

2023-03

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<https://pearl.plymouth.ac.uk/handle/10026.1/20695>

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10.1136/bmjopen-2022-069929

BMJ Open

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# BMJ Open Impact of digital technologies on self-efficacy in people with Parkinson's: a scoping review protocol

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**To cite:** Hall AM, Aroori S, Carroll CB, *et al.* Impact of digital technologies on self-efficacy in people with Parkinson's: a scoping review protocol. *BMJ Open* 2023;**13**:e069929. doi:10.1136/bmjopen-2022-069929

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2022-069929>).

Received 07 November 2022  
Accepted 27 February 2023



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## ABSTRACT

**Introduction** Parkinson's disease (PD) is the second most common neurological disease globally, for which currently no one definitive cause or cure exists. Estimates suggest that 145 000 people with Parkinson's (PwP) live in the UK. PD presents with motor and non-motor symptoms fluctuating significantly in and between individuals continually throughout the day. PD adversely affects activities of daily living, quality of life and well-being. Self-efficacy is an important belief to improve for PwP as it enables the individual to develop confidence in their ability to exert control over their own motivation, behaviour and social environment. This scoping review aims to identify digital technologies which have been shown to positively impact on promoting self-efficacy in PwP.

**Methods and analyses** Six bibliographic databases MEDLINE, PsycINFO, Web of Science, CINAHL, EMBASE and IEEE Xplore will be searched from the date of their inception to the May 2023. The primary outcome will be to identify interventions which are associated with a change in self-efficacy in PwP to enable positive and negative outcomes, as well as safety to be evaluated. The secondary outcomes of this review will focus on the intervention's proposed mechanisms for success, particularly looking at the impact they had on positive behaviour change(s) or modification(s) on study participants.

**Ethics and dissemination** This scoping review will not require ethical approval as it will use data collected from previously published primary studies. The findings of this review will be published in peer-reviewed journals and widely disseminated.

## INTRODUCTION

Parkinson's disease (PD) is an incurable neurodegenerative disorder, affecting more than 145 000 people in the UK.<sup>1</sup> Traditionally people with Parkinson's (PwP) have received care outside of their home setting, which is costly and inefficient, leading some researchers to argue the case for home-based care (HBC).<sup>2</sup> There is a growing body of evidence which supports the idea that HBC in a natural setting has parity with usual care in terms of clinical outcomes accompanied by elevated levels of service-user

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This scoping review will be the first to explore the impact of digitally enabled interventions on self-efficacy in people with Parkinson's.
- ⇒ Strengths of this study include the use of scoping review methods to conduct a comprehensive literature review of multiple electronic databases and the grey literature in order to report these findings under a common framework.
- ⇒ This protocol is limited by the wide breadth of articles available, and the diverse terminology used by researchers to describe self-efficacy.
- ⇒ This scoping review may be negatively influenced by publication bias.
- ⇒ Only article reviews published in English scientific journals will be considered eligible for inclusion.

satisfaction.<sup>3</sup> Previous reviews have examined self-management interventions to support PwP from several perspectives exploring qualitative features and a variety of other aspects of these support approaches including effectiveness.<sup>4-7</sup> These reviews do not provide a comprehensive overview or evaluation of digital interventions to improve self-efficacy in PwP.<sup>8</sup> In addition, the strength of evidence of effective interventions for PwP is sparse, for example, with a lack of randomised controlled trials.<sup>5</sup> In terms of the interventions which have been identified, they tend to have limited effectiveness.<sup>5</sup>

## Definition

For the purposes of this review, the definition of self-efficacy which will be used is that proposed by Bandura in 1977:

The belief in one's capabilities to organise and execute the courses of action required to manage prospective situations.<sup>9</sup>

Self-efficacy refers to an individual's confidence to undertake behaviour(s) that ultimately lead to the desired outcome whatever that might be.<sup>10</sup> It is for these reasons that

when potentially evaluating an intervention designed to improve self-efficacy, examining behaviour change/modifications, outcome(s) and context are essential elements to investigate. Self-management mechanistically requires effective self-efficacy in order to occur.<sup>11</sup> Therefore, a standardised, effective and convenient strategy to assess an individual's potential self-management potential as part of chronic care management is through the measurement of self-efficacy.<sup>12</sup> Furthermore, it has been hypothesised that improved self-efficacy is associated with superior outcomes and a reduction in health service resource use and burden.<sup>13</sup>

The complex relationship between self-efficacy and self-management presents a challenge in deciding which outcome measures will be considered to have measured self-efficacy and will be eligible for inclusion in the review. Studies will be considered eligible if they state they have measured self-efficacy or that a particular outcome is a direct or surrogate outcome which authors suggest promotes or stimulates self-efficacy in the PwP. It is expected that self-efficacy outcome measures may vary between studies, this will add a rich discussion as part of the review.

This scoping review aims to fill a gap in the literature by combining searching for digitally enabled interventions which support self-efficacy in PwP and will inform the refinement of an existing digitally enabled care pathway to support PwP.

The rapid acceptance and uptake of digital health technologies, which accelerated during the COVID-19 pandemic, makes focusing on these types of intervention increasingly important.<sup>14 15</sup> Recently, five reviews specifically focused on digitally enabled interventions to support PwP, reflecting a transition towards HBC.<sup>16–20</sup> It has been suggested that an operational definition of self-management is needed as this can heavily influence the records review on such interventions, this might also be true when reviewing self-efficacy interventions due to their shared complexity.<sup>21</sup> Earlier reviews which have explored self-management interventions for PwP from qualitative and quantitative perspectives have not examined digital interventions which promote self-efficacy in PwP.<sup>4 8 22 23</sup>

Healthcare in the UK is undergoing a digital revolution, outlined the National Health Service long-term plan.<sup>24</sup> This plan places increasing emphasis on home-based, self-managed care; that will require digitally enabled infrastructures and resources to be realised.<sup>25</sup> The relationship between self-management, self-efficacy and patient activation is a complex one, due to the interconnectedness of each, but clearly the promotion of self-efficacy is crucial to improve clinical outcomes and reduce healthcare costs.<sup>25–29</sup>

To effectively review the literature to identify relevant interventions, a scoping review methodology will be employed.<sup>30</sup> This scoping review aims to survey the landscape of published research which examines digitally enabled interventions which promote self-efficacy in PwP.

This review fills an identified gap in the literature which has recently focused on self-management rather than self-efficacy interventions to support PwP.<sup>4–8 16</sup>

## METHODS AND ANALYSIS

The scoping review framework conceived by Arksey and O'Malley<sup>31</sup> and its further refinements will be used to ensure its methodological robustness and reproducibility.<sup>31–33</sup> The resulting scoping review will use the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Scoping Review (PRISMA-ScR) reporting guidelines and checklist to ensure conformity.<sup>30</sup>

### Identifying the research question

Earlier reviews of self-management interventions including digitally enabled ones for PwP have identified significant heterogeneity between studies and weak evidence of effectiveness.<sup>4 5 8 34</sup> This has informed and influenced the research question in several ways; first, by focussing it on self-efficacy rather than self-management and concentrating on digitally enabled interventions rather than simply self-efficacy intervention in PwP. The latter reflecting the transition towards more HBC interventions to support PwP reported in the literature.<sup>2 3 20</sup>

The aim of this scoping review is to explore if digitally enabled interventions are associated with a change in self-efficacy in PwP.

### Research question

The research question examined is, 'In people with Parkinson's are digital technologies associated with a change in self-efficacy.' Previously reviews have focused on either self-management or digitally enabled interventions or a combination of the two to support PwP. This review will instead be examining the literature on digital interventions in PwP to see if they are associated with a change in self-efficacy, and in doing so will contribute valuable new knowledge to an area of research in which there is currently a gap. To achieve this, a Population Intervention Comparator Outcome(s) (PICO) framework was first developed and shown in table 1.

### Identifying relevant studies

To identify eligible records, selected bibliographic databases will be searched.

### Database selection and rationale

Bibliographic database selection was driven by a need to ensure broad coverage, level of sensitivity, catalogue listings, filter availability, study methodologies used, study design and database longevity.<sup>35</sup> When all these factors are considered, no single bibliographic database used on its own will ensure saturation of the literature is achieved, making a compelling case for carefully selecting and combining several bibliographic databases in the search strategy. Central to determining bibliographic database selection is the quality of the research question, its

**Table 1** PICO

PICO	Detail	Keywords	MeSH terms when used
Population	People with Parkinson's	Parkinson's disease OR Parkinson disease	Parkinsonian disorders OR Parkin* OR Neurodegenerative disorders
Intervention	Digital Health Technologies	Health technology OR Wearables OR Sensors OR Home-based care	Telemedicine OR Telehealth OR Telecare OR Digital Health OR eHealth
Comparator	None or usual care		
Outcomes	Self-efficacy	Self-monitoring OR Self- rehabilitation OR Resilience OR Behaviour change OR Behaviour modification	Self-efficacy OR Self Concept OR Self* OR Self-care

Keywords used where databases do not use MeSH terms and other controlled vocabulary is required. Keywords shown here are the prominent ones used as illustrative examples. A full list of all the keywords, MeSH terms and Boolean operators developed from this PICO used for each database are shown in [table 2](#).

MeSH, Medical Subject Headings; PICO, Population Intervention Comparator Outcome.

purpose, scope and need, which will influence all stages of the literature review.

### Databases

Bibliographic databases MEDLINE, PsycINFO, Web of Science, CINAHL, EMBASE and IEEE Xplore will be searched from the date of their inception to the May 2023. The process of determining which search terms, Boolean operators and filters should be used to effectively search the literature was an iterative process that drew on a priori knowledge previously accrued by the reviewing team. In addition, a subject specialist librarian was consulted for their views on the overall search strategy. Where appropriate, Medical Subject Headings (MeSH) terms such as when searching MEDLINE will be used. PsycINFO was included due to the likelihood that some interventions would involve behaviour change or modification. Search terms were purposefully broad as it has been shown that in searches of the literature involving dementia (which has some shared characteristics with PD) this approach provides enhanced sensitivity.<sup>36</sup> This has been particularly so in terms of identifying qualitative studies, rather than using complex strings of search terms.<sup>36</sup> Keywords will relate to a either MeSH terms or in their absence approximate equivalence.

### Search terms and use of Boolean operators

This process of identifying search terms and combinations of Boolean operators followed an iterative process which was adapted to reflect the controlled vocabulary for each database and identify which combinations will be used in the final review. This was done and used in conjunction with numerous filters due to the nature of the database. A full description of filters used for each database can be provided on request to enable readers to replicate the search themselves. [Table 2](#) shows the bibliographic databases searched, the search terms and Boolean operators used, and the number of records identified in the initial search of each database.

### Searching the grey literature

The bibliographic database Google Scholar will be used to search the grey literature. While Google scholar has been found to lack sensitivity and broadness of coverage when used in isolation and performs inferiorly to more extensively validated bibliographic databases when direct comparisons have been made, it has been found to complement searches finding sources in the grey literature which these other bibliographic databases do not.<sup>37–39</sup> Used in combination with more reliable bibliographic databases, Google Scholar can identify grey sources not held by these databases due to listing, cataloguing or controlled vocabulary used.<sup>40</sup>

### Hand searching

Eligible records will have their bibliographies searched to see if additional eligible records can be identified, which is a recognised element of reviewing the literature.<sup>41</sup> If deemed appropriate, practical, justified based on the findings of earlier phases of the scoping review, hand-searching specific areas of the literature will be undertaken. This will cease once saturation is deemed to have been reached by all members of the reviewing team. The scoping review following execution of this protocol will be reported using the PRISMA-ScR extension guidelines and checklist.<sup>30</sup> The final phase in the literature searching process will involve backward and forward searching to ensure no eligible studies have been omitted in the final review.<sup>42</sup>

### Data management

Potentially eligible records from each database will be exported into an EndNote V.20 library, for the purposes of de-duplication, study screening and overall record retrieval. Rayyan as recommended by Harrison *et al*<sup>43</sup> will be used to enable multiple reviewers reviewing and facilitate the review.

### Inclusion criteria

Studies will be eligible for inclusion if they evaluated self-efficacy as an outcome (method of self-efficacy

**Table 2** Database search combinations

Database	Search terms to be used and Boolean operators	Number of records identified in initial search
MEDLINE (EBSCO host)	Parkinsonian disorders <b>AND</b> Tele* OR Telemedicine OR Telehealth OR Telemonitoring OR Telepractice OR Telenursing OR Telecare <b>AND</b> Self* OR Behavior change OR Behavior Modification <sup>†</sup>	9875
PsycINFO	((Parkin* AND PEER (yes)) OR ((Parkinson disease) AND PEER (yes) OR ((Parkinsons disease) AND PEER (yes)) OR ((Parkinson's disease) AND PEER (yes)) OR ((Movement disorders) AND PEER (yes)) OR ((alpha synuclein) AND PEER (yes)) <b>AND</b> Technology AND PEER ((yes) OR ((Health technology) AND PEER ((yes) OR (Tele*AND PEER ((yes) OR (Telehealth AND PEER (yes)) OR (Telemedicine AND PEER ((yes) OR (Telemetry AND PEER (yes)) OR Sensors AND PEER (yes)) OR Wearables AND PEER (yes)) OR ((Assistive technology) AND PEER (yes)) OR ((Home based care) AND PEER (Yes)) OR ((Home-based care) AND PEER (yes)) OR ((IoT AND PEER (yes)) OR ((Internet of things) AND PEER (yes)) OR ((Virtual consultations) AND PEER (yes)) OR ((Video Consultations) AND PEER (yes))) <b>AND</b> ((Behav* AND PEER (yes)) OR Behavior AND PEER (Yes)) OR Behaviour AND PEER (yes)) OR ((Behavior Change) AND PEER (yes)) OR ((Behavior modification) AND PEER (yes)) OR (Self* AND PEER (yes)) OR ((Self Concept) AND PEER (yes)) OR ((Self efficacy) AND PEER (yes)) OR (AND PEER (yes)) OR (Self-efficacy AND PEER (yes)) OR (Selfmanagement AND PEER (yes)) OR Rehabilitation AND PEER (yes)) OR (Resilience AND PEER (yes)) AND (La.exact(ENG*) AND PEER (yes))	1576
CINAHL	MW (Parkinson's disease or Parkinson disease or pd or parkinsonism) <b>OR</b> SU Movement disorders <b>OR</b> MW Parkinsonian disorders <b>OR</b> TI Parkinson disease <b>AND</b> (telehealth or telemedicine or telemonitoring or telepractice or telecare) <b>OR</b> MW technology in healthcare <b>OR</b> MW digital technology <b>AND</b> TX (Self-efficacy or self efficacy or confidence or self esteem) <b>OR</b> TX self concept <b>OR</b> (selfmanagement or self-care or self-regulation or self-monitoring) <b>OR</b> MW (Behavior change or Behavior modification)	3891
Web of Science	(((((TI=(Parkinson disease)) OR TI=(Parkinson's disease)) OR TS=(Movement disorders)) OR ALL=(Parkin*)) AND ALL=(Tele*)) OR TS=(Digital health)) OR TS=(Mobile health)) OR TS=(eHealth)) OR TS=(Sensors)) OR TS=(Home based care)) OR TS=(Telemetry)) OR TI=(Virtual consultations)) AND TI=(self-efficacy)) OR TI=(self-efficacy)) OR TI=(self management)) OR TI=(self-management)) OR TS=(Patient activation level)) OR TS=(Behavior change)) OR TS=(Behaviour change)) OR TS=(Behaviour modification)) OR TS=(Behaviour modification))	2651
EMBASE	#1 Parkinson disease/or Parkin/or Parkin*.mp. #2 Parkinson's disease.mp. or exp Parkinson disease/ #3 controlled study/exp Parkinson disease/ or exp levodopa/or Parkinson disease*.mp. #4 Movement disorders.mp. exp motor dysfunction/ #5 1 or 2 or 3 or 4 <b>AND</b> #6 telecommunication/or Tele*.mp. or telemedicine/ #7 telemedicine.mp. or telemedicine robot/ or telecommunication/or telemedicine/ or healthcare delivery /or patient/ #8 telehealth.mp.or telecommunication/ or telehealth/or health care/or telemedicine #9 telecare.mp. or exp telecare/ #10 exp medical informatics/ or digital health.mp. #11 eHealth.mp./exp telehealth/ #12 mHealth.mp.or mobile health application/ #13 6 or 7 or 8 or 9 or 10 or 11 or 12 <b>AND</b> #14 exp self care / or self medication/or exp self concept/exp self-testing/ or self evaluation/ exp self-monitoring/or General self-efficacy scale/ or exp self help/ or self*.mp. or exp self report/ or self esteem/ or self-help device/ or Self-rating Depression Scale/ #15 self management.mp. or exp self care/ #16 self-efficacy.mp. or exp self concept #17 behavior*.mp. or exp behaviour modification/or exp care behavior #18 14 or 15 or 16 or 17 #19 5 <b>AND</b> 13 <b>AND</b> 18	3136

Continued



Table 2 Continued

Database	Search terms to be used and Boolean operators	Number of records identified in initial search
IEEE Xplore	("Mesh_Terms":Parkin*) OR ("All Metadata":Parkinson's disease) OR ("All Metadata":Neurodegenerative disorders) OR ("All Metadata":Idiopathic Parkinson's Disease) AND ("Mesh_Terms":Tele*) OR ("All Metadata":Digital Health) OR ("All Metadata":Mobile Health) AND ("Mesh_Terms":Self*) OR ("All Metadata":Self, concept) OR ("All Metadata":self, rehabilitation) OR ("All Metadata": Selfmanagement)	3195
Google Scholar	Parkinsonian disorders Telemedicine Self-efficacy Selfmanagement No Boolean operators used Filtered by date-2012-2022	2210

measurement will be captured) in all genders aged 18+ years old with no upper age limit, participants may come from any ethnic group and be diagnosed with PD or their care partners (CPs). The definition of digitally enabled will be broad to encompass the potential variety of technologies used. Interventions must have a digital element to be considered for inclusion, this must be more than electronic data capture and must have a degree of interactivity and user engagement. Eligible studies must state that participants are PwP or CPs of PwP. In terms of study design, qualitative, quantitative and mixed methods studies will be eligible.

### Exclusion criteria

Studies will be ineligible if they include participants with parkinsonism rather than PD. For the purposes of this review, studies in which the intervention group does not exclusively contain PwP, or their CPs will be ineligible. Studies not published in English, or where no full text is available will be ineligible. Digitally enabled interventions which only involve electronic data capture will be excluded. Reviews or other forms of secondary research or service evaluations will be excluded from being directly included in the review. However, reviews will be used to identify potentially relevant primary studies, particularly by reviewing their bibliographies.

### Screening and study selection

Potentially eligible records held in EndNote V.20 library will undergo de-duplication, after which the screening records will commence. Each of the two reviewers will screen the title and abstract of each record and will either include or exclude using the eligibility criteria previously described. This will create several records which are potentially eligible. Each reviewer will undertake study screening selection blinded to the other reviewer, so that neither influences the other. Once title and abstract screening is completed the selected records are compared, where agreement is reached, these records will continue to the next stage in the review process. Where there is disagreement between the two reviewers,

an initial discussion will take place between them to see if an agreement can be reached on if a record might be eligible. If agreement cannot be reached, a third independent reviewer will review the record and have final say on if it should be included in the next phase of the review.

Full texts of the potentially eligible studies will be obtained. If a full text for a record cannot for whatever reason be obtained and all avenues to retrieve it are exhausted, then it will be excluded from the review. Full-text screening will be undertaken by both reviewers following the eligibility criteria. The two reviewers will then meet to review which records they have agreed are eligible and should be included in the final review. Where disagreements on a records potential eligibility arise, a discussion between the two reviewers will take place to agree if a record should be included in the final review. Where agreement between the two reviewers cannot be resolved, a third independent reviewer will review the full-text record and will make the final decision on whether to include the record in the final review. The stages of the scoping review process and selection of records will be presented using the PRISMA ScR flow diagram 2020.<sup>44</sup>

### Charting the data and data extraction

Following completion of the screening process and de-duplication using EndNote V.20 software, data from eligible records will be transferred to a Microsoft Excel spreadsheet with a data extraction function or tool for further handling and management of the records. To ensure robustness data extraction this will be completed blindly by the two reviewers using a data extraction sheet specifically designed for this scoping review shown in table 3. To ensure the data extraction tool enables consistent data extraction, it will be evaluated initially on five studies and if required appropriate modifications made. Any such modification(s) to this data extraction sheet will be recorded contemporaneously and reported in the final scoping review.

**Table 3** Article information and data extraction

Article information	Data to be extracted	Additional comments
General information	Year of publication	
	Country of publication	
	Country study took place	
	Initial sample size	
	Analysed sample size	
	Study design	
Demographic data	Age	
	Sex	
	Ethnicity	
	Age of PD diagnosis	
	Marital status	
	PwP or caregiver (and relationship between if known)	
	Hoehn and Yahr score at time of recruitment	
	Socio-economic status	
	Disease duration	
	Index of multiple deprivation (IMD)	
	Level of digital literacy	
Intervention description	Excluded populations (if mentioned)	
	Intervention type: for example, Digital hybrid	
	Type of device: for example, smart phone, accelerometer, gyroscope, motion sensor	
	Duration of intervention and frequency	
	Length of intervention use overall	
	Level of intervention modification	
	Setting intervention took place	
	TIDieR items (if relevant)	
Outcome/ outcome measures	Scale used to measure self-efficacy	
	Magnitude of change in level of self-efficacy	
	Outcomes measured in addition to self-efficacy	
	PD symptoms measured	
	Objective measurement (Yes/No)	
	Self-reported or CG reported outcomes	
	Effective (Yes/No/Not evaluated)	
	Safety assessed	

IMD are a measure of relative deprivation used to rank neighbourhoods across the UK.  
TIDieR items is a 12-item checklist aimed at enabling the reporting of interventions in the public domain in sufficient detail.<sup>45</sup>  
PD, Parkinson's disease; PwP, people with Parkinson's.

Data extraction is intended to inform and facilitate construction of a narrative summary which accurately reflects the evidence found.<sup>45</sup>

### Intervention description consistency

To maximise the effectiveness of the review, ensure completeness of the intervention description, and to facilitate replication, the Template for Intervention Description and Replication (TIDieR) checklist will be used.<sup>45 46</sup> The TIDieR checklist aims to enable reviewers

and trialists to report interventions completely, assess study design robustly and facilitate replicability. While not all 13 items of this checklist will be applicable it will where appropriate be applied.

Secondary analysis will focus on participant characteristics or behaviour profiles to see if they are potentially associated with intervention success which is vital to understanding the mechanism by which this may occur. The overarching aim of the final scoping review

is intended to inform and better understand how such interventions might be effective, enabling the refinement of our own HBC pathway.

### Collating, summarising and reporting of results

This will involve collating and summarising the findings of the scoping review arising from the execution of this protocol to provide a narrative summary of published digitally enabled interventions which are associated with a change in self-efficacy in PwP. It is hoped that this collation and summary of results will primarily identify which interventions, if any, were effective, identifying the reasons for this. Second, to determine if any eligible records examined participant characteristics or behaviour profiles, which might potentially be associated with the success of the intervention. TIDieR characteristics for each eligible record will be tabulated to facilitate visualisation of the data identified from these records.

### Patient and public involvement statement

A Parkinson's UK advocate was consulted and provided valuable insights which influenced the design of this scoping review protocol and the review which will arise from it.

## RESULTS

The results will be presented in a PRISMA-ScR 2020 flowchart.<sup>44</sup>

## ETHICS AND DISSEMINATION

Ethical approval is not required as this scoping review utilises pre-existing published research already in the public domain and will be retrieved retrospectively. The findings of the scoping review resulting from the execution of the protocol described here, will be disseminated in peer-reviewed journal, symposia and conference presentations. Service-users, providers and other interested stakeholders will be informed of the outcome of this review and its implications for developing clinical interventions and potential outcomes for PwP and their CPs.

**Acknowledgements** The authors would like to thank Chris Johns and Sam Brown Information Specialists, University of Plymouth for their assistance in the development of this review protocol. Additionally, the authors would like to acknowledge and thank Jane Rideout Parkinson's UK Advocate for her valuable insights which influenced the design of this review protocol.

**Contributors** AMH conceived of the idea, developed the research question and study methods and contributed meaningfully to the drafting and editing. He has also approved the final manuscript. CBC, EM, VA aided in developing the research question and study methods, contributed meaningfully to the drafting and editing, and approved the final manuscript. SA acted as second reviewer during early preparatory searches and contributed to the development of the review protocol.

**Funding** AMH is undertaking a PhD studentship funded by the Faculty of Health at University of Plymouth.

**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

**Patient consent for publication** Not applicable.

**Provenance and peer review** Not commissioned; externally peer reviewed.

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