



## Invited commentary

# Pain management in the austere, high threat environment. Are regional anaesthetic and nerve blockade techniques a good option for more of our forward care providers?

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## Introduction

The relief of pain and suffering is an essential part of effective combat casualty care, with morbidity and mortality benefits extending well beyond the initial point of injury care.<sup>1-4</sup> Pain management has rightly been afforded priority in respected guidelines for initial tactical care of combat casualties<sup>5</sup> and also in prolonged casualty care guidelines.<sup>6</sup> The prospect of prolonged casualty care and evacuation times, as seen during recent conflict in Ukraine, has prompted further thought about optimal pain management in the context of large scale combat operations (LSCO). Traditional reliance on opioid analgesics and sedative agents may impose an unachievable burden for close monitoring of casualties in such conflicts, due to their potential side effects on cardiorespiratory function. While there may never be a 'silver bullet' to effectively treat all pain without imposing risks and complications, there has been recent interest in the potential role of regional anaesthesia (RA) and selective peripheral nerve blockade (PNB) in the forward threat environment.

## Principles of forward military analgesia

Analgesic options for the high threat environment must enable providers to balance the need for early aggressive analgesia with competing priorities unique to each tactical and clinical situation. The realities of the forward combat environment will inevitably place limitations on the options forward care providers have available to them. They may need to prioritise life preservation over complete alleviation of suffering – to do 'the most for the most' for example. Patients may need to stay in the fight and be alert to their surroundings. Conversely there may be times where the tactical situation necessitates a patient be comfortable enough to be silent and compliant despite

their injuries. In the forward threat environment, military care providers will inevitably find themselves in situations where they are unable to provide 'gold standard' analgesic options to all patients all of the time.

Military analgesia has therefore evolved to enable a range of options from simple self and buddy aid (splinting, combat pill packs with simple analgesics and transmucosal fentanyl); through to a range of parenteral opioids (morphine and fentanyl) administered by military medics; and for higher level medical providers, options include sedative and dissociative agents (ketamine and even pre-hospital induction of general anaesthesia).<sup>5-7</sup> Analgesic options throughout the continuum of care must be tailored to the severity of injury, as well as the CASEVAC team capabilities, along each leg of the evacuation chain. But early and effective analgesia, especially where it limits adverse impacts on haemodynamic or respiratory function, has numerous operational benefits. These include the facilitation of earlier evacuation without the need for advanced monitoring; avoidance of ventilator support; optimisation of patient comfort and probably decreasing the need for advanced trained personnel during some phases of the evacuation continuum. It is in this context that recent attention has turned to the use of RA and PNB in both military and civilian prehospital work.<sup>8-10</sup>

## PNB and RA techniques in the forward threat environment

The use of peripheral blocks and regional techniques in the military is not new. Indeed the US Office of the Surgeon General published the excellent *Military Advanced Regional Anesthesia and Analgesia Handbook* in 2008, designed for the education of anaesthesiology residents.<sup>11</sup> More recently, published online in *JHTAM* in January this year, Twerdahl et al outlined their

experiences of various PNB in the Role 2 maritime expeditionary environment.<sup>12</sup> They noted that “regional anaesthesia, and peripheral nerve blocks in particular, can play an important role in maritime expeditionary surgery and likely across the entire spectrum of high threat and austere environments”.<sup>12</sup> They described the safe and effective use of a range of advanced techniques, including transversus abdominis plane (TAP) blocks, supraclavicular brachial plexus blocks, wrist blocks, ankle blocks, and the targeted blockade of various individual peripheral nerves under ultrasound guidance. They also discussed the merits of simple anaesthetic wound infiltration and intravenous regional (Bier’s) blockade.

It is important to note their experience was in a Role 2, aboard the amphibious assault ship USS Wasp LHD 1, as part of a fleet surgical team (FST) with embarked specialists including an emergency physician and an anaesthetics provider with specific expertise in RA and PNB. They had the necessary equipment including ultrasound available to them. Importantly, they had the necessary background training and experience to understand the techniques, including their associated risks and complications. But to what extent are their experiences translatable across the entire battlefield care continuum and how can military care systems prepare to make best use of such techniques?

### **Which blocks are high yield in the forward threat environment?**

The blocks most likely to be safe and effectively provided by mid-level providers (non-physician providers such as medical technicians, nurses, nurse practitioners, physician assistants) in forward contexts are those which can be relatively easily provided by landmark techniques alone; can be augmented with ultrasound if available; do not require very large doses of local anaesthetic; do not involve areas of anatomy prone to complications; and are likely to be useful to alleviate suffering from common military injuries. Those blocks are likely to include the fascia iliaca compartment block (FICB), wrist block, ankle block, ring block, digital nerve block and of course local anaesthetic wound infiltration. With the caveat of some additional skills, training and with the availability of ultrasound; the other high yield blocks that may be provided by mid-level providers could include the axillary brachial plexus block, popliteal block, and possibly the serratus anterior plane block.

But successful implementation of such expanded skills for more effective forward analgesia will be contingent on *careful selection* of individual clinicians for personal attributes rather than a ‘*carte blanche*’ approach contingent upon posting history, attained rank, courses completed, or years of experience of an individual. Some of the techniques discussed, like ring blocks and local anaesthetic wound infiltration, are already available to medics in many advanced military systems. They should remain widely

available. But for the more advanced RA and PNB techniques, most providers should be trained in the identification of those patients likely to benefit from RA and PNB techniques, with the application of the techniques limited to a small number of selected individuals who would be in a position to maintain their training and proficiency.

### **Which providers should have these skills in the forward threat environment?**

If RA and PNB techniques offer obvious advantages to the austere and high threat environment, a valid question is this: “*To what extent can these techniques be safely and effectively delegated to non-physician providers, such as medical technicians, in the forward battlespace?*” In recent years attention has turned to the question of safety and efficacy for the use the FICB in the prehospital context, when provided by non-physician providers such as paramedics.<sup>13-15</sup> Such studies have generally found that in the civilian context, the use of FICB is both safe and effective when provided by appropriately trained paramedics. This is hardly surprising, because it has been the case for many years that appropriately trained hospital nurses and physician assistants, for example, can safely provide these blocks.

But caution must be applied when considering the validity and generalisability of published articles involving mid-level medical providers in the civilian compared to the military context, because there are obvious differences in such things as threat to providers, resupply and availability of stores and equipment, time available and patient-clinician ratios – to name only a few. Importantly, these selected civilian providers are usually working in busy trauma systems where there is a higher exposure to these techniques, and therefore a better ability to maintain clinical competence in them. Further, in the majority of relevant published articles, clinicians involved generally have a level of training and experience that is higher than the majority of medical technicians who are available to be deployed into the forward battlespace, even for wealthy, developed nations, such as Australia and the USA.

This is not to say that there is no role for training *some* military mid-level clinical providers in the use of a limited number of RA and PNB. Portable ultrasound machines are becoming smaller and more available in the forward environment, where much of the benefit of these techniques is likely to be manifest. But the likelihood of maintaining the safe and effective use of these techniques will be contingent upon the careful selection of a *limited* number of the more useful blocks and the application of these blocks by a *carefully selected and limited number* of forward care providers. This will ensure the selected individuals can maintain currency and proficiency in the selected techniques.

### **Conclusion**

So long as war remains a reality of human existence, it will be the case that soldiers suffer painful injuries in the forward

battlespace. Analgesia has always been an essential element of care throughout the evacuation chain and, over time, analgesic options have expanded as newer drugs and delivery methods have evolved. But all available analgesic options come with their risks as well as their benefits. This is equally true of RA and PNB, however these techniques offer the potential to substantially reduce (and sometimes even completely remove) the pain associated with some injuries sustained in forward threat and austere environments. Further, they can potentially do so without the need for advanced monitoring and cardio-respiratory support that occasionally hampers traditional opioid and sedative options.

In order to prepare for future conflicts where large numbers of casualties might need to be managed by small numbers of clinical providers with varying degrees of training and experience, it is important to consider which of these techniques may provide the most utility. It is also important to consider how to develop the skills and training for selected individuals, such that they can maintain enough currency of practice to remain proficient. RA and PNB techniques will have an increasingly important role in analgesia in future conflict. But it is unrealistic to assume that the skills, experience and techniques available to specialist clinicians and anaesthetics providers can be taught to all front-line care providers. The challenge is to devise a system that can safely delegate selected techniques to carefully selected individuals, and to consider how, and where, in the battlespace those selected providers will be deployed.

## Conflict of interest

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