



REVIEW

# FEEDBACK USE IN PARAMEDICINE: A SCOPING REVIEW

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## ABSTRACT

*Objective:* The aim of this scoping review is to determine how feedback is used in paramedicine.

*Introduction:* Feedback is widely recognised as essential for clinician growth in healthcare however there is limited research on its use within paramedicine. Paramedics place high value on effective feedback and different types and methods are used depending on context.

*Methods:* Peer-reviewed primary research involving any type of feedback used in paramedicine was included. We searched MEDLINE, CINAHL, EMCARE, SCOPUS, and grey literature from inception to March 2023. Two authors independently screened and selected studies for full-text review. One reviewer performed data extraction. This review followed JBI methodological guidance and PRISMA extension for scoping reviews.

*Results:* From 413 articles 20 were included in this review (16 quantitative, 3 qualitative, and 1 mixed-methods). Feedback is generally given under the themes of professional and personal development, quality improvement, resuscitation, and education. Paramedics have a strong desire for feedback to meet personal and professional needs. However, current provisions are inadequate and compounded by existing barriers. Informal routes of feedback are sought when formal routes are inadequate despite the latter having more weighting. Feedback in resuscitation either in real-time or post-incident positively modifies paramedic behaviour to improve performance. Feedback is used in paramedic services to standardise care as part of quality improvement. Within an education setting feedback as an education tool is well received and improves confidence for future performance.

*Conclusion:* Paramedics display a positive attitude to receiving feedback to meet personal and professional requirements. Desires for feedback outweigh provisions compounded by existing barriers, potentially creating a paramedic wellbeing issue. Feedback is an effective tool within paramedicine in modifying behaviours either immediately or post-incident to improve clinical performance.

*Keywords:* Paramedic, Paramedicine, Emergency Medical Services, Feedback, Out-of-hospital

## INTRODUCTION

Despite the importance of feedback within the wider healthcare system, its use in the paramedicine profession is not well documented in the literature (Eaton-Williams, Mold, & Magnusson, 2020a; Wilson, Janes, Lawton, & Benn, 2023). Paramedicine is an

evolving profession with a relatively young literature base and is no longer limited to the traditional emergency ambulance setting (Eaton, Mahtani, & Catterall, 2018; Williams, Beovich, & Olaussen, 2021). Irrespective of the working environment, paramedic wellbeing is a top priority and burnout remains a significant concern (Reardon, Abrahams, Thyer, & Simpson, 2020). The provision of effective feedback should be used as a tool to address the professional and emotional requirements of paramedics, potentially improving their wellbeing (Eaton-Williams, Mold, & Magnusson, 2020b; McGuire et al., 2021). Other benefits of feedback include clinical education, clinician self-reflection leading to autonomous practice and motivating paramedics to improve care (Cash, Crowe, Rodriguez, & Panchal, 2017; Persse, Key, & Baldwin, 2002).

Feedback is the delivery of evaluative information and represents a key concept in learning and improvement (Dai, Bertram, & Chahine, 2021; Hardavella, Aamli-Gagnat, Saad, Rousalova, & Sreter, 2017). Delivery of feedback to healthcare staff is essential for staff well-being and clinical performance through reinforcing positive and modifying negative behaviours (Burgess, van Diggele, Roberts, & Mellis, 2020). Feedback is provided formally or informally and should be reinforcing (positive) or constructive (negative) (Panneerselvam, 2018). Although the importance of reinforcing feedback is well documented, a balanced approach using constructive feedback should be provided to improve clinician competency and patient outcomes (Hardavella et al., 2017; Plunkett, 2022). A Cochrane review highlighted how audit and feedback leads to small but potentially important improvements in aligning patient care with expected clinical practice, however, this was largely focused on doctors (Ivers et al., 2012). Further key findings suggested feedback is most effective when baseline performance is poor, given by a supervisor or colleague, is repeated, given through multiple means, and includes clear goals.

Paramedics place high importance and value on effective feedback to gain clinical and emotional closure (Wilson, Howell, Janes, & Benn, 2022). Paramedics often work in small teams or as solo responders to patients in the community and by the nature of their work are often clinically isolated from the wider healthcare system. With an emphasis on reducing Accident and Emergency pressures, increasingly complex patients are being treated in the community leading to diagnostic uncertainty as they are referred to other healthcare providers or discharged from paramedic care (Blodgett, Robertson, Pennington, Ratcliffe, & Rockwood, 2021; Wilson et al., 2022). Consequently, despite paramedics often being the first medical contact for patients, the outcomes are often unknown due to minimal patient contact time and lack of formal clinical follow-up (Drennan, Blanchard, & Buick, 2021; Eaton-Williams et al., 2020a). This can lead to wellbeing issues and a missed opportunity for learning thus reinforcing the importance of feedback to validate clinical assessment and preliminary diagnoses (Koivulahti, Tommila, & Haavisto, 2020). Paramedics also use feedback to guide clinical self-reflection to improve future performance, a key aspect of essential continuing professional development requirements (Health & Care Professions Council, 2023; Thompson, Couzner, & Houston, 2020).

There are different known types and sources of feedback available to paramedics and access is dependent on context and resources. These include real-time feedback devices

or through quality improvement processes retrospectively after an incident (Simone, Ana Maria, & Fernando Tobal, 2020; Wang, Su, Fan, Hou, & Chen, 2020). However, even with various feedback sources available it is still lacking in consistent quantity and quality (Wilson et al., 2022). Along with infrequent provision there are existing barriers in place for paramedics receiving feedback which hinders professional and organisational learning (O'Hara et al., 2015). These include confidentiality issues, loss of further patient contact, experience, and skill level. Providing tailored, individual feedback to improve competency is also a resource-intensive process (Eaton-Williams et al., 2020a; O'Connor & Megargel, 1994).

Understanding what role feedback plays is essential to standardising and improving the quality of patient care provided by paramedics. For example, a recently published systematic review meta-analysis summarised how feedback affects the quality and safety of patient care in an Emergency Medical Services environment (Wilson et al., 2023). Another literature review focused on ambulance clinicians, highlighted how clinical performance is improved with feedback however, the effect on patient outcomes is unclear (Eaton-Williams et al., 2020a). Both reviews examined feedback only within a patient outcome context and highlights the literature gap on the concept of feedback in the paramedicine space compared to other health professions. This scoping review will focus on addressing this gap by encompassing all concepts of feedback. The aim of this scoping review is to determine how feedback is used within paramedicine.

## METHODS

### PROTOCOL AND REGISTRATION

This scoping review followed the Joanna Briggs Institute (JBI) guide for scoping reviews and adhered to the PRISMA extension for scoping reviews (PRISMA-ScR) (Aromataris & Munn, 2020; Tricco et al., 2018). A scoping review is chosen to map and summarise the existing literature, develop themes, and identify areas for future research (Munn et al., 2018). PRISMA-ScR is recommended in paramedicine scoping reviews as a standardised reporting format (Williams & Beovich, 2020). This scoping review was registered through the Open Science Framework[JF1] (Foster, Todd, & Williams, 2023).

### INCLUSION CRITERIA

#### *POPULATION*

Eligible studies included Paramedics, Emergency Medical Technicians (EMTs), or Emergency Medical Services (EMS). EMTs and EMS were included in the population field to increase the sensitivity of a paramedic filter (Olaussen, Semple, Oteir, Todd, & Williams, 2017).

#### *CONCEPT*

Primary studies which included feedback were included. The term "feedback" was not defined in this scoping review to capture all eligible literature.

CONTEXT

Any form of feedback provided or received within a domain of paramedicine practice or out-of-hospital environment.

SOURCE OF EVIDENCE SCREENING AND SELECTION

A database search was undertaken including MEDLINE, CINAHL, EMCARE, and SCOPUS. Grey literature was also searched using TROVE and Google Scholar. The literature search was completed from inception to 28th March 2023.

An initial search using MEDLINE was conducted to identify suitable MeSH terms and keywords. MeSH terms were adopted for each database. The following search terms were used; Paramedic\*, Emergency Medical Technicians.MeSH, Emergency Medical Services.MeSH, feedback, paramedicine, ambulance\*.

Eligible articles were exported into Endnote X20 before importing to COVIDENCE for duplicate removal and screening (The Endnote Team, 2013; Veritas Health Innovation, 2023). Two reviewers (JF and ST) independently screened the title and abstract for eligibility and then full-text review. Any conflicts were resolved by discussion. A third reviewer (BW) was available to resolve any unresolved conflicts however was not required. One author (JF) performed forward and backward citation chaining to identify further eligible studies.

ELIGIBILITY CRITERIA

Peer-reviewed literature with any empirical-methodological approach was included. Literature reviews and studies not in English were excluded. There were no date restrictions placed on the literature search.

DATA EXTRACTION

One reviewer (JF) performed data extraction on full-text articles into a data extraction template (See Table 1).

SEARCH RESULTS

Database searches revealed 423 records (MEDLINE n = 96, CINAHL n = 88, EMCARE n=82, SCOPUS n = 157). A total of 216 duplicates were removed by COVIDENCE. A total of 207 records were screened for title and abstract with 184 records excluded. Eight records were excluded after a full-text review. Six studies were retrieved through hand-searching grey literature (TROVE n = 1, Google Scholar n = 5) with one record excluded. After full text screening a total of 20 records were included in this scoping review. A PRISMA flow diagram summarises results and shows reasons for exclusion (Figure 1).

Legend
ALS = Advanced life support,
CPD = Continuing professional development,
CPR = Cardiopulmonary resuscitation,
ED = Emergency department,
EMS = Emergency medical services,
EMT = Emergency medical technician,
ERC = European resuscitation guidelines,
PLE = Pronounced life extinct,
TCA = Traumatic cardiac arrest

TABLE 1 Legend

Article	Location	Study Type	Population	Sample Size	Outcomes	Key findings	Theme
Avery, P., Thompson, C., & Cowburn, P. (2023).	United Kingdom	Mixed Methods	Paramedic training officers	n = 48	Evaluating improvement of Training officer paramedics through providing a simulation-debrief model.	Feedback from higher clinical sources is valued Immediate debriefing post-learning improved confidence Feedback and debriefing allow questions to complete the learning loop Feedback identifies errors and reinforces learning outcomes in an educational environment.	Education
Bleijenberg, E., Koster, R. W., de Vries, H., & Beesems, S. G. (2017).	Netherlands	Quantitative Statistical analysis	Paramedics and ambulance drivers	n = 34 17 paramedics 17 ambulance drivers	Study impact of post-resuscitation feedback on CPR quality	Feedback modifies behaviour during resuscitation Cardiac compression quality improved after receiving specific feedback	Resuscitation
Brinkrolf, P., Lukas, R., Harding, U., Thies, S., Gerss, J., Van Aken, H., Lemke, H., Schniedermeier, U., & Bohn, A. (2018).	Germany	Quantitative Statistical analysis	Paramedics and emergency physicians	n = 205 102 equipped with feedback devices (75 paramedic, 27 physician) 103 un-equipped (77 paramedics, 26 physicians)	Assess what is the acceptance level of real-time feedback Differences between crews with or without the equipment What aspects of real-time feedback have different acceptance levels	Ambulance crews have a positive attitude towards real-time resuscitation devices Ambulance crews perceive some aspects of feedback devices to improve safety	Resuscitation
Charlton, K., McClelland, G., Millican, K., Haworth, D., Aitken-Fell, P., & Norton, M. (2021).	United Kingdom	Quantitative Statistical analysis	Paramedics EMT Clinical Care assistants	n = 106 78 paramedics 28 non-paramedic	Primary outcome: Determine ventilation percentage difference in compliance following ERC guidelines with or without feedback Secondary outcome: Explore differences between paramedic and non-paramedic crews	Real-time ventilation feedback modified behaviour and improved ventilation quality Staff are receptive to using feedback devices	Resuscitation
Choi, B., Tsai, D., McGilivray, C. G., Amedee, C., Sarafin, J. A., & Silver, B. (2014).	USA	Quantitative Comparative analysis	Ambulance Clinicians	53/59 ambulance services in the state Did not specify the clinician's skill level	Evaluated whether hospital-directed EMS stroke follow-up tool improved documentation of adherence to EMS stroke protocols	Standardised feedback improved compliance with protocols Feedback modifies clinical behaviours/interventions and improves documentation Interprofessional feedback on specific patient groups improved care standards	Quality Improvement
Eaton-Williams, P., Mold, F., & Magnusson, C. (2020).	United Kingdom	Qualitative Phenomenological study. Semi-structured interviews	Paramedics	n = 8 From a total of 40 staff Convenience sampling from only one ambulance station	Explore paramedic perceptions of clinical performance feedback and attitudes towards the introduction of formal mechanisms for providing patient outcome feedback	Paramedics perceive formal feedback as absent or inadequate Paramedics want feedback on developmental and emotional needs Informal routes are taken when the formal routes are not sufficient Professional and emotional needs left unmet may increase work-related stress leading to a retention issue Negative feedback given should be done with positive intent and in a supportive environment Patient outcome feedback may reduce paramedic clinical isolation in the healthcare service. There are potential positives and negatives to receiving feedback depending on the nature of the feedback Monitored or supported feedback is resource intensive	Personal and Professional development
Hellevo, H., Sainio, M., Huhtala, H., Olkkola, K. T., Tenhunen, J., & Hoppu, S. (2014).	Finland	Quantitative Statistical analysis	Paramedics	n = 24	Analyse if CPR quality during transportation can be improved with a feedback device Determine compression depth	Real-time feedback devices improves compression depth and rate by modifying behaviours	Resuscitation

TABLE 1: Results

Article	Location	Study Type	Population	Sample Size	Outcomes	Key findings	Theme
Lyngby, R. M., Clark, L., Kjoelbye, J. S., Oelrich, R. M., Silver, A., Christensen, H. C., Barfod, C., Lippert, F., Nikolettou, D., Quinn, T., & Folke, F. (2021).	Denmark	Quantitative Statistical analysis	Paramedics EMT	n = 64 8 ALS paramedics 56 BLS paramedics	Ventilation quality (rate and tidal volume) Simulated environment	Ventilation quality improved with real-time feedback by modifying behaviours	Resuscitation
Lyon, R. M., Clarke, S., Milligan, D., & Clegg, G. R. (2012).	United Kingdom	Quantitative Statistical analysis	Ambulance crew (paramedic and non-paramedics)	n = 137	Assess the quality of prehospital resuscitation pre and post-individual feedback and training based on objective data captured by defibrillator telemetry.	Resuscitation can either be real-time through devices or post-event to evaluate the performance Both forms modify clinician behaviour to improve the quality of resuscitation	Resuscitation
McGuire, S. S., Luke, A., Klassen, A. B., Myers, L. A., Mullan, A. F., & Sztajnkrzyer, M. D. (2021).	USA	Quantitative Descriptive statistics. Online survey	EMT Paramedics	n = 94 61 paramedics, 33 EMT's 20% response rate	Describe the frequency of feedback received by ground-based EMS Factors associated with receiving feedback and how follow-up on patient outcomes related to EMS provider job satisfaction	There is a large lack of feedback provision to EMS staff both in quantity and quality Feedback has an impact on job satisfaction Feedback is reinforcing or constructive, a lack of feedback will miss clinical errors and not reinforce positive behaviours Better working relationships with other health providers may lead to better feedback provision systems Paramedics are often the first medical contact but do not get feedback for closure on outcomes Junior staff receive more feedback due to close supervision. Senior staff are often overlooked for feedback. Confidentiality is a barrier to feedback provision	Personal and Professional development
McGuire, S. S., Luke, A., Klassen, A. B., Myers, L. A., Mullan, A. F., & Sztajnkrzyer, M. D. (2021).	United Kingdom	Qualitative Semi-structured interviews	Paramedics EMT Clinical supervisors One ambulance service	n = 20 9 paramedics 4 EMT's 3 specialist paramedics 4 clinical supervisors	Explore perceptions of EMS professionals regarding the current provision of feedback and their view on how feedback impacts patient care, safety and staff wellbeing	Feedback provides paramedics validation on clinical decision making Paramedics want feedback for personal and professional development Barriers to feedback provision include time, confidentiality, resources and clinical isolation Feedback essential for paramedic self-reflection and supporting CPD, a fundamental professional competency Feedback should be given on an individual basis in a timely manner based on targets	Personal and Professional development
Mock, E. F., Wrenn, K. D., Wright, S. W., Eustis, T. C., & Slovis, C. M. (1997).	USA	Quantitative Observational study	Paramedic and EMT	n = 69 26 EMT's 43 Paramedics	Determine the type and frequency of immediate, unsolicited feedback received by EMS from patients, families and ED personnel	There is a distinct lack of feedback provided to EMS by family or ED staff A lack of feedback may lead to feelings of lack of recognition Feedback is more likely with critically unwell patients Feedback should be given in a structured way in an emotive atmosphere	Personal and Professional development
Morrison, L., Cassidy, L., Welsford, M., & Chan, T. M. (2017).	Canada	Qualitative Semi-structured interviews Interpretive descriptive technique	Paramedics	n = 12 From a total of 324 paramedics in the region	Explore paramedics perceived needs for feedback Explore what feedback they felt would improve their performance as healthcare providers	Paramedics desire feedback Clinical feedback can be positive or negative Formal feedback or informal feedback There are barriers to feedback There is a lack of frequency and consistency in receiving feedback Feedback is seen as an educational tool There are potential positives and negatives to staff receiving feedback	Personal and Professional development

TABLE 1: Results (continued)

Article	Location	Study Type	Population	Sample Size	Outcomes	Key findings	Theme
O'Connor, R. E., & Megargel, R. E. (1994).	USA	Quantitative Statistical analysis	All paramedics in New Castle County, Delaware	6 ALS units were in operation at the time Each ALS unit consisted of a 2 person team	QI process conveying results on chart audits to identify deficiencies and encourage improvement.	Quality Improvement feedback improves documentation and modifies paramedic behaviour Group feedback is less resource intensive and appropriate when a large percentage of staff are substandard Group feedback doesn't remove the need for individual feedback Individual feedback provided when a small percentage of staff are substandard	Quality Improvement
Ødegaard, S., Kramer-Johansen, J., Bromley, A., Myklebust, H., Nysæther, J., Wik, L., & Steen, P. A. (2007).	Norway and United Kingdom	Quantitative Statistical analysis	ALS-trained ambulance staff	n = 80	Determine if physical capability affects the quality of chest compressions	Real-time feedback improves chest compression quality Visual and audio feedback effective in modifying behaviour	Resuscitation
O'Meara, P., Munro, G., Williams, B., Cooper, S., Bogossian, E., Ross, L., Sparkes, L., Browning, M., & McClounan, M. (2015).	Australia	Quantitative Quasi-Experimental	Final-year Paramedicine and nursing students	n = 39 20 nursing students 19 paramedicine students	Determine if eye tracking and video feedback improves the quality of feedback and enhance situational awareness in students undertaking simulated emergency training	Video feedback is an educational tool to reflect on how to improve future performance	Education
Persse, D. E., Key, C. B., & Baldwin, J. B. (2002).	USA	Quantitative Prospective Chart review	Patients	n = 151	Determine if the quality improvement feedback loop would change the decision-making of paramedics	Objective feedback motivates paramedics to improve patient care Objective feedback prompted self-reflection on practice Feedback modified paramedic behaviour with non-conveyance rates	Quality Improvement
Rebecca E. Cash, Remle P. Crowe, Severo A. Rodriguez & Ashish R. Panchal (2017)	USA	Quantitative Cross-sectional. Electronic questionnaire	EMT grade (43.4%) or higher Paramedics (46.1%) in a civilian setting	n = 15,766 From a total of 310,711 on the register	Describe prevalence of feedback received within 30 days -Areas for feedback -Who gave it -Timing of it -Usefulness Factors associated with receiving feedback within 30 days	Feedback is not routinely given Lack of feedback is a missed opportunity for education and improving patient care Majority of feedback is given verbally and informally. Informal feedback is often given soon after the event by colleagues Formal feedback was given by more senior clinicians days after the event. Feedback has a higher value from senior clinicians Need to optimise the feedback process. Potential for more dedicated time with senior clinicians Junior clinicians and higher skillset paramedics more likely to receive feedback Senior staff may not recognise they are being given feedback Lack of data sharing is a barrier to feedback EMS staff want to be given feedback to improve patient care	Personal and Professional development
Ter Avest, E., McWhirter, E., Dunn, S., Griggs, J. E., & Lyon, R. M. (2019).	United Kingdom	Quantitative Descriptive statistics	Air Ambulance teams (1 doctor and 1 paramedic) Patients who died from traumatic cardiac arrest	n = 159	Percentage of patients with TCA PLE and cause of death established by coroners report Agreement between clinical diagnosis and coroners report for patients who die after TCA	A lack of feedback leads to a missed opportunity to evaluate the care provided and improve pattern recognition Interprofessional feedback and data sharing are not routine and are an opportunity to improve patient care	Quality Improvement
Weber, A., Delpont, S., & Delpont, A. (2022).	Australia	Quantitative Statistical analysis	Paramedic students	n = 40	Evaluate providing real-time feedback on the provision of CPR quality Evaluate fatigue from maintaining CPR	Real-time feedback improved cardiac compression depth by modifying behaviours	Resuscitation

TABLE 1: Results (continued)

STUDY CHARACTERISTICS

A total of 16 studies were quantitative, three qualitative, and one mixed-methods in nature. The year of publication ranged from 1994 to 2023 with a median year of 2017. The focus of the studies was paramedics only (n = 6), mixed skillsets (n = 11), students (n = 2), and patients (n = 1). The study focused on patients was included as it involved a feedback loop involving paramedics. Figure 2 displays the distribution of studies based on their country of origin (Figure 2).

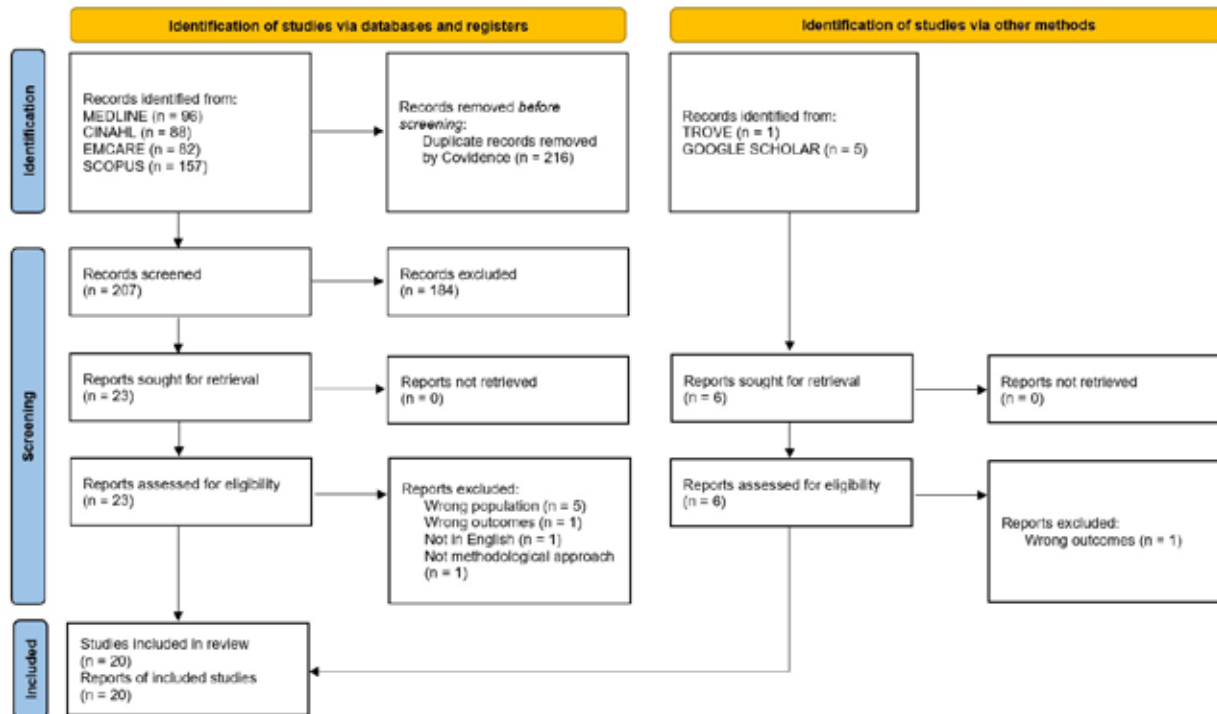


Figure 1. PRISMA flow diagram

After data extraction four overarching themes were developed. These themes were Personal and Professional Development, Quality Improvement, Resuscitation, and Education.

FEEDBACK IN PERSONAL AND PROFESSIONAL DEVELOPMENT

A total of six records were categorised into the theme of personal and professional development. In the UK three qualitative studies highlighted how paramedics desired and described clinical feedback as an essential aspect of personal, emotional, and professional development (Eaton-Williams et al., 2020b; Morrison, Cassidy, Welsford, & Chan, 2017; Wilson et al., 2022). Patient outcome feedback was desired for emotional closure, clinical curiosity, and self-reflection to improve future patient care (Cash et al., 2017; Morrison et al., 2017). Paramedics described that when feedback needs are unmet there



is an increase in work stress due to patient outcome or clinical diagnosis uncertainty leading to burnout and a retention issue (Eaton-Williams et al., 2020b).

Multiple studies including qualitative and quantitative methodologies reported a perceived lack of feedback in consistency, quality, and quantity (Cash et al., 2017; Eaton-Williams et al., 2020b; McGuire et al., 2021; Morrison et al., 2017). Two studies from the USA reported that 30% and 50% of staff had received no feedback within the last 30 days (Cash et al., 2017; McGuire et al., 2021). A lack of feedback may lead to feelings of lack of recognition (McGuire et al., 2021; Mock, Wrenn, Wright, Eustis, & Slovis, 1997). Junior staff and staff with higher clinical skillset were more likely to receive feedback compared to senior staff who were often overlooked (Cash et al., 2017; McGuire et al., 2021). One study reported junior staff with less than two years of experience were more likely to receive feedback while staff with greater than 16 years of experience had 41% lower odds (Cash et al., 2017). However, the same study acknowledged senior staff may not recognise feedback is being provided due to their seniority. In the emergency department, ambulance paramedics were not given unsolicited feedback by family members 76% of the time or emergency department staff 73% of the time (Mock et al., 1997).

Feedback provided was classed as formal or informal, with informal routes being provided more frequently (Eaton-Williams et al., 2020b; Morrison et al., 2017). The most common route for informal feedback was verbal (94.8%), followed by email (35.1%), written (18.5%), and by mobile text (16.3%) (Cash et al., 2017). Feedback was most common from a crewmate or partner (70.9%) followed by supervisors (59.6%), hospital staff (57.4%), training officers, (42.6%) and medical directors (20.6%) (Cash et al., 2017). Email was the most common form of formal feedback from a senior officer four days after an event and verbal feedback provided by a crewmate was the most common informal route (Cash et al., 2017). Feedback was deemed to have more value from sources of higher clinical authority (Cash et al., 2017). Existing barriers to feedback provision included time, confidentiality, and clinical isolation (McGuire et al., 2021; Wilson et al., 2022). Monitored and supportive feedback was also reported as a labour-intensive barrier (Eaton-Williams et al., 2020b).

Feedback is also categorised as being reinforcing (positive) or constructive (negative) with benefits and risks to both (McGuire et al., 2021; Morrison et al., 2017). One study from the USA suggested 60% of staff received no constructive feedback and 65% received no reinforcing feedback within 30 days (McGuire et al., 2021). There are perceived risks in receiving reinforcing and constructive clinical feedback and it should be provided in a timely manner based on specific targets (Eaton-Williams et al., 2020b; Mock et al., 1997; Wilson et al., 2022). Reinforcing feedback increased clinician confi-

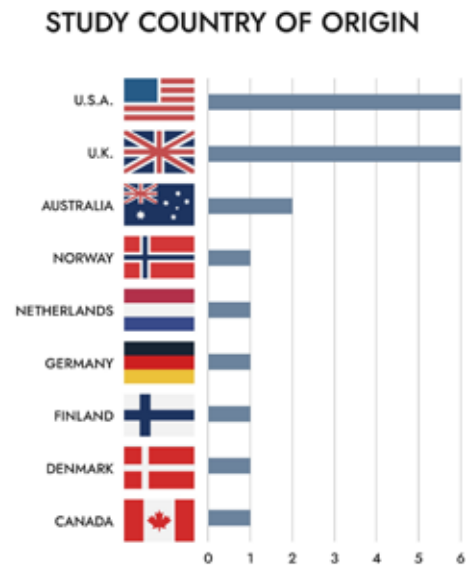


Figure 2. Study country of origin

dence and job satisfaction (Eaton-Williams et al., 2020b; Morrison et al., 2017). Conversely, constructive feedback could damage the clinician's self-image and promote fears of reprimand (Eaton-Williams et al., 2020b; Morrison et al., 2017).

#### FEEDBACK ON QUALITY IMPROVEMENT

A count of four records were categorised under Quality Improvement (QI). Feedback is provided in QI to set standards, evaluate performance, and facilitate improvement (O'Connor & Megargel, 1994; Persse et al., 2002). Specific feedback loops positively modify behaviours in line with expected clinical practice and improve documentation quality (Choi et al., 2014; O'Connor & Megargel, 1994). Group feedback can be used when a large percentage of staff are substandard while individual feedback is provided when a small percentage of staff are substandard (O'Connor & Megargel, 1994). A QI feedback loop improved endotracheal intubation documentation compliance (84.4% -> 98.8%) and decreased trauma scene times greater than 10 minutes (24.8% to 1.4%) (O'Connor & Megargel, 1994). Another feedback loop reduced the number of dissatisfied patients (8 -> 0) and reduced the number of paramedic-initiated non-conveyance in the elderly (14-> 4) although this was not statistically significant (Persse et al., 2002). This feedback loop consisted of a training conference capturing paramedics and facilitators who emphasised the non-judgemental nature of quality improvement programs.

Two records addressed multidisciplinary sources for QI (Choi et al., 2014; Ter Avest, McWhirter, Dunn, Griggs, & Lyon, 2019). Hospital-directed feedback using a 10-point standardised patient outcome feedback form improved clinical documentation and resulted in a statistically significant increase in overall compliance with stroke-specific state protocols (Choi et al., 2014). A UK study showed 32% of injuries in patients with traumatic cardiac arrest pronounced deceased on the scene were identified by the coroner and not identified on the scene (Ter Avest et al., 2019). A lack of routine feedback with the aims of QI is a barrier to evaluating care and a missed opportunity to improve injury pattern recognition (Ter Avest et al., 2019).

#### FEEDBACK IN RESUSCITATION

A total of eight records were categorised under the theme of feedback in resuscitation. Most resuscitation-themed records originated in Europe (n = 7) and one record from Australia. Feedback within resuscitation was given immediately using real-time feedback devices or post-resuscitation to evaluate performance (Lyon, Clarke, Milligan, & Clegg, 2012). Regardless of feedback type there was an improvement in resuscitation quality achieved by modifying clinical behaviours to adhere to existing resuscitation guidelines (Bleijenberg, Koster, de Vries, & Beesems, 2017; Charlton et al., 2021; Hellevuo et al., 2014; Lyngby et al., 2021; Lyon et al., 2012; Odegaard et al., 2007; Weber, Delpont, & Delpont, 2022). There was also a theme of narrowing the performance range through a reduction in extremes of values (Bleijenberg et al., 2017; Charlton et al., 2021; Lyngby et al., 2021; Lyon et al., 2012). Among paramedics, there was a generally positive attitude towards the use of resuscitation feedback devices (Brinkrolf et al., 2018; Charlton et al., 2021). Feedback was classed into auditory, visual, and voice prompts and

there was a perception of increased safety with use (Brinkrolf et al., 2018). In Germany, 87.4% of staff had positive attitudes with satisfaction increasing with repeated training and exposure (Brinkrolf et al., 2018).

A total of two records focused on providing real-time ventilation feedback within a simulated environment (Charlton et al., 2021; Lyngby et al., 2021). A Danish study revealed how ventilation quality was significantly superior to real-time ventilation in a simulated environment (Lyngby et al., 2021). There was an improvement in ventilation rate (66.7% -> 97.4%), volume (53.4% -> 77.5%) and combined rate and volume (22.1 -> 75.3%). This significant improvement in ventilation quality was also seen in a UK study where compliance with European Resuscitation Council guidelines increased (9% -> 91%) (Charlton et al., 2021).

The use of a real-time chest compression feedback device modifies behaviours to improve chest compression quality (Bleijenberg et al., 2017; Hellevuo et al., 2014; Lyon et al., 2012; Odegaard et al., 2007; Weber et al., 2022). Simulated chest compressions in a moving vehicle improved chest compression depth (51mm -> 56mm) with an emphasis on reduced extremes of values (Hellevuo et al., 2014). Real-time visual and auditory feedback can be used to overcome physical and emotional barriers to provide correct compression depth and compression quality and can allow for positive modification with real-time feedback regardless of physical capability (Odegaard et al., 2007). One record found compression quality increased with Australian paramedic students who also reported increased fatigue with increased compression depth (Weber et al., 2022). Two records focused on comparing resuscitation quality pre- and post-feedback for prehospital cardiac arrests (Bleijenberg et al., 2017; Lyon et al., 2012). A study from the Netherlands focused on the impact of providing feedback on compression rate, fraction, and post-shock pause from defibrillator downloads post-cardiac arrest (Bleijenberg et al., 2017). After peer-to-peer feedback was provided, compression fraction increased (79% -> 86%) and the longest post-shock pause decreased (40 seconds to 19 seconds). This was similar in a UK study where providing individual feedback on defibrillator downloads increased compression fraction (73% -> 79%) and a reduction in median time to shock (20.25 seconds to 13.5 seconds) (Lyon et al., 2012).

#### FEEDBACK IN EDUCATION

A count of two records were placed into the theme of feedback used in education and both shared similar traits where feedback was provided promptly post-event in a controlled educational environment. One record included the use of recorded video feedback on student paramedicine performance in Australia within a simulated educational environment (O'Meara et al., 2015). Students highly valued this form of feedback and its use to guide and reflect on their practice to improve future performance. Another record focused on providing immediate feedback to training officer paramedics after a simulated scenario in the United Kingdom (Avery, Thompson, & Cowburn, 2023). Feedback was provided by higher sources of clinical authority and linked to pre-defined learning objectives. Training officers reported satisfaction with the quality of feedback provided and improved confidence. Despite the articles in an educational setting with

the extremes of paramedicine qualification, we did not identify any records looking at feedback to patient-facing qualified paramedics in an educational environment.

## DISCUSSION

The purpose of this review was to examine how the concept of feedback is used in paramedicine due to the literature gap and the advantages of feedback observed in other health professions (Ivers et al., 2012). By synthesising the results of this review, this discussion will explore the current practices and challenges and identify future insights. Paramedics have a strong desire to receive feedback to achieve personal and professional closure however these needs are currently not being adequately met. There is a perceived infrequency and inadequacy of received feedback alongside an inequality with experienced staff less likely to receive it. Informal feedback routes are often sought through the form of a work colleague when formal routes such as workplace reviews are inadequate and do not satisfy this strong need for feedback. When feedback has been provided, particularly within resuscitation or quality improvement domains, there are positive modifications in behaviour to improve clinical performance. This suggests paramedics have a positive attitude to improve their own ability to provide quality patient care. Although feedback positively modifies paramedic compliance it is unclear if this directly improves patient outcomes. Within an educational context, promptly provided feedback is highly valued by recipients.

The perceived inconsistency and inadequacy of feedback among paramedics is concerning despite the effects it has on modifying behaviour and improving clinical performance. However, this is not unique to paramedics as residency doctors have also reported poor feedback mechanisms, suggesting this may not be limited to the paramedicine profession (Ramani et al., 2017). Increasing the frequency of reinforcing feedback should satisfy the lack of recognition and may enhance paramedic resilience and self-confidence in a health care profession with numerous stressors (Eaton-Williams et al., 2020a). Informal peer-to-peer feedback among paramedics is the dominant source of feedback, most likely due to the immediate accessibility from a trusted colleague. Therefore, paramedics should be provided with adequate training in feedback provision and there is potential to establish a robust system of peer-to-peer feedback. However, there is a risk of peer-to-peer feedback being positively skewed due to an unwillingness to upset colleagues (Ramani et al., 2017; Stockdill, Hendricks, Barnett, Bakitas, & Harada, 2023). Within the hospital environment peer-to-peer feedback is seen as a potentially underutilised and low-resource method for improving clinical performance (Stockdill et al., 2023). However, paramedics often work in a unique out-of-hospital environment and feedback requirements may therefore be different to that of other health professionals. This distinct working environment should also take into consideration other factors such as workplace culture and existing barriers.

The organisational culture and existing barriers can partly attribute to inconsistent and inadequate feedback provision. An organisation's underlying culture should lay the foundations of effective feedback provision by moving away from a culture of blame and see all forms of feedback, particularly constructive, as an opportunity for learning (Ramani et al., 2017). Being within a supportive and fair organisational culture that

is willing to learn from mistakes improves the overall reception of constructive feedback (Plunkett, 2022; Ramani et al., 2017). Additionally, constructive feedback should be delivered with a clear position of positive intent, using a structured approach in a supportive environment to minimise damage to self-perception (Eaton-Williams et al., 2020b; Mock et al., 1997; Ramani et al., 2017). In addition to addressing the underlying culture, it is crucial to address existing barriers hindering effective feedback provision. Patient outcome feedback is challenging due to the loss of patient contact as they are transferred or discharged from care. Inconsistency is also partly attributed to confidentiality and non-integrated health systems. Integrating feedback within a multidisciplinary setting may lead to mutual learning and potentially reduce the clinical isolation often felt by paramedics. There is currently no widely accepted standardised feedback template which may also explain the inconsistency. The use of a standardised template provides this consistency and a concurrent improvement in performance (Choi et al., 2014). Despite these barriers, there are clinical areas, such as resuscitation, when feedback has been successfully implemented into paramedic practice.

The ability of emergency ambulance paramedics to perform resuscitation skills remains a fundamental competency and is imperative to improving cardiac arrest outcomes (Dyson et al., 2016). It is therefore unsurprising to see how most records investigated either real-time or post-incident feedback. Providing resuscitation feedback to paramedics produced an improvement in future clinical performance suggesting paramedics are receptive to feedback. In particular, the use of real-time feedback devices provides a method to immediately and positively modify critical resuscitation skills such as reduced time to shock along with chest compression and ventilation quality. This is reflected in current international resuscitation guidelines recommending that real-time devices are used in clinical practice to ensure quality resuscitation across emergency care systems (Wyckoff et al., 2021). However, the uptake and type of devices used within the emergency ambulance services are unknown. Outside of resuscitation, feedback has also demonstrated its benefits in an educational context, particularly with student paramedics.

Feedback is an established part of health education and is one of the most important interactions between a student and a teacher (Burgess et al., 2020). Student paramedics are often in a position where feedback is constantly provided under close supervision through their mentors or educators. A scoping review on paramedic student clinical education placements revealed that student paramedics demonstrate high levels of self-motivation and place clear requirements on the need for clear, objective feedback (Carroll, Peddle, & Malik, 2023). This feedback is seen as crucial for enhancing their foundational knowledge and facilitating a better understanding of their own progress. Implementing regular feedback throughout the paramedic's career can serve as a method to maintain and nurture this early motivation and curiosity. However, our findings suggest there is a decline in feedback given to clinicians after two years of experience, despite the importance of a paramedic's ongoing development. This highlights a feedback inequality and feedback should be provided on a continuum throughout the paramedic's career and not decline after reaching qualified status. Additionally, we only

identified two records under the theme of education and the scarcity of literature on feedback within paramedic education might suggest a need to evaluate feedback provision in this setting.

#### AREAS FOR FURTHER RESEARCH

All articles investigated the reception of feedback and further research should explore the prevalence and content of feedback that is provided by paramedics. A standardised feedback template using paramedic or multidisciplinary insight should reduce feedback inequalities and represents a future area of interest. There is an opportunity to explore multidisciplinary collaboration using feedback to reduce institutional barriers. Although feedback in QI improved clinician performance further research should establish if there is a link between feedback and patient outcomes.

#### STRENGTHS AND LIMITATIONS

As far as we know this is the first scoping review to look at how feedback is used in paramedicine and the review followed a structured PRISMA-ScR framework (Tricco et al., 2018). Paramedic-specific search terms were used to increase sensitivity (Olaussen et al., 2017). Despite this, several limitations should be considered. The literature is not solely focused on paramedics and includes other emergency medical staff due to different EMS models around the world. Consequently, this review may not be representative of the paramedicine profession. One reviewer performed the grey literature search, forwards and backward citation tracking, and hand searching. As a result, it is possible some records were not identified for review. One reviewer performed data extraction and there is a risk of bias in the data content extracted and theme development.

#### CONCLUSION

Feedback is used within paramedicine as part of professional and personal development, quality improvement, resuscitation, and education. Paramedics' desire for formal feedback currently outweighs the infrequent and inconsistent provision, creating a wellbeing concern. There are existing barriers to paramedics receiving feedback that are unique due to their working environment. Feedback modifies behaviour immediately or post-incident and generally improves clinical performance. Feedback is essential in paramedic clinical education and should be continually provided throughout the paramedic's career to facilitate personal and professional growth.

#### REFERENCES

- Aromataris E, Munn Z (Editors). *JBIM Manual for Evidence Synthesis*. JBI, 2020. Available from <https://synthesismanual.jbi.global>. <https://doi.org/10.46658/JBIMES-20-01>
- Avery, P., Thompson, C., & Cowburn, P. (2023). Training the trainers: Improving the quality of education delivered to paramedics through a simulation-debrief model. *British Paramedic Journal*, 7(4), 51–56. <https://doi.org/10.29045/14784726.2023.3.7.4.5>

- Berger, S., Saut, A. M., & Berssaneti, F. T. (2020). Using patient feedback to drive quality improvement in hospitals: a qualitative study. *BMJ Open*, *10*(10), e037641. <https://doi.org/10.1136/bmjopen-2020-037641>
- Bleijenberg, E., Koster, R. W., de Vries, H., & Beesems, S. G. (2017). The impact of post-resuscitation feedback for paramedics on the quality of cardiopulmonary resuscitation. *Resuscitation*, *110*, 1–5. <https://doi.org/10.1016/j.resuscitation.2016.08.034>
- Blodgett, J. M., Robertson, D. J., Pennington, E., Ratcliffe, D., & Rockwood, K. (2021). Alternatives to direct emergency department conveyance of ambulance patients: a scoping review of the evidence. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, *29*(1), 1–21. <https://doi.org/10.1186/s13049-020-00821-x>
- Brinkrolf, P., Lukas, R., Harding, U., Thies, S., Gerss, J., van Aken, H., Lemke, H., Schliedermeier, U., & Bohn, A. (2018). A better understanding of ambulance personnel's attitude towards real-time resuscitation feedback. *International Journal for Quality in Health Care*, *30*(2), 110–117. <https://doi.org/10.1093/intqhc/mzx189>
- Burgess, A., van Diggele, C., Roberts, C., & Mellis, C. (2020). Feedback in the clinical setting. *BMC Medical Education*, *20*(2), 1–5. <https://doi.org/10.1186/s12909-020-02280-5>
- Carroll, A. G., Peddle, M. R., & Malik, G. (2023). Undergraduate paramedicine students' experiences of feedback during clinical placement on-road: A scoping review. *Nursing & Health Sciences*, *25*(1), 18–29. <https://doi.org/10.1111/nhs.12995>
- Cash, R. E., Crowe, R. P., Rodriguez, S. A., & Panchal, A. R. (2017). Disparities in feedback provision to emergency medical services professionals. *Prehospital Emergency Care*, *21*(6), 773–781. <https://doi.org/10.1080/10903127.2017.1328547>
- Charlton, K., McClelland, G., Millican, K., Haworth, D., Aitken-Fell, P., & Norton, M. (2021). The impact of introducing real time feedback on ventilation rate and tidal volume by ambulance clinicians in the North East in cardiac arrest simulations. *Resuscitation Plus*, *6*, 100130. <https://doi.org/10.1016/j.resplu.2021.100130>
- Choi, B., Tsai, D., McGillivray, C. G., Amedee, C., Sarafin, J. A., & Silver, B. (2014). Hospital-directed feedback to emergency medical services improves prehospital performance. *Stroke*, *45*(7), 2137–2140. <https://doi.org/10.1161/strokeaha.114.005679>
- Dai, C. M., Bertram, K., & Chahine, S. (2021). Feedback credibility in healthcare education: A systematic review and synthesis. *Medical Science Educator*, *31*(2), 923–933. <https://doi.org/10.1007/s40670-020-01167-w>
- Drennan, I. R., Blanchard, I. E., & Buick, J. E. (2021). Opportunity for change: Is it time to redefine the role of paramedics in healthcare? *Canadian Journal of Emergency Medicine*, *23*(2), 139–140. <https://doi.org/10.1007/s43678-021-00105-y>
- Dyson, K., Bray, J. E., Smith, K., Bernard, S., Straney, L., & Finn, J. (2016). Paramedic exposure to out-of-hospital cardiac arrest resuscitation is associated with patient survival. *Circulation: Cardiovascular Quality and Outcomes*, *9*(2), 154–160. <https://doi.org/10.1161/circoutcomes.115.002317>
- Eaton-Williams, P., Mold, F., & Magnusson, C. (2020a). Effective clinical feedback provision to ambulance clinicians: a literature review. *Journal of Paramedic Practice*, *12*(3), 109–117. <https://doi.org/10.12968/jpar.2020.12.3.109>
- Eaton-Williams, P., Mold, F., & Magnusson, C. (2020b). Exploring paramedic perceptions of feedback using a phenomenological approach. *British Paramedic Journal*, *5*(1), 7–14. <https://doi.org/10.29045/14784726.2020.06.5.1.7>

- Eaton, G., Mahtani, K., & Catterall, M. (2018). The evolving role of paramedics – a NICE problem to have? *Journal of health services research and policy*, 23(3), 193-195. <https://doi.org/10.1177/1355819618768357>
- Foster, J., Todd, S., & Williams, B. (2023). Feedback use in paramedicine: a scoping review. *Open Science Framework*. <https://doi.org/10.17605/osf.io/gtv9b>
- Hardavella, G., Aamli-Gagnat, A., Saad, N., Rousalova, I., & Sreter, K. B. (2017). How to give and receive feedback effectively. *Breathe*, 13(4), 327–333. <https://doi.org/10.1183/20734735.009917>
- Health & Care Professions Council. (2023). *The standards of proficiency for paramedics*. <https://www.hcpc-uk.org/standards/standards-of-proficiency/paramedics/>
- Hellevo, H., Sainio, M., Huhtala, H., Olkkola, K. T., Tenhunen, J., & Hoppu, S. (2014). The quality of manual chest compressions during transport – effect of the mattress assessed by dual accelerometers. *Acta Anaesthesiologica Scandinavica*, 58(3), 323–328. <https://doi.org/10.1111/aas.12245>
- Ivers, N., Jamtvedt, G., Flottorp, S., Young, J. M., Odgaard-Jensen, J., French, S. D., O'Brien, M. A., Johansen, M., Grimshaw, J., & Oxman, A. D. (2012). Audit and feedback: Effects on professional practice and healthcare outcomes. *Cochrane Database of Systematic Reviews*, 2012(6). <https://doi.org/10.1002/14651858.cd000259.pub3>
- Koivulahti, O., Tommila, M., & Haavisto, E. (2020). The accuracy of preliminary diagnoses made by paramedics - A cross-sectional comparative study. *Scandinavian Journal of Trauma, Resuscitation and Emergency Medicine*, 28(1), 70. <https://doi.org/10.1186/s13049-020-00761-6>
- Lyngby, R. M., Clark, L., Kjoelbye, J. S., Oelrich, R. M., Silver, A., Christensen, H. C., Barfod, C., Lippert, F., Nikolettou, D., Quinn, T., & Folke, F. (2021). Higher resuscitation guideline adherence in paramedics with use of real-time ventilation feedback during simulated out-of-hospital cardiac arrest: A randomised controlled trial. *Resuscitation Plus*, 5, 100082. <https://doi.org/10.1016/j.resplu.2021.100082>
- Lyon, R. M., Clarke, S., Milligan, D., & Clegg, G. R. (2012). Resuscitation feedback and targeted education improves quality of pre-hospital resuscitation in Scotland. *Resuscitation*, 83(1), 70–75. <https://doi.org/10.1016/j.resuscitation.2011.07.016>
- McGuire, S. S., Luke, A., Klassen, A. B., Myers, L. A., Mullan, A. F., & Sztajnkrzyer, M. D. (2021). It's time to talk to prehospital providers: Feedback disparities among ground-based emergency medical services providers and its impact on job satisfaction. *Prehospital and Disaster Medicine*, 36(4), 486–494. <https://doi.org/10.1017/s1049023x21000601>
- Mock, E. F., Wrenn, K. D., Wright, S. W., Eustis, T. C., & Slovis, C. M. (1997). Feedback to emergency medical services providers: the good, the bad, and the ignored. *Prehospital and Disaster Medicine*, 12(2), 145–148. Accessed from: <https://pubmed.ncbi.nlm.nih.gov/10186999/>
- Morrison, L., Cassidy, L., Welsford, M., & Chan, T. M. (2017). Clinical performance feedback to paramedics: What they receive and what they need. *AEM Education and Training*, 1(2), 87–97. <https://doi.org/10.1002/aet2.10028>
- Munn, Z., Peters, M. D. J., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Medical Research Methodology*, 18(1), 143. <https://doi.org/10.1186/s12874-018-0611-x>



- O'Connor, R. E., & Megargel, R. E. (1994). The effect of a quality improvement feedback loop on paramedic skills, charting, and behavior. *Prehospital and Disaster Medicine*, 9(1), 35–38. <https://doi.org/10.1017/s1049023x00040814>
- O'Hara, R., Johnson, M., Siriwardena, A. N., Weyman, A., Turner, J., Shaw, D., Mortimer, P., Newman, C., Hirst, E., Storey, M., Mason, S., Quinn, T., & Shewan, J. (2014). A qualitative study of systemic influences on paramedic decision making: Care transitions and patient safety. *Journal of health services research and policy*, 20(1), 45-53. <https://doi.org/10.1177/1355819614558472>
- O'Meara, P., Munro, G., Williams, B., Cooper, S., Bogossian, F., Ross, L., Sparkes, L., Browning, M., & McClounan, M. (2015). Developing situation awareness amongst nursing and paramedicine students utilizing eye tracking technology and video debriefing techniques: A proof of concept paper. *International Emergency Nursing*, 23(2), 94–99. <https://doi.org/10.1016/j.ienj.2014.11.001>
- Ødegaard, S., Kramer-Johansen, J., Bromley, A., Myklebust, H., Nysæther, J., Wik, L., & Steen, P. A. (2007). Chest compressions by ambulance personnel on chests with variable stiffness: Abilities and attitudes. *Resuscitation*, 74(1), 127–134. <https://doi.org/10.1016/j.resuscitation.2006.12.006>
- Olaussen, A., Semple, W., Oteir, A., Todd, P., & Williams, B. (2017). Paramedic literature search filters: Optimised for clinicians and academics. *BMC Medical Informatics and Decision Making*, 17(1), 1–6. <https://doi.org/10.1186/s12911-017-0544-z>
- Panneerselvam, S. (2018). Feedback among nursing professionals: A narrative review. *International journal for research in health sciences and nursing*, 8(2), 266-271. Accessed from: [https://www.researchgate.net/publication/323073798\\_Feedback\\_among\\_Nursing\\_Professionals\\_A\\_Narrative\\_Review](https://www.researchgate.net/publication/323073798_Feedback_among_Nursing_Professionals_A_Narrative_Review)
- Persse, D. E., Key, C. B., & Baldwin, J. B. (2002). The effect of a quality improvement feedback loop on paramedic-initiated nontransport of elderly patients. *Prehospital Emergency Care*, 6(1), 31–35. <https://doi.org/10.1080/10903120290938742>
- Plunkett, A. (2022). Embracing excellence in healthcare: the role of positive feedback. *Archives of Disease in Childhood - Education and Practice*, 107(5), 351–354. <https://doi.org/10.1136/archdischild-2020-320882>
- Ramani, S., Post, S. E., Könings, K., Mann, K., Katz, J. T., & van der Vleuten, C. (2017). It's just not the culture: A qualitative study exploring residents' perceptions of the impact of institutional culture on feedback. *Teaching and Learning in Medicine*, 29(2), 153–161. <https://doi.org/10.1080/10401334.2016.1244014>
- Reardon, M., Abrahams, R., Thyer, L., & Simpson, P. (2020). Review article: Prevalence of burnout in paramedics: A systematic review of prevalence studies. *Emergency Medicine Australasia*, 32(2), 182–189. <https://doi.org/10.1111/1742-6723.13478>
- Stockdill, M., Hendricks, B., Barnett, M. D., Bakitas, M., & Harada, C. N. (2023). Peer observation of teaching: A feasible and effective method of physician faculty development. *Gerontology & Geriatrics Education*, 44(2), 261–273. <https://doi.org/10.1080/02701960.2021.2019030>
- Ter Avest, E., McWhirter, E., Dunn, S., Griggs, J. E., & Lyon, R. M. (2019). Prehospital death after traumatic cardiac arrest: Time for better feedback? *Air Medical Journal*, 38(2), 78–81. <https://doi.org/10.1016/j.amj.2018.11.010>
- The Endnote Team. (2013). *Endnote* (Version Endnote 20). Philadelphia, PA: Clarivate.

- Thompson, J., Couzner, L., & Houston, D. (2020). Assessment partnerships from the start: building reflective practice as a beginning paramedic student competency. *Australasian Journal of Paramedicine*, 17. <https://doi.org/10.33151/ajp.17.750>
- Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., Moher, D., Peters, M. D. J., Horsley, T., Weeks, L., Hempel, S., Akl, E. A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M. G., Garritty, C., ... Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Annals of Internal Medicine*, 169(7), 467–473. <https://doi.org/10.7326/m18-0850>
- Veritas Health Innovation. (2023). *Covidence systematic review software*. Melbourne, Australia. Accessed from: <https://www.covidence.org>
- Wang, S. A., Su, C. P., Fan, H. Y., Hou, W. H., & Chen, Y. C. (2020). Effects of real-time feedback on cardiopulmonary resuscitation quality on outcomes in adult patients with cardiac arrest: A systematic review and meta-analysis. *Resuscitation*, 155, 82–90. <https://doi.org/10.1016/j.resuscitation.2020.07.024>
- Weber, A., Delpont, S., & Delpont, A. (2023). Assessing student paramedics' measurements of fatigue and quality of cardiopulmonary resuscitation on a simulated cardiac arrest case. *Australasian Emergency Care*, 26(3), 211–215. <https://doi.org/10.1016/j.auec.2022.12.002>
- Williams, B., Beovich, B., Is, M., & Assistant, R. (2020). An assessment of scoping review reporting within paramedicine: A scoping review. *Australasian Journal of Paramedicine*, 17. doi: <https://doi.org/10.33151/ajp.17.834>
- Williams, B., Beovich, B., & Olausson, A. (2021). The definition of paramedicine: An international Delphi study. *Journal of Multidisciplinary Healthcare*, 14, 3561–3570. <https://doi.org/10.2147/jmdh.s347811>
- Wilson, C., Howell, A. M., Janes, G., & Benn, J. (2022). The role of feedback in emergency ambulance services: A qualitative interview study. *BMC Health Services Research*, 22(1), 1–11. <https://doi.org/10.1186/s12913-022-07676-1>
- Wilson, C., Janes, G., Lawton, R., & Benn, J. (2023). Types and effects of feedback for emergency ambulance staff: A systematic mixed studies review and meta-analysis. *BMJ Quality & Safety*, 32(10), 573–588. <https://doi.org/10.1136/bmjqs-2022-015634>
- Wyckoff, M. H., Singletary, E. M., Soar, J., Olasveengen, T. M., Greif, R., Liley, H. G., Zideman, D., Bhanji, F., Andersen, L. W., Avis, S. R., Aziz, K., Bendall, J. C., Berry, D. C., Borra, V., Böttiger, B. W., Bradley, R., Bray, J. E., Breckwoldt, J., Carlson, J. N., ... West, R. L. (2021). 2021 international consensus on cardiopulmonary resuscitation and emergency cardiovascular care science with treatment recommendations: summary from the basic life support; advanced life support; neonatal life support; education, implementation, and teams; first aid task forces; and the COVID-19 working group. *Resuscitation*, 169, 229–311. <https://doi.org/10.1016/j.resuscitation.2021.10.040>



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