Mapping the role of patient and public involvement during the different stages of healthcare innovation: A scoping review

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Abstract
Background: Patient and public involvement (PPI) has become increasingly important in the development, delivery and improvement of healthcare. PPI is used in healthcare innovation; yet, how it is used has been under-reported. The aim of this scoping review is to identify and map the current available empirical evidence on the role of PPI during different stages of healthcare innovation.

Methods: The scoping review was conducted in accordance with PRISMA-ScR and included any study published in a peer-reviewed journal between 2004 and 2021 that reported on PPI in healthcare innovation within any healthcare setting or context in any country. The following databases were searched: Medline, EMBASE, CINAHL, PsycInfo, HMIC and Google Scholar. We included any study type, including quantitative, qualitative and mixed-method studies. We excluded theoretical frameworks, conceptual, scientific or grey literature as well as discussion and opinion papers.

Results: Of the 87 included studies, 81 (93%) focused on or were conducted by authors in developed countries. A wide range of conditions were considered, with more studies focusing on mental health (n = 18, 21%) and cancer care (n = 8, 9%). The vast majority of the studies focused on process and service innovations (n = 62, 71%). Seven studies focused on technological and clinical innovations (8%), while 12 looked at both technological and service innovations (14%). Only five studies examined systems innovation (5%) and one study looked across all types of innovations (1%). PPI is more common in the earlier stages of innovation, particularly problem identification and invention, in comparison to adoption and diffusion.

Conclusion: Healthcare innovation tends to be a lengthy process. Yet, our study highlights that PPI is more common across earlier stages of innovation and focuses mostly on service innovation. Stronger PPI in later stages could support the adoption and diffusion of innovation.
1 | BACKGROUND

Patient and public involvement (PPI) is premised on the principle that healthcare should be patient-centred, involving patients and the public in the design, conduct and dissemination of research and improvement work. Since the mid-1990s, PPI has become increasingly integrated into research, delivery and improvement in health and social care systems across the globe to the extent that it is now widely considered best practice. This paper focuses on PPI in healthcare innovation. While many studies have focused on reporting the benefits and challenges of PPI, these studies have tended to focus on earlier stages of the research process, such as research design and conduct. In their systematic review of 66 studies reporting the impact of PPI on health and social care research, for example, Brett et al. found little regarding the impact of PPI upon the implementation of innovations. These findings mirror other studies that appear to have generated substantial evidence regarding PPI involvement in the early stages of research, but where less is known about PPI is the later stages such as implementation, spread and scale-up.

Although there are many reviews on the role of PPI, they are often targeted within particular health services, including cancer care and mental health, or address a specific part of the research or innovation journey. Two previous scoping reviews have focused upon PPI in health research (the early stage of innovation) and PPI in health policy-making. To date, no reviews have been carried out to provide a holistic picture of PPI across all stages of innovation and across different areas of healthcare. In response to this evidence gap, this paper reports the findings of a scoping review to identify and map the currently available empirical evidence regarding the role of PPI during the different stages of healthcare innovation.

Before the scoping review is presented, we first outline our use of the terms PPI and innovation. Both are terms that lack a universal definition and so require clarification when used. Regarding PPI, we adapted the definition that the UK-based National Institute for Health Research (NIHR) Centre for Engagement and Dissemination uses for PPI in research. This definition was chosen to reflect the scope of the innovation journey. Based on this, we define PPI in the innovation journey as an ‘active partnership’ between members of the public, patients and those supporting innovation in healthcare. Regarding innovation, we used Greenhalgh et al.’s widely accepted definition: ‘innovation in service delivery and organization [is] a novel set of behaviours, routines, and ways of working that are directed at improving health outcomes, administrative efficiency, cost effectiveness, or users’ experience and that are implemented by planned and coordinated actions (p. 582)’. This definition is broad enough to include not only technological advances and new medical devices but also service innovation and quality improvement initiatives, reflecting the wide scope of innovation in healthcare.

Building on this, we considered four main stages of innovation as defined by Gabriel et al: (1) problem identification, the identification and conduct of research into different health problems; (2) invention, the development of ideas for new services or products, or new ways of providing a service; (3) adoption, the implementation of new ideas into practice, including prototyping, piloting and evaluating safety and effectiveness; and (4) diffusion, the wider uptake of the ideas, services or products into use across the whole organisation/s. Also following Gabriel et al., we focused on three types of innovation: technological and clinical innovations, which include new drugs, diagnostic tests, medical devices, software and surgical techniques; process and service innovations, including new institutions, business models, service models, clinical pathways, roles, education and training; and systems innovations, including policy innovations and systems reforms. Such mapping sought to identify good practice as well as evidence gaps (if any) to inform future research objectives.

2 | METHODS

We conducted the scoping review in accordance with Tricco et al. A protocol was developed, following Peters et al., and was revised by members of the research team and two experts in the field of healthcare innovation. The protocol is available upon request from the corresponding author.

2.1 | Inclusion and exclusion criteria

2.1.1 | Types of participants

We included studies that considered the involvement of the public or patients across healthcare innovations, often referred to as service users or expert patients.
2.1.2 | Concept/phenomenon of interest

Our primary focus was to identify and map the involvement of the public or patients across any stage of healthcare innovation. As mentioned previously, our interest related to any practice innovation of the delivery of healthcare, including new medication, medical devices, care models, treatment programmes and service or quality improvement initiatives. To reflect our focus on healthcare delivery, we excluded innovations relating to healthcare financial management or governance, following the Cochrane Effective Practice and Organisation of Care taxonomy of health systems interventions. Papers related to commissioning, educational and/or workforce development or those only focusing on evidence or knowledge utilisation were also excluded. While our definition of systems innovation includes policy innovation, we chose to exclude papers detailing policy to avoid duplicating a previous review. This is discussed in further detail in the discussion and limitations sections.

2.1.3 | Context

The context for this review included peer-reviewed studies within any healthcare setting or context including the primary, secondary, acute or community setting, in any country.

2.1.4 | Types of studies

We included any empirical study type that reported on PPI in healthcare innovation within our inclusion criteria, including quantitative, qualitative and mixed-method studies. Theoretical frameworks, conceptual, scientific or grey literature such as case reports, evaluations, guidelines on how PPI should be conducted or service reviews as well as discussion and opinion papers were excluded.

There were no restrictions on language; the internal research team had the capacity to translate papers in Greek, Spanish, Italian, German, Dutch and Chinese. We aimed to use Google Translate for studies in other languages, but this was not required. Studies were limited from 2004, to reflect the publication of the definition of innovation used to shape the review.

2.1.5 | Types of outcomes

Specific outcomes were not applicable in this study because our intention was to identify and map the empirical evidence in relation to PPI involvement across all stages of innovation—successful or unsuccessful.

2.2 | Search strategy

The search strategy followed Peters et al.’s three-step process.

2.2.1 | Step 1

An initial search of Medline was carried out to identify the key words required for Step 2. However, due to the excessive number of hits (>70,000), a number of revised stages were carried out within the research team, to ensure a balance between adequate searching and unnecessary hits (see Appendix S1 for the revised version). As such, a second database was not searched and analysed to provide search terms. An example of the revised search terms included Delivery of health care; Patient or public or citizen or service user or lay or people; Involve* or participa* or co-crea* or co-design or co-produ*; Implement*or innovat* or spread or diffusion of innovation or evidence-based practice or quality improvement or adopt or translational medical research.

2.2.2 | Step 2

Using the key words and revised search strategy, the following bibliographic database sources were searched: Medline, EMBASE, CINAHL, PsycInfo, HMIC and Google Scholar. Data were limited from 2004 onwards; no language was excluded due to the translating capacity of the wider team. An initial search was conducted on 23 October 2019, and it was updated on 21 September 2021.

2.2.3 | Step 3

Citation checking was carried out for all included texts generated from the database sources to identify any additional papers that fulfilled our inclusion/exclusion criteria.

2.3 | Review screening process and results

All searches were carried out by C. F. For the bibliographic database search results, the citations were uploaded to Mendeley, deduplicated and uploaded to Rayyan, a systematic review screening software. A. Z. and C. S. carried out the initial screening, where titles and abstract were screened against the inclusion criteria. For papers that fulfilled the criteria, C. F. obtained the full texts and uploaded them to Rayyan. Full-text screening was carried out in a blinded manner by A. Z. and C. S. They screened the papers independently from each other and then met to discuss and resolve potential conflicts. Following this, C. F. carried out citation checking of all the included papers that captured additional papers. A. Z. and C. S. double-screened the papers from citation checking. C. F. carried out a Google Scholar search to cross-check against our included papers, which were double-screened by A. Z. and C. S.

Five papers were found in incidental searches during the initial phase, when C. F., who ran the searches, familiarized herself with the project. These papers were double-screened by A. Z. and C. S., and all were included in the final review.
2.4 | Data charting process

A data extraction tool was adapted from the Joanna Briggs Institute and refined with input from the research team to meet the specific needs of this review. C. F. charted the data from the main searches, and C. S. updated and refined the form. V. C. and E. O. conducted a blinded double-check of the data extraction. Any discrepancies were resolved between C. S., V. C. and E. O.

A critical appraisal of individual papers was beyond the scope of this study.17

2.5 | Synthesis of data

We first summarized the studies by the type and stage of innovation. Studies were then grouped by the innovation stage that they focused on, and narrative synthesis was used to identify the main findings that they presented.

3 | RESULTS

The PRISMA diagram below (Figure 1), developed following the updated guidelines for reporting systematic reviews,18 provides an overview of our search and screening process.

The key characteristics of the included studies are summarized in Table 1. Of the 87 studies included in this review, 48 (55%) used qualitative methods, 2 (2%) used quantitative methods and 14 (16%) used mixed methods. Eighteen (21%) were case studies and five (6%) were randomized-controlled trials.

The vast majority of the studies focused on or were conducted by authors in developed countries: Australia (n = 6, 7%), Canada (n = 11, 13%), Denmark (n = 2, 2%), Finland (n = 1, 1%), Germany (n = 1, 1%), Ireland (n = 1, 1%), New Zealand (n = 1, 1%), Norway (n = 1, 1%), Sweden (n = 5, 6%), The Netherlands (n = 2, 2%), the United Kingdom (n = 31, 36%) and the United States (n = 16, 18%). Three studies (3%) had international focus or compared more than two countries, one was conducted in Colombia (1%), one in India (1%), two in India and Pakistan (2%), one in Kenya (<1%) and one in Uganda (1%).

The studies considered a wide range of conditions. The conditions that were seen more frequently among the 87 studies included were mental health (n = 18, 21%) and cancer care (n = 8, 9%). Other areas included human immunodeficiency virus (HIV) (n = 4, 5%), services for older people (n = 3, 3%), young patients (n = 3, 3%), cardiovascular conditions (n = 2, 2%), dementia (n = 2, 2%), muscular–skeletal health (n = 2, 2%), pediatrics (n = 2, 2%) and rheumatology (n = 2, 2%). A number of
them did not focus on a specific disease and are classified as general in Table 1.

3.2 | Type of innovation

Following the definition of Gabriel et al., the vast majority of the studies focused on process and service innovations (n = 62, 71%). Seven studies focused on technological and clinical innovations (8%), while 12 looked at both technological and service innovations (14%). Only five studies examined systems innovation (6%). One study focused on all types of innovation (1%). The studies detailing process and service innovation focused predominantly on quality improvement. Of the seven studies on technological and clinical innovations, two looked at digital health,19,20 one at clinical platforms21 and one at patient-recorded outcomes.22

3.3 | Stages of innovation

Mirroring research on PPI in general, it is evident from this review that PPI is more common in the earlier stages of innovation, particularly problem identification and invention, in comparison to adoption and diffusion.

Five studies focused on problem identification in healthcare research.23–27 Fourteen studies focused on the invention. One involved consent processes;28 five focused on quality improvement using ‘living labs’,29 patient surveys,30 patient forums31 or a combination of different methods.32,33 Twenty-seven studies looked at both problem identification and invention, the majority of which were quality improvement initiatives. Twenty-seven studies considered adoption, while only six analysed PPI in wider diffusion or scaling up of innovations. Finally, only five studies looked at all stages of the innovation process.

A summary of studies by stage and type of innovation is presented in Table 2 below. The data are also presented using an infographic developed by a design company (Design Science: bring knowledge to life. https://design-science.org.uk/) to facilitate interpretation by different audiences (Figure 2).

3.4 | Methods of PPI engagement

The majority of the studies included in the review (n = 32, 37%) described public and patient involvement and engagement in quality improvement initiatives.

The review included 24 studies (28%) involving PPI in codesign or codevelopment of health services. The methods used included patient journey mapping, surveys and workshops,20,45,55,100,102 expert panels of patients and carers,36,81 a user board,57 PPI in the format of a conference,36 Delphi methods to reach consensus,28 living laboratories for technology innovation,29 stakeholders activities22,35,101 and interviews with patients.58 Two studies presented codevelopment of clinical guidelines using qualitative methods.40,82 Other studies used various methods.19,37,49,83–85

Participation in research activities was described in 14 studies (16%).24–27,34,59–66,83 Patients and the public participated in various ways, through advisory and face-to-face discussion groups,34,62,63 virtual steering groups,59 online surveys and workshops26 and network activities.65 Some innovative initiatives included video-reflexive ethnography that allowed clinicians to explore the needs of patients and their families in end-of-life care.60

Eleven studies described the direct involvement of patients and the public in health service delivery either via peer-led activities or volunteering.38,39,52,67,86–95 Peer-service delivery was predominantly described in mental health services and considered eating disorders,67,89 maternal depression in South Asia,97,88,91 a service-user-led computerized cognitive behavioural therapy in the United Kingdom and an addiction recovery programme in the United States.38 The studies presenting volunteering activities all focused on hospital settings in the United Kingdom.39,86,90

4 | DISCUSSION

To summarize, two main trends are evident across the review. First, PPI in healthcare innovation has taken a number of approaches, and the majority of the studies reviewed focused on process and service innovation (n = 62, 71%), while only seven studies (8%) focused on technological
| Author (year)          | Country                  | Study design       | Area                       | Type of innovation                                    | Process of innovation                        | Methods of PPI engagement                                      |
|-----------------------|--------------------------|--------------------|----------------------------|-------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------|
| Abelson et al. (2019) | Canada                   | Mixed methods      | General                    | Technological and clinical/process and service        | All                                         | QI initiatives (other)                                       |
| Absolom et al. (2015) | UK                       | Case study         | Cancer                     | Technological and clinical/process and service        | Problem identification/invention            | Research participation (advisory group)                       |
| Adams et al. (2015)   | UK                       | Qualitative study  | Cancer                     | Process and service innovation                        | Problem identification/invention/adoption   | QI initiative (filmed patient narratives-storytelling)      |
| Alvis et al. (2020)   | Colombia                 | Qualitative study  | Coagulopathies              | Invention                                             |                                             | Consensus conference                                        |
| Amirkhanyan et al. (2019) | US                   | Qualitative study  | Nursing homes               | Process and service innovation                        | Invention                                   | QI initiatives (other)                                       |
| Andersson and Olheden (2012) | Sweden       | Qualitative study  | General                    | Process and service innovation                        | Problem identification                      | QI initiatives (variety of methods)                           |
| Armstrong et al. (2013) | UK                       | Case study         | General                    | Process and service innovation                        | Problem identification/invention            | QI initiatives (variety of methods)                           |
| Ashby et al. (2007)   | UK                       | Case study         | Services for older people   | Process and service innovation                        | Problem identification/invention            | Research participation (virtual steering group)               |
| Ashford et al. (2019) | US                       | Mixed methods      | Substance use disorder      | Process and service innovation                        | Invention/adoptive/diffusion                | Peer-led service delivery                                    |
| Atif et al. (2017)    | Pakistan and India       | Qualitative study  | Mental health               | Process and service innovation                        | Invention/adoption                         | Peer-led service delivery                                    |
| Baim-Lance et al. (2019) | US                     | Qualitative study  | HIV                        | Process and service innovation                        | Invention                                   | Coproduction (various methods)                                |
| Baker et al. (2016)   | Canada                   | Case study         | General                    | Process and service innovation                        | Problem identification/invention            | QI initiatives (variety of methods)                           |
| Bakibinga et al. (2020) | Kenya                  | Qualitative study  | General                    | Technological and clinical                            | Invention/adoptive/adoption                | Codevelopment (various methods)                               |
| Berg et al. (2015)    | Norway                   | Case study         | HIV                        | Process and service innovation                        | Problem identification/invention/adoption   | Codesign (user board)                                        |
| Bichel et al. (2009)  | Canada                   | Case study         | General                    | Process and service innovation                        | Problem identification/invention/adoption   | Codesign (conference model)                                  |
| Boelens et al. (2014) | Europe                   | Qualitative study  | Cancer                     | Process and service innovation                        | Invention                                   | Codesign (consensus process using the Delphi method)         |
| Boivin et al. (2009)  | UK                       | Qualitative study  | General                    | Systems                                                | Invention/adoptive/adoption                | Codevelopment of clinical guidelines (qualitative study with patients) |
| Bouchard et al. (2020) | Canada                   | Qualitative study  | Cardiovascular              | Process and service innovation                        | Invention                                   | Codevelopment (steering committee, patient/carer experiences) |
| Boustani et al. (2012) | US                       | Case study         | Dementia                    | Technological and clinical/process and service        | All                                        | QI initiatives (network participation)                       |
| Boyd et al. (2012)    | New Zealand              | Qualitative study  | Cancer                     | Technological and clinical/process and service        | Problem identification/invention           | Codesign (patient journey mapping, surveys, workshops)      |
| Author (year)            | Country | Study design    | Area                  | Type of innovation                  | Process of innovation | Methods of PPI engagement                                                                 |
|-------------------------|---------|----------------|-----------------------|-------------------------------------|-----------------------|------------------------------------------------------------------------------------------|
| Brighton et al. (2018)  | UK      | Qualitative study | Palliative care       | Process and service innovation      | Problem identification | Research participation (online forum for palliative care and rehabilitation research)     |
| Bygholm and Kanstrup (2017) | Denmark | Qualitative study | Services for older people | Technological and clinical/process and service | Invention             | Codesign of technology innovation (living laboratories)                                    |
| Carlsson et al. (2006)  | Sweden  | Qualitative study | Cancer                | Process and service innovation      | Problem identification/invention | QI initiatives (network participation)                                                     |
| Cavanagh et al. (2011)  | UK      | Case study      | Mental health          | Technological and clinical/process and service | Invention/adoption/diffusion | Peer-led service delivery                                                                   |
| Cheng et al. (2021)     | Australia | Qualitative study | Mental health          | Technological and clinical           | Adoption               | Workshops                                                                                 |
| Cheetham et al. (2013)  | UK      | Case study      | Services for young people | Technological and clinical/process and service | Invention/adoption     | QI initiatives (variety of methods)                                                        |
| Collier and Wyer (2016) | Australia | Qualitative study | End-of-life and infection control | Process and service innovation      | Problem identification/invention | Research participation (video-reflexive ethnography)                                     |
| Crocker et al. (2016)   | UK      | Qualitative study | General               | Technological and clinical/process and service | Problem identification | Research participation (various activities)                                                |
| De Souza et al. (2016)  | UK      | Case study      | Rheumatology           | Technological and clinical/process and service | Problem identification/invention/adoption | QI initiative (independent patient advisory group)                                         |
| Desai et al. (2019)     | US      | Case study      | Mental health          | Process and service innovation      | Problem identification/invention | Research participation (stakeholders engagement and training)                              |
| Farmer et al. (2018)    | Australia | Qualitative study | General               | Systems                             | All                    | Codesign (community activities and workshops)                                              |
| Finn et al. (2018)      | UK      | Quantitative    | General               | Process and service innovation      | Invention              | QI initiatives (questionnaire, email communication, public meetings)                      |
| Forbat et al. (2009)    | UK      | Qualitative study | Cancer                | Process and service innovation      | Invention/adoption     | QI initiatives (variety of methods)                                                        |
| Gillard et al. (2010)   | UK      | Qualitative study | Mental health          | Process and service innovation      | Problem identification | Research participation (coresearch)                                                        |
| Godfrey et al. (2020)   | UK      | Mixed methods   | Mental health          | Process and service innovation      | Invention/adoption     | Volunteering in healthcare delivery                                                       |
| Gustavsson (2014)       | Sweden  | Qualitative study | Neonatal              | Process and service innovation      | Problem identification/invention/adoption | QI initiatives (variety of methods)                                                        |
| Gustavsson and Andersson (2019) | Sweden | Qualitative study | Paediatric             | Process and service innovation      | Invention              | QI initiatives (variety of methods)                                                        |
| Gustavsson et al. (2016)| Sweden  | Qualitative study | Paediatric             | Process and service innovation      | Problem identification/invention | QI initiatives (variety of methods)                                                        |
| Hackett et al. (2018)   | Canada  | Qualitative study | Mental health          | Process and service innovation      | Problem identification/invention | Codesign (experience maps and focus groups)                                                |
| Author (year)    | Country       | Study design | Area                  | Type of innovation                  | Process of innovation                      | Methods of PPI engagement                      |
|-----------------|---------------|--------------|-----------------------|-------------------------------------|---------------------------------------------|-----------------------------------------------|
| Hester et al. (2015) | Ireland       | Mixed methods | Mental health         | Technological and clinical/process and service | Problem identification/invention          | QI initiatives (focus groups)                 |
| Holland et al. (2019) | UK            | Qualitative study | General              | Process and service innovation     | All                                         | Coproduction (various methods)                |
| Howson et al. (2018) | UK            | Qualitative study | General              | Process and service innovation     | Invention/adoption                          | Volunteering in healthcare delivery           |
| Kanstrup et al. (2015) | Denmark       | Qualitative study | Diabetes             | Technological and clinical         | Problem identification/invention          | Codesign (variety of methods)                 |
| Kendall et al. (2006) | UK            | Qualitative study | Cancer               | Process and service innovation     | Problem identification/invention          | Research participation (patient and carer discussions group) |
| Khodyakov et al. (2017) | US            | Qualitative study | General              | Process and service innovation     | Problem identification/invention          | QI initiatives (expert panel including patients) |
| Khodyakov et al. (2019) | US            | Mixed methods | Muscular-skeletal    | Process and service innovation     | Problem identification/invention          | QI initiatives (key stakeholders group)        |
| Kiracho et al. (2020) | Uganda        | Mixed methods | General              | Systems                            | Adoption                                    | Community score cards                         |
| Lai et al. (2020) | UK            | Mixed methods | Cardiovascular        | All                                | Problem identification                     | Research participation (online surveys and workshops) |
| Laurance et al. (2014) | International | Case study    | General              | Technological and clinical/process and service | Problem identification/invention/adoption | QI initiatives (community engagement strategies) |
| Lavoie-Trembla (2016) | Canada        | Qualitative study | General              | Process and service innovation     | Problem identification/invention          | Codesign (patient interviews)                 |
| Louch et al. (2019) | UK            | Qualitative study | General              | Process and service innovation     | Invention/adoption                          | Volunteering in healthcare delivery           |
| Ma et al. (2020) | Canada        | Mixed methods | Physiotherapy         | Process and service innovation     | Problem identification/invention          | Codevelopment of intervention (participation in expert panel) |
| Ma et al. (2019) | Canada        | RCT           | General              | Technological and clinical         | Problem identification/invention          | Codevelopment (stakeholder engagement activities) |
| Mamary et al. (2004) | US            | Qualitative study | HIV                  | Process and service innovation     | Problem identification/invention          | QI initiatives (focus groups)                 |
| Maxwell et al. (2008) | UK            | Qualitative study | HIV                  | Systems                            | Invention/adoption                          | QI initiatives (variety of methods)           |
| McKeivitt et al. (2017) | UK            | Qualitative study | Stroke               | Process and service innovation     | Invention/adoption                          | QI initiatives (consultation exercises; lay membership; and elicitation of patient perspectives) |
| Omeni et al. (2014) | UK            | Mixed methods | Mental health         | Process and service innovation     | Unclear/variied                            | QI initiatives (variety of methods)           |
| Ottman et al. (2011) | Australia     | Mixed methods | Services for older people | Process and service innovation     | Problem identification/invention          | Research participation (users & carer focus groups) |
| Patel et al. (2019) | US            | Qualitative study | End-of-life care      | Process and service innovation     | Problem identification/invention          | QI initiatives (community engagement strategies) |
| Palukka et al. (2021) | Finland       | Qualitative study | Opioid substitution treatment | Process and service innovation     | Invention                                  | Meetings with stakeholders                    |
| Author (year)          | Country          | Study design | Area                  | Type of innovation          | Process of innovation                              | Methods of PPI engagement                             |
|-----------------------|------------------|--------------|-----------------------|----------------------------|----------------------------------------------------|------------------------------------------------------|
| Patterson et al. (2009) | UK               | Qualitative study | Drug misuse            | Process and service innovation | Problem identification/invention/adoption           | QI initiatives (variety of methods)                  |
| Peeters et al. (2014)  | The Netherlands  | Qualitative study | General               | Process and service innovation | Invention                                          | QI initiatives (variety of methods)                  |
| Pollard et al. (2014)  | UK               | Qualitative study | General               | Process and service innovation | Problem identification/invention                    | QI initiatives (patient reference groups)            |
| Prothero et al. (2017) | UK               | Qualitative study | Rheumatology           | Process and service innovation | Adoption                                            | Codesign (workshops)                                 |
| Raue et al. (2021)     | USA              | Quantitative study | Depression            | Process and service innovation | Invention                                          | Lay-delivered intervention                          |
| Renedo and Marston (2011) | UK             | Qualitative study | General               | Process and service innovation | Unclear/varied                                     | QI initiatives (variety of methods)                  |
| Renedo et al. (2015)   | UK               | Qualitative study | General               | Process and service innovation | Unclear/varied                                     | QI initiatives (variety of methods)                  |
| Roennow et al. (2020)  | International    | Qualitative study | Scleroderma           | Process and service innovation | Invention                                          | Community advisory board                             |
| Rowe et al. (2020)     | Australia        | Qualitative study | Mental health          | Technological and clinical   | Invention/adoption                                 | Codesign (workshops and usability testing sessions) |
| Sanger et al. (2007)   | Germany          | Case study    | General               | Process and service innovation | Invention/adoption/diffusion                        | Co-creation of guidelines (patient forum)            |
| Shklarov et al. (2017) | Canada           | Mixed methods | Chronic conditions     | Process and service innovation | Problem identification/invention                    | Research participation (peer-to-peer research)       |
| Singh et al. (2018)    | Canada           | Case study    | General               | Process and service innovation | Problem identification/invention                    | Research participation (research networks)           |
| Singla et al. (2014)   | Pakistan and India | Qualitative study | Mental health         | Process and service innovation | Invention/adoption                                 | Peer-led service delivery                            |
| Singla et al. (2020)   | India            | Qualitative study | Mental health          | Process and service innovation | Invention/adoption                                 | Peer-led service delivery                            |
| Sprague Martinez et al. (2020) | USA       | Mixed methods | Health for young      | Process and service innovation | Problem identification/invention                    | Survey and photovoice                                |
| Stice et al. (2020)    | US               | RCT           | Mental health          | Process and service innovation | Problem identification/invention                    | Peer-led service delivery                            |
| Stice et al. (2013)    | US               | RCT           | Mental health          | Process and service innovation | Invention/adoption                                 | Peer-led service delivery                            |
| Stover et al. (2019)   | US               | Case study    | General               | Technological and clinical   | Invention/adoption                                 | Codesign (stakeholder engagement activities)        |
| Strudwick et al. (2021) | Canada    | Mixed methods | Mental health          | Process and service innovation | Invention                                          | Codesign (stakeholders engagement)                  |
| Toncinic et al. (2020) | The Netherlands  | Mixed methods | General               | Technological and clinical   | Problem identification/invention                    | QI initiatives (stakeholders analysis)               |
| Walsh et al. (2016)    | Australia        | Case study    | Muscular-skeletal healthcare | Process and service innovation | Invention/adoption/diffusion                        | QI initiatives (variety of methods)                  |
| Author (year) | Country | Study design | Area Description | Type of innovation | Process of innovation | Methods of PPI engagement |
|--------------|---------|--------------|------------------|-------------------|----------------------|--------------------------|
| Walshe et al. (2019) | UK | RCT | Dementia | Process and service innovation | Problem identification/invention/ adoption | Research participation (various activities) |
| Whiting et al. (2016) | UK | Qualitative study | Services for young people | Process and service innovation | Invention | QI initiatives (patient forum) |
| Wilson et al. (2015) | UK | Qualitative study | Mental health | Technological and clinical/process and service | All | Research participation (various activities) |
| Wilson et al. (2018) | UK | Case study | Mental health | Process and service innovation | Invention/ adoption | Co-development (various methods) |
| Yeary et al. (2011) | US | Case study | Cancer | Process and service innovation | Adoption/diffusion | Co-production activities (community and academic partners collaborated) |
| Young et al. (2005) | US | RCT | Mental health | Process and service innovation | Invention/adoption/diffusion | Co-production (various methods) |

Abbreviation: HIV, human immunodeficiency virus; RCT, Randomised Clinical Trial; QI, Quality Improvement.

| Stages of innovation | Problem identification | Invention | Adoption | Diffusion |
|----------------------|------------------------|------------|----------|-----------|
| Type of innovation   | Technological and clinical | 14 21,25,26,29,34-43 | 16 19-22,24,35,44-53 | 11 19,20,22,44,46,48,50-54 | 4 44-50-52 |
|                      | Process and service     | 42 23-27,29,34,36,44-48,50,51,55-99 | 64 24,30-34,36-39,44-48,50-53,55-99 | 30 27-39,444,46,48,50-53,57,64,66,71,76,80,82-84,86-94,100,101 | 10 102 |
|                      | Systems                 | 2 26,102   | 4 40-42,102 | 4 40,41,43,102 | 1 102 |

Note: Some studies described more than one type of innovation or fell across different stages of innovation, so the total number does not add up to the final number of studies included.
innovation and five (6%) on systems innovation. In terms of technological innovation, this trend is reflected in Gagnon et al.'s\textsuperscript{103} review of PPI in health technology assessment, where the use of PPI in the development of technology is recognized as a relatively recent growth area. Second, the studies reviewed focused on PPI in earlier stages of the innovation journey in comparison to later stages, reflecting PPI trends in general.\textsuperscript{4,5} Drawing on the studies reviewed and the literature in the field, we next discuss why these trends might be prevalent.

### 4.1 PPI is most frequently used in service improvement innovation

As outlined, the majority of the studies reviewed focused on service innovation (n = 62, 71%). Armstrong et al.\textsuperscript{68} for example, presented three case studies to highlight the role of PPI in quality improvement work. Similarly, Khodyakov et al.\textsuperscript{69} explored how PPI can be used to improve outpatient care. Various methods were used to achieve this. Traditional methods such as interviews,\textsuperscript{58} focus groups\textsuperscript{70} and surveys\textsuperscript{55} were frequently used; however, more innovative and participatory methods were also found. Hacket et al.,\textsuperscript{55} for example, used experienced-based codesign to include young people in the improvement of youth mental health services. Collier and Wyer\textsuperscript{60} used reflexive video ethnography to improve end-of-life care.

One reason for this trend could be that process and service innovation is an aspect of healthcare innovation that has long been associated with patient inclusion. Coproduction, experienced-based codesign and other patient-centred methods for improvement have an evidence-based background for effective healthcare improvement work.\textsuperscript{104,105} The use of these participatory methods to carry out PPI work in service innovation is reflected in the studies reviewed. Across the studies, these approaches were used to improve HIV care in Norway\textsuperscript{27} and United States of America\textsuperscript{85}; access to primary care in Canada\textsuperscript{36}; services for cancer care across Europe\textsuperscript{26}; mental health services in Canada,\textsuperscript{25} England\textsuperscript{24,83} and the United States of America\textsuperscript{84}; secondary care in Canada\textsuperscript{58}; colorectal cancer screening in the United States of America\textsuperscript{101}; management of rheumatoid arthritis\textsuperscript{102}; rehabilitation services for people with spinal cord injury\textsuperscript{26}; and to develop patient guidelines in Germany.\textsuperscript{82}

PPI was found to be used least in technology (n = 7, 8%) and systems (n = 5, 6%) innovation. Various studies addressing the use of PPI in technological innovation have also identified this trend. Caution and ambivalence towards the use of PPI in health technology development have long been noted.\textsuperscript{103} Recently, it was identified that the use of PPI is increasing in this area of innovation; however, challenges continue, including lack of public knowledge/awareness and lack of guidance on how to use PPI in health technology innovation.\textsuperscript{103} It has been suggested that the slow take-up of PPI in this field of innovation is due to the dual roles of the health technology community to contribute to both research and policy-making.\textsuperscript{107} Where PPI is well established and accepted in health research, studies have shown that the lack of a universal and rigorous approach to PPI is perceived to be unreliable by policy-makers.\textsuperscript{106,107}

While PPI was found in fewer studies detailing technology innovation, interestingly, the use of PPI in these studies tended to be grounded in participatory approaches rather than traditional research methods with a participatory angle such as interviews and surveys. Codesign was a particularly common approach to PPI in this area of innovation. Codesign techniques were used to develop the use of technology in nursing homes,\textsuperscript{29} to develop diabetes technology\textsuperscript{49} and to develop an online mental health support platform.\textsuperscript{20} This is perhaps a reflection of the design element involved in these methods and the parallels found in the design of technology. Additionally, such methods tend to focus on the earlier stages of innovation, perhaps going some way towards explaining the trend to utilize PPI at the beginning of the innovation journey rather than the end.

### 4.2 PPI is most frequently used at the beginning of the innovation journey

In the introduction, we set out the innovation journey to include four stages: problem identification, invention, adoption and effectiveness and diffusion.\textsuperscript{3,9,10} The majority of studies concentrated on one or two of these stages and these tended to focus on the earlier stages of problem identification, invention and adoption. As outlined, only six studies focused specifically on the use of PPI at the final diffusion stage.\textsuperscript{39,52,82,84,92,101}

Significantly, only five studies addressed PPI at all stages of the innovation journey.\textsuperscript{37,44,50,83,102} PPI is intended to be a whole-process approach, meaning that PPI is included at all stages of the research or innovation journey. The ‘nothing about us, without us’ slogan borrowed from disability studies and often used to describe the ethos of PPI summarizes this aim well. Despite this, PPI work is often criticized for its limited use. Other studies have identified that PPI work tends to take place at the beginning of a project to aid planning and agenda-setting and then dwindle off.\textsuperscript{3,9,10} A similar trend has been observed in technological innovation in healthcare,\textsuperscript{108} whereby, it has been identified that PPI is more likely to be found at planning and implementation stages in comparison to monitoring and dissemination stages. This has led to PPI being criticized as a tick-box exercise to fulfill funding requirements,\textsuperscript{109} and as virtue signalling.\textsuperscript{110}

It has recently been suggested that ‘what gets done is what can be measured’.\textsuperscript{111} This claim is based on the increasing call to measure the impact of PPI and how this is prescribed by funding bodies. Russel et al.\textsuperscript{111} use the NIHR as an example and show that reporting the impact of PPI is typically focused on things that can be measured quantitatively, such as the number of events and participants. Here, we suggest that this observation goes some way towards explaining why PPI tends to be used at earlier stages in the innovation process.

Related to this point, research and innovation tend to be lengthy processes. To include PPI throughout requires commitment and support, time and resources from both researchers and patient and public participants.\textsuperscript{112} There are numerous evidence-based strategies to support effective PPI and retention of participants; however, as illustrated in this review and others, PPI is seldom used in the later stages of research.\textsuperscript{113,114} Another reason for this trend is that PPI work is notoriously underfunded and often delegated to junior staff members, who are more likely to move onto other roles within the course of a project.\textsuperscript{115}
Those tasked with facilitating PPI work often do so in addition to existing roles, which can lead to PPI activity falling by the way side when other work has to be prioritized. In response to these limiting issues, Boylan et al.\textsuperscript{109} call for ‘a dedicated initiative aimed at solidifying involvement as part of research culture’ (p. 729). To date, this has not happened, although the UK Standards for Public Involvement could be a step in the right direction.\textsuperscript{116} It must be acknowledged, however, that these standards have been developed with the United Kingdom in mind and may not be transferable to countries with alternative healthcare systems or to those with differing cultural values addressing healthcare.

### 4.3 Limitations

The studies found reflected our search terms and inclusion and exclusion criteria. These terms and criteria limited the study as follows. First, our search terms reflected the language commonly used in our definition of PPI, chosen for its broad scope and popular use. Although this definition is well used in the PPI literature, the process of doing PPI work has been variously described and not all countries use the same terminology. Indeed, the term ‘engagement’ is often used in Canada and Scandinavian countries. The exclusion of wider terms may go some way towards explaining why the vast majority of the papers found took place in high-income countries. PPI is a particularly western concept and activity and is not well used in low- and middle-income countries.\textsuperscript{117} Wider search terms may have yielded more geographically varied studies; however, as Miah et al.\textsuperscript{117} point out, the premise of PPI itself is western in nature and can be challenging to implement in countries where professional and patient relationships are structured hierarchically.

Second, our exclusion criteria limit the scope of findings in our review. Examples of PPI used in innovations in healthcare policy were excluded so as not to duplicate the findings of a recent review of PPI in healthcare policy.\textsuperscript{10} This had the effect of limiting the number of studies found to address systems research. For this reason, our findings will be less relevant to those exploring health systems innovation, specifically policy innovation. To reflect our focus on healthcare delivery, we also excluded papers addressing finance and governance. Although not explicitly part of healthcare delivery, these issues do of course impact on the delivery of healthcare, and further research into the use of PPI in these areas would be useful. In addition to this, we also excluded studies addressing service reviews and evaluations. Including such studies may have had the effect of providing more studies detailing PPI at the later stages of innovation.

Finally, the focus of this review was to identify and map how PPI is used in healthcare innovation. Consequently, we did not comment on the success or impact of the PPI work nor did we comment on the inclusivity or diversity of the PPI work being reported.

### 4.4 Recommendations/future research

Our recommendations and future research findings are based on both the review findings and their limitations. As outlined, our main findings showed first that PPI was most commonly used in service improvement innovations and least used in technological and systems innovation; second, PPI is most often used in the earlier stages of the innovation journey. Building on these findings, we recommend the following:

1. Further research should be conducted to explore why PPI is not as well used in health technology and systems innovation.
2. More research should be done to promote the use of and improve the accessibility of PPI, especially for use in health technology and systems innovation.
3. A whole-system approach to PPI is adopted in all forms of healthcare innovation work to ensure that PPI is used throughout the innovation journey rather than just at the early stages. In a recent systematic review of barriers and enablers of PPI,\textsuperscript{118} it was found that a whole-system approach will increase the buy-in and partnership working necessary to support successful PPI work.

Based on our study limitations, we make the following observations and recommendations. While the benefits of PPI in healthcare research and delivery are widely accepted, PPI has also been subject to wide-ranging critique. PPI activity is significantly under-evaluated, resulting in a poor evidence base and limited understanding of how PPI can improve research processes and outcomes.\textsuperscript{119} Where the impact of PPI is reported, the attention tends to focus on improvement and delivery outcomes. The impact on the participants themselves is underexplored.\textsuperscript{120} As outlined, we did not comment on this based on our research purpose to identify and map PPI in healthcare innovation. In addition to this, PPI work is increasingly being criticized for its lack of inclusivity and diversity.\textsuperscript{121} The typical PPI participant has been described as white, middle class and male.\textsuperscript{122} Based on these criticisms and the limitations of our search, we recommend that further research is needed to explore the impact of PPI in healthcare innovation, particularly focusing on patient and public experience. We also recommend that further research is needed to explore and promote diversity in PPI work in healthcare innovation.

In addition to this, as observed in our review findings and limitations, the majority of the studies found were conducted in high-income countries. With the exception of a few published papers,\textsuperscript{123,124} there has been limited exploration of why PPI is seldom used in low- and middle-income countries nor how PPI could be used in these countries. Building on this, we recommend that further research is needed to explore the use of PPI or similar engagement strategies in healthcare innovations in low- and middle-income countries.

### 5 Conclusion

At the time of conducting this scoping review, no reviews had been carried out to provide a holistic picture of PPI across all stages of innovation and across different areas of healthcare. This scoping
review set out to address this evidence gap by identifying and mapping the use of PPI work in healthcare innovation. In doing this, we have highlighted two main findings that are generally consistent with the PPI and healthcare innovation literature: first, PPI is used most frequently in service improvement innovations and the least in system and technology innovations and, second, PPI is most used in the early stages of innovation.

At present, PPI in healthcare innovation runs the risk of being described as a tick-box exercise or virtue signalling. As outlined above, we have set out a range of recommendations in response to this. What is most important, however, is that if PPI is accepted to be as beneficial as it is often reported to be, that there are systems of support in place to guide its use and ensure its accessibility and inclusivity across the whole innovation journey. While PPI should not be a one-size-fits-all approach, it has been identified that the lack of measurable variables and the lack of a universal definition or approach render evidence gained from PPI work unpalatable to certain and influential audiences such as policy-makers. As suggested earlier, the UK Standards for Public Involvement could be a step in the right direction.\textsuperscript{116}

To support this conclusion, as outlined in our recommendations, we advocate for a whole-system approach to PPI to ensure that PPI is used across the whole innovation journey, not just at the earlier stages. Stronger PPI in later stages is likely to support the adoption and diffusion of innovation.

AUTHOR CONTRIBUTIONS
Claire Feeley carried out all the searches. Claire Feeley, Alexandra Ziemann, Victoria Cluley, Ellinor K. Olander and Charitini Stavropoulou were involved in the data extraction and analysis. All authors were involved in the interpretation of the results, contributed to the writing up of the manuscript and approved the submitted version.

DATA AVAILABILITY STATEMENT
All data generated or analysed during this study were included in this published article and/or its Supporting Information Materials.

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REFERENCES
1. Richards T. Patient and public involvement in research goes global. The BMJ. 2017. Accessed June 30, 2021. https://blogs.bmj.com/bmj/2017/11/30/tessa-richards-patient-and-public-involvement-in-research-goes-global/
2. Baines RL, Regan de Bere S. Optimizing patient and public involvement (PPI): identifying its “essential” and “desirable” principles using a systematic review and modified Delphi methodology. Health Expect. 2018;21(1):327-335. doi:10.1111/hex.12618
3. Brett J, Staniszewska S, Mockford C, et al. Mapping the impact of patient and public involvement on health and social care research: a systematic review. Health Expect. 2014;17(5):637-650. doi:10.1111/j.1369-7625.2012.00795.x
4. Crawford MJ, Rutter D, Manley C, et al. Systematic review of involving patients in the planning and development of health care. BMJ. 2002;325(7375):1263. doi:10.1136/bmj.325.7375.1263
5. Mockford C, Staniszewska S, Griffiths F, Herron-Murray S. The impact of patient and public involvement on UK NHS health care: a systematic review. Int J Qual Health Care. 2012;24(1):28-38. doi:10.1093/intqhc/mrz066
6. Greenhalgh T, Papoutsi C. Spreading and scaling up innovation and improvement. BMJ. 2019;365:l2068.
7. Pli KH, Schou LH, Pili K, Jarden M. Current trends in patient and public involvement in cancer research: a systematic review. Health Expect. 2019;22(1):3-20.
8. Minogue V, Holt B, Karban K, Gelsthorge S, Firth I, Ramsay T. Service user and carer involvement in mental health education, training and research: a literature review. Ment Health Learn Disabil Res Pract. 2009;6(2):211-227.
9. Mathie E, Wilson P, Poland F, et al. Consumer involvement in health research: a UK scoping and survey. Int J Consum Stud. 2014;38(1):35-44. doi:10.1111/ijcs.12072
10. Conklin A, Morris Z, Nolte E. What is the evidence base for public involvement in health-care policy?: results of a systematic scoping review. Health Expect 2015;18(2):153-163. doi:10.1111/hex.12038
11. Centre for Engagement and Dissemination. Patient and Public Involvement (PPI). Research Design Service South Central. 2017. Accessed June 25, 2021. https://www.rds-sc.nihr.ac.uk/ppi-information-resources/
12. Greenhalgh T, Robert G, Macfarlane F, Bate P, Kyriakidou O. Diffusion of innovations in service organizations: systematic review and recommendations. Milbank Q. 2004;82(4):581-629.
13. Gabriel M, Stanley I, Saunders T. Open Innovation in Health. NESTA. 2017. Accessed June 25, 2021. https://www.google.com/search?client=firefox-b-d&q=Gabriel%2BM%2C%2BStanley%2B%-2BSaunders%2B%2BOpen%2Binnovation%2Bin%2Bhealth
14. Trico AC, Lillie E, Zarin W, et al. A scoping review on the conduct and reporting of scoping reviews. BMC Med Res Methodol. 2016; 16(1):1-10.
15. Peters MD, Godfrey CM, Khalil H, McInerney P, Parker D, Soares CB. Guidance for conducting systematic scoping reviews. JBI Evid Implement. 2015;13(3):141-146.
16. Cochrane Effective Practice and Organisation of Care. EPOC Taxonomy. 2021. Accessed June 25, 2021. https://epoc.cochrane.org/epoc-taxonomy
17. Munn Z, Peters MD, Stern C, Tufanaru C, McArthur A, Aromataris E. Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. BMC Med Res Methodol. 2018;18(1):1-7.
18. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71. doi:10.1136/bmj.n71
19. Bakibinga P, Kamande E, Kisia L, Omuya M, Matanda DJ, Kyebubutungi C. Challenges and prospects for implementation of community health volunteers’ digital health solutions in Kenya: a qualitative study. BMC Health Serv Res. 2020;20(1):1-12.
20. Rowe SC, Davenport TA, Easton MA, et al. Co-designing the InnoWell Platform to deliver the right mental health care first time to regional youth. Aust J Rural Health. 2020;28(2):190-194.
21. Tončinić S, de Wildt-Liesveld R, Vrijhoef HJ. Evaluation of a digital platform that engages stakeholders in the co-creation of healthcare innovations: a mixed-methods study. Int J Care Coord. 2020;23(1):33-42.
22. Stover AM, Tompkins Stricker C, Hammelef K, et al. Using stakeholder engagement to overcome barriers to implementing patient-reported outcomes (PROs) in cancer care delivery: approaches from 3 prospective studies. *Med Care*. 2019;57:S92-S99.

23. Andersson AC, Olheden A. Patient participation in quality improvement: managers' opinions of patients as resources. *J Clin Nurs*. 2012;21(23-24):3593.

24. Gillard S, Turner K, Neffgen M, Griggs I, Demetriou A. Doing research together: bringing down barriers through the 'coproduction' of personality disorder research. *Ment Health Rev J*. 2010;15:29-35.

25. Crocker JC, Boylan AM, Bostock J, Locock L. Is it worth it? Patient and public views on the impact of their involvement in health research and its assessment: a UK-based qualitative interview study. *Health Expect*. 2017;20(3):519-528.

26. Lai FY, Abbasciano RG, Tabberer B, Kumar T, Murphy GJ. Identifying research priorities in cardiac surgery: a report from the James Lind Alliance Priority Setting Partnership in adult heart surgery. *BMJ Open*. 2020;10(9):e038001.

27. Brighton LJ, Pask S, Benalia H, et al. Taking patient and public involvement online: qualitative evaluation of an online forum for palliative care and rehabilitation research. *Res Involv Engagem*. 2018;4(1):1-12.

28. Boelens PG, Taylor C, Henning G, et al. Involving patients in a multidisciplinary European consensus process and in the development of a 'patient summary of the consensus document for colon and rectal cancer care'. *Patient*. 2014;7(3):261-270.

29. Bygholm A, Kanstrup AM. This is not participatory design—a critical analysis of eight living laboratories. *Stud Health Technol Inf*. 2017;233:78-92.

30. Finn V, Stephenson J, Astin F. Patient preferences for involvement in health service development. *Br J Nurs*. 2018;27(17):1004-1010.

31. Whitting L, Roberts S, Etchells J, Evans K, Williams A. An evaluation of the NHS England Youth Forum. *Nurs Stand*. 2016;40:589-595.

32. Peeters MGP, Delnoij DJM, Friese RD. Stronger, but not (yet) an equal. The use of quality improvement instruments and strategies by patient organisations in the Netherlands. *Soc Sci Med*. 2014;115:56-63.

33. Gustavsson SM, Andersson T. Patient involvement 2.0: experience-based co-design supported by action research. *Action Res*. 2019;17(4):469-491.

34. Absolom K, Holch P, Woroncow B, Wright EP, Velikova G. Beyond lip service and box ticking: how effective patient engagement is integral to the development and delivery of patient-reported outcomes. *Qual Life Res*. 2015;24(5):1077-1085.

35. Ma JK, West CR, Ginis KAM. The effects of a patient and provider co-developed, behavioral physical activity intervention on physical activity, psychosocial predictors, and fitness in individuals with spinal cord injury: a randomized controlled trial. *Sports Med*. 2019;50:1379-1389.

36. Bichel A, Erfle S, Wiebe V, Axelrod D, Conly J. Improving patient access to medical services: preventing the patient from being lost in translation. *Healthc Qual*. 2009;13:61-68.

37. Holland-Hart DM, Addis SM, Edwards A, Kenkre JE, Wood F. Coproduction and health: Public and clinicians’ perceptions of the barriers and facilitators. *Healthc Exp*. 2019;72:102-110.

38. Ashford RD, Meeks M, Curtis B, Brown AM. Utilization of peer-based substance use disorder and recovery interventions in rural emergency departments: patient characteristics and exploratory analysis. *J Rural Ment Health*. 2019;43(1):17-29.

39. Louch G, Mohammed MA, Hughes L, O’Hara J. “Change is what can actually make the tough times better”: a patient-centred patient safety intervention delivered in collaboration with hospital volunteers. *Healthc Exp*. 2019;72:102-113.

40. Boivin A, Green J, van der Meulen J, Légaré F, Nolte E. Why consider patients’ preferences?: a discourse analysis of clinical practice guideline developers. *Med Care*. 2009;47:908-915.

41. Maxwell C, Aggleton P, Warwick I. Involving HIV-positive people in policy and service development: recent experiences in England. *AIDS Care*. 2008;20(1):72-79.

42. Alvis LF, Sánchez P, Acuña L, et al. National registry of haemophilia and other coagulopathies: a multisector initiative in the Colombian Health System. *Haemophilia*. 2020;26(6):e254-e261.

43. Kiracho EE, Namuhani N, Apolot RR, et al. Influence of community scorecards on maternal and newborn health service delivery and utilization. *Int J Equity Health*. 2020;19(1):1-12.

44. Boustani MA, Frame A, Munger S, et al. Connecting research discovery with care delivery in dementia: the development of the Indianapolis Discovery Network for Dementia. *Clin Interv Aging*. 2012;7:509-516.

45. Boyd H, McKernon S, Mullin B, Old A. Improving healthcare through the use of co-design. *NZ Med J*. 2012;125(1357):76-87.

46. de Souza S, Galloway J, Simpson C, et al. Patient involvement in rheumatology outpatient service design and delivery: a case study. *Healthc Exp*. 2017;20(3):508-518.

47. Hester L, O’doherty LJ, Schnittger R, et al. SEQuEnCE: a service user-centred quality of care instrument for mental health services. *Int J Qual Health Care*. 2015;27(4):284-290.

48. Laurance J, Henderson S, Howitt PJ, et al. Patient engagement: four case studies that highlight the potential for improved health outcomes and reduced costs. *Health Aff*. 2014;33(9):1627-1634.

49. Karstrup AM, Bertelsen P, Nahr C. Patient innovation: an analysis of patients’ designs of digital technology support for everyday living with diabetes. *Health Inf Manag J*. 2015;44(1):12-20.

50. Abeljon J, Tripp L, Kandasamy S, Burrows K, Team PIS. Supporting the evaluation of public and patient engagement in health system organizations: results from an implementation research study. *Healthc Exp*. 2019;22(5):1132-1143.

51. Wilson P, Mathie E, Keenan J, et al. ReseArch with Patient and Public involvement: a realist evaluation: the RAPPORT study. *Health Services and Delivery Research*. 2015.

52. Cavanagh K, Seccombe N, Littbetter N, Bunnell D. Supported, service-user led, computerised cognitive behavioural therapy (CCBT) self-help clinics. *J Public Ment Health*. 2011;10(4):225-233.

53. Cheetham M, Ellins A, Callum J. Involving young people in health service delivery. *Nurs Stand*. 2013;27(30):35-40.

54. Cheng VWS, Piper SE, Ottavio A, Davenport TA, Hickie IB. Recommendations for designing health information technologies for mental health drawn from self-determination theory and co-design with culturally diverse populations: template analysis. *J Med Internet Res*. 2021;23(2):e23502. doi:10.2196/23502

55. Hackett CL, Mulvage G, Miattello A. Co-designing for quality: creating a user-driven tool to improve quality in youth mental health services. *Healthc Exp*. 2018;21(6):1013-1023.

56. Ma JK, Cheifetz O, Todd KR, et al. Co-development of a physiotherapist-delivered physical activity intervention for adults with spinal cord injury. *Spiral Cord*. 2020;58(7):778-786.

57. Berg RC, Gamst A, Said M, et al. True user involvement by people living with HIV is possible: description of a user-driven HIV clinic in Norway. *J Assoc Nurses AIDS Care*. 2015;26(6):732-742.

58. Lavoie-Tremblay M, O’Connor P, Biron A, MacGibbon B, Cyr G, Fréchette J. The experience of patients engaged in co-designing care processes. *Healthc Care Manag*. 2016;35(4):284-293.

59. Ashby SM, Maslin-Prothero SE, Rout AC. Involving service users and their carers as equal partners in a project using electronic communication. *Ann N Y Acad Sci*. 2007;1114(1):362-368.

60. Collier A, Wyr M. Researching reflexively with patients and families: two studies using video-reflexive ethnography to collaborate with patients and families in patient safety research. *Qual Health Res*. 2016;26(7):797-803.

61. Desai MU, Bellamy C, Guy K, Costa M, O’Connell MJ, Davidson L. “If You Want to Know About The Book, Ask the Author”: enhancing
community engagement through participatory research in clinical mental health settings. Behav Med. 2019;45(2):177-187.
62. Kendall M, Boyd K, Campbell C, et al. How do people with cancer wish to be cared for in primary care? Serial discussion groups of patients and carers. Fam Pract. 2006;23(6):644-650.
63. Ottmann G, Laragy C, Allen J, Feldman P. Coproduction in practice: participatory action research to develop a model of community aged care. Syst Pract Action Res. 2011;24(5):413-427.
64. Shklarov S, Marshall DA, Wasylik T, Marlett NJ. “Part of the Team”: mapping the outcomes of training patients for new roles in health research and planning. Health Expect. 2017;20(6):1428-1436.
65. Singh S, Burns KK, Rees J, Picklyk D, Spence J, Marlett N. Patient and family engagement in Alberta health services: improving care delivery and research outcomes. Healthc Manage Forum. 2018;31:57-61.
66. Walshe C, Kinley J, Patel S, et al. A four-stage process for intervention description and guide development of a practice-based intervention: refining the Namaste Care intervention implementation specification for people with advanced dementia prior to a feasibility cluster randomised trial. BMC Geriatr. 2019;19(1):1-11.
67. Stice E, Rohde P, Shaw H, Gau JM. Clinician-led, peer-led, and internet-delivered dissonance-based eating disorder prevention programs: effectiveness of these delivery modalities through 4-year follow-up. J Consult Clin Psychol. 2020;88(5):481-494.
68. Armstrong N, Herbert G, Aveling EL, Dixon-Woods M, Martin G. Optimising patient involvement in quality improvement. Health Expect. 2013;16(3):e36-e47.
69. Khodyakov D, Stockdale SE, Smith N, Booth M, Altman L, Rubenstein LV. Patient engagement in the process of planning and designing outpatient care improvements at the Veterans Administration Health-care System: findings from an online expert panel. Health Expect. 2017;20(1):130-145.
70. Mamary EM, Toevs K, Burnworth KB, Becker L. Developing consumer involvement in rural HIV primary care programmes. Healthc Manage Forum. 2004;7(2):157-164.
71. Adams M, Robert G, Maben J. Exploring the legacies of filmed patient narratives: the interpretation and appropriation of patient films by health care staff. Qual Health Res. 2015;25(9):1241-1250.
72. Carlsson C, Nilbert M, Nilsson K. Patients’ involvement in improving cancer care: experiences in three years of collaboration between members of patient associations and health care professionals. Patient Educ Couns. 2006;61(1):65-71.
73. Gustavsson S, Gremyr I, Kenne Sarenmalm E. Designing quality of services in England: a national survey. Healthc Manage Forum. 2016;35(3):268-272.
74. Sängä S, Brunsann M, Engert G, Quadur B, Ollenschläger G. Patientenbeteiligung am Programm für Nationale Versorgungsleitlinien--Stand und Konsequenzen. Z Für Ärztl Fortbild Qual Im Gesundheitswesen-Ger J Qual Health Care. 2007;101(2):109-116.
75. Wilson J, Clarke T, Lower R, et al. Creating an innovative youth mental health service in the United Kingdom: the Norfolk Youth Service. Early Interv Psychiatry. 2018;12(4):740-746.
76. Young AS, Chinman M, Forquer SL, et al. Use of a consumer-led intervention to improve provider competencies. Psychiatr Serv. 2005;56(8):967-975.
77. Balm-Lance A, Tietz D, Lever H, Swart M, Agins B. Everyday and unavoidable coproduction: exploring patient participation in the delivery of healthcare services. Socio Health Illn. 2019;41(1):128-142.
78. Godfrey M, Green J, Smith J, et al. Process of implementing and delivering the prevention of delirium system of care: a mixed method preliminary study. BMC Geriatr. 2020;20(1):1-15.
79. Singla D, Lazarus A, Atif N, et al. “Someone like us”: delivering maternal mental health through peers in two South Asian contexts. J Affect Disord. 2014;168:452-458.
80. Singla DR, Ratjen C, Krishna RN, Fuhr DC, Patel V. Peer supervision for assuring the quality of non-specialist provider delivered psychological intervention: lessons from a trial for perinatal depression in Goa, India. Behav Res Ther. 2020;130:103533.
81. Stice E, Rohde P, Durant S, Shaw H, Wade E. Effectiveness of peer-led dissonance-based eating disorder prevention groups: results from two randomized pilot trials. Behav Res Ther. 2013;51(4-5):197-206.
82. Howson F, Robinson SM, Lin SX, et al. Can trained volunteers improve the mealtime care of older hospital patients? An implementation study in one English hospital. BMJ Open. 2018;8(6):e022285.
83. Atif N, Krishna RN, Sikander S, et al. Mother-to-mother therapy in India and Pakistan: adaptation and feasibility evaluation of the peer-delivered Thinking Healthy Programme. BMC Psychiatry. 2017;17(1):1-14.
84. Walsh L, Hill S, Wuks AE, et al. Harnessing and supporting consumer involvement in the development and implementation of Models of Care for musculoskeletal health. Best Pract Res Clin Rheumatol. 2016;30(3):420-444.
85. Forbat L, Hubbard G, Kearney N. Patient and public involvement: models and muddles. J Clin Nurs. 2009;18(18):2547-2554.
86. McKevitt C, Ramsay A, Perry C, et al. Patient, carer and public involvement in major system change in acute stroke services: the construction of value. Health Expect. 2018;21(3):685-692.
87. Amirkhanyan AA, Cheon O, Davis JA, Meier KJ, Wang F. Citizen participation and its impact on performance in US nursing homes. Am Rev Public Adm. 2019;49(7):840-854.
88. Palukka H, Haapasarkki A, Auvinnen P, Parviainen J. Outlining the role of experiential expertise in professional work in health care service co-production. Int J Qual Stud Health Well-Being. 2021;16(1):1954744.
97. Raue PJ, Dawson A, Hoeft T, et al. Acceptability of a lay-delivered intervention for depression in senior centers. *Aging Ment Health*. 2021;25(3):445-452.

98. Roennow A, Sauvé M, Welling J, et al. Collaboration between patient organisations and a clinical research sponsor in a rare disease condition: learnings from a community advisory board and best practice for future collaborations. *BMJ Open*. 2020;10(12):e039473. doi:10.1136/bmjopen-2020-039473

99. Strudwick G, McLay D, Lo B, et al. Development of a resource guide to support the engagement of mental health providers and patients with digital health tools: multimethod study. *J Med Internet Res*. 2021;23(4):e25773. doi:10.2196/25773

100. Prothero L, Georgopoulou S, De Souza S, Bosworth A, Bearne L, Lempp H. Patient involvement in the development of a handbook for moderate rheumatoid arthritis. *Health Expect*. 2017;20(2):288-297.

101. Yeary K, Flowers E, Ford G, et al. Development of a community-based participatory colorectal cancer screening intervention to address disparities, Arkansas, 2008-2009. *Prev Chronic Dis*. 2011;8(2):A47.

102. Farmer J, Carlisle K, Dickson-Johnson S, Mockford C, et al. A systematic review of public involvement in the National Institute of Health Research's Health Technology Assessment agencies. *Int J Technol Assess Health Care*. 2014;30(3):297-307.

103. Gagnon MP, Dipankulk MT, Poder TG, Payne-Gagnon J, Mbamba G, Beretta V. Patient and public involvement in health technology assessment: update of a systematic review of international experiences. *Int J Technol Assess Health Care*. 2021;37:e36.

104. Bate P, Robert G. *Bringing User Experience to Healthcare Improvement: The Concepts, Methods and Practices of Experience-Based Design*. Radcliffe Publishing; 2007.

105. Cluley V, Radnor Z. Progressing the conceptualization of value cocreation in public service organizations. *Perspect Public Manag Gov*. 2020;20(2):1-13.

106. Gauvin FP, Abelson J, Giacomini M, Eyles J, Lavis JN. Moving cautiously: public involvement and the health technology assessment community. *Int J Technol Assess Health Care*. 2011;27(1):43-49.

107. Gauvin FP, Abelson J, Giacomini M, Eyles J, Lavis JN. "It all depends": conceptualizing public involvement in the context of health technology assessment agencies. *Soc Sci Med*. 2010;70(10):1518-1526.

108. Moran R, Davidson P. An uneven spread: a review of public involvement in the National Institute of Health Research's Health Technology Assessment program. *Int J Technol Assess Health Care*. 2011;27(4):343-347.

109. Boylan AM, Locock L, Thomson R, Staniszewska S. "About sixty per cent I want to do it": Health researchers’ attitudes to, and experiences of, patient and public involvement (PPI)—A qualitative interview study. *Health Expect*. 2019;22(4):721-730.

110. Johannessen J. The Trouble with Patient and Public Involvement (PPI). Keynote at Cochrane Colloquium. 2018.

111. Russell J, Fudge N, Greenhalgh T. The impact of public involvement in health research: what are we measuring? Why are we measuring it? Should we stop measuring it? *Res Involv Engagem*. 2020;6(1):1-8.

112. Brett J, Staniszewska S, Mockford C, et al. A systematic review of the impact of patient and public involvement on service users, researchers and communities. *Patient*. 2014;7(4):387-395.

113. Jinks C, Carter P, Rhodes C, et al. Patient and public involvement in primary care research—an example of ensuring its sustainability. *Res Involv Engagem*. 2016;2(1):1-12.

114. Greenhalgh T, Hinton L, Finlay T, et al. Frameworks for supporting patient and public involvement in research: systematic review and co-design pilot. *Health Expect*. 2019;22(4):785-801.

115. Snape D, Kirkham J, Preston J, et al. Exploring areas of consensus and conflict around values underpinning public involvement in health and social care research: a modified Delphi study. *BMJ Open*. 2014;4(1):e004217.

116. UK Standards for Public Involvement. Better public involvement for better health and social care research. 2021. Accessed July 12, 2021. https://www.invo.org.uk/wp-content/uploads/2019/11/UK-standards-for-public-involvement-v6.pdf

117. Miah J, Sheikh S, Francis RC, et al. Patient and public involvement for dementia research in low- and middle-income countries: developing capacity and capability in South Asia. *Front Neurol*. 2021;12:637000. doi:10.3389/fneur.2021.637000

118. Ocloo J, Garfield S, Franklin BD, Dawson S. Exploring the theory, barriers and enablers for patient and public involvement across health, social care and patient safety: a systematic review of reviews. *Health Res Policy Syst*. 2021;19(1):8. doi:10.1186/s12961-020-00644-3

119. Abrams R, Park S, Wongsritas S, et al. Lost in reviews: looking for the involvement of stakeholders, patients, public and other non-researcher contributors in realist reviews. *Res Synth Methods*. 2021;12(2):239-247. doi:10.1002/jrsm.1459

120. Thompson J, Bissell P, Cooper CL, Armitage CJ, Barber R. Exploring the impact of patient and public involvement in a cancer research setting. *Qual Health Res*. 2014;24(1):46-54. doi:10.1177/1049732313514462

121. Dawson S, Campbell SM, Giles SJ, Morris RL, Cheraghi-Sohi S. Black and minority ethnic group involvement in health and social care research: a systematic review. *Health Expect*. 2018;21(1):3-22. doi:10.1111/hex.12597

122. Maguire K, Britten N. “How can anybody be representative for those kind of people?” Forms of patient representation in health research, and why it is always contestable. *Soc Sci Med*. 2017;183:62-69. doi:10.1016/j.socscimed.2017.04.049

123. Cook N, Siddiqi N, Twiddy M, Kenyon R. Patient and public involvement in health research in low and middle-income countries: a systematic review. *BMJ Open*. 2019;9(5):e026514. doi:10.1136/bmjopen-2018-026514

124. Luck A. International Public Engagement Wellcome.Gathering views of international public and community engagement with research across Africa and India. 2016. Accessed July 12, 2021. https://wellcome.org/sites/default/files/international-public-engagement-wellcome-sep16.pdf

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