Rapid Evaluations of Innovations: A Scoping Review

Gill Norman (✉ gill.norman@manchester.ac.uk)

University of Manchester

Thomas Mason

University of Manchester

Jo Dumville

University of Manchester

Peter Bower

University of Manchester

Paul Wilson

University of Manchester

Nicky Cullum

University of Manchester

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Abstract

Background

There is increasing demand for more rapid evaluation of innovation in health and social care, to support timely decision-making about service redesign. These pressures have increased during the COVID-19 pandemic. Making evaluations more rapid raises challenges in terms of ensuring rigour and the effective use of resources, but assessment of rapid evaluation methodologies has been lacking.

Methods

We conducted a scoping review to map the developing field of methods of rapid evaluation of innovation in health and social care, to describe the existing literature, categorise different approaches to rapid evaluation, and identify knowledge gaps. We searched multiple databases and websites of key organisations. We prioritised studies with relevance to the context of the NHS in England. We extracted information to enable us to classify and map existing studies on key characteristics. We undertook a narrative synthesis to identify the evidence and the gaps; focussing on the different approaches to conducting rapid evaluation in primary research.

Results

We identified 14069 records from our searches of which 352 explored rapid evaluations of innovations, methods for rapid evaluation or rapid evaluation of implementation.

Our scoping review identified four main approaches used for rapid evaluation:

- (1) Use of a methodology designed specifically for rapid evaluation;
- (2) Increasing rapidity by doing less or using a less time-intensive methodology;
- (3) Use of alternative technologies and/or data to increase the speed of an existing evaluation method;
- (4) Adaptation of part of a non-rapid evaluation

Discussion

This scoping review identified a lack of clarity about 'rapid evaluation' but identified some useful preliminary categories. There is very little comparative research on the impact of using rapid rather than standard evaluation. There is a need for clarity and consistency in terms of what constitutes rapid evaluation, the development of specific methodologies for making evaluation more rapid, and assessment of the advantages and disadvantages of rapid methodology in terms of rigour, cost and impact.

Background

There is increasing demand for timely, rigorous evaluation of innovation in health and social care. Demand has been amplified during the COVID-19 pandemic where the responsiveness of research infrastructure has been under intense focus.

We adopt the definition of innovation as: *any novel technology, device, procedure, set of behaviours, routine, or way(s) of working that is directed at improving health outcomes, administrative efficiency, cost-effectiveness or users' experience - and is implemented by planned and coordinated actions* (1). Thus, innovation can include alterations in service delivery, organisation and financing, as well as clinical and care practices.

Evaluation is a complex and multifaceted undertaking which lacks a single definition. Using a broad definition that encompasses research, typically evaluation investigates whether an overall benefit is gained over alternative activities. Phase III randomised controlled trials (RCTs) and full systematic reviews of innovations remain the 'gold-standard' of comparative effectiveness methods; although quasi-randomised approaches are sometimes all that is feasible. For other uncertainties around innovations (e.g. acceptability, feasibility) there are well established quantitative, qualitative and mixed methods (and corresponding approaches to evidence synthesis).

Whilst the need for rapidity in evaluation is widely recognised, there has been limited assessment of how rapidity is reportedly achieved in practice (2–4). This is particularly the case for primary evaluation where investigation of the literature is more limited; in contrast to the more active and developing body of work on methods for rapid reviews (5–9).

The term 'rapid evaluation' is widely used for approaches that aim to adopt pragmatic methods for timely assessment of innovations but there is uncertainty about what this means in a practical sense. Rapid evaluation can be conceptualised to include rapid conception and inception of the evaluation process in response to an identified need, or rapid completion of the whole evaluation process, but linking these ideas to practice still requires investigation.

A scoping review is required to map reports of rapid evaluation for innovations in health and social care, the types of questions for which they are deployed and to identify gaps in our knowledge about these approaches that may inform further research.

Research Questions

In this scoping review we explored the following research questions:

- What methodologies and methods have been used to undertake rapid evaluations of health and social care innovations? How are these approaches suggested to deliver rapidity?
- What is the published, comparative evidence for particular rapid evaluation methodologies? That is, have these methodologies been compared to non-rapid standard (however defined) methods or other rapid methodologies?

Methods

Approaches to scoping for rapid evaluations

In this scoping review, we aimed to: identify and summarise evaluations which had been described as 'rapid'; document the ways in which study authors considered that evaluation was made 'rapid' and summarise evidence that compares the risks and benefits of rapid evaluation and alternative approaches. We accepted authors' definitions of what constituted 'rapid evaluation'. We considered evaluations of the safety and effectiveness of innovations as well as a wider set of outcomes, including acceptability and user experience. In this scoping review we did not seek to assess the quality of studies. We adopted an iterative approach to review methods. Our protocol was completed before the review and published on OSF (10).

Inclusion eligibility

Our inclusion criteria (Table 1) were used to screen the results of the database search. We developed the inclusion criteria iteratively to ensure that the most relevant research was captured; we anticipated this flexibility in the protocol.

We only included publications in English. We documented relevant non-English publications but could not extract data from them or include them in the review due to the available resources.

Search

We searched PubMed/MEDLINE, EMBASE and Health Management Information Consortium (HMIC) databases together with Google and Google scholar. We also looked at websites of key organisations (e.g. RSET, BRACE, Nuffield Trust and Health Foundation, THIS Institute) involved in rapid evaluations and references of identified studies. The search strategy (see Appendix) was developed by an information specialist with expertise in scoping and methodological work. We selected terms to balance sensitivity and specificity. There were two main facets to the search: a search for rapid evaluations undertaken from inception and a search specifically for rapid reviews undertaken from 2014 date used in a high quality scoping review of rapid reviews (5). We subsequently narrowed the scope to exclude rapid reviews (Table 1).

Screening

One researcher screened initial search results by title and abstract and selected potentially relevant records for full text evaluation; a sample of 5% of records was screened by a second researcher for consistency. Records obtained at full text were screened by one researcher; a second researcher assessed 10% of these initially to check consistency and was subsequently available for discussion in cases of uncertainty.

Data extraction

We extracted sufficient information to enable us to classify studies on their key characteristics and to thereby 'chart' the available literature (Arksey & O'Malley; 2005) (11). Following the recommendations of Levac (12) we developed and piloted a bespoke data form to enable coding for the variables listed, using two researchers, with a small sample of included studies. Data were subsequently coded by one researcher, and a sample was cross-checked by a second researcher, who was also consulted in cases of uncertainty.. Coding variables and categories were revised on an iterative basis. Where possible we recorded the following information:

- Study ID including year of publication
- Country, grouped by low or middle income countries (LMIC) and high income
- Definition(s) of rapid evaluation used by authors including timescale
- Study designs as described by authors
- Question(s) the evaluation sought to address
- Type of data collected and collection/analysis methods
- Nature of innovations evaluated (if practical example)
- Nature of outcomes
- Stage, scope, characteristics and purpose of evaluation e.g. local/regional/national; formative/iterative/summative
- Evaluation methods adaptation to context/complexity of intervention

Synthesis and analysis

We grouped the studies around key characteristics. We developed a narrative synthesis to identify the evidence and the gaps regarding the different approaches to rapid evaluation. We also focused on methods and studies relevant to the English NHS context.

Results

Results of the search and screening process

We identified 14,069 records following de-duplication. Preliminary assessment determined 1464 records of potential relevance, and we excluded 1044 records related to rapid reviews. The remaining 420 records were fully assessed and then reduced to 352 records detailing rapid evaluations of innovations (Figure 1).

Most included publications were based in LMIC across Africa (93 studies) and Asia or the Middle East (92 studies), with smaller numbers undertaken in Central and South America (21 studies) and some being multinational. Of the 126 publications about research in Europe, North America or Australasia, a substantial number (54 studies) looked at regulatory process evaluations. Because these regulatory evaluations typically operated at a national or supra-national policy level, we have not documented them in detail, although we considered the applicability of the study designs used. A list of these studies is

available on request. The remaining studies were methods papers, primary evaluations or evaluations of implementation.

Most studies were undertaken in primary care, community settings, or in specific non-hospital-based services (often described as ‘clinics’). This was the case across both high income and LMICs. Relatively few studies took place in alternative settings such as hospitals, schools or prisons.

Because we have an interest in rapid evaluation relevant to the NHS in England, and because of the volume of literature in the review, we focused on data from high income countries, but draw some examples from LMIC studies where appropriate and informative (13). Further details of primary and implementation research studies in the UK and other high income countries, including context and settings, are given in Appendix 2.

Methodologies and methods used for rapid evaluation

After mapping included studies, we identified four preliminary categories that summarise approaches employed with the aim of achieving *rapid* evaluation:

- Use of a methodology designed specifically for rapid evaluation which involved the whole research process;
- Increasing rapidity by doing less, or using a less time-intensive methodology;
- Adaptation of a non-rapid evaluation to make this a rapid part of the wider study (e.g. the recruitment stage of a trial or the analysis phase of a qualitative study)
- Use of alternative technologies and/or data sources to increase rapidity of an existing evaluation methodology;

We also identified a group of studies which described their methods as “rapid” but with limited information on what promoted rapidity. Our initial assessment suggested that evaluations completed within a period of weeks or a few months was what qualified them as “rapid” in the eyes of the authors.

Below we expand on each category, giving illustrative examples for each.

1. Methodology specifically designed for rapid evaluation (rapid methodology)

We identified a number of methodological approaches described as being used specifically for rapid evaluation (examples and methodologies detailed in Supplementary Table 1). Examples include methods described variously as rapid assessment procedures or processes (14, 15); rapid evaluation (16); or rapid appraisal procedures or processes (17–19) and rapid ethnographic assessments, ethnographic appraisals or ethnography (20–25). Many of these approaches were closely related while some were explicit adaptations of other rapid approaches e.g. rapid appraisal (19), rapid participatory appraisal (26, 27) and rapid participatory appraisal with meta-planning (28); or rapid assessment and response (RAR)

(29); rapid assessment response and evaluation (RARE) (30); and rapid assessment procedure informed clinical ethnography (RAPICE) (31, 32). A number of studies described themselves as adaptations of rapid assessment processes for specific evaluation purposes (33–36). Some approaches, such as “plan, do, study, act,” and rapid cycle evaluation were drawn from areas such as quality improvement and wider implementation science (37–39). There was also a small number of papers which examined limitations of a particular methodology or looked at the impact of rapid applications of these methodologies (40–42). This included highlighting the need for researchers to have received an appropriate level of training in the methodology. A small number of methodologies were designed and used solely or primarily in LMIC (e.g. rapid assessment of avoidable blindness) (43).

The overarching characteristics of the methodologies designed to increase rapidity were that they were qualitative or mixed methods. None was exclusively quantitative nor were capable of *comparative* assessment of innovations (as is often required for health technology assessment). The actual methods employed in these studies shared core features including: multiple assessment methods (e.g., a combination of interviews of a small number of participants and wider surveys), and triangulation of data from the different approaches. The types of evaluation questions addressed in these studies largely focused on issues of the applicability of previous research; acceptability of interventions; barriers and facilitators to intervention implementation or access; and stakeholder views and experiences.

2. Increasing rapidity by doing less, or using a less time-intensive version of an existing methodology

The second approach to rapid evaluation described in studies involved undertaking evaluation on a smaller scale or in a less-intensive way (Table 2); sometimes with overlap with use of an alternative technology (see section 4 below) (44, 45).

Sometimes authors carried out a smaller study, with fewer sites and/or participants meaning that less data collection and analysis was required. Shortening the data-collection period was also adopted (46–48). One of these studies (49) represented one of the few comparative studies identified in the review (see section below). Some studies balanced the impact of using smaller samples by employing techniques identified in methods designed specifically for rapid evaluation above, such as stating that they used random or pseudo-random participant/site selection, or selected participants to ensure representativeness (44, 50–52). In other cases no such measures were reported; such studies accepted – explicitly or implicitly – the trade-off between rapidity and representativeness or reliability of research (53). An alternative approach involved using a less-intensive method resulting in reduced information collected for each participant or site. This included using a briefer form of a research tool (survey or questionnaire) (44, 54).

3. Adaptation of part of a standard evaluation method

Several included studies reported methods they used with the aim of increasing the rapidity of a discrete element or stage of an evaluation, where the evaluation as a whole used a standard, non-rapid method

(Table 3). This usually targeted the earlier stages of an evaluation process, including research priority setting (59, 60), ethical approval (61), and participant identification and recruitment. In some cases these addressed challenges specific to LMIC contexts or recruitment of participants from minority communities. For example, methods were employed to ensure informed consent so that enrolment for subsequent studies could be undertaken rapidly because necessary groundwork had been undertaken (62–67). At later stages of the evaluation process we identified continuous collection or data analyses as a means to increase rapidity of evaluation in RCTs (68, 69). In qualitative studies the focus was on rapid methods for data analysis (70, 71). Here, as in section 2 above there was some overlap with the use of technological innovation to increase rapidity (see section 4 below) (72)

4. Using alternative technology or data source

The use of different or newer technology to rapidly acquire and/or analyse routine data was another approach to making evaluation more rapid (Table 4). As we have noted there is some overlap between this and the classifications above but think that this is worth considering separately as it represents a technological streamlining of an existing process rather than an adaptation of the research design (44, 45). These studies involved using technology to automate or otherwise try to improve rapidity of one or more of data collection, collation, or analysis. Studies which involved acquiring or using existing data sets to enable modelling of effectiveness were also included (80–82). A majority of these studies were undertaken in the context of monitoring of uptake and safety profiles of vaccinations.

Studies which simply described methods as rapid

A number of studies described themselves as ‘rapid’ without identifying the use of an explicit methodology or approach. These studies often reported a timeframe of weeks or months for the research. We noted above that some used core elements of recognised methodologies but some gave very little or no information. Studies which did this without giving any information about the methods employed were reported in abstract form only; contacting authors was beyond the remit of this scoping review. We also noted that this was more common in studies taking place in LMIC which were outside the narrower final scope of the review; this may have been due to greater pressure on resource and time.

Studies comparing a rapid with an alternative method

In a small number of cases we identified comparisons of a rapid evaluation/method with a standard method but these were limited in number, perhaps because rapid evaluations are being undertaken out of necessity and because they are undertaken to address particular types of research questions.

One study compared the use of rapid evaluation with standard evaluation of an enhanced health programme in care homes; the study was described as assessing rapid evaluation but the rapid evaluation itself took 2.5 years (49). Nevertheless this was the only explicit comparison we found. This study assessed the cost consequences of implementing the programme and compared the use of shorter and longer-term interrupted time-series (ITS) analyses, using shorter and longer time-series of aggregated data (49). The authors found that the longer-term analyses had a materially different interpretation, an

improved model fit and greater precision; they considered that the shorter-term analyses produced results likely to be misleading. The time period required for acceptable internally valid ITS based studies is contested more generally (88–91).

A second study compared rapid with usual qualitative analysis in an evaluation of a home birth service in the UK (70). The study authors reported on the total time taken in the data-management process as well as the analysis component; the agreement between the findings and recommendations of the two processes was also considered. The authors concluded that rapid analysis delivered a modest time-saving which may have been greater if there had been greater concordance between the characteristics of the two research teams; there was substantial overlap in findings between the two analysis approaches but recommendations diverged more. The two analyses were undertaken by different research teams which had differing levels of contextual experience, different stakeholder audiences and differing opportunities for analysis discussion and this was identified as a limitation in the study, together with the fact that rapid analysis was a novel approach for the researchers involved. The study authors concluded that rapid analysis may potentially deliver valid findings while taking less time; but recommended further comparisons using additional data sets with more similar research teams.

Discussion

Summary

This scoping review identified a lack of clarity about approaches described under the term rapid evaluation in primary research. The approaches to rapid evaluation which we identified could be grouped into four broad categories: studies using specific methodologies designed for rapid evaluation; studies which carried out less evaluation or less intensive evaluation; studies which used rapid methods only for a particular stage of evaluation; studies which used technology to increase rapidity. We also identified some studies which either described themselves as rapid but did not indicate what made them rapid, or only stated a timeframe as being what made them rapid. There was very little comparative research on the impact of using rapid rather than standard evaluation outside of regulatory frameworks (49, 70).

It is notable that we did not identify rapid evaluation methodologies clearly designed to assess the comparative effectiveness of innovations. Studies using bespoke, rapid methodologies used qualitative or mixed methods and mainly assessed aspects of user experience and acceptability along with associated barriers and facilitators, and the implementation of innovations in particular contexts. This may reflect the types of questions which are considered suitable for rapid evaluation and the impetus to develop rapid evaluation methods in these areas of research but it may also reflect conceptions of what evaluation is possible within a limited timeframe.

Limitations of the review

Because this is a scoping rather than a full systematic review we did not conduct quality assessment of the identified studies; we therefore document the nature of the research available rather than assessing

its reliability (11, 12). We do not attempt to evaluate the success or otherwise of methods proposed as enabling rapid evaluation but have accepted study authors' own assessments of the usefulness or success of their methods. A further limitation of this review is that we were unable to identify (and therefore include) studies that may have carried out work which represents rapid evaluation but have failed to describe it as such (for example, retrospective quantitative analyses). This is a consequence of our focus on work that was described as rapid by its authors. Conversely, we identified some evaluations which the study authors described as rapid, but which would not commonly be considered as rapid, except in comparison to an even more detailed and lengthy standard process. We explicitly excluded pilot studies (often RCTs) because these were considered to be assessing feasibility rather than undertaking evaluation (92). This may have contributed to a skewing of the literature identified towards non-quantitative methods, but the pilot studies we did identify did not label themselves as being rapid studies e.g.(93–95). We are aware that we may therefore have omitted some examples of studies which would meet some definitions of rapid. However, these limitations would not explain the relative paucity of studies comparing rapid to alternative methods in the identified literature; this appears to be a genuine evidence gap.

Interpretation of the studies

The drive towards rapid evaluation raises tensions for those commissioning and delivering research. Evaluation studies strive to achieve rigour (broadly, internal and external validity, or their qualitative equivalents) and scope (answering a range of questions, including those relating to access, effectiveness, cost effectiveness, acceptability, equity and implementation). These have to be achieved under constraints of cost and time. The greater the scope of the project, and the greater the protection against validity threats, the higher is the cost and time. These known trade-offs are being explored by organisations such as BRACE and RSET (96).

Occasionally, researchers can trade off time against cost. For example, national recruitment drives (such as those under COVID in trials such as RECOVERY) have maintained high levels rigour under time pressure by deploying significant resources (97). Some of the factors delaying evaluation delivery can be managed through additional resources. However some, such as long-term follow up, cannot be managed in that way. In regulatory contexts these trade-offs may be addressed through mechanisms of post-marketing surveillance (98), but this only applies to a subset of innovations such as pharmaceuticals or medical devices.

Where studies cannot be accelerated through additional resource, or where costs are constrained, rapid evaluation essentially involves trading off rigour or scope against time. Some of those trade-offs can be profound. For example, a study of new innovation might eschew questions of comparative effectiveness and cost-effectiveness entirely and restrict the scope of the study to issues of staff acceptability and implementation. This seemed to be the approach adopted in some of the studies identified in the review. Quantitative rapid evaluations are more likely to evaluate impacts of innovations on short-term indicators (such as processes of care) which are often proxies for outcomes where longer-term follow-up is required. Therefore the limitations of such approaches are likely to depend on the strength and consistency of the

relationship between the proxy and the ideal longer-term outcome. Some decision-making frameworks (such as the NICE digital framework) specifically identify some interventions where such significant trade-offs are legitimate (99). Contextual pressures (such as the pandemic) may force trade-offs to ensure timely decisions; such pressures of available resource may partially explain why the majority of primary research identified was based in LMIC countries.

Other trade-offs will be more marginal. For example, a decision maker might accept a smaller sample (and hence a lower level of quantitative precision) or more selective recruitment (at some cost in external validity). It is also the case that reduced statistical power related to using shorter post-intervention time periods might be at least partly offset by using a comparative design (such as difference-in-differences) rather than interrupted time series, since estimates from comparative designs are based on more information than non-comparative approaches. Such trade-offs impact on rigour and scope in a more limited way that might be more acceptable. Larger trade-offs will be potentially easier to assess in terms of their impact – for example, eschewing questions of comparative effectiveness will, or should, restrict what can be claimed about an innovation. Some trade-offs are more difficult to judge in terms of their impact.

The role of rapid evaluation methodology is to reduce impacts on rigour and scope as far as possible, while maintaining the benefits in terms of time. We identified several examples of these in the literature, although there was limited comparative work on their success (49, 70). Since conducting prospective comparisons of rapid and non-rapid evaluation methods is time-consuming and resource intensive, it may be possible to use retrospective analysis of existing data to explore the impact of using shorter analysis periods. For example it would be possible to conduct a sensitivity analysis of truncated sets of timepoints in an interrupted time series, and to compare the results to the full analysis. Performing such analyses on several sets of data from different studies would allow assessment of whether there was a consistent impact on results but would be possible with only a limited set of study designs.

Future research

There is a need for clarity and consistency in terms of what constitutes rapid evaluation and, in particular, what demarcates rapid and non-rapid evaluation. Consensus on definitions and more consistent labelling will be important in allowing ongoing assessment of this developing field. We suggest that better description would involve clarity about what aspects of the research process were conducted more rapidly, when this occurred in the research process, and what the potential impacts could be.

The development of specific rapid methodologies and technologies are needed to provide a toolkit for research teams to meet the challenges of rapid evaluation.

The development of these methodologies needs to be matched by comparative work on their advantages and disadvantages, such as the impact on uncertainty. Such comparative work will be challenging, adding cost and complexity in a context where commissioners and researchers are seeking to reduce

both and will require innovative methodologies, such as testing rapid methods nested within 'standard' projects e.g. (68, 69) to maximise efficiency.

Declarations

Ethics approval and consent to participate

This is a scoping review of previously published studies so ethical approval and consent to participate are not applicable.

Consent for publication

Not applicable

Availability of data and materials

This is a scoping review of previously published studies so all the data used in the review is already in the public domain. Full lists of all studies considered after initial screening are available from the corresponding author on reasonable request, together with the dataset generated by the review process. Studies whose data substantially contributed to the review are cited in the bibliography.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

GN and TM carried out the review process with input from JD, PB, PW and NC. All authors contributed to interpretation of the data. GN wrote the first draft of the manuscript text. TM, PB, PW and NC reviewed and substantially edited and revised the manuscript.

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Tables

Due to technical limitations, table 1 is only available as a download in the Supplemental Files section.

Table 2
Approaches to increasing rapidity through less evaluation/less time-intensive evaluation

Approach employed with aim of increasing rapidity	Description of methods	Example
Shortening response period	Survey; safety monitoring cohort. Survey also used increased number of reminders to improve response rate	Joseph 2003(46) Demeulemeester 2017(47) Ghandi-Banga 2018(48)
Using telephone instead of face-to-face interviews	Interviews	Williams 2019(45) Wichmann 2009(44)
Using a rapid interview method	Interviews; need to apply rapid method appropriately noted	Hamilton 2013 (54)
Using fewer participants in interviews	Interviews. Additional measures included random or quasi-random sampling of participants; use of samples selected for representativeness; use of small core group for all stages of project.	Wichmann 2010; (44) Dunbar 2018;(55) Brown-Johnson 2019;(56) Hamaraman 2014(57) Quintero Romero 2006 (58) Loosier 2010 (50)
Using fewer study sites	Lot quality survey etc. Random or quasi-random site selection (e.g. housing blocks; in some instances the selection of sites/participants is the same process.	Brown-Johnson 2019; Hamaraman 2014(56, 57). Cakir 2008;(51) Akande 2005(52) are examples from LMIC
Evaluating a small/low volume site	Site audit/evaluation – acknowledged small site volume made rapidity possible	Delaney 2019(53)
Using a shorter time-scale for pre/post data periods	Interrupted time series – non-rapid comparator method also used.	McCarthy 2019(49)

Table 3

Adaptation of a discrete stage of a non-rapid evaluation to make this a rapid part of the wider study

Study stage targeted for rapid methods	Rapid methods	Examples
Priority setting	To improve rapidity of research question prioritisation; applicable to multiple study designs.	Gray 2017; Newlands 2018,(59, 60)
Ethics approval	Intended to reduce time to obtain ethical approval by addressing requirements for multiple approvals; applicable to multiple study designs.	Khan 2014 (61)
Recruitment and participation	Reducing time taken to identify participants and complete recruitment through methods to pre-specify or identify potential participant. Primarily used in RCTs.	Bower 2015; Brown 2019; Deane 2017 (73-75)
Rapid bilingual appraisal	Reducing barriers to inclusion in rapid evaluation; applicable to multiple study designs where language is a potential barrier.	Whelan 2004 (67)
Ensuring informed consent	Preliminary work to enable more ethical and rapid recruitment; applicable to multiple study designs. Examples identified come from LMIC.	Kenge-Ouafo 2014; Abay 2016; Addissie 2016; Gebresilase 2015; Bull 2012 (62-66)
Assessment of barriers to process	Tool for rapid assessment of barriers to process; assessed within an RCT.	Alolod 2015, 2016 Traino 2012 (76-78)
Structure of treatment groups/assignment	Proposal for flexible structuring of treatment assignment and use of single control group for multiple potential vaccine candidates in multi-stage RCT.	Moodie 2013 (79)
Nesting of additional studies	Continuous rapid data analysis in realist study embedded in standard RCT.	Hensel 2016 (69)
Data collection	Bespoke reporting platform; cohort study protocol to rapidly assess vaccines as well as epidemiology of disease.	Simpson 2015 (72)
	Data tracking and rapid continuous feedback to participants (My Own Health Report). Designed to provide continuous collection and analysis of data in a pragmatic RCT.	Glasgow 2014 (68)
Data analysis	Rapid analysis of data with or without other rapid stages; used in qualitative (comparative) study; embedded realist study; cohort study.	Taylor 2018; Burgess-Allen 2010; Glasgow 2014; Hensel 2016 (68-71)

Table 4
Use of an alternative technology or data source

Study authors' suggested rapid innovation	Research design	Impact/intention of method	Example(s)
New digital systems	Registry study	Introduction of new computerised systems to assess vaccination coverage of routine immunisation programmes; computerised child registers also became available. Computer-assisted telephone surveys. Authors stated that it enabled more timely feedback to co-ordinators of district vaccination programmes and rapid identification of random samples for interview	Begg 1989 (83) Wichmann 2009(44) Williams 2019 (45)
Using bespoke data platform	Cohort	Nationally representative sample assessed using linking of multiple data sources from clinical practice, laboratory results and death certification. Designed to assess pandemic influenza reporting and vaccination impact; plan to be implemented for future influenza pandemic	Simpson 2015(72)
Secure web-based tool for pharmacovigilance	Cohort	Secure web-based tool for small number of set fields focused on single medications in hospice context using rapid prospective reporting at agreed time-points to allow rapid aggregation of data on small numbers of participants from multiple centres	Currow 2012(84)
Automation of data collection	Registry study	Use of hospital routine data collection to populate registry with validation to analyse costs for two different methods of triage of designated patient group	Noack 2018(82)
Automation of data processing	Registry study	Use of regional/organisational vaccine information system to rapidly assess influenza vaccine campaign safety and coverage	Alguacil-Ramos 2019(85) CDC 2005(86)
Use of existing data sets	Registry-based studies	Use of data from an insurance database to populate a comparison of a specified adverse event (identified by an RCT) between interventions, using a much larger population	Gagne 2013 (87) Dodd 2018(81) Noack 2018(82)
Simulation of impact of vaccination using existing health care data sets	Simulation study	Use of established data sets to run simulations on how vaccine coverage and population characteristics impact ability to detect safety signals for influenza vaccinations. Signal generation recommendation only.	Dodd 2018(81)

Figures

Figure 1

PRISMA diagram showing study flow for the review

Supplementary Files

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