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Fascia iliaca compartment blocks by paramedics for suspected proximal femoral fracture in the prehospital setting: a rapid scoping review.

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ABSTRACT

INTRODUCTION: Over 70,000 cases of Proximal Femoral Fracture (PFF) occur annually in the United Kingdom (UK), primarily affecting the elderly. These injuries are associated with high morbidity and mortality, and often see inadequate pain management in the prehospital setting. The Fascia Iliaca Compartment Block (FICB), a regional anaesthesia technique, is the gold standard of care in Emergency Departments (ED). This review aims to assess the literature on paramedic-performed FICB for suspected PFF in the prehospital setting, highlighting benefits and challenges to guide future practice and policy in the ambulance sector.

MATERIALS AND METHODS: A rapid scoping review was conducted following the Joanna Briggs Institute (JBI) methodology, with modifications for this project's limitations. A systematic search of the databases CINAHL, PubMed, EMBASE, and Medline was performed. A synthesis matrix was created to extrapolate data from the included studies and allow for a coherent interpretation of results. Each included study was subject to a critical appraisal conducted using the Mixed Methods Appraisal Tool (MMAT).

RESULTS: Data was extracted from three studies and two reports which identified four key themes emerged: paramedic competency in performing FICB, patient perspectives, adverse events, and training and governance. Studies showed paramedics can competently perform FICBs in prehospital settings. Verbal pain scores were lower following an FICB compared to standard care with IV morphine, which required more supplementary morphine for break-out pain. Concern for causing harm was a consistent theme among the paramedics performing FICB, particularly in precipitating an adverse event sequela. Adverse events were more common in non-FICB groups, with only one case of local anaesthetic toxicity in the FICB group, which was correctly managed by the paramedic.

CONCLUSIONS: Paramedics can competently perform FICB in the prehospital setting, showing promising results in pain relief compared to intravenous morphine. However, higher-level research is needed for confirmation. Patients generally tolerated paramedic-led FICB well, with minimal concerns. Training and governance remain significant barriers to implementing FICB in local ambulance services.

KEY WORDS: Fascia iliaca compartment block, proximal femur fracture, hip fracture, paramedic, analgesia, prehospital.

INTRODUCTION

Proximal femoral fractures (PFF) denote a variety of fracture injury patterns between the region of the anterior femoral head and up to five centimetres inferior to the lesser trochanter, depending on their relation to the hip joint capsule [1]. These fractures and intracapsular or neck-of-femur fractures (NOF) represent a significant burden for the National Health Service (NHS) in the United Kingdom (UK), with over 72,000 cases recorded in the National Hip Fracture Database (NHFD) in 2022 [2]. Whilst these are not uncommon injuries for any adult [3], the elderly population (aged 65+) accounts for a significant proportion of their incidence, often following a fall complicated by co-morbidities such as osteoporosis [4]. Over sixty per cent of all suspected PFF cases seen by UK emergency departments (ED) between 2020 and the first quarter of 2024 were determined to be NOF fractures, with over 80% of these patients requiring admission via ambulance [2]. It is not uncommon, therefore, for the generalist paramedic to encounter these individuals who present with often severely painful injuries. A key recommendation in the gold standard care for these patients is prompt administration of adequate analgesia [1]. Paracetamol, ibuprofen, nitrous oxide, and morphine sulphate are the analgesic agents available to most ambulance-based paramedics in the UK [5].

However, most of these treatments have limitations when administering to elderly patients due to either contra-indication, caution due to renal or hepatic impairment, or the ability to self-administer the medication in the case of nitrous oxide [5]. There is a trend of underutilisation of both pharmacological and non-pharmacological analgesic strategies in prehospital suspected NOF fractures by paramedics [6]. The rationale for this is multifactorial, often due to challenging extrication, with considerations toward avoiding conveyance delay and concerns of inducing haemodynamic instability due to systemic intravenous (IV) opioid analgesia. This is a concern, as oligoanalgesia is recognised to increase the risk of delirium, leading to prolonged admissions, poorer mobility following surgery and a reduction in quality of life after discharge [7-9]. From an ethical perspective, paramedics uphold an obligation to prevent harm by avoiding inhumane treatment and promoting dignity. It is evident that in current prehospital practice, inadequate analgesia administration is commonplace [6] and suggests paramedics are not presently best equipped to care for these patients. In the context of PFF, The Royal College of Emergency Medicine (RCEM) and Royal College of Physicians RCOP [10-12] advocates the timely administration of a Fascia Iliaca Compartment Block (FICB). FICB is the most utilised analgesia for these cases, with over 44% of patients receiving one guided by ultrasound or landmarking techniques [2] with a good efficacy and safety profile [12]. RCEM [11] makes clear recommendations for departments to ensure that a large cohort of practitioners can deliver early FICBs to manage pain and avoid delay. FICB can be safely and effectively administered by non-medical practitioners, such as nurses, using an anatomical landmark approach without ultrasound guidance [13,14]. The RCEM [11] protocol for the landmarking technique of administration utilises a blunt-tipped needle to pass through both the fascia lata and fascia iliaca by noting a dual 'pop' sensation before administering a volume of a local anaesthetic such as bupivacaine into the iliaca compartment.

This review aims to explore the existing literature in paramedic-led FICB administration using the landmarking technique in the prehospital setting.

MATERIALS AND METHODS

This review was conducted according to JBI methodology for scoping reviews [15]. The five-stage framework has been used to structure the identification of a research question, relevant literature, study selection, data charting, and the collation, summarising, and reporting of results [16].

Identifying the research question

The research question was formulated using the Population, Concept, and Context (PCC) framework to develop an appropriate search strategy [17].

- Population:** Qualified paramedics in an emergency medical service (EMS). Excluded were qualified paramedics working within advanced EMS services, such as helicopter emergency medical services (HEMS).
- Concept:** Administration of a FICB using the landmark technique (without ultrasound guidance) from the perspective of a paramedic and patient before a conveyance to the emergency department.
- Context:** The context was adults aged 18 years or older who sustained a suspected proximal femoral fracture in the prehospital setting.
- Research Question:** What are the perceived advantages and challenges surrounding fascia iliaca compartment block (FICB) using the landmark technique (without ultrasound guidance) by qualified paramedics for adults aged 18 years or older with a suspected proximal femoral fracture in the prehospital setting?

Identifying relevant studies

An initial limited search of Medline and CINHALL was performed to identify index terms, applicable synonyms, and keywords to inform the final search strategy (Supplement File 1). A database search was performed on the 1st of June 2024 in Medline, CINHALL, PubMed and EMBASE with the results screened and managed using Rayyan [18].



SUPPLEMENT FILE

<https://irdim.net/cci/multimedia/0162-24-RA-supplement1.pdf>



Study selection

Initially, the title and abstract of each study were screened for suitability. Following an abstract and title screening, studies for full-text examination were screened against the inclusion and exclusion criteria in table 1, figure 1 [19,20].

Table 1: Inclusion and exclusion criteria.

Inclusion	Exclusion
- Primary research on Paramedic-performed Fascia Iliaca Compartment Block in the prehospital setting	- Secondary research, including systematic review
- English language	- Protocols
- Primary research	- Population not registered Paramedics
- Published 10 years or less	- Registered Paramedics working within specialised services, e.g HEMS
	- Ultrasound-guided FICB administration

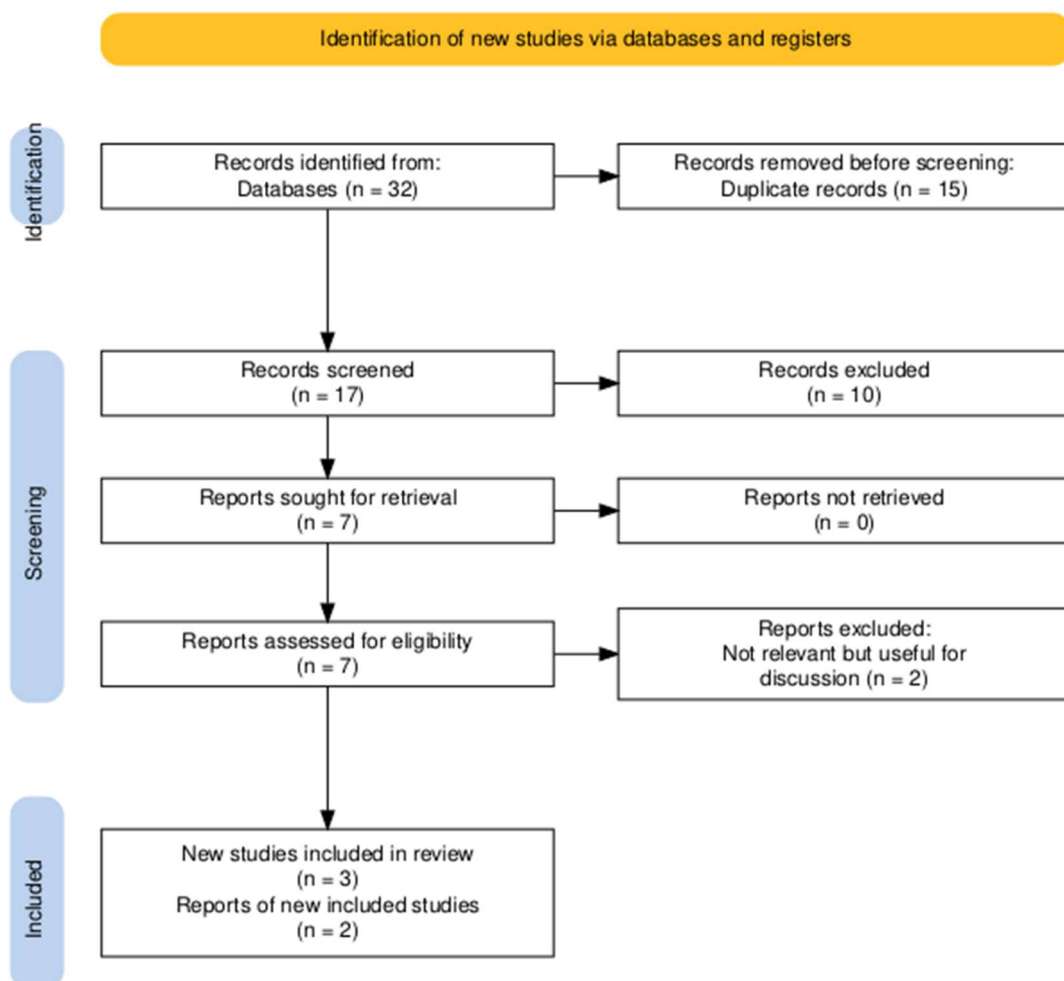


Figure 1: PRISMA flow diagram showing the identification, screening and inclusion process.

Charting and extracting the data

A synthesis matrix was created to extrapolate data from the included studies and allow for a coherent interpretation of results. Data was organised into author(s), year, title, year of publication, country of publication, research methodology, aim, and population size (supplement file 2). Relevant findings from each study were summarised to aid in identifying emerging themes.



Collating, summarising and reporting the results

The reviewed articles were collated, summarised, and reported in the data extraction table in supplement file 2. Each included study was subject to a critical appraisal conducted using the Mixed Methods Appraisal Tool (MMAT).

RESULTS

The search retrieved three studies and two reports that met the eligibility criteria. Following the data extraction process, four emerging themes were identified: ability to perform FICB, patient perspectives, adverse events, and training (table 2). To quantify the reliability of findings from each study and to support the applicability of later discussion, each included methodology has been critically appraised using the Mixed Methods Appraisal Tool (MMAT) (figure 2) [21].

Paramedic Ability to Perform FICB

McRae et al. [22] and Jones et al. [23] studied paramedic-performed FICBs for patients with suspected PFF using the landmarking technique. McRae et al. [22] reported 12 FICBs, with only one participant unable to identify the anatomical landmarks. Jones et al. [23] reported 17 paramedic-performed FICBs, but 14 patients did not receive the intervention due to contraindications, such as anticoagulation therapy or a hip prosthesis. Jones et al. [23] noted their study was not powered to detect significant differences between trial arms, highlighting a limitation of FICB, especially with rising co-morbidity among the elderly [24]. Both studies showed paramedics can competently perform FICBs in prehospital settings. Evans et al. [25] found paramedics expressed confidence in the administration process. Neither McRae et al. [22] nor Jones et al. [23] observed significant differences in prehospital time between intervention arms, with an average of 10 minutes to perform the procedure. While Evans et al. [25] reported uncertainty about the analgesic effect post-FICB, McRae et al. [22] found a 50% reduction in median pain scores in the FICB group versus 22% in the standard care group, with pain reduction noted within 15 minutes of administration.

To address ethical concerns of oligoanalgesia due to poor evidence of FICB efficacy for PFF in 2015, an initial dose of IV morphine was given before the FICB procedure [22]. Clinician anxiety about ineffective blocks and potential adverse events was discussed by Fordyce [26] and Evans et al. [27]. Only McRae et al. [22] objectively assessed the nerve block quality by testing patients' perception of cold stimuli on the upper leg. Two patients reported no sensation reduction, indicating an ineffective block, while the remaining nine had either a complete or partial blockade with effective analgesia [22].

Table 2. Summary of key themes.

Ability to perform a FICB
<ul style="list-style-type: none"> • Diagnostic Accuracy: Paramedics routinely assess for PFF and can differentiate patients and suspect PFF accurately and competently. Instances of misdiagnosis of PFF occurred infrequently and typically occurred where fractures were in the region of the acetabulum or pubic ramus. • Technical Accuracy: Paramedics can competently identify landmarks and perform an effective FICB without requiring ultrasound. The technical skills associated with FICB align well with prior clinical skills such as cannulation and parenteral drug preparation. • Paramedic Perceptions: FICB was welcomed by paramedics. It was incorporated easily into clinical practice and minimally affected on-scene times. Concerns about the sterility of the prehospital environment were raised.
Patient perspectives
<ul style="list-style-type: none"> • Lower reported pain levels were achieved in groups receiving a FICB, with relief typically reported after fifteen minutes of administration. Patients were more comfortable during transfers between stretchers and trolleys following a FICB. • Further doses of morphine were commonly required in non-FICB patient populations. • Paramedic perceptions: Positive. Patients accepted the procedure despite its administration location being close to the injury site and groin. • Patients' overwhelming memory of their injury was severe pain rather than a recollection of the treatment efficacy of FICB.
Adverse events
<ul style="list-style-type: none"> • Fewer incidences of adverse events were reported in the FICB populations. Greater incidences were reported in populations receiving systemic opioids; these included nausea and vomiting. • Only one incidence of local anaesthetic toxicity was reported and successfully managed by the paramedic. • FICB was morphine-sparing and considered a benefit to elderly patients who were commonly comorbid.
Training and Governance
<ul style="list-style-type: none"> • Governance: Many paramedics saw governance as a barrier to the wider implementation of FICB. Paramedics recognised the need for specific local protocols and policy changes to support FICB delivery, including patient group directives (PGD) to ensure medicinal practice remains within the scope of the law. • Training and skill currency: Concerns of skill maintenance were consistent among all participants delivering FICB. Paramedics are concerned with skill degradation as a consequence of procedural infrequency. Regular refresher training was desirable to maintain confidence; operational challenges were seen as a likely hindrance.

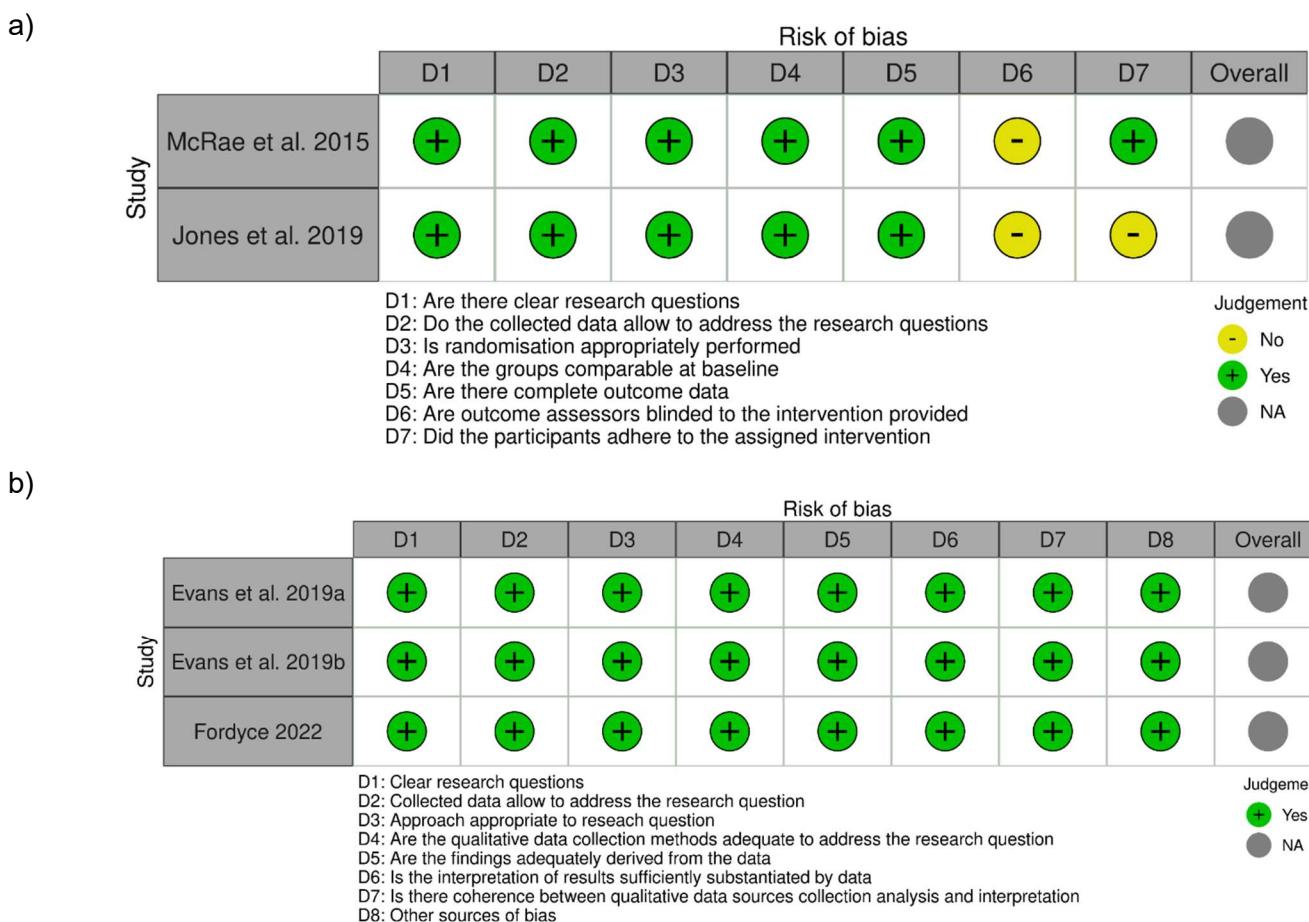


Figure 2. a) RCT MMAT bias appraisal; b) Qualitative MMAT bias appraisal.

Patient perspectives

McRae et al. [22] found that verbal pain scores were lower following an FICB compared to standard care with IV morphine, which required more supplementary morphine for break-out pain. Similarly, Jones et al. [23] reported significantly lower morphine administration in their FICB group compared to standard care. Pain levels at handover to the ED were similar, but McRae et al. [22] noted lower pain levels during transfer in the FICB group. Evans et al. [27] interviewed six patients and one relative within 10 days of injury to gauge perceptions of receiving an FICB from a paramedic. Of the 13 eligible patients, two were too unwell to participate, and four were non-contactable. All interviewed patients reported severe pain, obscuring most prehospital memories, including FICB procedures. Only one patient recalled the consent process, perceiving the FICB as beneficial for a more comfortable extrication. Interviewees consistently expressed reassurance and trust in paramedic care, providing psychological comfort that complemented analgesia effects. McRae et al. [22] used a 5-point Likert scale to measure patient satisfaction with analgesia, finding no statistical difference; all participants reported good or very good levels. Interview data did not highlight specific issues related to the FICB procedure, such as injections near the injury site or groin.

Adverse events

Concern for causing harm was a consistent theme among the paramedics performing FICB, particularly in precipitating an adverse event sequela [23,25,26]. Jones et al. [23] were the only authors to report a single incidence of local anaesthetic toxicity, correctly identified and promptly managed by the paramedic team. Evans et al. [27] acknowledged amplified concerns from paramedics following this incident. The remaining reported adverse events were isolated to the standard care groups, associated with the effects of higher doses of IV morphine, and included nausea and vomiting [22,23]. Reassuringly, no cases of respiratory depression or respiratory arrest were noted across either quantitative studies McRae et al. [22] and Jones et al. [23]. Given the adverse events related to IV morphine, a reduction in morphine requirements was highlighted as a benefit of FICB in McRae et al. [22] and Jones et al. [23]. Further evidence-based teaching surrounding the risks and success rates of FICB has been suggested to mitigate clinician anxieties [26]. Human factors played a role in clinician confidence levels, particularly as Evans et al. [25] reported, kit familiarity was essential, especially when managing an adverse event.

Training and Governance

Studies agree that specialist training is essential for paramedics to perform FICB competently [22,23,25,26] (table 3). Fordyce [26] highlighted a preference among paramedics for a graduated exposure approach, including pre-learning, theatre time, ED, and prehospital exposure, with senior supervision improving confidence. Each quantitative study provided additional training packages for paramedics [22,23]. Evans et al. [25] reported universal praise for the training provided by Jones et al. [23], with suggestions for more prehospital scenario training and frequent in-hospital days to maintain skills [25]. Fordyce [26] identified concerns about competition for hospital training, reducing procedural exposure, which is a particular issue for paramedics with limited training availability. Skill retention and procedural frequency are major concerns; most paramedics completed training months before performing FICBs, increasing anxiety and pressure to avoid harm [25]. Fordyce [26] also linked low procedural frequency with reduced clinician confidence. Governance and protocolisation, along with the poor evidence base for efficacy and cost-effectiveness, are key barriers to wider FICB implementation in the prehospital setting [22,23,26].

Table 3. FICB training programmes delivered by the reported quantitative studies to enrolled paramedics.

McRae et al. (2015)	Jones et al. (2019)
<ul style="list-style-type: none"> • Self-directed online training package. • 1 day of in-hospital didactic and simulation training led by a senior anesthesiologist (grade not specified). 	<ul style="list-style-type: none"> • Self-directed online training package. • 3-hour didactic session led by a consultant anesthesiologist. • Training sessions within the hospital setting to perform FICB • Each paramedic performed three real FICBs and peer-critiqued a further three before being able to recruit patients into the study. • Ad hoc refresher sessions

DISCUSSION

This review aimed to appraise the evidence on paramedic-performed FICB using the landmark technique for suspected PFF in the prehospital setting. The research highlighted various benefits and challenges from the perspectives of paramedics, patients, and study authors, supporting the wider literature that FICB is a safe and effective analgesic route for PFF patients, providing significant pain relief [6,12,27]. The findings affirm paramedics' capability and competence in performing FICB without supervision [22,23]. Given the similarity between FICB and other paramedic skills like anatomical landmarking, intravenous and intraosseous cannulation, and parenteral drug preparation, it is unsurprising that paramedics can adapt to this procedure [28]. Paramedics are naturally adaptable professionals due to their dynamic working environments and the continual development of evidence-based practice [29]. Autonomous clinical practice is fundamental in paramedicine, and working unsupervised as senior decision-makers is common [30].

FICB was well-received by patients and paramedics, offering an alternative route of analgesia. A clinically relevant theme was the higher incidence of adverse effects in morphine-only patient cohorts compared to FICB groups [22,23]. Intravenous morphine acts systemically and can cause various adverse effects, including constipation, urine retention, nausea, vomiting, and delirium [31,32]. In contrast, FICB offers targeted analgesia. Patients receiving FICB required less supplementary morphine, consistent with Kassam et al. findings of reduced morphine administration in perioperative FICB cohorts [33]. This is crucial for patients with chronic kidney disease or those developing rhabdomyolysis after long ambulance wait times, as higher morphine administration demands more from the kidneys, worsening renal function and patient outcomes [1,34-37]. Kassam et al. [33] suggested dose-adjusting morphine based on renal function, but this is not feasible in the prehospital setting. Therefore, guidelines recommend smaller initial morphine doses for elderly patients due to expected poor renal function [5]. FICB can positively influence PFF analgesic care and improve postoperative outcomes. However, challenges remain for the wider implementation of FICB in prehospital paramedic practice, including the importance of technical skill training, maintenance, and procedural governance [25,26]. Additional training was necessary to ensure the reliability, safety, and ethicality of McRae et al. and Jones et al. studies [22,23]. Their training programs involved senior anaesthetists and hospital learning environments, with Fordyce [26] finding regular procedural frequency and refresher training improved clinician confidence and mitigated skill fade. The operational demand on UK Ambulance Trusts, with over 750,000 incidents attended in May 2024 alone [38], makes rolling out a suitable FICB training program challenging. This issue also affected paramedic-performed advanced airway management with endotracheal intubation (ETI), leading to its removal from the paramedic scope of practice outside specialist roles due to safety concerns and skills maintenance issues [39-41]. Operational challenges should not justify avoiding upskilling clinicians as evidence grows. An NHS England culture assessment highlighted a trend of prioritising staffing and resources over staff development, leading to poor behaviours and lack of support for professional development [42]. Fordyce [26] noted similar concerns among paramedics.

The NHS Long Term Workforce Plan recognises the need to enhance the scope of allied health professionals, including paramedics, and increase their exposure to rotational training placements [43]. As evidence for FICB grows, there may be a case for its inclusion under these national targets.

Limitations

There are several important limitations to acknowledge within this rapid scoping review. There were several interchangeable search terms related to proximal femoral fracture when developing the search strategy. These terms were often used interchangeably and without precision within the literature. Studies were limited to those performed in the last 10 years. Additionally, grey literature searching and identification of studies through reference lists was not performed. Despite the promising findings from the included studies, the small population sizes limit the degree of generalisability to wider paramedic practice and prehospital care. Both quantitative study designs acknowledged their paramedic cohorts were self-selected volunteers. Their thoughts and experiences may not be a true representation of the wider paramedic community.

CONCLUSIONS

This rapid review aimed to appraise the benefits and challenges surrounding paramedic-led FICB for adult patients with suspected proximal femoral fractures in the prehospital setting. The review confirms that paramedics can learn, safely landmark and perform FICB without senior supervision. Despite its exploratory nature, this study offers some insight into the potential advantageous effects on reported pain levels following FICB in comparison to standard care with intravenous morphine alone. Supplementary morphine was needed more frequently in non-FICB patient cohorts, and this was associated with higher incidences of adverse effects in comparison to FICB. This review identified only one reported case of local anaesthetic toxicity, correctly identified and managed by the paramedic. Several barriers prevent the wider implementation of prehospital FICB by paramedics. Training and governance are key concerns among paramedics in maintaining procedural confidence and mitigating skill fade. Organisational factors and operational demands within the ambulance sector are significant challenges to professional development. The present paucity of higher-level evidence on prehospital FICB by paramedics prevents generalisability and applicable conclusions and reflects the need for further research. Nevertheless, FICB is a promising tool in the ever-widening inventory of prehospital pain management. The findings of RAPID2 [44], expected in 2025, may prove crucial in mapping the future role of this procedure and its place in prehospital paramedic practice.

SUPPLEMENTARY INFORMATION

Funding: No fund was received related to this study.

Institutional Review Statement: The study was conducted according to the guidelines of the Declaration of Helsinki.

Informed Consent Statement: Not applicable

Data Availability Statement: The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest: The authors declare no conflicts of interest.

REFERENCES

- [1] National Institute for Health and Care Institute (NICE), 2023. The management of hip fracture in adults. [WWW]: <https://www.nice.org.uk/guidance/cg124/evidence/full-guideline-msword-183081997> (accessed 23 April 2024)
- [2] Royal College of Physicians (RCOP), 2023. 15 years of quality improvement: the 2023 National Hip Fracture Database report on 2022. [WWW]: <https://www.nhfd.co.uk/2023report> (accessed 01 May 2024)
- [3] Pourabbas B, Emami MJ, Vosoughi AR, Mahdaviazad H, Kargarshouroki Z. Mortality and Function After Surgically-Treated Hip Fracture in Adults Younger than Age 60. *Acta Ortop Bras.* 2017; 25(4): 129-131. doi: <https://doi.org/10.1590/1413-785220172504158145>
- [4] Emmerson BR, Varacallo M, Inman D. *Hip Fracture Overview*. StatPearls Publishing: Treasure Island; 2024.
- [5] JRCALC Clinical Guidelines 2022. Association of Ambulance Chief Executives (AACE) and Joint Royal Colleges Ambulance Liaison Committee (JRCALC). [WWW]: <https://www.classprofessional.co.uk/ems-fire/jrcalc/jrcalc-guidelines/2022-jrcalc-clinical-guidelines/> (accessed 01 May 2024)
- [6] Davis S, Olausson A, Bowles KA, Shannon B. Review article: Paramedic pain management of femur fractures in the prehospital setting: A systematic review. *Emerg Med Australas.* 2021; 33(4): 601-609. doi: <https://doi.org/10.1111/1742-6723.13793>
- [7] Herrick C, Steger-May K, Sinacore DR, Brown M, Schechtman KB, Binder EF. Persistent pain in frail older adults after hip fracture repair. *J Am Geriatr Soc.* 2004; 52(12): 2062-2068. doi: <https://doi.org/10.1111/j.1532-5415.2004.52566.x>
- [8] Balen RV, Essink-Bot ML, Steyerberg E, Cools H, Habbema DF. Quality of life after hip fracture: a comparison of four health status measures in 208 patients. *Disabil Rehabil.* 2003; 25(10): 507-519. doi: <https://doi.org/10.1080/0963828031000090443>
- [9] Morrison RS, Magaziner J, Gilbert M, Koval KJ, McLaughlin MA, Orosz G, et al. Relationship between pain and opioid analgesics on the development of delirium following hip fracture. *J Gerontol A Biol Sci Med Sci.* 2003; 58(1): 76-81. doi: <https://doi.org/10.1093/gerona/58.1.m76>
- [10] RCEM Clinical Guidance The Royal College of Emergency Medicine (RCEM) has clinical guidelines available for professionals working in emergency medicine. [WWW]: <https://rcem.ac.uk/clinical-guidelines/> (accessed 01 May 2024)
- [11] Quality Improvement Information about delivering quality care and quality improvement, alongside the Royal College of Emergency Medicine's Clinical Audit resources and reports. [WWW]: <https://rcem.ac.uk/quality-improvement-2/#previous-audits> (accessed 01 May 2024)
- [12] Wan HY, Li SY, Ji W, Yu B, Jiang N. Fascia Iliaca Compartment Block for Perioperative Pain Management of Geriatric Patients with Hip Fractures: A Systematic Review of Randomized Controlled Trials. *Pain Res Manag.* 2020; 2020: 8503963. doi: <https://doi.org/10.1155/2020/8503963>
- [13] Obideyi A, Srikantharajah I, Grigg L, Randall A. Nurse administered fascia iliaca compartment block for pre-operative pain relief in adult fractured neck of femur. *Acute Pain* 2008; 10(3): 145-149. doi: <https://doi.org/10.1016/j.acpain.2008.05.014>
- [14] Randall A, Grigg L, Obideyi A, Srikantharajah I. Fascia Iliaca compartment block: A nurse-led initiative for preoperative pain management in patients with a fractured neck of femur. *J Orthop Nurs.* 2008; 12(2): 69-74. doi: <https://doi.org/10.1016/j.joon.2008.07.007>

- [15] Peters MDJ, Godfrey C, McInerney P, Munn Z, Tricco AC, Khalil H. Scoping Reviews (2020). Aromataris E, Lockwood C, Porritt K, Pilla B, Jordan Z, editors. JBI Manual for Evidence Synthesis. JBI; 2024. doi: <https://doi.org/10.46658/JBIMES-24-09>
- [16] Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Internat J Soc Res Method.* 2002; 8(1): 19-32. doi: <https://doi.org/10.1080/1364557032000119616>
- [17] Pollock D, Peters MDJ, Khalil H, McInerney P, Alexander L, Tricco AC, et al. Recommendations for the extraction, analysis, and presentation of results in scoping reviews. *JBI Evid Synth.* 2023; 21(3): 520-532. doi: <https://doi.org/10.11124/JBIES-22-00123>
- [18] Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan-a web and mobile app for systematic reviews. *Systematic Reviews* 2016; 5: 210. doi: <https://doi.org/10.1186/s13643-016-0384-4>
- [19] Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021; 372: n71. doi: <https://doi.org/10.1136/bmj.n71>
- [20] Haddaway NR, Page MJ, Pritchard CC, McGuinness LA. PRISMA2020: An R package and Shiny app for producing PRISMA 2020-compliant flow diagrams, with interactivity for optimised digital transparency and Open Synthesis. *Campbell Syst Rev.* 2022; 18(2): e1230. doi: <https://doi.org/10.1002/cl2.1230>
- [21] McGuinness LA, Higgins JPT. Risk-of-bias VISualization (robvis): An R package and Shiny web app for visualizing risk-of-bias assessments. *Res Synth Methods.* 2021; 12(1): 55-61. doi: <https://doi.org/10.1002/jrsm.1411>
- [22] McRae PJ, Bendall JC, Madigan V, Middleton PM. Paramedic-performed Fascia Iliaca Compartment Block for Femoral Fractures: A Controlled Trial. *J Emerg Med.* 2015; 48(5): 581-589. doi: <https://doi.org/10.1016/j.jemermed.2014.12.016>
- [23] Jones JK, Evans BA, Fegan G, Ford S, Guy K, Jones S, et al. Rapid Analgesia for Prehospital hip Disruption (RAPID): findings from a randomised feasibility study. *Pilot Feasibility Stud.* 2019; 5: 77. doi: <https://doi.org/10.1186/s40814-019-0454-1>
- [24] Vetrano DL, Calderón-Larrañaga A, Marengoni A, Onder G, Bauer JM, Cesari M, et al. An International Perspective on Chronic Multimorbidity: Approaching the Elephant in the Room. *J Gerontol A Biol Sci Med Sci.* 2018; 73(10): 1350-1356. doi: <https://doi.org/10.1093/gerona/glx178>
- [25] Evans BA, Brown A, Bulger J, Fegan G, Ford S, Guy K, et al. Paramedics' experiences of administering fascia iliaca compartment block to patients in South Wales with suspected hip fracture at the scene of injury: results of focus groups. *BMJ Open* 2019; 9(2): e026073. doi: <https://doi.org/10.1136/bmjopen-2018-026073>
- [26] Fordyce E. Allied health professional confidence in giving prehospital fascia iliaca blocks. *J Paramedic Practice.* 2023; 15(1): 16-26. doi: <https://doi.org/10.12968/jpar.2023.15.1.16>
- [27] Evans BA, Brown A, Fegan G, Ford S, Guy K, Jones J, et al. Is fascia iliaca compartment block administered by paramedics for suspected hip fracture acceptable to patients? A qualitative study. *BMJ Open* 2019; 9(12): e033398. doi: <https://doi.org/10.1136/bmjopen-2019-033398>
- [28] The standards of proficiency for paramedics. [WWW]: <https://www.hcpc-uk.org/standards/standards-of-proficiency/paramedics/> (accessed 20 May 2024)
- [29] Williams B, Beovich B, Olausson A. The Definition of Paramedicine: An International Delphi Study. *J Multidiscip Healthc.* 2021; 14: 3561-3570. doi: <https://doi.org/10.2147/JMDH.S347811>

- [30] Murdoch S. Clinical decision-making and its place in paramedic practice. *J Paramedic Practice*. 2021; 11(5): 1–5.
doi: <https://doi.org/10.12968/jpar.2019.11.5.CPD1>
- [31] Murphy PB, Bechmann S, Barrett MJ. *Morphine*. StatPearls Publishing: Treasure Island; 2024.
- [32] Electronic Medicines Compendium (EMC), 2023. Morphine sulfate 10mg/ml solution for injection: Healthcare Summary of Product Characteristic.
[WWW]: <https://www.medicines.org.uk/emc/product/13178/smpc>
(accessed 28 June 2024)
- [33] Kassam AAM, Gough AT, Davies J, Yarlaga R. Can we reduce morphine use in elderly, proximal femoral fracture patients using a fascia iliac block? *Geriatr Nurs*. 2018; 39(1): 84-87.
doi: <https://doi.org/10.1016/j.gerinurse.2017.07.003>
- [34] Hirst JA, Hill N, O'Callaghan CA, Lasserson D, McManus RJ, Ogburn E, et al. Prevalence of chronic kidney disease in the community using data from OxRen: a UK population-based cohort study. *Br J Gen Pract*. 2020; 70(693): e285-e293.
doi: <https://doi.org/10.3399/bjgp20X708245>
- [35] Merchant AA, Ling, E. An approach to treating older adults with chronic kidney disease. *CMAJ* 2023; 195(17): E612-E618.
doi: <https://doi.org/10.1503/cmaj.221427>
- [36] Basu NN, Kald B, Heath D. Morphine delays discharge following ambulatory surgery: a prospective institutional study. *J Perioper Pract*. 2009; 19(8): 254-256.
doi: <https://doi.org/10.1177/175045890901900804>
- [37] Walker J, Webster CA. Pharmacological considerations for fracture management. *Pharmac J*. 2023; 311(7980).
doi: <https://doi.org/10.1211/PJ.2023.1.200947>
- [38] Ambulance Quality Indicators Data 2024-25.
[WWW]: <https://www.england.nhs.uk/statistics/statistical-work-areas/ambulance-quality-indicators/ambulance-quality-indicators-data-2024-25/>
(accessed 28 June 2024)
- [39] Henderson T, Endacott R, Marsden J, Black S. Competence of UK paramedics in performing standard paramedic skills. *J Paramedic Practice*. 2023; 15(10): 410-417.
doi: <https://doi.org/10.12968/jpar.2023.15.10.410>
- [40] Deakin CD, King P, Thompson F. Prehospital advanced airway management by ambulance technicians and paramedics: is clinical practice sufficient to maintain skills? *Emerg Med J*. 2009; 26(12): 888-891.
doi: <https://doi.org/10.1136/emj.2008.064642>
- [41] College of Paramedics (COP), 2018. Intubation Consensus Statement.
[WWW]: https://collegeofparamedics.co.uk/COP/News/Intubation_Consensus_Statement_.aspx
(accessed 28 June 2024)
- [42] Culture review of ambulance trusts.
[WWW]: <https://www.england.nhs.uk/long-read/culture-review-of-ambulance-trusts/>
(accessed 28 June 2024)
- [43] NHS Long Term Workforce Plan.
[WWW]: <https://www.england.nhs.uk/long-read/nhs-long-term-workforce-plan-2/>
(accessed 28 June 2024)
- [44] Kingston M, Jones J, Black S, Evans B, Ford S, Foster T, et al. Clinical and cost-effectiveness of paramedic administered fascia iliaca compartment block for emergency hip fracture (RAPID 2)—protocol for an individually randomised parallel-group trial. *Trials* 2022; 23: 677.
doi: <https://doi.org/10.1186/s13063-022-06522-3>