COS for multimorbidity outcomes specifically for LMIC by identifying outcomes that have been reported in the literature, including the views of people living with multimorbidity and their caregivers through interviews, and developing consensus using Delphi surveys and consensus meetings. Development of the two COS aims to increase the consistency of selection, collection and reporting of outcomes in future studies of interventions to prevent and to treat multimorbidity.

A considerable strength of the study is the involvement of people living with multimorbidity and their family caregivers throughout, including in interviews to gain their perspective on important outcomes. This involvement is increasingly recognised as an important contributor to COS (24,37,38) as it highlights new outcomes from the service user perspective. Aiming for approximately fifty participants from interviews and a wide range of participants in the Delphi globally(39), the study will generate outcomes and gain consensus from a range of diverse settings.

The research team comprises experienced researchers and experts in the field of multimorbidity and COS development. The support of the Global Alliance for Chronic Disease (GACD), the World Psychiatry Association (WPA) and partners in IMPACT (Improving Outcomes in Mental and Physical Multimorbidity and Developing Research Capacity) will help provide links to local groups and identify appropriate stakeholders for the consensus process as well as for the dissemination of the outcomes generated from the study.

There are some relevant limitations. First, the scope is broad; despite the systematic effort to conduct a comprehensive and inclusive COS development, with involvement of a wide range of LMIC stakeholders, it is possible that there may be limitations to the generalisability of the final core outcome sets due to heterogeneity of interventions, target conditions and diversity of countries, cultures and experiences.

A further limitation is that although the study aims to develop COS that will be relevant to LMICs more generally, it will only include representation from some LMIC regions. We recognise that LMICs are not a homogenous category and social and cultural differences will necessitate future research investigating how these COS can be applied to other regions.

To be flexible and adaptable for a range of LMIC settings, and feasible within the available time and resource constraints, the planned interviews are limited in number and relatively short and semi-structured and the transcription will focus only on the most relevant sections. Due to internationally different clinical standards and the potential stigma associated with labelling

people as "at risk", we decided not to conduct interviews focusing on prevention only. This may risk missing outcomes which would be obtained from a more in-depth exploration

Although our aim is to secure participation from a wide spread of geographical areas, there are a number of challenges to involvement. To take part in Delphi surveys and consensus meetings, English proficiency, a computer and Internet access will be required. This poses challenges for engagement with some stakeholder groups, inclusiveness and participant attrition. Additionally, since patient and public involvement is still a developing concept in many contexts and specifically in global health research(40–43) identifying appropriate patient representatives for our consensus panel may prove challenging.

Despite these challenges, this is the first attempt to develop core outcome sets for multimorbidity seeking input from a wide range of LMIC partners and participants(21).

Our COSMOS study follows a systematic widely practiced approach to generate core outcomes and meets the methodological standards put forth by the COMET initiative. It will generate a template for steps in developing international consensus involving LMICs, and two COS for use in future multimorbidity prevention and treatment trials, helping to generate evidence to address this important global health priority.

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Table 1: Delphi Stakeholder Characteristics

Stakeholder group	Characteristic
People with multimorbidity/family members/caregivers	
	Age (≤65; >65)
	Sex (male; female)
	Multimorbidities
	Community/primary care, secondary care; specialist healthcare
	Level of formal education (<= 10 years/>10years)
	Region of residence
Health professionals	
	Profession (doctor, nurse, allied health, community workers)
	Specialist area relevant to multimorbidity
	Region of residence
Policy makers and managers	
	Region of residence
Researchers	
	Specialist area relevant to multimorbidity
	Region of residence

Table 2: Definition of consensus for outcomes in the Delphi surveys

Consensus IN	Consensus that outcome should be included in the core outcome set	70% or more participants scoring 7–9 AND <15% participants scoring 1–3
Consensus OUT	Consensus that outcome should not be included in the core outcomes set	50% or fewer participants scoring 7 to 9 in each stakeholder group
No consensus	Uncertainty about importance of outcome	Anything else