

RQ [##]: [Can regional anaesthesia be used in patients for pain relief before transfer to the operating theatres for debridement?]

Section 1: Background:

Regional anaesthesia is an established method to provide analgesia for patients in the operating room and in the postoperative period. While it offers unique advantages, it is not commonly utilised in the prehospital period or in the emergency department. However, this is changing nowadays. The blockade of the femoral nerve (via fascia iliaca compartment block) provides good analgesia for femoral fractures and anteromedial thigh wounds, reducing opioid requirements and allowing for pain-free transfers. Indications explicitly include anteromedial thigh wounds requiring exploration or initial cleaning and dressing before shifting to the theatre.

Regional anaesthesia can be initiated before the operation, either solely or in combination with sedation or general anaesthesia. Single-shot techniques provide analgesia for several hours after surgery, whereas continuous infusions can continue for several days as part of a multimodal analgesic regimen. Recent battlefield literature suggests that the use of regional anaesthesia as an early intervention improves safety and reduces pain and injury-related complications. Early treatment has potential long-term benefits, including reduction in chronic pain sequelae such as causalgia and post-traumatic stress disorder.

Sabapathy et al. stated that “On Arrival Block,” wherein a brachial block is given to a severely injured upper extremity as the first step of the management protocol in the main operating room, bypassing the emergency department, is a “game changer” in trauma care. Immediate pain relief on arrival builds confidence in the system, thereby allowing pain-free initial examination.

High-quality clinical trials are needed to determine which technique is most effective, the optimal timing of intervention, and whether specific surgical populations may benefit most. Preoperative regional anaesthesia has little proven influence on postoperative outcome, though it clearly improves management of pre-existing pain states before surgery. Pre-emptive analgesia remains an attractive concept,

but evidence remains contested. Specifically for debridement (burn, traumatic, or infective wound), no large RCTs exist examining regional anaesthesia purely as a pre-transfer bridge, as opposed to its role as the primary anaesthetic technique.

The practice is clinically meaningful as it reduces opioid consumption, facilitates patient positioning, and may reduce central sensitisation. Enthusiasm for Regional anaesthesia has grown as it is driven not only by awareness of the disadvantages of high-dose opiates, but by increasing clinical competence, ultrasound guidance, and confidence in regional anaesthesia techniques.

Section 2: Data extraction table

S.no	Author, year of publication, Country	Study Design	Sample Size (add individually for each group if multiple groups compared)	Study population (Inclusion and exclusion criteria)	Groups compared	Results
1.	Tor Lutter et al., 2024, South Africa.	Narrative Review/CPD Article	N/A (Review of clinical concepts)	Generalist doctors and patients in District hospitals and clinics.	Regional anaesthesia (RA) vs Traditional analgesia (eg, opioids)	Regional anaesthesia provides effective, prolonged analgesia and improves patient satisfaction. USG-guided regional anaesthesia is advocated for safety and access.
2.	Goldsmith et al., 2024, USA	Retrospective Multicentre Cohort study (National USG Guided Nerve Block Registry)	2735 USG guided nerve block encounters from January 1st 2022, to December 31st 2023)	Adults undergoing USG-guided nerve blocks in emergency departments (ED) Exclusion: Nerve blocks without USG guidance.	Safety and pain reduction across 11 ED sites.	Total complication rate was 0.4%(1 major,10 minor).70.8% of patients reported 51% to 100% pain relief.

3.	Hughes et al., 2019, Australia	Retrospective Cohort	727 total participants (433 received analgesic medication)	Adults with pain (ATS>1). Exclusion: Cardiac pain, pregnancy and transfers.	Time to first analgesic medication (TTA) vs. ED Length of stay (LOS) (minutes).	TTA is independently associated with ED LOS(p<.001). Reducing TTA to 30 mins could decrease LOS by 19 mins/patient.
4.	Pasquier et al., 2019, Switzerland	Randomised controlled double-blind trial.	30 (15 Fascia iliaca blocks and 15 Sham control groups)	Patients >70 yrs with hip fracture. Exclusion: Anticoagulation, cognitive disorder, chronic pain	Landmark-based Fascia iliaca block (FIB) vs. Sham saline injection.	No significant difference in pain reduction between groups(p=0.53); results influenced by high preexisting morphine use.
5.	Downs et al., 2023, USA	Retrospective Review of Quality Improvement (QI) data	486 patients with hip fractures.	ED patients with hip fractures. (FICB) Fascia iliaca compartment block. Exclusion: (infection, anticoagulants)	Feasibility of large-scale ED implementation and physician credentialing	Achieved an 86% credentialing rate for emergency physicians. The block was delivered to a high volume of eligible trauma patients.
6.	Nikolajsen et al.,1998 Denmark	Prospective Randomised Double-Blind Trial.	31 total at 6 months (14 in active block,17 in control)	Patients undergoing lower limb amputation.	GA with preoperative Extradural bupivacaine/morphine vs. GA with Extradural Normal saline and systemic morphine.	Preoperative block had no long-term effect on phantom limb pain (PLP), allodynia, or wind-up-like pain at 6 months.

7.	Makkar et al., 2022, India	Randomised Controlled Trial	30 (15 Block group, 15 Control group)	Trauma patients (18-60 yrs) requiring below- knee amputation. Exclusion: Diabetes, malignancy	Pre-emptive single- shot sciatic nerve block(ropivacaine) vs Normal saline control	Phantom limb pain at 6 months: 46.7% (Block) vs. 66.7% (Control); Significant reduction in acute postoperative pain attacks(p=0.011).
8.	Chin et al., 2013, Canada	Cochrane Systematic Review (22 RCTs)	1732 participants	Adults and children undergoing surgery of the lower arm (hand, forearm, elbow)	Infraclavicular brachial plexus blocks vs. all other brachial plexus blocks.	ICB success rate (88.2%) is comparable to other blocks; ICB has less tourniquet pain(p=0.02) and faster performance times.

Section 3: Results summary

The source material provides a comprehensive evaluation of regional anaesthesia (RA) and pain management across various clinical settings, with a focus on safety, efficacy, and healthcare metrics.

Procedural Safety and Implementation - Evidence from a large multicentre registry, the Goldsmith et al. study showed that the 2,735 ultrasonography-guided nerve block (UGNB) encounters in emergency departments (EDs) confirm a very low complication rate of 0.4%. Major complications are rare (0.04%), and most minor issues are transient sensory or motor deficits that resolve without long-term sequelae.

Furthermore, implementation studies of Downs et al. showed that emergency physicians can be rapidly credentialed to perform these procedures; for instance, one ED achieved an 86% credentialing rate for fascia iliaca compartment blocks (FICB) within a year, successfully delivering the block to 54% of eligible hip fracture patients.

Health Service Impact and Pain Efficacy - Providing rapid analgesia significantly influences the hospital length of stay. Hughes et al., a retrospective review of 727 ED patients, found that time to first analgesic (TTA) is independently associated with ED length of stay (LOS). Reducing TTA to a 30-minute benchmark could decrease LOS by approximately 19 minutes per patient, potentially saving over 500 days of care annually in high-volume settings. While Goldsmith et al. show that most RA techniques show high efficacy, with 70.8% of UGNB patients reporting 51%–100% pain relief, results can vary based on pre-existing analgesia. One randomised controlled trial (RCT), Pasquier et al., found that landmark-based FICB provided no additional benefit for hip fractures when patients had already received prehospital morphine.

Comparative Outcomes of Specific Techniques - Infraclavicular Block (ICB): A systematic review of 22 studies, and 1732 participants, Chin et al. found that ICB has a success rate (88.2%) comparable to other brachial plexus blocks for lower arm surgery. Key advantages of ICB include a significantly lower incidence of tourniquet pain (11.9% vs 18.0%) and faster performance times compared to complex multiple-injection techniques.

Amputation and Chronic Pain: RCTs investigating the prevention of phantom limb pain (PLP) show mixed results. One study, Nikolajsen et al., found no long-term prophylactic effect of preoperative extradural blocks on stump sensation or wind-up-like pain. However, another trial, Makkar et al., using pre-emptive sciatic nerve blocks, reported a 20% absolute reduction in PLP incidence at six months, and while not statistically significant, the block was effective in reducing acute postoperative pain and sleep disturbance.

Clinical Utility in Resource-Limited Settings - Tor Lutter et al. study demonstrate regional anaesthesia as a vital skill for generalist doctors in district hospitals. It offers effective, prolonged analgesia and improves patient satisfaction compared to traditional opioids. Advocacy for ultrasound-guided RA is emphasized to improve access, safety, and reliability in low-resource environments.

Section 4: Discussion

Regional Anaesthesia (RA) in Resource-Limited and Emergency Settings - Tor Lutter et al. reported that regional anaesthesia is a critical skill for generalist doctors in district hospitals, providing effective, prolonged analgesia that significantly improves patient satisfaction compared to traditional methods. While the lack of equipment in these settings often results in a reliance on anatomical landmarks, there is a strong advocacy for the transition to ultrasound-guided RA as it becomes more user-friendly and affordable. The primary barrier to widespread adoption remains a lack of formal training and context-sensitive guidelines.

Safety and Implementation of Ultrasound Guided Nerve Blocks (UGNB)- Large-scale registry data by Goldsmith et al., confirm that UGNBs are safe when performed by emergency physicians, with a complication rate of just 0.4%. Most procedural complications involve transient sensory or motor deficits that are self-resolving, which highlights the importance of clinician awareness and patient counselling regarding expected motor blocks to prevent secondary injuries like falls. Successful implementation in the emergency department (ED) requires multidisciplinary collaboration and structured credentialing programs. Procedures like the fascia iliaca compartment block (FICB) serve as an effective "stepping stone" for emergency clinicians to grow comfortable with RA techniques.

Analgesic Timing and Operational Impact- Hughes et al. demonstrated that a patient's time to first analgesic (TTA) is a reliable independent predictor of their total ED length of stay (LOS). Interventions designed to reduce TTA—such as nurse-initiated analgesia—not only benefit the patient through faster pain relief but also potentially reduce overcrowding and staff burnout in the hospital. However, the efficacy of the analgesic must be weighed against the speed of administration, as fast yet ineffective analgesia may not yield the same operational benefits.

Analgesic Efficacy in Acute Trauma - Pasquier et al.'s study showed that Landmark-based fascia iliaca blocks (FIB) may not provide significant supplemental pain relief for hip fractures when patients have already reached low pain scores with prehospital morphine. This suggests a "ceiling effect" for analgesia in the ED. Furthermore, evidence indicates that ultrasound guidance may produce superior outcomes to landmark techniques by ensuring a more reliable sensory blockade territory. Chin et al. demonstrated that in lower arm surgeries, the infraclavicular block (ICB) is as effective as other approaches but offers the distinct advantages of lower tourniquet pain and faster performance times compared to complex multiple-injection techniques.

Sabapathy et al. state that **‘On arrival block’**, by which a brachial plexus block is administered to a patient who has sustained a major injury to the upper limb upon his arrival at the hospital, as the first step of the management protocol in the main operating room instead of in the emergency department. ‘On arrival block’ is given following a quick primary survey and ruling out acute brachial plexus injury.

“On Arrival Block” has many advantages:

1. Immediate pain relief, a humane principle and one which improves patient confidence in the system.
2. Avoids the administration of major opioids for pain, which can create difficulties during the assessment phase of the injury.

3. A tourniquet can be applied without causing pain before the initial dressing is removed in anticipation of massive bleeding.
4. Permits a pain-free, detailed clinical evaluation of the injury.
5. Facilitates taking radiographs in the main operating room, with no overlap of fractured bones, as often occurs when X-rays of major injuries are taken with bandages intact.
6. This block anaesthetic is used for the definitive surgery, avoiding the need for general anaesthesia and hence found to be very cost-effective.

Providing lower limb “On Arrival Blocks” is the logical extension of this practice. Use of femoral nerve blocks on arrival enables us to use a tourniquet for removal of the dressings of bleeding and for crush injuries of the legs. Even in cases of fractured femoral shafts, a femoral nerve block will reduce the pain.

Regional Anaesthesia and Chronic Pain Prevention - The use of RA to prevent phantom limb pain (PLP) following amputation has yielded mixed results. According to Nikolajsen et al., preoperative extradural blocks appear ineffective at preventing long-term hyperexcitability or PLP, likely because the "nociceptive barrage" from the surgical trauma outlasts the block's duration. Similarly, Makkar et al.'s study showed that the pre-emptive sciatic nerve blocks are highly effective for acute postoperative pain; they do not significantly alter the incidence of PLP at six months. These findings suggest that chronic pain is a complex result of maladaptive neural plasticity, and future research should explore whether continuous perineural catheters offer better long-term prophylaxis than single-shot techniques.

Section 5: Risk of bias of included studies

Study

Risk of Bias

- 1, Tor Lutter et al., 2024, - **HIGH** – This is a CPD article and narrative review rather than an empirical study.
2. Goldsmith et al., 2024, - **MODERATE** – Retrospective observational study, lacks a control group and relied on self-selected sites.
3. Hughes et al., 2019, - **MODERATE** - Retrospective design at a single site with potential selection bias.

4. Pasquier et al., 2019, - **LOW** - Randomised, double-blind, placebo-controlled design with concealed assignments and longitudinal analysis.
5. Downs et al., 2023, - **MODERATE** – Retrospective review of quality improvement data of a tertiary trauma centre
6. Nikolajsen et al., 1998 - **LOW**. Prospective, randomised, double-blind design with standardised sensory assessment protocols.
7. Makkar et al., 2022 - **LOW** – Prospectively registered RCT with random allocation with blinding for drug preparer and investigator
8. Chin et al., 2013 - **LOW** – Cochrane systematic review with strict methodological standards.

Section 5: Response/Recommendation

Regional anaesthesia, preferably with ultrasound guidance, should be used in patients for pain relief before transfer to the operating theatres for debridement, since it offers effective, prolonged analgesia and improves patient satisfaction compared to traditional opioids. In many cases this could be the exclusive anaesthesia for the definitive surgeries.

Section 6: Level/ strength of Evidence:

HIGH

Justification – Inclusion of Cochrane systematic review (Chin et al.), Rigorous experimental designs of double blind RCT (Pasquier et al.,2019; Nikolajsen et al.,1998; Makker et al,2022), large-scale real-world data with multicenter registry study(Goldsmith et al.,2024), consistency of safe outcomes with safety and methodological breadth collectively recommend that USG-guided regional anaesthesia should be used in patients for pain relief before transfer to the operating theatre for Debridement.

References:

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