FEEDBACK USE IN PARAMEDICINE: A SCOPING REVIEW

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Keywords: feedback, out-of-hospital, paramedic, paramedicine, emergency medical services, EMS

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, & Olausson, 2021). Irrespective of the working environment, paramedic wellbeing is a top priority and burnout remains a significant concern (Reardon, Abraham, 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-Gaagnat, 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[1] (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).
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<th>Article</th>
<th>Location</th>
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<tbody>
<tr>
<td>Brinkkorf, P., Lukas, R., Harding, U., Thies, S., Gerns, J., Van Aken, H., Lemke, H., Schniedermeier, U., &amp; Bohn, A. (2018).</td>
<td>Germany</td>
<td>Quantitative Statistical analysis</td>
<td>Paramedics and emergency physicians</td>
<td>n = 205</td>
<td>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</td>
<td>Ambulance crews have a positive attitude towards real-time resuscitation devices. Ambulance crews perceive some aspects of feedback devices to improve safety.</td>
<td>Resuscitation</td>
</tr>
<tr>
<td>Choi, B., Tsai, D., McGillivray, C. C., Amedee, C., Sarfin, J. A. &amp; Silver, B. (2014).</td>
<td>USA</td>
<td>Quantitative Comparative analysis</td>
<td>Ambulance Clinicians</td>
<td>53/59 ambulance services in the state Did not specify the clinician’s skill level</td>
<td>Evaluated whether hospital-directed EMS stroke follow-up tool improved documentation of adherence to EMS stroke protocols</td>
<td>Standardised feedback improved compliance with protocols. Feedback modifies clinical behaviours/interventions and improves documentation. Interprofessional feedback on specific patient groups improved care standards</td>
<td>Quality Improvement</td>
</tr>
<tr>
<td>Eaton-Williams, P., Mold, F., &amp; Magnusson, C. (2020).</td>
<td>United Kingdom</td>
<td>Qualitative Phenomenological study Semi-structured interviews</td>
<td>Paramedics</td>
<td>n = 8</td>
<td>Explore paramedic perceptions of clinical performance feedback and attitudes towards the introduction of formal mechanisms for providing patient outcome feedback</td>
<td>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.</td>
<td>Personal and Professional development</td>
</tr>
<tr>
<td>Helleveuo, H., Saiino, M., Huhtala, H., Olkkola, K. T., Tirkkonen, J., &amp; Hoppu, S. (2014).</td>
<td>Finland</td>
<td>Quantitative Statistical analysis</td>
<td>Paramedics</td>
<td>n = 24</td>
<td>Analyse if CPR quality during transportation can be improved with a feedback device Determine compression depth</td>
<td>Real-time feedback devices improves compression depth and rate by modifying behaviours</td>
<td>Resuscitation</td>
</tr>
</tbody>
</table>

**TABLE 1:** Results
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</tr>
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<tr>
<td>Lyngby, R. M., Clark, L., Kjelsbye, J. S., Oelrich, R. M., Silver, A., Christensen, H. C., Barfoot, C., Lippert, F., Nikolletou, D., Quinn, T., &amp; Folke, F. (2021).</td>
<td>Denmark</td>
<td>Quantitative Statistical analysis</td>
<td>Paramedics EMT</td>
<td>n = 64</td>
<td>8 ALS paramedics 56 BLS paramedics</td>
<td>Ventilation quality (rate and tidal volume) Simulated environment</td>
<td>Ventilation quality improved with real-time feedback by modifying behaviours</td>
</tr>
<tr>
<td>Lyon, R. M., Clarke, S., Milligan, D., &amp; Clegg, G. R. (2012).</td>
<td>United Kingdom</td>
<td>Quantitative Statistical analysis</td>
<td>Ambulance crew (paramedic and non-paramedics)</td>
<td>n = 137</td>
<td></td>
<td>Assess the quality of prehospital resuscitation pre and post-individual feedback and training based on objective data captured by defibrillator telemetry.</td>
<td>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</td>
</tr>
<tr>
<td>McGuire, S. S., Luke, A., Klassen, A. B., Myers, L. A., Mullan, A. F., &amp; Sztajnkrycer, M. D. (2021).</td>
<td>USA</td>
<td>Quantitative Descriptive statistics. Online survey</td>
<td>EMT Paramedics</td>
<td>n = 94</td>
<td>61 paramedics, 33 EMT’s 28% response rate</td>
<td>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</td>
<td>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</td>
</tr>
<tr>
<td>McGuire, S. S., Luke, A., Klassen, A. B., Myers, L. A., Mullan, A. F., &amp; Sztajnkrycer, M. D. (2021).</td>
<td>United Kingdom</td>
<td>Qualitative Semi-structured interviews</td>
<td>Paramedics EMT Clinical supervisors One ambulance service</td>
<td>n = 20</td>
<td>9 paramedics 4 EMT’s 3 specialist paramedics 4 clinical supervisors</td>
<td>Explore perceptions of EMS professionals regarding the current provision of feedback and their view on how feedback impacts patient care, safety and staff wellbeing</td>
<td>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</td>
</tr>
<tr>
<td>Mock, E. F., Wieron, K. D., Wright, S. W., Eustis, T. C., &amp; Slovis, C. M. (1997).</td>
<td>USA</td>
<td>Quantitative Observational study</td>
<td>Paramedic and EMT</td>
<td>n = 69</td>
<td>26 EMT’s 43 Paramedics</td>
<td>Determine the type and frequency of immediate, unsolicited feedback received by EMS from patients, families and ED personnel</td>
<td>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</td>
</tr>
<tr>
<td>Morrison, L., Cassidy, L., Welshon, M., &amp; Chan, T. M. (2017).</td>
<td>Canada</td>
<td>Qualitative Semi-structured interviews Interpretive descriptive technique</td>
<td>Paramedics</td>
<td>n = 12</td>
<td>From a total of 324 paramedics in the region</td>
<td>Explore paramedics perceived needs for feedback Explore what feedback they felt would improve their performance as healthcare providers</td>
<td>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</td>
</tr>
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**TABLE 1:** Results (continued)
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<tbody>
<tr>
<td>O'Connor, R. E., &amp; Megajzel, R. E. (1994).</td>
<td>USA</td>
<td>Quantitative Statistical analysis</td>
<td>All paramedics in New Castle County, Delaware</td>
<td>n = 6 ALS units were in operation at the time Each ALS unit consisted of a 2 person team</td>
<td>QI process converting results on chart audits to identify deficiencies and encourage improvement.</td>
<td>Quality Improvement feedback improves documentation and modifies paramedic behaviour</td>
<td>Quality Improvement</td>
</tr>
<tr>
<td>O'Meara, P., Munro, G., Williams, B., Cooper, S., Bogossian, F., Ross, L., Sparkes, L., Browning, M., &amp; McCluskey, M. (2015).</td>
<td>Australia</td>
<td>Quantitative Quasi-Experimenatal</td>
<td>Final-year Paramedic and nursing students</td>
<td>n = 39 20 nursing students 19 paramedic students</td>
<td>Determine if eye tracking and video feedback improves the quality of feedback and enhance situational awareness in students undertaking simulated emergency training</td>
<td>Video feedback is an educational tool to reflect on how to improve future performance</td>
<td>Education</td>
</tr>
<tr>
<td>Persse, D. E., Key, C. B., &amp; Baldwin, J. B. (2002).</td>
<td>USA</td>
<td>Quantitative Prospective Chart review</td>
<td>Patients</td>
<td>n = 151</td>
<td>Determine if the quality improvement feedback loop would change the decision-making of paramedics</td>
<td>Objective feedback motivates paramedics to improve patient care</td>
<td>Quality Improvement</td>
</tr>
<tr>
<td>Rebecca E. Cash, Remle P. Crowe, Severo A. Rodriguez &amp; Ashish R. Panchal (2017)</td>
<td>USA</td>
<td>Quantitative Cross-sectional, Electronic questionnaire</td>
<td>EMT grade (43.4%) or higher Paramedics (46.1%) in a civilian setting</td>
<td>n = 15766 From a total of 310,711 on the register</td>
<td>Describe prevalence of feedback received within 30 days -Aimess for feedback -Who gave it -Timing of it -Usefulness Factors associated with receiving feedback within 30 days</td>
<td>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</td>
<td>Personal and Professional development</td>
</tr>
<tr>
<td>Ter Avest, E., McWhirter, E., Dunn, S., Griggs, J. E., &amp; Lyon, R. M. (2019).</td>
<td>United Kingdom</td>
<td>Quantitative Descriptive statistics</td>
<td>Air Ambulance teams (1 doctor and 1 paramedic) Patients who died from traumatic cardiac arrest</td>
<td>n = 159</td>
<td>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</td>
<td>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</td>
<td>Quality Improvement</td>
</tr>
<tr>
<td>Weber, A., Delport, S., &amp; Delport, A. (2022).</td>
<td>Australia</td>
<td>Quantitative Statistical analysis</td>
<td>Paramedic students</td>
<td>n = 40</td>
<td>Evaluate providing real-time feedback on the provision of CPR quality Evaluate fatigue from maintaining CPR</td>
<td>Real-time feedback improved cardiac compression depth by modifying behaviours</td>
<td>Resuscitation</td>
</tr>
</tbody>
</table>

**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-
ence 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; Helllevuo et al., 2014; Lyngby et al., 2021; Lyon et al., 2012; Odegaard et al., 2007; Weber, Delport, & Delport, 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; Hellevo 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 (Hellevo 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.

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