Implementation Science

SYSTEMATIC REVIEW

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Reporting feedback on healthcare outcomes to improve quality in care: a scoping review

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Abstract

Background Providing healthcare providers (HCPs) feedback on their practice patterns and achieved outcomes is a mild to moderately effective strategy for improving healthcare quality. Best practices for providing feedback have been proposed. However, it is unknown how these strategies are implemented in practice and what their real-world effectiveness is. This scoping review addresses this gap by examining the use and reported impact of feedback reporting practices in various clinical fields.

Methods A systematic review of the literature was conducted, and electronic databases were searched for publications in English between 2010—June 2024. We included studies that utilized and evaluated feedback reporting to change HCP behaviours and enhance outcomes, using either qualitative or quantitative designs. Two researchers reviewed and extracted data from full texts of eligible studies, including information on study objectives, types of quality indicators, sources of data, types of feedback reporting practices, and co-interventions implemented.

Results In 279 included studies we found that most studies implemented best practices in reporting feedback, including peer comparisons (66%), active delivery of feedback (65%), timely feedback (56%), feedback specific to HCPs' practice (37%), and reporting feedback in group settings (27%). The majority (68%) combined feedback with co-interventions, such as education, post-feedback consultations, reminders, action toolboxes, social influence, and incentives. 81% showed improvement in quality indicators associated with feedback interventions. Interventions targeting outcome measures were reported as less successful than those targeting process measures, or both. Feedback interventions appeared to be more successful when supplemented with post-feedback consultations, reminders, education, and action toolboxes.

Conclusion This review provides a comprehensive overview of strategies used to implement feedback interventions in a wide range of practice settings. Targeting process measures or combining them with outcome measures results in more positive outcomes. Additionally, feedback interventions may be slightly more effective when combined with other interventions designed to facilitate behaviour change. These findings can provide valuable insights for others wishing to implement similar interventions.

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Keywords Quality of care, Audit and feedback, Healthcare providers, Feedback reports, Performance measurement, Value-based healthcare

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Contributions to the literature

- Reporting feedback to care providers on care processes and outcomes is widely used to improve care delivery with mild-to-moderate efficacy. Evidence synthesis of the best feedback approaches applied in practice is lacking.
- This scoping review synthesizes evidence on feedback reporting practices from various clinical fields and research methodologies and highlights co-interventions most likely to be successful in achieving behaviour change and clinical improvement.
- The results will help feedback designers, policymakers, and researchers to implement targeted feedback reporting strategies and identify areas for future research.

Background

Healthcare systems face challenges in ensuring high-quality care while managing rising healthcare costs [1]. Variability in care delivery and outcomes across clinical settings further raises concerns about the consistency and quality of care provided [2]. In response to these challenges, Porter and Teisberg introduced the concept of value-based healthcare (VBHC), which defines value as the outcomes achieved relative to the costs of achieving them [3]. VBHC emphasizes improving value for patients by systematically monitoring and evaluating patient-centred quality indicators, such as patient-reported outcome measures (PROMs), patient-reported experience measures (PREMs), and clinician-reported measures [4–8]. However, a critical gap in VBHC lies in the uncertainty surrounding how to utilize collected data to enhance care processes effectively [9].

A common strategy to improve care is providing feedback to healthcare providers (HCPs) based on data about their performance, often known as Audit and Feedback. In such strategies, HCP's data on outcomes and processes of care is compared to predefined standards or peers' performance data [10]. The primary goal of feedback is to facilitate evidence-based practice by integrating clinical guidelines, standardizing care processes, and identifying areas for improvement [11]. Control theory suggests that by making performance data visible, feedback helps HCPs recognize gaps in care, prioritize quality improvement efforts, and enhance patient outcomes [12]. Feedback can be reported at the individual or team level, and can differ in terms of content, recipients (e.g., individual clinicians, teams, or organizations), delivery modes (e.g., written or verbal), and contexts. Their primary objective is to initiate a learning cycle that includes data monitoring, reflection, adjustments to care, and documentation of changes [13, 14]. In this study, we refer to these practices as feedback interventions [13].

Despite widespread use, feedback interventions demonstrate modest, variable effectiveness [15], with progress plateauing in recent decades [16, 17]. Progress in the efficacy of feedback interventions may be hindered by the limited use of theory to understand the mechanisms driving behaviour change. Theories of behaviour change, such as the Clinical Performance Intervention Theory (CP-FIT), offer valuable frameworks for understanding these mechanisms [14]. CP-FIT conceptualizes feedback as part of a sequential process, encompassing goal setting, interaction with data, perception, acceptance, intention formation, and behavioural adaptation. It identifies key factors—recipient characteristics, feedback attributes, and contextual variables—that influence each step. Importantly, CP-FIT underscores the role of feedback presentation and delivery as critical determinants of success.

To support effective feedback design, CP-FIT encompasses 42 recommendations to design effective feedback interventions of which 12 are related to display and delivery of feedback, including providing peer comparisons, delivering feedback through knowledgeable sources, ensuring timely reporting, and using user-friendly designs [14]. While these practices are supported by extensive qualitative data and theories, there is a lack of comprehensive overview of studies with diverse research designs and clinical settings to understand the effective application of feedback reporting strategies in practice [9, 14].

Additionally, despite well-designed feedback interventions, HCPs often encounter barriers that hinder behaviour change [18, 19]. While comprehensive reviews addressing barriers to implement feedback interventions are lacking, Geerligs et al. identified key challenges arising from organizational factors, such as misalignment with organizational culture and workflow incompatibility with the intervention [20]. Staff-related barriers include resistance to change, insufficient commitment, unclear roles, and inadequate skills to effectively engage with feedback. Furthermore, structural issues such as underdeveloped data infrastructure [21, 22], competing organizational goals [23], and the absence of a systematic approach to implementing insights gained from feedback exacerbate these challenges [21].

To address these barriers, feedback interventions are often paired with complementary implementation strategies (co-interventions) to enhance engagement and promote the adoption of evidence-based practices [24]. When feedback serves as the primary intervention, co-interventions are used to either help HCPs engage with feedback to change practice (e.g., through education or consultations) or facilitate behaviour change (e.g., incorporating an action toolbox within a feedback dashboard)

[14]. Grol et al. categorized these implementation strategies into facilitative (e.g., training, reminders) and coercive approaches (e.g., financial incentives, leveraging social influence) [19]. Literature suggests that implementation strategies tailored to overcome contextual barriers and support both the interaction with feedback and post-feedback actions improve the effectiveness of feedback interventions [14]. Previous reviews have investigated the effectiveness of different implementation strategies in clinical practice [25–28], however, a formal evidence synthesis of these strategies within the context of feedback interventions remains absent, highlighting an important gap in the literature.

In summary, various methods for reporting feedback and influencing the behaviour of HCPs through co-interventions have been suggested in the literature. However, the absence of thorough formal assessments of these methods leads to a lack of clarity regarding their effectiveness. This review examines feedback interventions across diverse healthcare settings to understand how they are implemented in practice and identifies mechanisms that consistently drive behaviour change, regardless of contextual differences.

Objective and research questions

This scoping review aimed to assess current evidence regarding the utilization and effectiveness of feedback approaches and co-interventions to involve HCPs in continuous learning and quality improvement. This led to the following three research questions (RQs):

1. What methods are applied in clinical practice for reporting feedback to HCPs?
2. What co-interventions are applied in clinical practice to facilitate HCPs' behaviour change when reporting feedback?
3. What are the reported impacts of feedback (co-) interventions on care processes and patient outcomes?

Methods

A scoping review was performed using the Joanna Briggs Institute methodology [29]. Scoping reviews efficiently map and summarize diverse literature on a broad topic, offering an overview irrespective of evidence quality, in contrast to other systematic review types [30, 31]. Our study protocol was registered on Open Science Framework (https://doi.org/ https://doi.org/10.17605/OSF.IO/GAJVS) [32]. Results are presented following the PRISMA flow diagram [33], and the PRISMA-ScR (preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews) checklist [34] (Additional file 1). The authors acknowledge the assistance of OpenAI's ChatGPT in refining sentence structure and improving clarity during the manuscript preparation. ChatGPT was used solely for language support, with all research and analysis conducted independently by the authors.

Inclusion criteria

The inclusion criteria sought studies that met the following conditions:

1. Empirical studies in which feedback interventions are evaluated, using either qualitative or quantitative study designs (including pilot studies).
2. Studies in English language.
3. Studies published between January 2010 and June 2024 to ensure the incorporation of the most up-to-date research on feedback practices in healthcare. This timeframe was selected to capture key developments, such as value-based healthcare (VBHC) [35], EHR-integrated feedback, and real-time performance monitoring [36]. Additionally, research prior to 2010 was found to have limited use of theory in intervention design [37], further justifying the focus on more recent studies that integrate these advancements.
4. Studies in which all of the following are true:
    a. End-users are HCPs involved in patient care, including physicians, nurses, surgeons, and other clinical providers. This broad definition was chosen as feedback interventions aimed at improving care quality apply across various roles within healthcare settings. Feedback interventions directed at trainee HCPs were excluded as such interventions targeted on trainees typically prioritize proficiency in clinical duties rather than learning from practice data.
    b. Feedback is provided to HCPs with the goal of improving the quality of care, defined as improvements in process measures (e.g., adherence to clinical guidelines, timely care delivery) and outcome measures (e.g., patient health outcomes, satisfaction) [38].
    c. Methods of feedback reporting (quality indicators used, mode of feedback reporting) are clearly described.
5. For studies involving multifaceted interventions to improve quality of care, feedback must serve as a core component:

a Either as standalone approaches or in combination with co-interventions as a core intervention.
b These feedback interventions should assess quality of care using:

- Process measures and/or
- Outcome measures.

Search strategy

Comprehensive searches in MEDLINE (Ovid), CINAHL (EBSCO), Embase (Ovid), PsycINFO (Ovid), Cochrane Library, Scopus, and Google Scholar were conducted. Expert librarians assisted in utilizing controlled vocabulary (e.g., MeSH, Emtree) to capture relevant terms related to HCPs' performance and feedback reporting. Multiple pilot searches were performed, combining Medical Subject Headings with text words and synonyms for terms such as feedback,' 'audit and feedback,' 'performance feedback,' 'dashboard,' 'data communication,' 'quality improvement,' and 'healthcare professionals.'

The search strategy incorporated wildcard characters and Boolean logic for variations in spelling and plural forms. Index terms were adapted for each database. The search was initially conducted in December 2022 and updated in June 2024. Articles from the initial search and exemplar articles identified by our team were used to develop and refine search terms and indexing. The full search strategy for all databases is provided in Additional file 2.

Selection of studies

After compiling and organizing the identified studies, they were uploaded into Rayyan, a web-based tool designed for systematic reviews [39]. Duplicates were removed, and 6,282 studies were eligible for title and abstract screening. One reviewer (EV) manually screened titles and abstracts, while the second reviewer (MA) utilized ASReview, an open-source machine learning aided software [40]. This combined approach balanced nuanced interpretation with rapid processing, consistency, and error reduction [41, 42]. ASReview offers various classifier models to determine the relevance of included articles. For our study, we used the default settings [41, 43]. Before screening, ASReview was trained on 5 relevant and 5 irrelevant articles manually screened and uploaded in the software to allow the software to identify relevant articles more accurately. Subsequently, MA assessed articles based on eligibility criteria until encountering 100 consecutive irrelevant articles, marking completion of this phase. After title and abstract screening, full texts of potentially eligible articles were retrieved and independently screened by MA and EV against the inclusion criteria. Disagreements during title and abstract screening, as well as full text screening, were resolved through consensus or consultation with the senior author (WD). All excluded articles were meticulously documented, including reasons for their exclusion.

Data charting and analysis

A Microsoft Excel-based data charting form was developed and tested by MA and EV to identify variables relevant to the RQs. The form included sections such as author(s), publication year, study objectives, study design, research methods, intervention details, and results. To synthesize evidence on methods used in clinical practice for reporting feedback to HCPs (RQ1), data were collected on feedback modes, quality indicators, and the application of best practices outlined in the CP-FIT framework for feedback display and delivery [14]. Each study was evaluated to determine whether it adhered to the CP-FIT best practices. We calculated the average number of best practices used per study, identified the most and least frequently applied practices, and provided examples of their practical implementation (see Additional file 3). To answer which co-interventions are applied in practice to facilitate behaviour change (RQ2), we collected data defining co-interventions as strategies in combination with feedback to either facilitate engagement with feedback or target specific behaviours to support the feedback process and enhance the effectiveness of the intervention. We applied the Expert Recommendations for Implementing Change (ERIC) taxonomy to list different co-interventions [11]. Additionally, the framework of implementing new interventions in clinical practice by Grol et al. (1992) was employed to categorize the co-interventions into facilitative and coercive approaches [19]. Facilitative approaches included competence-based (e.g., education, post-feedback consultations) and performance-based (e.g., reminders) interventions, while coercive approaches involved structural changes in environment and financial incentives to facilitate behaviour change. To collect evidence on the reported impacts of feedback (co-) interventions on care processes and patient outcomes (RQ3), descriptive analyses using tables and graphical figures were performed to compare the number of studies that reported positive outcomes across various research designs, types of co-interventions, and quality indicators. A positive outcome was defined as a statistically significant improvement ($p < 0.05$) in the desired direction after the intervention in at least one primary quality indicator targeted for change. The included studies were categorized based on the Joanna Briggs Institute (JBI) Levels of Evidence for Effectiveness, which reflect the strength and reliability of the evidence. Studies were assigned level 1 (experimental), level 2

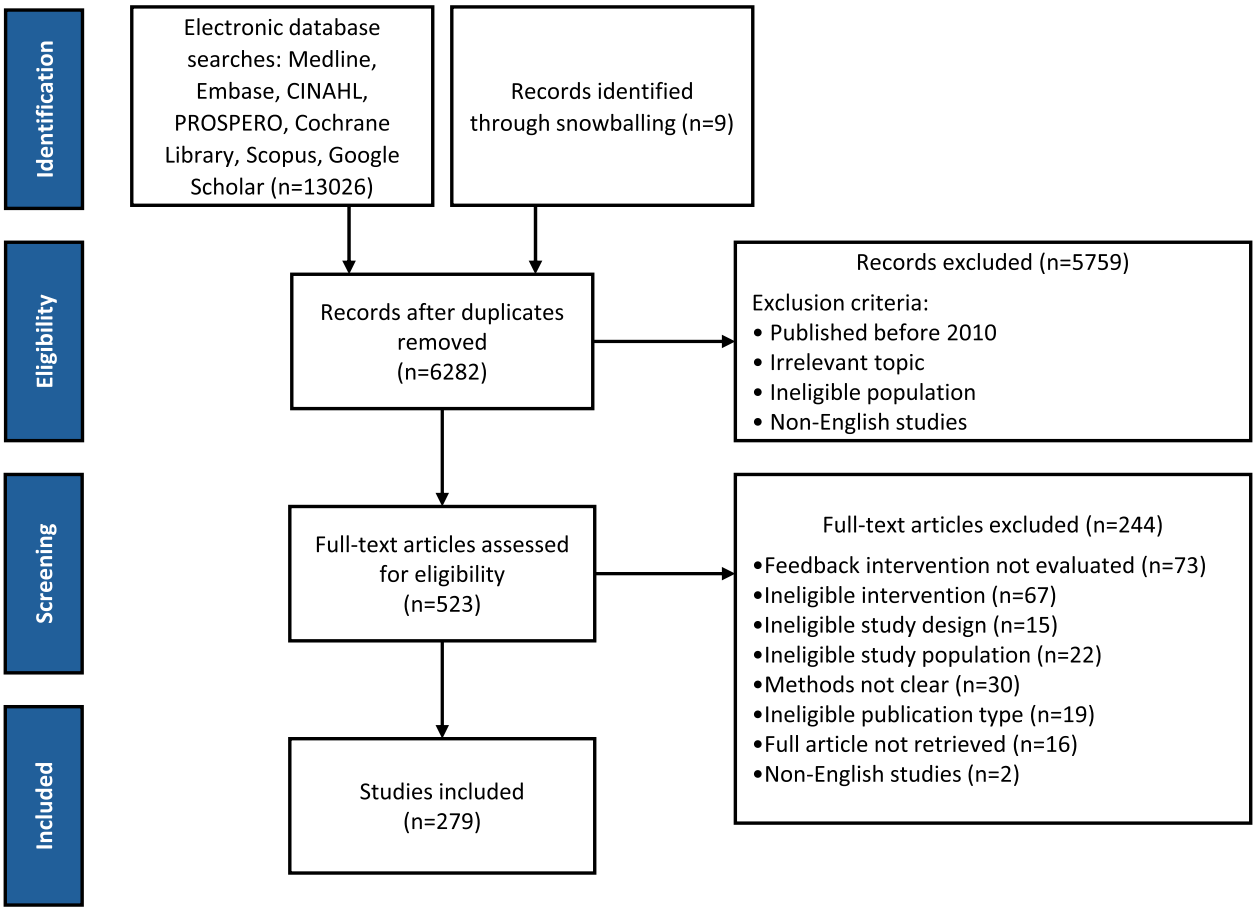

Fig. 1 Flowchart of the literature search

(quasi-experimental), level 3 (analytical), level 4 (descriptive) or level 5 (expert opinion) [44]. Finally, qualitative data presented in the studies underwent a combined inductive and deductive thematic analysis to identify and summarize factors contributing to intervention effectiveness. The analysis process began with an inductive approach to allow themes to emerge directly from qualitative data from the included studies. Data were categorized into factors related to feedback intervention and other factors affecting HCP behaviour. Later, subthemes (e.g., valid data, meaningful data) were mapped to the CP-FIT framework, using a deductive approach to conceptualize how identified factors influenced behaviour change. The primary analysis was conducted by MA, while WD reviewed the codes, themes, and final interpretations through detailed discussions. These discussions served to enhance the trustworthiness of the findings by ensuring consensus and refining interpretations.

Results

Study selection process

The database searches initially identified 13,026 articles, with an additional 9 articles retrieved through snowballing references. Following the removal of 6,753 duplicates, 6,282 unique articles underwent screening. Of those, 523 articles underwent full-text review, resulting in a total of 279 articles for detailed analysis. Figure 1 summarizes the review process of the publications using a PRISMA flowchart [33]. Additional file 3 includes an overview of studies and extracted data.

Additional file 4 provides a list of studies excluded at the full-text level, along with the reasons for their exclusion.

Study characteristics

Included studies were published between 2010 and June 2024, with the majority published after 2017 (69%) (Fig. 2). Most of the studies originated from the United States of America (39%) and Canada (17%). Figure 3 depicts that in 27% of the included studies feedback was used in primary care (adult and paediatric),

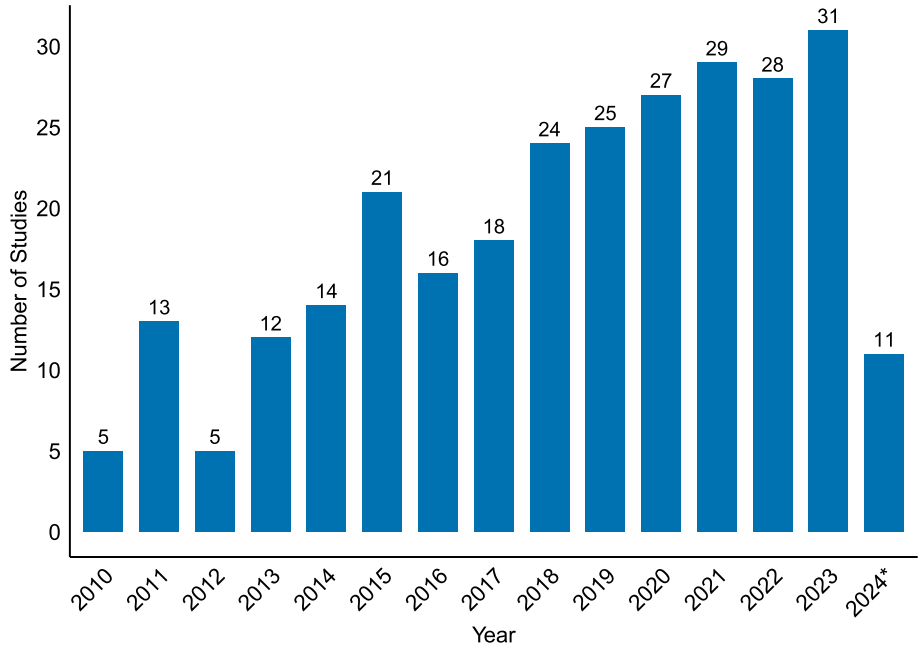

Fig. 2 Number of publications per year. Legend: Note. Studies were searched up to June 2024

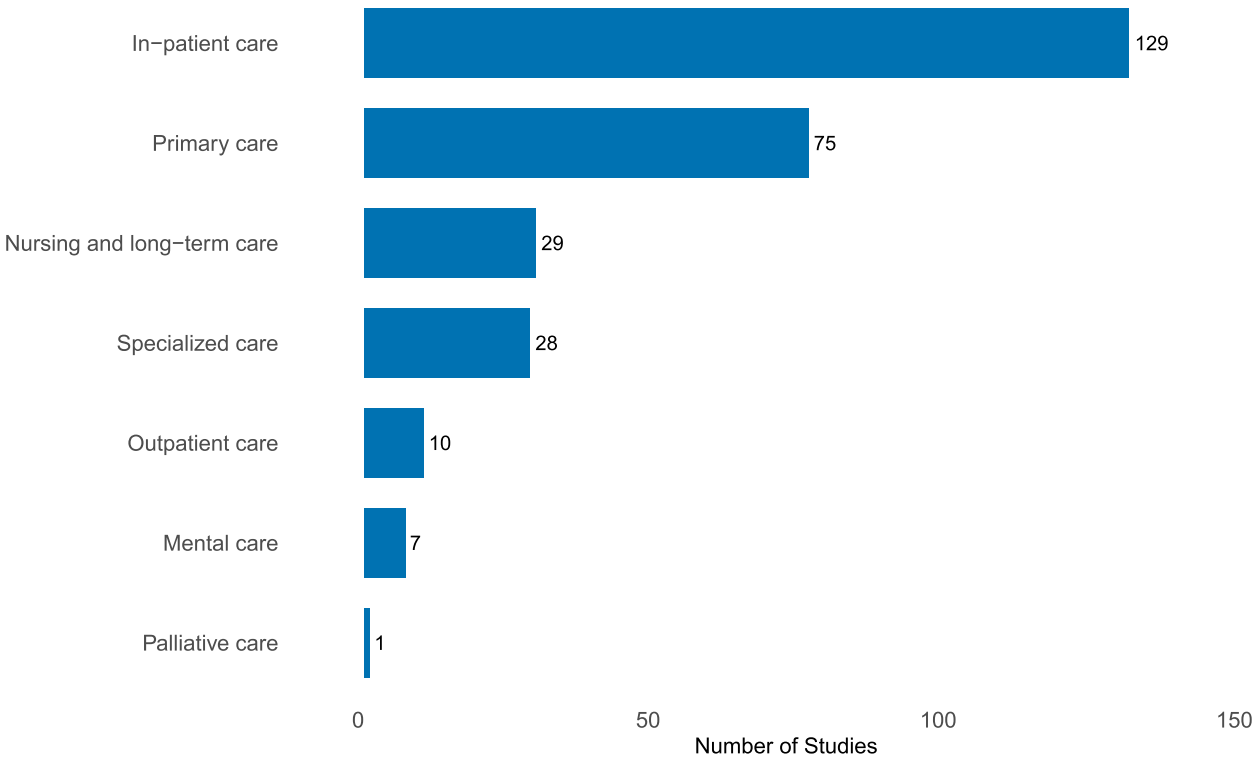

Fig. 3 Number of publications per clinical area

46% in in-patient care (pre/post-surgical care, tertiary hospitals), 10% in nursing and long-term care, 10% in specialized care settings (e.g., cancer care, urology, respiratory care, dermal care), 4% in out-patient care, 3% in other care settings (e.g., palliative care, mental care). A majority of the studies compared feedback interventions with usual care or no intervention (80%). Only a minority compared the feedback intervention with another intervention (20%). Among the included studies, 50% were pre-post studies without a control group (JBI level 2), 22% randomized controlled trials (RCTs) (JBI level 1), 16% qualitaative studies (JBI level 5), 10% quasi-experimental (JBI level 2) and 2% stepped wedge trials (JBI level 1) (Table 1).

Methods applied in clinical practice for reporting feedback

Table 2 summarizes the types of feedback reporting practices used. Most studies delivered feedback in a written format, primarily utilizing written reports or emails (37%), 15% studies reported feedback verbally, 20% studies reported feedback using a combined method and 18% studies applied digital formats such as online dashboard or web-based systems. In terms of the quality indicators used in the interventions, 60% of studies used only process measures, 8% used only outcome measures, and 25% used a combination of both. In 7% of studies, the types of measures weren't clearly reported. Process measures included clinical assessments (e.g., catheter removal, compliance related to pain assessment tools), adherence to guidelines, prescribing behaviours (e.g., VTE prophylaxis, radiation use, antibiotics, statins), resource utilization (e.g., colonoscopy process indicators for cancer, ICU stay, hospital readmission, ER visits), and documentation of procedures (e.g., discharge summary documentation). Outcome measures comprised clinician-reported outcomes (e.g., bloodstream infection rates, prevalence of anaemia e.g., clinical remission, blood pressure control, glycated haemoglobin (HbA1c)), adverse outcomes (e.g., rate of severe hyperglycaemia days, acquired pressure ulcers prevalence, mortality rates and cardiovascular events), and patient-reported outcome measures (PROMs) (e.g., self-reported pain). Additionally, two studies fell under the 'other' category, examining healthcare professionals' ratings of their professionalism.

Table 1 Summary of study designs

Study Design	Comparing feedback intervention to no intervention *N* = 224 (80%)	Comparing feedback intervention with another intervention *N* = 55 (20%)
RCT *N* = 61 (22%)	30 (13%)	31 (57%)
Stepped wedge trial *N* = 7 (2%)	7 (3%)	0 (0%)
Quasi experimental controlled *N* = 27 (10%)	13 (6%)	14 (25%)
Pre-post with historic control *N* = 140 (50%)	135 (60%)	5 (9%)
Qualitative *N* = 44 (16%)	39 (18%)	5 (9%)

Best practices of reporting feedback recommended by CP-FIT

On average, the included studies implemented 3 out of the 12 recommended best practices for feedback reporting (Table 3; Additional file 3) [14]. The most frequently employed practices were providing feedback with peer comparisons (66%), delivering timely feedback (56%), offering feedback specific to HCPs' practice (37%), actively delivering feedback (65%), and presenting feedback in group settings (27%). In contrast, some best practices were infrequently

Table 2 Methods to deliver feedback

Category	Sub-category	N (%)
Mode of feedback reporting	Verbal and written	57 (20%)
	Written/ emails	102 (37%)
	Verbal	41 (15%)
	Dashboard	34 (12%)
	Not known	28 (10%)
	Web-based system	18 (6%)
Choice of quality indicators	Only outcome measures	21 (8%)
	Only process measures	168 (60%)
	Both	70 (25%)
	Not described	20 (7%)
Types of quality indicators	Clinical assessments/ procedures	70 (29%)
	Prescribing behaviours	52 (22%)
	Adherence to guidelines	29 (12%)
	Resource Utilization	22 (9%)
	Documentation of measurements	16 (7%)
	PREMs	6 (3%)
	Clinician reported outcomes	46 (16%)
	Measures of adverse outcomes	41 (15%)
	PROMs	11 (4%)
	Professionalism	4 (1%)

The feedback reporting approaches incorporate evidence from all included studies

Abbreviations: *PREMs* Patient-Reported Experience Measures, *PROMs* Patient-Reported Outcome Measures

Table 3 Summary of 'best practices' that studies reported to use when reporting feedback

CP-FIT hypotheses related to feedback reporting: Feedback interventions are more effective when:	Studies using the proposed practice N (%)	Examples of how these practices were applied
Data Display		
1. Feedback highlights areas of improvement	24 (9%)	• Focusing on HCPS performing low • Highlighting aspects that need more improvement
2. Feedback shows the details of patients used to calculate HCPs' clinical performance	29 (10%)	• When patient lists were not added, HCPs requested for it for further clarification
3. Feedback is specific to HCPs' practice	103 (37%)	• Individualized to a HCP's performance Case-by-case/ roleplay scenarios
4. Feedback is timely using recent data to calculate HCPs' current performance	157 (56%)	• Given regular and weekly/ monthly feedback
5. Feedback shows trends between current and past performance	21 (8%)	• Compared to different time points in past months • Changes in comparison to peers
6. Feedback is presented with peer comparisons	185 (66%)	• Good and bad behaviours were highlighted • Compared averages of other HCPs
7. Feedback communicates the relative importance of feedback contents	46 (19%)	• Special focus on suboptimal performance • Outliers were highlighted in feedback • Weak and strong points were discussed separately • Via briefs or educational sessions
8. Feedback employs user-friendly designs when presented to HCPS	34 (12%)	• Web-based feedback with user-friendly designs • Access to web-based system was not laborious • Action tools with user-friendly designs • Concise descriptions with visualizations to promote usability • Being too wordy made feedback difficult to interpret
Data Delivery		
9. Feedback is non-punitive	27 (11%)	• Non-judgemental and encouraging language • Give time and opportunities to celebrate and reflect on both strengths and weaknesses • No penalties for low performances • Use of leaderboard that may discourage low performers but was not the case as the culture of accountability and promotion of learning was prevalent
10. Uses knowledgeable source for reporting feedback to HCPs	32 (11%)	• Perceived credible when data came with additional details • When source or data was unclear, feedback was perceived as uncredible • Local team/ member of team involved in overall feedback intervention
11. Feedback actively delivered to HCPs	180 (65%)	• Dynamic web-based action toolbox to facilitate actions post feedback • QI teams or leaders • Reminders and emails • Posters • Hand delivered reports • Verbal presentations/ individualized feedback • Education • Actionable suggestions • Surveys to report actions taken • Roleplay scenarios
12. Feedback is reported in group settings	65 (27%)	• Comparisons with other organizations top performers • Ranked feedback • Peer comparisons within own centre or department • Comparisons on a national level • Other organizations aggregated results

Supplementary file 3 includes details of studies that reported CP-FIT practices

Abbreviations: HCPs Healthcare providers

used, such as designing user-friendly feedback (12%), using a knowledgeable source for reporting feedback (11%), and showing trends between past and current performance (8%).

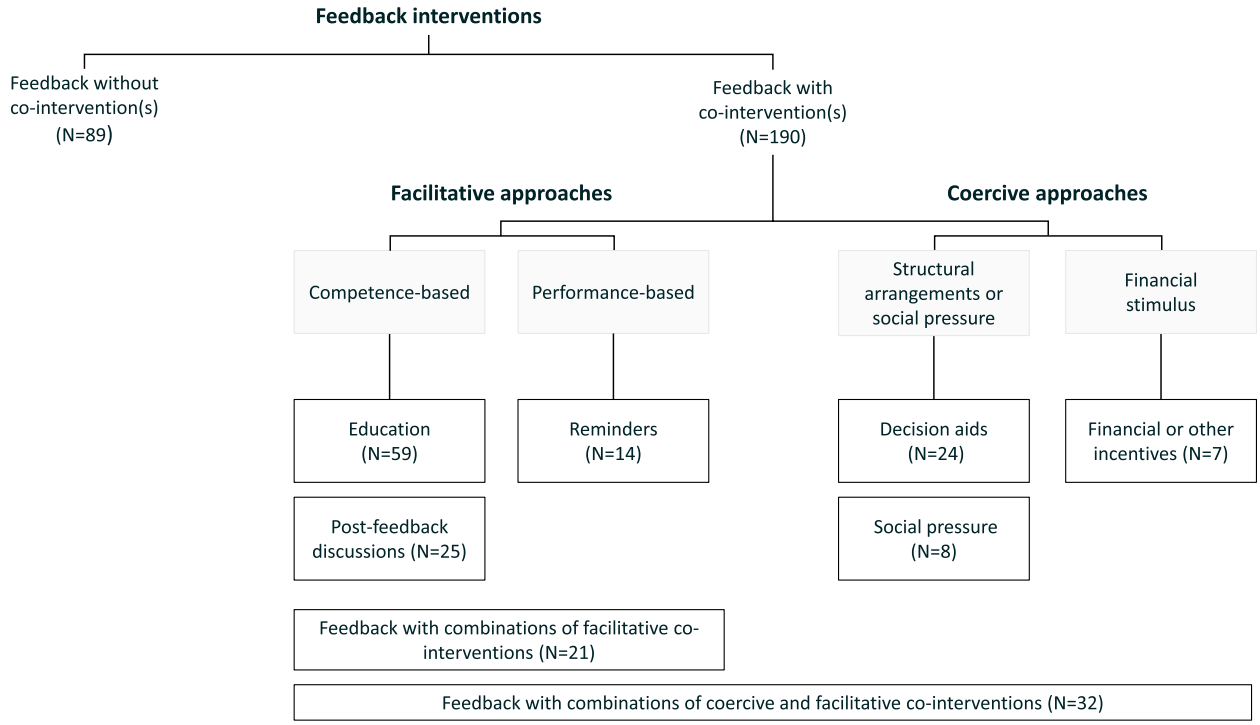

Fig. 4 Summary of types of (co) interventions

Co-interventions applied in practice to facilitate behaviour change

In total 190 studies (68%) employed a multifaceted intervention approach, combining feedback with various co-interventions, while 89 (32%) reported feedback without co-intervention (Fig. 4).

Co-interventions using facilitative approaches

Of the 190 studies, 60% applied education as a co-intervention, either alone (31%) or combined with other strategies (29%). Education primarily addressed care performance gaps informed by feedback, while reminders and post-feedback consultations directly targeted feedback. Reminders (22%) served as prompts to encourage adherence to feedback recommendations, either alone or combined with other strategies like education or action toolboxes. Post-feedback consultations (19%) allowed HCPs to clarify feedback, reflect on practice, and plan actions with expert support.

Co-interventions with coercive approaches

Structural modifications to practice settings were reported as co-interventions in 34% of studies, applied either alone (13%) or in combination with other co-interventions (22%). These included action toolboxes, pocket-sized guidelines, and clinical pathways, primarily aimed at improving targeted practices and thereby supporting feedback interventions. Financial or non-monetary incentives, such as gift cards, vouchers, or Continuing Medical Education (CME) credits, were implemented in 8% of studies, either independently or alongside other co-interventions. Social influence strategies, reported in 5% of studies, often involved increasing awareness of clinical norms or publicly sharing HCP performance results.

Reported impact of various approaches for facilitating behaviour change and clinical improvement

Interventions showing improvements in quality of care by study design

Overall, 235 studies quantitatively assessed the effectiveness of feedback (co-)interventions, with 191 (81%) reporting improvements in at least one primary quality indicator. Among pre-post studies without a control group, 91% studies showed improvements. In quasi experimental controlled group and stepped wedge trials, 79% studies reported improvements, while in RCTs, 61% showed improvements.

Interventions with improvements in quality of care by types of quality indicators

Of these studies, 230 used either process measures (62%), outcome measures (8%) or a combination of both (30%). Improvement in quality of care was reported in 85% of

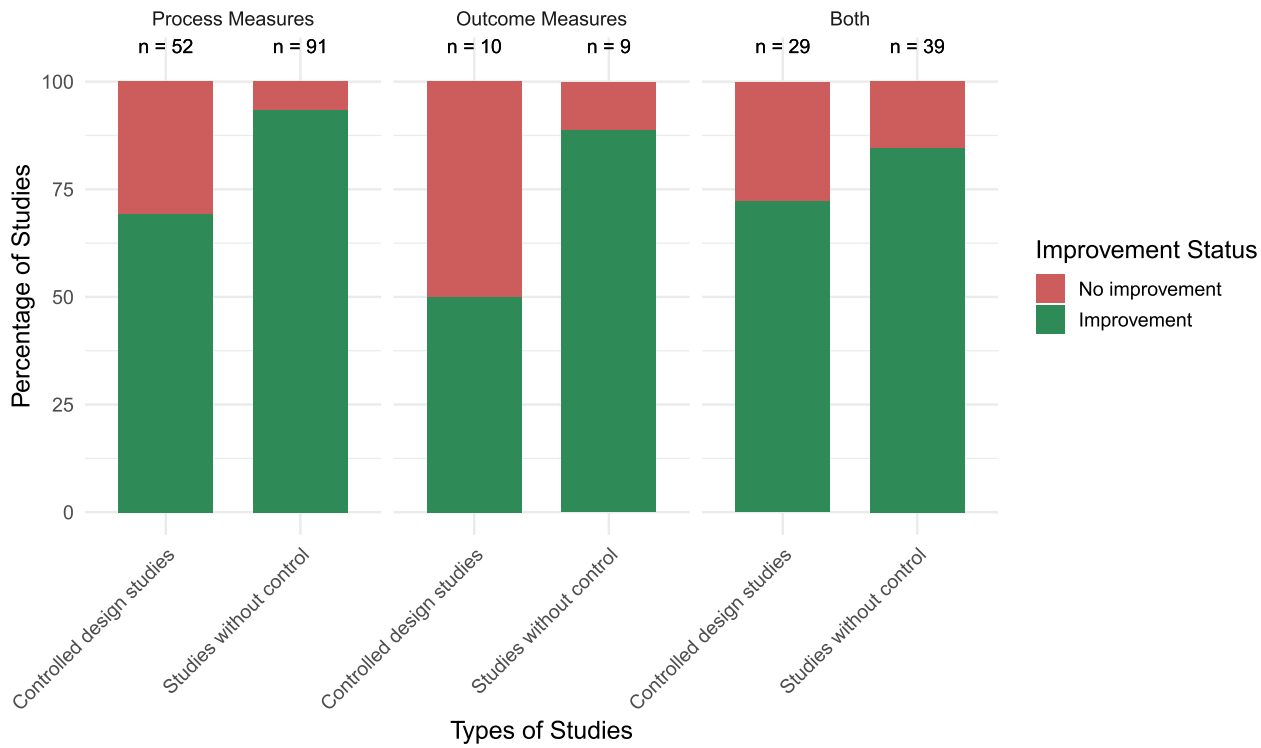

Fig. 5 Summary of studies with improvements/ non-significant or no improvements by choice of outcomes

studies utilizing process measures, 68% of those using outcome measures, and 79% of studies incorporating both. These differences were further pronounced when stratified by study design: in controlled study designs, improvements were observed in 69% of studies using process measures, 50% using outcome measures, and 72% incorporating both (Fig. 5).

The most frequently reported improvements in process measures included clinical assessments (89%), such as evaluations for cancer pain, venous thromboembolism (VTE) risk, or procedures involving core biopsies and radiological imaging (e.g., CT, MRI). These assessments were often part of diagnostic protocols or pre/post-surgical procedures, such as catheter placement or adherence to aseptic techniques. Improvements were also commonly reported in prescribing practices, including the use of antibiotics, medications for chronic conditions (e.g., cardiovascular drugs), immunizations, and high-risk medications such as opioids for cancer pain, with 82% of studies highlighting positive changes. Conversely, process measures related to resource utilization—such as hospital admission or re-admission rates, length of stay (LOS), or reducing unnecessary diagnostic procedures like CT scans—showed less frequent improvement, reported in 45% of studies.

For outcome measures, 67% of studies reported improvements in clinician-reported outcomes, such as pain scores in acute care, clinical remission or adequate nutrition and growth in paediatric chronic disease management, or laboratory measures like blood pressure, temperature control, or infection rates. Improvements in PROMs were less frequently observed, with 64% of studies documenting positive changes. Adverse outcomes, including mortality rates, infection rates, and cardiovascular events, showed the least improvement, with only 27% of studies reporting favourable results.

Studies showing improvements in quality of care by types of co-interventions

Studies that included co-interventions reported improvements in 141 out of 169 studies (83%). In comparison, those without co-interventions showed improvements in 51 out of 66 studies (77%).

Co-interventions with facilitative approaches

Of the studies, that applied education as a co-intervention, 76% reported improvements in at least one primary quality indicator. Improvements were more frequently reported (84%) when HCPs were educated on strategies to enhance care delivery. In-person educational meetings were the most commonly reported method, with 89% of studies indicating positive outcomes; studies with hybrid educational approaches reported improvements in 96% of studies; outreach visits in which where experts provide

Table 4 Number of studies with improvements by types of co-interventions and study designs

	Controlled designs[a]	Non-controlled designs[a]	Examples
Without co-intervention (*N* = 66)	18/27 (67%)	33/39 (85%)	
With co-intervention(s) (*N* = 169)	47/68 (69%)	94/101 (93%)	
Co-intervention Types			
Facilitative Approaches:			
Education 74/112 (84%)	24/38 (63%)	61/64 (95%)	Topics: • Strategies for improvement (*N* = 32) • Reflection on findings (*N* = 12) • Current guidelines (*N* = 27) • Importance of improvement goals (*N* = 6) • Data literacy (*N* = 3) • Unclear (*N* = 8) Mode: • In-person (*N* = 53) • Hybrid (*N* = 24) • Distance learning (*N* = 18) • Outreach visits *(N* = 7) • Unclear (*N* = 10)
Post-feedback consultations (*N* = 24/29)	9/12 (75%)	15/17 (88%)	• Counselling actions post-feedback (*N* = 17) Clarifying details about feedback (*N* = 12)
Reminders (*N* = 24/29)	10/13 (77%)	14/16 (88%)	• Via emails/ electronic alerts (*N* = 24): • Via text messages (*N* = 1) • Verbal (*N* = 4)
Coercive Approaches			
Decision Aids (*N* = 31/39)	15/21 (71%)	16/18 (89%)	• Clinician decision support systems (CDSS)/ action toolbox (*N* = 18) • Pocket size guidelines/ cue cards/ posters (*N* = 17) • Clinician care pathways (*N* = 4)
Social influence (*N* = 5/8)	0/3 (0%)	5/5 (100%)	• Engaging patients in QI (*N* = 7) Publicly posting outcomes (*N* = 1)
Incentives (*N* = 9/13)	3/5 (60%)	6/8 (75%)	• Financial incentive (*N* = 9) • Continuing medical education (CME) credits (*N* = 4) • Light refreshments/ gift cards (*N* = 1)

The section prior to "Co-intervention Types" separates studies with and without co-interventions and their reported outcomes. Below we describe which co-intervention were used in different studies and number of studies reporting improvements

[a] Controlled designs include randomized controlled trials, stepped wedge trials and other quasi experimental designs with a control group, non-controlled designs include quantitative studies with historic control only

personalized education in HCPs' work settings resulted in improvements in 29% of studies. Post-feedback consultations showed improvements in 83% of studies. Similar results were observed for interventions including reminders (83%) (Table 4).

Co-interventions using coercive approaches

Studies that applied co-interventions using a coercive approach reported mixed results. Among co-interventions with structural changes, decision support tools/ action toolboxes pre-filled with suggested actions, and supporting materials were associated with improvements in approximately 79% of studies. Incentives such as financial rewards or continuing medical education (CME) credits were reported as effective in about 69% of studies. Similar trends were observed for studies applying social influence as a main co-intervention, with around 63% reporting positive outcomes.

Effectiveness of (co-) interventions based on content analysis of qualitative studies

We included 44 studies that utilized a qualitative research design. Thematic analysis of the results and discussion sections of these studies revealed two main themes regarding the effectiveness of feedback interventions: 'feedback-related factors' and 'other sources influencing behaviour'. Additional file 5 provides examples of how feedback related factors and external factors were perceived to be important for the effectiveness of feedback interventions in different studies.

Feedback related factors

The perceived usefulness of interventions was influenced by several feedback related factors; whether the data on which the feedback was provided was credible, valid and meaningful. Feedback that is timely, is non-punitive, applies user-friendly designs and compares data to other

HCPs, was easier to interpret by HCPs and facilitated behaviour change.

Other factors influencing HCP behaviour

Organizational factors play an important role, with adequate resources, such as sufficient time and manpower to carry out tasks related to the quality improvement intervention, emerging as a common theme to be necessary for effective feedback implementation. This is followed by strong leadership, a culture that supports learning, and the presence of co-interventions, all of which create an environment conducive to utilizing feedback. HCP factors, including self-efficacy, knowledge/skills to use data, and expectation management, also determine how feedback is perceived and utilized. For example, when HCPs felt accountability towards their patients, they were more engaged with feedback [45]. Furthermore, external factors such as interactions with other HCPs within own organization or network may further enhance motivation to change behaviour and apply feedback in practice.

Additionally, patient behaviours such as patients demanding more antibiotics than those recommended, can undermine HCPs' control over desired practices, thereby impacting their engagement with feedback [46]. Conversely, the involvement of health insurers adds to the complexity of how feedback is perceived and acted on. Table 5 provides a joint meta-synthesis display of findings from qualitative and quantitative studies.

Discussion

In the current scoping review, we collected available evidence on feedback reporting practices to HCPs focusing on outcomes and process measures from various clinical fields. Our objectives were to explore current feedback practices in the literature, examine co-interventions applied to facilitate behaviour change, and identify the most successful interventions in changing behaviour and achieving clinical improvement. We observed that most studies focused on process measures as targets of clinical improvement, primarily using written reports or emails. On average, studies reported using 3 out 12 best practices described in (CP-FIT) theory [14]. Additionally, most studies (68%) combined feedback with co-interventions. The results of comparative studies and other observational studies pointed to facilitative co-interventions, such as education and post-feedback consultations and reminders, as the most successful approaches. Action toolboxes and clinician decision support tools also appeared to be effective co-interventions. Studies that targeted either process measures or a combination of process and outcome measures more frequently observed improvements in assessed quality indicators compared to those targeting only outcome measures.

Comparison with existing literature

First, our results showed that process measures were predominantly targeted to assess practice patterns such as prescribing behaviours or ordering certain tests, which is consistent with previous findings [15, 16]. While outcome measures are the outcomes that matter most to patients [3], they can be more challenging to act upon by HCPs and are often influenced by external factors such as disease complexity, severity, and patient population types, despite the use of statistical methods available to control for these sources of bias [47, 48]. On the other hand, process measures are often considered more actionable, particularly in multisite quality improvement interventions where there may be significant contextual differences between sites [49]. In these settings, process measures can offer clearer insights into the desired practice changes, which are less prone to bias. Our findings suggest that a combined approach, targeting both process and outcome measures, can yield greater improvements and enhance the effectiveness of feedback interventions, ultimately driving better patient outcomes while providing actionable insights to HCPs.

Best practices were variably incorporated in the designs of feedback interventions. Included studies most frequently incorporated peer comparisons within the feedback, timely feedback delivery, and active feedback methods. Social influence by delivering feedback in a group setting, was common as well, suggesting that this motivates HCPs to adopt behaviours of their peers [50, 51]. Psychological theories also support this notion that humans have a natural tendency to conform to social norms and learn by observing others [52, 53]. Conversely, practices such as reporting feedback with a user-friendly design, using knowledgeable sources for reporting feedback, and showing trends in data were less frequently applied. The lower number of studies reporting the use of user-friendly designs may be due to the fact that 15% of studies delivered feedback verbally, where the importance of user-friendly designs is diminished. Another explanation for the infrequent reporting of these practices could be that, although studies followed 'best practices' in reporting feedback to HCPs, some practices were more frequently cited, while others were likely used but not adequately reported, possibly due to insufficient or unclear documentation of study design and methods.

The issue of poor reporting of feedback practices in detail has also been highlighted in previous studies, [54, 55] which complicates the detection of differences between studies and their effects on clinical improvement. In recent years, several reporting guidelines have been proposed [56, 57], and taxonomies of behavioural

Table 5 Meta-Synthesis Matrix: Integrating Feedback Reporting Approaches and Co-Interventions to Enhance Effectiveness

Key Components	Quantitative Studies	Qualitative Studies	Interpretations
Feedback Delivery			
CP-FIT best practices to report feedback			
• Timely Feedback	Studies testing timely feedback ranging from weekly to monthly reports reported positive improvements compared to feedback reported less frequently	Delays between patient reviews and engagement hindered ownership and monitoring	Feedback delivered on timely and frequent intervals keep HCPs engaged and take ownership of quality improvement interventions
• Feedback specific to HCPs' care delivery		Group feedback caused ambiguity about individual vs. team performance	Individualized feedback is clearer and more actionable
• Peer Comparisons		Peer comparisons prompted reflection, but lack of peer discussion reduced guidance	Peer comparisons are usually included with feedback data and facilitate comprehension. Group-facilitated discussion further enhance impact of feedback
• Feedback with user-friendly designs		Clear formats (e.g., dashboards, Venn diagrams) enhanced usability; overly complex designs hindered interpretation. valuable insights into personal practice variations	Feedback should use simple charts and graphs, with concise text to complement more complex visualizations
Types of Quality Indicators			
• Process Measures	85% studies reported improvements in clinical procedures and assessments, prescribing behaviours)		Process indicators tied to clinician actions drive better outcomes
• Outcome Measures/ and process measures	68% studies showed improvements, particularly in clinician-reported outcomes		Combining process and outcome measures enhances impact and relevance over using outcome measures alone
• Data characteristics		**Meaningful data** tied to HCP control improved feedback acceptance **Data Security**: Public sharing without improvement time was seen as punitive; secure email delivery was preferred **Data Validity**: Concerns over coding accuracy and validity reduced trust **Patient Background**: Missing baseline patient information hindered interpretation	Relevant, valid, and contextual data, delivered securely and confidentially, enhances feedback trust, acceptance, and clarity
Types of Co-interventions applied with feedback intervention	**Facilitative approaches** (e.g., education, reminders, post-feedback consultations) improved outcomes **Coercive approaches:** Structural modifications e.g., action toolboxes, supported practice changes; coercive methods (e.g., financial incentives) were less effective	Structural changes and evidence-based practice support were well-received, with training by feedback champions or peers valued	Facilitative approaches and structural supports are preferred; coercive methods such as financial incentives have less impact

Table 5 (continued)

Key Components	Quantitative Studies	Qualitative Studies	Interpretations
Other factors influencing feedback intervention		Perceived accountability enhanced engagement with feedback Limited knowledge and skills for interpreting data impeded interaction with data and performance External factors, such as patient demands for specific drugs or services, influenced HCP decision-making, while involvement of insurers and other stakeholders with conflicting objectives discouraged acceptance of feedback	To enhance feedback engagement, emphasize strategies that promote accountability, provide targeted training to improve data interpretation skills, and address external influences by aligning stakeholder goals and managing patient expectations effectively

Abbreviations: *HCPs* Healthcare providers, *CP-FIT* Clinical performance feedback intervention theory

interventions have been published to facilitate transparent reporting [11, 58]. However, only a few studies have demonstrated compliance with these guidelines or the use of taxonomies [55].

Co-interventions were commonly used to assist HCPs with behaviour change, primarily through education and decision-support tools, or to support feedback engagement, such as post-feedback consultations and reminders. While most studies employed co-interventions, studies that applied multiple co-interventions often used similar mechanisms. According to Grol et al., facilitative approaches target HCPs' intrinsic motivation, while coercive approaches, such as financial incentives, target extrinsic motivation [19]. Notably, among the 19% of studies implementing multiple co-interventions, nearly half relied exclusively on facilitative strategies. For the long-term sustainability of quality improvement initiatives, addressing both facilitative and coercive approaches may be beneficial [19].

Feedback is a widely used strategy for integrating evidence-based practices into real-world clinical settings. Its effectiveness depends on multiple factors, including the motivation and capability of HCPs, the availability of organizational resources, and the identification of barriers that may hinder implementation [24, 57–59]. Successful feedback interventions require careful planning, adaptation to the clinical context, and ongoing evaluation to ensure meaningful improvements in care. Factors such as organizational culture, resource availability, and external pressures can significantly influence the uptake and impact of feedback interventions.

Regarding the effectiveness of co-interventions, we compared studies that used co-interventions with those that did not. Studies with co-interventions showed slightly more improvements. We observed that co-interventions such as education, post-feedback consultations, reminders, and action tools appeared to be more successful. Earlier studies also reflected the success of education combined with feedback [60, 61]. Additionally, we found that in-person education and distance learning methods, such as printed materials, showed greater improvements, consistent with prior reviews [60, 62]. In contrast, methods such as outreach visits by experts to provide education were less successful. Furthermore, education targeting practice improvement strategies yielded higher enhancements compared to topics on general awareness on quality improvement intervention. This aligns with previous findings emphasizing HCPs' preference for practice-based educational interventions [63, 64]. Co-interventions employing a coercive approach yielded mixed results, whereas action toolboxes emerged as more successful than interventions involving incentives and social influence. While one literature review demonstrated the efficacy of clinician decision support tools in enhancing clinical processes and outcomes [65], there is currently no clear synthesis of evidence regarding their effectiveness when combined with feedback.

Limitations

Our scoping review collected evidence from diverse clinical settings, providing a comprehensive understanding of the various applications of feedback in practice. However, this review encountered challenges and limitations. Our search was limited to studies published from 2010 onward, which may have excluded earlier research on feedback interventions. However, this timeframe aligns with significant advancements in feedback delivery, such as EHR integration, real-time performance monitoring [36], and theory-driven approaches [37]. We included only English-language studies to ensure consistent interpretation. These decisions may have caused some relevant non-English studies or papers published prior to 2010 to be excluded. Additionally, our database search identified 279 eligible studies, most of which were observational, making it challenging to assess effectiveness. We observed that studies without a controlled design showed more improvements in outcomes compared to those with a controlled design. This might be because pre-post intervention studies, while feasible and practical in such contexts, cannot control for confounders that may influence the results. Furthermore, the diverse approaches and quality indicators used across various clinical settings made synthesizing evidence on the reported impacts of (co-) interventions difficult, as comparing results across studies was challenging. Finally, our search strategy may have inadvertently overlooked studies using different terminology, such as alternative terms for studies involving broader quality improvement initiatives with feedback. To mitigate this risk, we iteratively refined our search strategy in collaboration with experienced librarians.

Implications and future research

There is a crucial need to explore how to design feedback interventions effectively, as prior studies show large variations in their effectiveness [16, 66], indicating limited knowledge of the best approaches. A prior Cochrane review [16] compared different feedback interventions, but the focus on including only high-quality studies many lower-quality studies may have excluded, potentially limiting the diversity of clinical settings represented. However, including high-quality studies ensures more reliable insights and a robust assessment of the interventions' impact. While these studies provide important evidence, they do not encompass all clinical contexts. Our scoping review highlights key practices and types of co-interventions, such as education, post-feedback consultations,

and action toolboxes, that appear to be more effective. Future research should confirm these findings through well-designed and transparently reported studies to broaden the applicability of feedback interventions across a wider range of clinical settings.

Conclusion

This review provides a comprehensive overview of strategies used to implement feedback interventions across various practice settings. Our findings suggest that feedback interventions incorporating both outcome and process measures, as well as those combined with other co-interventions such as education, action toolboxes, and reminders, tend to be more effective. These insights have practical implications for designing future feedback interventions and implementation strategies that are intended for the uptake of evidence-based practices, emphasizing the importance of selecting strategies that are tailored to intervention settings, address barriers and the types of motivation being targeted. For future research, it is crucial to explore the individual and additive effects of these co-interventions, along with their long-term sustainability, to better understand how to maintain improvements over time in diverse clinical settings.

Abbreviations

HCPs	Healthcare Providers
VBHC	Value-based healthcare
PREMS	Patient-reported experience measures
PROMS	Patient-reported outcome measures
RCT	Randomized controlled trials

Supplementary Information

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Additional file 1.

Additional file 2.

Additional file 3.

Additional file 4.

Additional file 5.

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Authors' contributions

MA and WD created the study concept and design. MA constructed and refined the search strategy. MA and EV extracted the data. Analysis of the data was completed by MA. RW, DN, CJW and WD provided critical input on data interpretation. Drafting of the manuscript was done by MA. All authors revised the manuscript critically for important intellectual content and approved the final manuscript.

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