

Treatment at Point of Injury Through the Lens of Capability

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Over the last two decades, Australia's asymmetric wars have been characterised by coalition air superiority, unrestricted communications, rapid evacuation, relatively infrequent casualties and well-resourced, readily defended hospitals. In contrast, future peer-on-peer conflicts will likely feature high casualty rates, limited air evacuation, constrained communications, smaller and less targetable health facilities, and strained resources and lines of communication.¹⁻³ Mass-casualty events, prolonged field care and resource limitation would be the norm. As a result, ADF health planners may need to evolve from an evacuation-, doctor- and hospital-centric model of care to a forward, austere healthcare paradigm.

In this context, we welcome the article by Pilgrim and colleagues, who make a compelling case for augmenting the skillset of first responders, who may be best positioned to prevent avoidable deaths in future conflicts.⁴ We would like to explore three of their proposals further while arguing that future discussions should focus not on individual skills but on health capabilities.

Capability is 'the power to achieve a desired operational effect in a nominated environment within a specified time, and to sustain that effect for a designated period'.⁵ The Fundamental Inputs to Capability (FIC) are 'elements or inputs, which in combination, form the basis of capability'.⁵

Pilgrim et al.'s work demonstrates how important it is that commanders and clinicians clearly understand the objectives of operational health support. Best practice capability development must weigh the positive impact of each clinical effect, either in terms of lives preserved or moral advantage, against its associated logistic and training burden, as well as the opportunity costs of not allocating those resources elsewhere.

The paper addresses the capability 'manage tension pneumothorax in the field'. The authors propose teaching finger thoracostomy (FT) to combat first aiders (CFAs). Traditional teaching and ATLS guidance on FT is that the casualty requires either intubation or immediate intercostal catheter (ICC) insertion to avoid respiratory failure from a 'sucking

chest wound' open pneumothorax.⁶ Nonetheless, open pneumothorax is less immediately life-threatening than tension pneumothorax. JTS TCCC guidelines now endorse FT without either intubation or ICC insertion; the resultant wound can be covered with a chest seal.⁷ Accepting that finger thoracostomy represents appropriate field management of tension pneumothorax, we must consider how this capability might be developed with respect to FIC. Even in high-volume pre-hospital trauma networks, FT is usually restricted to senior paramedics with extensive additional training and ready access to retrieval platforms. This contrasts with the practice environment of the CFA. However, FT's better success rate and robustness may make this a better fit for the nominated environment of prolonged field care capability.

Pilgrim et al. also implicitly address the capability 'resuscitate an exsanguinating trauma patient in the field' when they proposed that medics (soon to be known as 'Health Technicians') should transfuse packed red blood cells (PRBC), and perform Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA).

Many well-established clinical skills already support this capability: field tourniquet application, direct or junctional pressure and avoidance of hypothermia and excessive crystalloids. Moreover, these skills are simple and quick to teach, with inexpensive consumables and negligible waste. The same can't be said for packed cell transfusion and REBOA.

Blood supply logistics are complex. Civilian pre-hospital transfusion practices are only tenable because paramedics return to supply nodes several times daily. Sustaining forward blood supplies for more than a few hours requires refrigeration, reliable power and temperature-stable transport; this seems inconsistent with the 'long duration in austere conditions ... limited logistic[s] ... and far removed from technical support' missions described by the authors. Blood stocks are also limited; PRBC could likely only be allocated to a fraction of medics.

Returning to the capability of resuscitating bleeding trauma patients, it may be more appropriate for health

technicians to administer volume replacement and haemostatic products such as calcium, tranexamic acid, lyophilised plasma and fibrinogen concentrate. These have favourable supply chain characteristics and arguably better address the coagulopathy associated with life-threatening haemorrhage. Using the lens of FIC, we can identify barriers to capability implementation; for example, the ADF would need to partner with industry and develop supply chains to access these products, which are not universally available in Australia.

Alternatively, training medics in walking-blood-bank whole blood transfusion may be possible. Whole blood may offer other advantages over PRBC beyond the scope of this letter, but, notably, the JTS guidelines endorse the use of pre-hospital whole blood, not PRBC.⁸ Given the initial and annual training burden associated with the authority to transfuse, as well as the potential for wastage, it may be wiser for transfusion to be practised only by select providers, such as medical officers and special operations medics, who are also more likely to be able to provide the other advanced treatments needed by an exsanguinating casualty.

Finally, Pilgrim et al. advocate teaching REBOA to medics (although we understand they were advocating this as a niche skill for highly-select medics). In the high casualty, prolonged field care environment they envision, we feel this skill will not materially contribute to the ADF's capability of managing shocked trauma patients in the field for three reasons. First, whether REBOA offers any survival benefit, even in experienced hands, is controversial.^{9,10} Second, REBOA is an advanced technical procedure, almost exclusively performed by specialist medical practitioners, including in the

several pre-hospital examples cited by the authors and the JTS guidelines.⁹ Finally, REBOA 'should never be undertaken without expedient access to definitive haemorrhage control'.⁹ JST guidelines suggest a time-to-surgery of 15–30 minutes as a reasonable requirement for insertion.⁹ This may be achievable in metropolitan London, but even the authors' suggested cut-off of 90 minutes seems inconsistent with their estimated evacuation times of 1–6 hours. REBOA is an intervention reserved for highly-select patients as judged by a senior medical specialist, with surgical intervention immediately available. REBOA is not a procedure we should be pushing forward to first responders.

We conclude by thanking Pilgrim et al. for their contribution to this discussion. We look forward to further robust debate to help define those skills that best contribute to deployed health capability while remaining practical and cost-effective in a time when there are multiple competing demands on the Defence budget.

(These opinions are those of the authors alone and may not reflect those of their affiliated organisations).

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