Surgical residents' perceptions of feedback: a scoping review to identify gaps and opportunities for improvement in surgical education

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Submitted to: JMIR Medical Education
on: August 18, 2024

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Abstract

Background: Feedback is essential for learning and improving medical education and surgery performance. Surgery residents recognize the importance of feedback for their development, but there is a lack of understanding regarding their perception of the feedback received during training.

Objective: This scoping review aims to identify and map out data from studies that report surgical residents' perceptions of the feedback received during their education, analyze them, determine knowledge gaps, and disseminate the research findings.

Methods: A comprehensive search strategy was performed on March 15, 2024, using descriptors in English, Portuguese, and Spanish, encompassing the period since 2017. Databases of journals indexed in Medline, Directory of Open Access Journals, Directory of Open Access Scholarly Resources, Academic Search Premier, BioMed Central Open Access, and Wiley-Blackwell were consulted. Studies involving resident physicians of any surgical specialty and their perceptions of feedback received during surgical education were included. Data were extracted, described, and analyzed both quantitatively and qualitatively.

Results: Thirteen articles were included in the review, with most studies being conducted in the United States (76.9%). The majority of the studies were primary (92.3%), retrospective (66.6%), and involved general surgery residents (53.8%). Most of the articles did not mention the method or instrument used to provide feedback. The feedback content varied, with intraoperative skills being the most prevalent theme (46.1%). Residents' perceptions of feedback were heterogeneous, with general and overall perceptions being the most reported (92.3%). A comparison between residents' and attendings' perceptions revealed discrepancies in the frequency and quality of feedback. The impact of feedback was measured in only 15.4% of the articles, portraying positive outcomes.

Conclusions: This scoping review reveals that most studies focus on comparing perceptions, ideal feedback characteristics, or general perceptions without emphasizing the impact of feedback. There is a lack of detailed descriptions of feedback perception and standardized instruments to measure it. Future research should focus on developing standardized instruments and investigating the impact of feedback on surgical residents' learning outcomes. The findings of this scoping review can inform educators and policymakers in improving surgical training programs and enhancing residents' learning progress.

(JMIR Preprints 18/08/2024:65535)
DOI: https://doi.org/10.2196/preprints.65535

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Surgical residents' perceptions of feedback: a scoping review to identify gaps and opportunities for improvement in surgical education

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Abstract

Background: Feedback is essential for learning and improving medical education and surgery performance. Surgery residents recognize the importance of feedback for their development, but there is a lack of understanding regarding their perception of the feedback received during training.
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impact of feedback was measured in only 15.4% of the articles, portraying positive outcomes.
Conclusions: This scoping review reveals that most studies focus on comparing perceptions, ideal feedback characteristics, or general perceptions without emphasizing the impact of feedback. There is a lack of detailed descriptions of feedback perception and standardized instruments to measure it. Future research should focus on developing standardized instruments and investigating the impact of feedback on surgical residents' learning outcomes. The findings of this scoping review can inform educators and policymakers in improving surgical training programs and enhancing residents' learning progress.
Keywords: feedback; surgery; medical education; internship and residency; perception.

Introduction

Background

Feedback is the delivery of information based on direct observation[1] that must always generate an action in the learner [2]. It constitutes specific information about the comparison between learners' performance or knowledge regarding a task and the desired standard, and the objective is that learners seek to improve their performance and reduce the distance between the ideal and the real [3]. In other words, it is a process in which learners acquire knowledge about their performance and use it to improve the quality of their work or learning strategies [4].
Thus, it is an essential tool for learning and improving performance in any sphere of education, especially in medical education and surgery [5–8]. Although its mechanism is not fully known, it is an important part of the resident physician's training [9], and it must aim to provide qualified care for patients [1,10]. For this reason, the delivery of feedback to residents continues to be an important area of study in medical teaching [5,11].
There are different ways of giving feedback to learners: orally, in writing, through simulation, by videotaping learners, using audience response systems, computer-based feedback and patient feedback, among others [6,11–13]. Similarly, many methodologies concerning the delivery of feedback have been described, namely, feedback sandwich, Pendleton, Pendleton plus, learning conversation, in groups, among peers, multisource feedback, and self-feedback [7,14–16]. However, independent of the approach, all of them must focus on three learning domains: cognitive, psychomotor, and affective [17].
The large number of methodologies reflects the former paradigm related to feedback. At that time, the question that needed to be answered was "How can we develop the best feedback?". Therefore, studies in this field have focused on the quality of the information to be transmitted, how to transmit such information, and what would be the best moment to do so [10]. However, such a paradigm has changed. Notably, the crucial question that needed to be answered was, in fact, "How do learners become attentive to feedback and use more effectively the information they receive?" [18]. Thus, the priority has become the progress achieved in learning and the learner's engagement in the process enabled by the feedback; the term used for this is feedforward [16]. Recent studies on this topic have taken this path [2,7,10,15,19].
Therefore, how the feedback is perceived and the reaction it generates in the learner is as important (or even more important) as the methodology that is used, the moment when it is given, or the information that is provided. It is known that medical students and residents consider that the amount of feedback they receive is insufficient [11,12,20]. Furthermore, they usually have different perceptions than teachers do [3,9,18,19], although some studies have shown that residents and teachers can share similar opinions concerning the qualities of effective feedback [10]. Feedback is considered effective when it can generate results and promote positive and desirable development [3]. Some factors that reportedly influence that perception are the teacher's credibility in the opinion of the learner; who is responsible for giving feedback when the teams are multidisciplinary; the

manner and environment in which feedback is given; the teacher's educational beliefs; the learner's individual experiences; the learner's level of expectation and motivation; and the relationship between feedback and the reflection it generates in the learner [5,7,11,15,21,22].

In opposition to active, or external feedback, in which the teacher has a primordial role in the learning process, the reflection that the feedback generates in the learner, or internal feedback, enables them to go through stages of competence awareness theory [23], when it becomes a metacognitive learning process—a step that is inseparable from the intentional learning process [3]. That is, the learner's perception of the feedback they receive is extremely relevant to their learning progress. In addition, the incorporation of metacognitive aspects in the learning process equips the student with skills to become a lifelong learner [24].

Prior work

Surgical residents recognize that feedback provides useful suggestions for future improvement and that a lack of feedback can cause frustration [25] or affect self-confidence [26]. They prefer to receive feedback during or immediately after a case, face-to-face, and value it much more when it is received within one week of the event [27]. However, both resident and staff surgeons agree that postoperative feedback is given far less often than it should be [28]. Moreover, surgery residents desire better feedback during residency to grow and develop as leaders [29].

Nevertheless, the studies pertinent to the matter differ very much in methodology, population, context, and objective, which makes it even more difficult to achieve a clear understanding of it. Among all knowledge synthesis methodologies, scoping reviews are the best way to present a broad overview of evidence in heterogeneous scenarios, summarizing and promoting better comprehension [30–32]. In addition, despite the relevance of the theme, in a preliminary search, few scoping reviews were found. Although all of them are focused on surgery residents' training [33–35], none have focused on their feedback perceptions during and over their education. Therefore, a scoping review on this topic provides an unequivocal contribution to the understanding and enhancement of surgical residents' learning progress.

Goal of this study

The present scoping review aims to identify and map out data from studies that report surgical residents' perceptions of the feedback received during their education, analyze them, determine knowledge gaps, and disseminate the research findings.

Methods

This scoping review was carried out rigorously and transparently according to Arksey and O'Malley's [36] structure, using the first 5 stages: i) identify the research question, ii) identify relevant studies, iii) select studies, iv) map out the data, and v) collate, summarize, and report the results. Although the sixth stage of Arksey and O'Malley's structure (consulting) was not completed in this review, the results of the review can inform this stage in a future study. The structure is congruent with The Joanna Briggs Institute's (JBI) scoping review methodology [32]. According to the aim of the study, the following research question was formulated: what is known about surgical residents' perceptions of feedback in their training? The protocol of this scoping review was already published [37].

Search strategy

The search strategy was performed on March 15, 2024, by a librarian who is a specialist in the digital search strategy through the following descriptors: formative feedback, hospital medical staff, teaching, general surgery, and perception, with their correspondents in Portuguese and Spanish, encompassing the period since 2017. The databases of journals indexed in Medline, Directory of

Open Access Journals (DOAJ), Directory of Open Access Scholarly Resources (ROAD), Academic Search Premier (ASP), BioMed Central Open Access (BMC), and Wiley-Blackwell (Wiley) were consulted, using descriptors or synonyms, according to *Descritores em Ciências da Saúde* (DeCS) and Medical Subject Headings (MeSH), for each item of the strategy.

Inclusion and exclusion criteria

This review included studies whose population consisted of resident physicians of any surgical specialty, approaching their perceptions of the feedback received during their surgical education. Studies with qualitative and quantitative approaches, primary studies, systematic reviews, meta-analyses, meta-syntheses, books, and guidelines were considered eligible. Publications of opinions, consensuses, retractions, editorials, websites, and advertisements published in the media were excluded.

Study selection

After excluding duplicate articles, titles and abstracts were independently analyzed by two researchers (CC and GS), and those that did not meet the inclusion criteria were excluded. To align the inclusion criteria among the researchers, the title and abstract of 25 random articles were previously analyzed, achieving 92% agreement. The complete texts of the remaining articles were evaluated by the main researcher. The reasons for the exclusion of articles that were fully read are registered in the results section. Any disagreement that emerged among the researchers at any stage of the selection process was solved through discussion or the addition of other researchers. Additional sources were included in the review after a manual search was performed by the main researcher (CC) as long as they met the eligibility criteria, were important for completing the study, and had not been identified by the search strategy.

Charting the data

For each selected study, data were charted by the main researcher via a Microsoft Excel® spreadsheet. The extracted data included the following: publication details (journal, year, title, author, country, type of study, and study design), residents' specialty, sample size, feedback method, feedback instrument, feedback timing, feedback content, feedback effectiveness, residents' perceptions, perception instrument and the impact of such perceptions.

Synthesis of results

All the extracted data were described and statistically analyzed quantitatively. Qualitative analysis was carried out for the parameters of feedback content, feedback effectiveness, and residents' perceptions. For that analysis, all the topics covered were listed and then classified [38].

Results

The search of the databases resulted in 588 articles. The complete results of the search strategy with descriptors in English according to the database are shown in Table 1.

Table 1. Results of the search strategy with descriptors in English according to the database.

Database	Date and time of search	Number of articles found	Descriptors
	March 15, 2024		

Medline	15:02h	149	(“Formative Feedback” OR “Feedback, Formative” OR “Constructive Feedback” OR “Feedback, Constructive” OR “Feedback (Learning)”) AND (“Medical Staff, Hospital” OR “Hospital Medical Staff” OR “Hospital Medical Staffs” OR “Staff, Hospital Medical” OR “Staffs, Hospital Medical” OR “Medical Staffs, Hospital” OR “Physicians, Junior” OR “Junior Physician” OR “Junior Physicians” OR “Physician, Junior” OR “Registrars, Hospital” OR “Hospital Registrar” OR “Hospital Registrars” OR “Registrar, Hospital” OR “Attendant Physicians, Hospital” OR “Hospital Attendant Physician” OR “Hospital Attendant Physicians” OR “Attendant Physician, Hospital”) AND (“Teaching” OR “Training Techniques” OR “Training Technique” OR “Technique, Training” OR “Techniques, Training” OR “Training Technics” OR “Technic, Training” OR “Technics, Training” OR “Training Technic” OR “Pedagogy” OR “Pedagogies” OR “Teaching Methods” OR “Teaching Method” OR “Method, Teaching” OR “Methods, Teaching” OR “Academic Training” OR “Training, Academic” OR “Training Activities” OR “Training Activity” OR “Activities, Training” OR “Activity, Training” OR “Techniques, Educational” OR “Educational Techniques” OR “Educational Technique” OR “Technique, Educational” OR “Educational Technics” OR “Educational Technic” OR “Technic, Educational” OR “Technics, Educational”) AND (“General Surgery” OR “Surgery, General” OR “Surgery”) AND (“Perception”)
DOAJ[a]	15:08h	167	
ROAD[b]	15:15h	118	
ASP[c]	15:20h	63	
BMC[d]	16:18h	31	
WILEY[e]	16:21h	60	

[a]Directory of Open Access Journals
[b]Directory of Open Access Scholarly Resources
[c]Academic Search Premier
[d]BioMed Central Open Access
[e]Wiley-Blackwell

Of the 588 articles, 270 were excluded because they were duplicates. The titles and abstracts of the remaining 318 articles were independently analyzed by two researchers (CC and GS). A total of 284 articles that did not meet the inclusion criteria were excluded. Therefore, 34 articles remained that were fully read by the main researcher (CC). Of these, only six articles fulfilled the eligibility criteria and were included in the review. Nine articles were excluded because their population did not correspond to the population review (of these, four included general surgery residents and residents of nonsurgical specialties, without showing the results in separate groups). Seventeen articles were excluded because their concept did not meet the concept review requirements (of these, four were about feedback in surgical education but not its perception). One article was excluded because we did not have access to the full text. Seven additional articles were included in the review after a manual search was performed by the main researcher. Overall, 13 articles were included in the review. A Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-SR) flow diagram [36,39–41] presents, in full, the results of the process of searching for and including studies (Figure 1).

Most studies were carried out in the United States of America (n=10; 76.9%), two in Canada (15.4%) and one in Pakistan (7.7%). All the articles were primary studies, except for that by McKendy *et al.* [42], which consisted of a systematic review published in 2017 that brought together works published from 1994--2014 that discussed intra- and perioperative teaching and feedback, but there was no emphasis on the perception of feedback. Among the 12 primary studies analyzed in this scoping review, eight (66.6%) were retrospective, and four (33.4%) were prospective. Among the retrospective studies, four (50%) involved only qualitative analysis, three (37.5%) involved both quantitative and qualitative analysis, and one (12.5%) involved only quantitative analysis. All the prospective studies were quantitative and qualitative. Among the 13 articles, seven included general surgery residents (53.8%), one included neurosurgery residents, one included ophthalmology residents, and two included residents from more than one surgical specialty. The residents' specialties were not mentioned in the systematic review included in this review. Except for the systematic review article, which was composed of 26 articles, and the study by Neal *et al.* [43], which counted the number of completed forms (2968 forms) and not the number of residents, the average population of the remaining 11 articles was 29.3 residents, with a minimum of 7 and a maximum of 84 residents.

The method used to provide feedback was not mentioned in 11 of the 13 articles, except in McKendy *et al.* [42], in which multiple methods were described (such as multisource feedback, 60-minute feedback, learning conversation, and other forms of structured feedback), and in Kamal *et al.* [44], in which multisource feedback and learning conversation methods were used. This lack of information about feedback methods in most studies represents a significant gap in the literature, as understanding the specific approaches used is crucial for evaluating their effectiveness and potential for implementation in surgical education programs.

The instrument used to provide feedback was not mentioned in five of the 13 articles (38.5%). In three articles (23%), feedback was provided formally (via written comments) or informally (verbally), and in another three (23%), it was provided exclusively via written comments but used specific instruments for this purpose. In one article (7.7%), the instrument used was videotape review. In the review by McKendy *et al.* [42], several instruments were identified, including interviews and semistructured interviews, focus groups, specific instruments, videotapes, surveys, and ethnographic observations. The variability in feedback instruments and the lack of standardization across studies make it challenging to compare results and draw definitive conclusions about the most effective feedback methods in surgical education.

Most of these studies were based on feedback provided during the perioperative period (n=9; 69.2%), with the other four articles referring to feedback provided at any time during the resident's training. One of the articles presented feedback provided monthly after the end of the internship and every six months through formal evaluation.

The feedback content was not addressed in six articles (46.1%). The topics covered were diverse and were divided into five groups after their content was analyzed: preoperative planning (PoP), intraoperative skills (IoS), next steps (NS), nontechnical performance (NtP), and general content (G). The PoP theme refers to feedback related to the preparation of the operating room and the discussion of the surgical tactics to be used during the procedure that will follow and can also be called briefing in specialized literature. The IoS theme refers to feedback related to the operative technique and specific and general surgical skills (e.g., respect for tissue, time and motion efficiency, instrument handling, knowledge of procedure steps, knowledge of anatomy, surgical key points, independent practice, posture, and body language during surgery). Next steps were defined as referring to the progression of surgical skill, how to improve the fulfillment of a certain task, or goals to be followed for adequate surgical development. NtP refers to all content about communication skills, leadership, teamwork, self-confidence, decision-making, and coping with stressful situations. Finally, general subjects were defined as those related to nonspecific feedback, personality characteristics, and resident habits. The number of feedback content themes present in each article varied from two to four. The IoS theme was the most prevalent, being present in six articles (46.1%). The NS, NtP and G themes had the same prevalence, each being present in three of the articles (23%). The PoP theme was the least prevalent and was found in only two articles (15.3%). This variability in feedback content and the lack of comprehensive coverage across all important aspects of surgical training highlight the need for more standardized and holistic approaches to feedback in surgical education.

Only two articles (15.3%) did not mention what would be considered ideal feedback by residents. In the remaining 11 articles (84.7%), the topic was approached in a very heterogeneous way, with its content evaluated and divided into five groups, namely, feedback content, specific feedback characteristics, characteristics of the teacher or provider of the feedback, when to provide feedback and how to do so. The most prevalent element was the specific characteristics of feedback, which was present in eight articles (61.5%). Among these characteristics, the adjectives most present in residents' reports were useful, direct, regular, and formative. The other words used were as follows: ongoing, in a learning environment, objective, current, evaluative, accurate, natural, explicit, multisource, specific, with mentoring help, timely, face-to-face, neutral, in a coaching style, through third-party real-time observation, and constructive. The second most prevalent element referred to the form of providing feedback, which was present in five articles (38.4%). The two forms mentioned were verbal and written. The ideal time to do so was mentioned in four articles (30.7%), with the moment immediately after the surgical procedure being the most cited. Other moments mentioned were as follows: preoperative, intraoperative, during the case, after the end of the internship, and after the video review. The content of ideal feedback was listed in three articles (23%), with the following themes chosen: resident progress, resident performance, areas for improvement, and learning points. The characteristics of the teacher were listed only by McKendy *et al* [42] as follows: enthusiastic, calm, courteous, competent, empathetic, and supportive, that shows control, and allows independence.

All the articles described residents' perceptions of feedback, although with different approaches, and were then divided into four groups: general and overall perception of feedback (GaO), comparison between residents' perceptions of feedback received and attendants' perceptions of feedback provided (RxA), the content of feedback perceived by the resident (CP) and the immediate reaction to feedback (Im). GaO was the topic most covered by the studies and was present in 12 of them (92.3%). Although less common, RxA was addressed in five articles (38.4%). CP was reported in 4 articles (30.7%), and Im was reported in only one (7.7%). This distribution of focus areas in the literature suggests a need for more comprehensive studies that address all aspects of feedback perception, particularly immediate reactions and specific content perceptions, which are currently underrepresented.

Concerning the general perceptions of residents, the review conducted by McKendy *et al.* [42] revealed that the overall feedback received was constructive. Bello *et al.* [27] reported that 80% of

the residents reported feedback as very or extremely important to their surgical training, that all of them considered verbal, face-to-face feedback as the most valuable and that they preferred feedback during (92%), or immediately after (65%) cases. Similarly, Dedhia *et al* [45] reported that residents may be more receptive to feedback after the case. The same authors also state that residents are less likely to interpret an intraoperative interaction as feedback as long as they are more likely to be interpreted by residents as intraoperative teaching rather than feedback. On the other hand, Lees *et al.* [26] reported that positive feedback contributed the most to confidence levels by providing positive reinforcement, affirmation, and encouragement and that negative feedback could be useful if it was given constructively. Gupta *et al.* [46] reported that 87% of residents found feedback to be helpful more than 40% of the time, yet one-half of respondents believed that feedback was lacking in preoperative, intraoperative, and postoperative settings. Furthermore, 63% of the residents reported that attendant surgeons established a safe environment to ask questions fewer than 20% of the time. In Vu *et al* [29] article, every resident described feedback, both encouraging and corrective, as an important part of leadership development, especially in improving day-to-day leadership practices, and that informal feedback was difficult to both recognize and interpret. According to Neal *et al.* [43], any type of written feedback was significantly associated with a higher level of feedback quality than leaving a blank space. Residents in the Rivard *et al* [47] study revealed that they especially valued feedback when they were allowed to demonstrate real-time improvement. Similarly, Sisak *et al* [48] reported that residents received adequate faculty mentorship and appropriate feedback from general surgery attendants that was beneficial to their learning (83%). To Collings *et al* [49], debriefing, especially after challenging cases, was valued, and affirmative feedback was appreciated and helped highlight the correct technique. Finally, Go *et al* [50] reported that residents appreciate feedback on aspects of the operation that are not often covered by operating surgeons, including ergonomics and emotional intelligence issues.

Concerning the comparison of the perception of feedback by residents and preceptors, there is generally no correlation between them, whether in terms of the frequency with which it is provided, its quality, or even in the perception that the feedback was provided. For example, McKendy *et al* [42] reported that residents provided significantly less intraoperative feedback regarding surgical skills, technique, and instrument handling guidance than did attendants. In the same article, residents reported receiving less frequent or worse quality feedback than did attendants. Similarly, Nathwani *et al* [28] reported that the current practices of providing feedback were significantly different than what residents and staff perceived as ideal practices. In another way, Dedhia *et al* [45] reported that residents and faculty generally agreed on the importance of timing and the subjective areas of feedback and demonstrated no significant difference in overall satisfaction with operative feedback. However, they stated that residents, on average, identified fewer moments of feedback than faculty did. Only the article by Kamal *et al* [44] described residents' immediate reactions upon receiving feedback, describing their behaviors as friendly. This lack of focus on immediate reactions to feedback represents another gap in the literature that warrants further investigation.

The methods used to evaluate residents' perceptions included a survey (n=7, 53.8%), an interview (n=5, 38.5%), and a focus group (n=1, 7.7%). The lack of standardized assessment tools for evaluating residents' perceptions of feedback is a notable limitation in the current literature. The impact of feedback was measured in only two articles (15.4%), all of which portray positive impacts such as improvement in time to complete the procedure, economy of movement, and overall improvement in attitudes. This scarcity of studies measuring the impact of feedback represents a significant gap in our understanding of the effectiveness of feedback in surgical education and highlights the need for more research in this area.

A summary of the results can be found in Table 2, Table 3, and Table 4.

Table 2. General data of the articles.

Authors	Year	Country	Type	Design	Residents' specialty	Sample size

McKendy *et al* [42]	2017	Canada	Review	Systematic review	Not mentioned	26 articles
Kamal *et al* [44]	2017	Pakistan	Primary	Prospective, qualitative and quantitative	Ophtalmology	10 residents
Nathwani *et al* [28]	2017	USA[a]	Primary	Retrospective, qualitative and quantitative	General surgery	23 residents
Bello *et al* [27]	2018	USA	Primary	Retrospective, qualitative and quantitative	General and plastic surgery	23 residents + 7 fellows
Lees *et al* [26]	2018	Canada	Primary	Retrospective, qualitative	General surgery	7 residents
Dedhia *et al* [45]	2019	USA	Primary	Prospective, qualitative and quantitative	General surgery	23 residents
Gupta *et al* [46]	2020	USA	Primary	Retrospective, quantitative	General surgery	84 residents
Vu *et al* [29]	2020	USA	Primary	Retrospective, qualitative	General surgery	18 residents
Neal *et al* [43]	2022	USA	Primary	Prospective, qualitative and quantitative	Neurosurgery	2968 forms
Rivard *et al* [47]	2022	USA	Primary	Retrospective, qualitative	General, plastic, thoracic and critical care surgery	46 residents
Sisak *et al* [48]	2023	USA	Primary	Retrospective, qualitative and quantitative	Plastic, cardiothoracic and vascular surgery and urology	21 residents
Collings *et al* [49]	2023	USA	Primary	Retrosprective, qualitative	General surgery	39 residents
Go *et al* [50]	2024	USA	Primary	Prospective, qualitative and quantitative	General surgery	22 residents

[a]United States of America

Table 3. Articles' feedback data.

Authors	**Feedback method**	**Feedback instrument**	**Feedback timing**	**Feedback content**	**Ideal feedback characteristics**

McKendy *et al* [42]	Learning conversation, multisource feedback, structured feedback, 60-minute feedback	Videotape, specific instrument, survey, interview, focus group, semistructured interview, ethnographic observation	Intra and peri-operative	IoS[a], NtP[b], NS[c], G[d]	Content, specific characteristics (e.g., timely, constructive), provider's characteristics
Kamal *et al* [44]	Multisource feedback, learning conversation	Mini-peer assessment tool questionnaire	Anytime	NtP, G	Not mentioned
Nathwani *et al* [28]	Not mentioned	Not mentioned	Postoperative	IoS, NtP	Feedback timing (immediate), feedback instrument (verbal and written)
Bello *et al* [27]	Not mentioned	Standardized operative performance rating tool	Postoperative	Not mentioned	Specific characteristics (e.g., face-to-face, timely)
Lees *et al* [26]	Not mentioned	Formal (written) and informal (verbal)	Intra and postoperative	Not mentioned	Specific characteristics (e.g., constructive, positive reinforcement)
Dedhia *et al* [45]	Not mentioned	Video review	Intra and peri-operative	PoP, IoS	Feedback timing (after the case)
Gupta *et al* [46]	Not mentioned	Not mentioned	Preoperative, intraoperative, postoperative	Not mentioned	Specific characteristics (e.g., helpful), feedback timing (throughout perioperative period), feedback instrument
Vu *et al* [29]	Not mentioned	Formal (written), informal	Anytime, monthly end-of-rotation	Not mentioned	Content (leadership-specific),

			evaluations, semiannual review		specific characteristics (e.g., recognizable, interpretable), feedback instrument
Neal *et al* [43]	Not mentioned	Online written form, based on Surgical Autonomy Program based on Vygotsky's Zone of Proximal Development	Postoperative	IoS, NS, G	Content, feedback instrument (written)
Rivard *et al* [47]	Not mentioned	Not mentioned	Preoperative, intraoperative, postoperative	Not mentioned	Specific characteristics (e.g., allows real-time improvement), feedback timing, feedback instrument t
Sisak *et al* [48]	Not mentioned	Not mentioned	Anytime	Not mentioned	Not mentioned
Collings *et al* [49]	Not mentioned	Not mentioned	Anytime	IoS, NS	Specific characteristics (e.g., affirmative, highlights correct technique)
Go *et al* [50]	Not mentioned	Verbal and/or written Surgical Entrustable Professional Activity-based	Postoperative	PoP[e], IoS	Specific characteristics (e.g., covers non-technical aspects like ergonomics and emotional intelligence)

[a]Intraoperative skills
[b]Nontechnical performance
[c]Next steps
[d]General content
[e]Preoperative planning

Table 4: Article residents' perception and feedback impact data.

Authors	Residents' perception	Perception assessment instrument	Impact	Other concept aspects
McKendy *et al* [42]	RxA[a], GaO[b], CP[c]	Survey	Improvement in time to complete the procedure, errors, and economy of movement	Observation of teaching behaviors in the operating room. Identification of effective teaching strategies. Resident and attendant perceptions of teaching behaviors. Models for delivering structured feedback
Kamal *et al* [44]	Im[d]	Face-to-face interview	Overall improvement in attitudes	None
Nathwani *et al* [28]	RxA, GaO, CP	Survey	Not measured	None
Bello *et al* [27]	GaO	Semistructured interview	Not measured	None
Lees *et al* [26]	GaO	Preinterview activity, semistructured interview, postinterview research brief/member check	Not measured	Development of confidence
Dedhia *et al* [45]	RxA, GaO, CP	Survey	Not measured	Details about the types of feedback observed in the video. Convey opinions on current perioperative feedback experiences.
Gupta *et al* [46]	GaO	Survey	Not measured	None
Vu *et al* [29]	RxA, GaO	Interview	Not measured	Importance of feedback for leadership development in residency. Inadequacy of current feedback mechanisms. Barriers to giving and receiving leadership-specific feedback. Resident-driven recommendations for better leadership feedback.
Neal *et al* [43]	RxA, GaO	Survey	Not measured	None

Rivard *et al* [47]	GaO	Survey via MedHub	Not measured	Faculty behaviors promoting learner operative skills and autonomy.
Sisak *et al* [48]	GaO	Survey via REDCap	Not measured	None
Collings *et al* [49]	GaO	Focus groups and semistructured protocol	Not measured	None
Go *et al* [50]	GaO, CP	Written comments and structured interview	Not measured	Chief resident skill and entrustment progression.

[a]Residents' *versus* attendants' feedback perceptions
[b]General and overall feedback perception
[c]Feedback content perceived
[d]Immediate feedback response

Discussion

Principal findings

This scoping review was designed according to the first 5 stages of Arksey and O'Malley's structure and is congruent with JBI's methodology. Although the search strategy developed included articles in English, Portuguese, and Spanish, only articles in English were included in the review. This fact already demonstrates the deficit in non-English literature on the proposed topic. Furthermore, the articles included were scarce and had very varied methodologies, confirming the need for a study that compiles relevant information on the subject in an organized way. Although most of these studies were primary studies, only three of them were prospective. This fact is relevant since retrospective studies in this field require more of the participants' memory to have reliable information. Therefore, believing in the perception of the feedback received when the circumstances of this moment are not exactly determined can generate opinions that are not as consistent with reality and therefore of less scientific value.

Notably, the number of articles included in this review manually was greater than that included through the search strategy. This highlights a potential limitation in the search strategy used and suggests that future reviews on this topic might benefit from a more comprehensive search approach, possibly including additional databases or refining the search terms used.

Although the main objective of this review is to study residents' perceptions of the feedback received when they are learning surgery, this is not necessarily the topic of most of the studies included in it. This scoping review includes articles whose concepts also consisted of observing teaching behaviors in the operation room; identifying effective teaching strategies; identifying resident and attendant perceptions of teaching behaviors; developing models for delivering structured feedback; developing residents' confidence; developing leadership in residency; overcoming barriers to giving and receiving feedback; and identifying faculty behaviors that promote learners' operative skills and autonomy and chief resident skill and entrustment progression. However, even in these studies, it was possible to find data related to residents' perceptions of feedback, which is why they were included here.

As this was the concept of this scoping review, residents' perceptions clearly represented information present in all the articles, but not in all studies this perception was described in detail, and feedback was often characterized only as valuable. This is most likely because, as already mentioned, the main objective of these studies is, in most cases, not the perception of the feedback itself but rather other aspects of it. These data are in line with the finding that only two articles studied the impact generated by the feedback received, although this is currently the key concept in this matter, the feedforward. This lack of focus on the impact of feedback represents a significant gap in the literature and suggests a need for future research to prioritize this aspect.

Likewise, other articles were concerned with comparing the perception of feedback from the student's perspective with that of the teacher. In this context, studies differ, but in general, students perceive feedback less when it is not explicit, whether verbally or in writing than what teachers say they provide, although both agree on its importance. This discrepancy highlights a potential communication gap between residents and preceptors that could be addressed in future educational interventions.

On the other hand, how such perceptions were assessed was very heterogeneous, almost always through a survey prepared by the researcher of each article or through a semistructured interview without standardization, which generated information that was not at all relevant. Perhaps the use of a unique instrument previously validated to measure learners' perception of feedback would be highly valuable for interpreting the data obtained and allowing for more meaningful comparisons across studies.

The feedback provided in the perioperative period was the most prevalent, of which the postoperative period was the most frequent. However, this was not always carried out immediately after the procedure but rather later. On the other hand, even though the importance of feedback provided in the pre- and intraoperative periods was recognized, it was not frequently perceived because the nonverbal interaction was sometimes used and because it was often confused with intraoperative teaching. In this regard, it is important to highlight that feedback must be student-centered, while intraoperative teaching focuses on aspects of the surgical subject. The recognized lack of feedback in the pre- and immediate postoperative periods is attributed to preceptors' declared lack of free time to provide quality feedback.

The lack of mention of the method used to provide feedback in almost all the articles can be attributed mainly to the nonprospective nature of the studies, with the preceptors being responsible for how to approach the resident, both verbally and in writing. These were the most commonly used forms of providing feedback in the articles included in this scoping review, with the use of specific instruments being less frequent. This characteristic matches the preferences declared by residents in some articles regarding the characteristics of ideal feedback, which are defined as face-to-face, timely, direct, objective, natural, and explicit. However, the lack of standardization in feedback methods across studies makes it difficult to draw definitive conclusions about the most effective approaches.

In almost half of the articles, the content covered in the feedback was related to IoS. This proved to be a highly valued topic when it was received by residents, especially when it was related to their performance and opportunities to improve their performance. However, in 46.1% of the articles, the topics covered in the feedback were not detailed, which can lead to misinterpretation of the information regarding the perception of the feedback. This lack of detailed information about feedback content represents another gap in the literature that future studies should address.

Limitation

This scoping review has an important limitation. The search strategy used descriptors in Portuguese, Spanish, and English, which surely excluded articles from different languages and cultures. Moreover, it is already known that feedback conception and practice differ according to culture and the environment [51]. Thus, the findings of this scoping review may not depict feedback perceptions

worldwide.

Conclusions

Conducting a scoping review is the best way to map what is known about a subject and to analyze related concepts and determine gaps in the published literature. In this scoping review, several gaps concerning surgical residents' perceptions of the feedback received during their education were identified:

1. Lack of standardized methods and instruments for providing and assessing feedback
2. Limited focus on the impact of feedback (feedforward concept)
3. Discrepancies between residents' and preceptors' perceptions of feedback
4. Insufficient detail in describing feedback content and residents' perceptions
5. Underrepresentation of immediate reactions to feedback
6. Scarcity of prospective studies
7. Limited cultural diversity in the literature

Although recent studies on this matter have shown that their main objective should be the progress achieved in learning and the learner's engagement in the process enabled by the feedback, this could not be found in our review. Instead, most of the articles included were about the comparison between residents' and attendants' perceptions of the feedback, the characteristics of the ideal feedback, or the residents' perceptions of the feedback but without emphasis on its impact. This information is very important, but it can be considered just part of the necessary knowledge. Knowing the best way to deliver feedback just makes sense if it is possible to measure the impact of the feedback delivered.

Similarly, the lack of a detailed description of the perception of the feedback was noted. Most articles presented only general perceptions, without any instrument standardization for the measurement of such perceptions or even the answers achieved. Therefore, the use of a specific instrument for this kind of study would be highly valuable. Thus, answers could be better analyzed, and with this, educators could consider whether the educational objectives in surgery education are being achieved. As part of knowledge translation [52], such an understanding could lead to modifications to the medical curriculum and its development or even contribute to understanding how to proceed to enhance internal feedback and residents' learning progress.

Finally, because this scoping review excluded articles in languages other than English, Portuguese, and Spanish, it may not represent feedback perceptions worldwide. Further reviews including different cultures and languages are still necessary to provide a more comprehensive understanding of feedback perceptions in surgical education globally.

Future research directions should address these identified gaps:

1. Develop and validate standardized instruments for assessing residents' perceptions of feedback in surgical education.
2. Conduct more prospective studies focusing on the impact of feedback on residents' learning outcomes and skill development.
3. Investigate the discrepancies between residents' and preceptors' perceptions of feedback, and develop strategies to align these perceptions.
4. Explore the immediate reactions to feedback and their influence on long-term learning and skill acquisition.
5. Conduct studies that provide detailed descriptions of feedback content and residents' perceptions, allowing for a more nuanced understanding of effective feedback practices.
6. Expand research to include diverse cultural contexts and non-English speaking countries to gain a more comprehensive global perspective on feedback in surgical education.
7. Investigate the effectiveness of different feedback methods and instruments in improving surgical skills and knowledge.
8. Explore the potential of technology-enhanced feedback methods in surgical education and

their impact on residents' learning.

By addressing these research directions, the field of surgical education can move towards more evidence-based, effective, and learner-centered feedback practices. This, in turn, can lead to improved learning outcomes for surgical residents and ultimately enhance patient care.

In conclusion, this scoping review has highlighted significant gaps in our understanding of surgical residents' perceptions of feedback. While feedback is universally recognized as crucial for learning and skill development in surgical education, there is a clear need for more standardized, comprehensive, and impact-focused research in this area. By addressing these gaps, educators and policymakers can develop more effective feedback strategies, leading to improved surgical training programs and better-prepared surgeons. As the field of surgical education continues to evolve, it is crucial that feedback practices evolve alongside it, always keeping the ultimate goal of improved patient care at the forefront.

Acknowledgments

To Zélia Cristina Regis, librarian of the Faculty of Medicine of São José do Rio Preto, Brazil, for her collaboration in designing the search strategy.

Conflicts of interest

None declared.

Author contributions

CC is the main researcher and was responsible for the scoping review conceptualization and performance of the data curation, investigation, formal analyses, writing the original draft, writing review and editing, and project administration. GS contributed to the investigation and data curation. ES, AE, AC, AL, VB, DO, and AO contributed to the writing, review, and editing. JA contributed to the protocol conceptualization and formal analyses, writing, review and editing, and supervision. All authors contributed to the manuscript reading and the approval of the submitted version.

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Abbreviations

ASP: Academic Search Premier
BMC: BioMed Central Open Access
CP: feedback content perceived
DOAJ: Directory of Open Access Journals
G: general content
GaO: general and overall feedback perception
Im: immediate feedback response
IoS: intraoperative skills
JBI: Joanna Briggs Institute
NS: next steps
NtP: nontechnical performance
PoP: preoperative planning
PRISMA-SR: preferred reporting items for systematic reviews and meta-analyses extension for scoping reviews
ROAD: Directory of Open Access Scholarly Resources
RxA: residents' *versus* attendants' feedback perceptions
USA: United States of America
WILEY: Wiley--Blackwell

Supplementary Files

Figures

PRISMA-SR flow diagram showing the number of identified, screened, eligible, and included articles.