DEPLOYED MEDICAL & HEALTHCARE DELIVERY

Delivering Battlefield Medicine at Scale:

Insights from Defence Analyst Tim Ripley

Defence iQ

Tim Ripley

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For soldiers fighting along the frontlines in Ukraine, the war is brutal and unforgiving. Death or injury could come at any minute from artillery fire, drone attacks or mines. Safety comes from remaining underground in deep trenches and bunkers, protected from shrapnel and camouflaged from the ever-present aerial drones that spot any movement in the open.

Many observers liken this to the stalemate of the Western Front in World War One but, in France between 1914 and 1918 the combat zone only stretched a few hundred metres behind the frontline. In Ukraine in the 21st century, near continuous drone surveillance means that for up to 20 kilometres behind the frontline few soldiers dare venture out into the open. Even the most heavily armoured vehicles driving in this zone are vulnerable to attack from missiles and drones. Soldiers often spend weeks at a time on duty in frontline trenches and bunkers because it is too dangerous to break cover to be rotated back to rear areas after their tour of combat duty.

For those unlucky enough to be wounded in action in Ukraine, providing them with lifesaving medical treatment and evacuation is a major challenge. This has upended decade of experience, as well as rendering a great deal of medical technology redundant.

Providing first aid to Ukrainian and Russian soldiers wounded outside cover, getting them immediate first aid can be time consuming and expose other personnel to great risk. For soldiers with serious injuries, this can often be a death sentence. Even if it is possible to recover the casualty to cover and stabilise them, evacuating them back from the frontline to field hospitals in safe areas can take many hours or even days. Keeping casualties stable for extended periods until evacuation becomes possible, involves a whole

of additional challenges. The sheer intensity and scale of the Ukraine war, in turn means that providing long term medical support for hundreds of thousands of casualties has a become a 'whole of society' endeavour, requiring close co-operation and integration with civilian medical services.

For medical personnel of NATO countries, the type of scenario being played out in Ukraine rendered obsolete much of the doctrine, procedures and equipment that they employed over the past 30 years on peacekeeping and counterinsurgency operations in the Balkans, Iraq and Afghanistan. Between 2001 and 2021, a wounded NATO soldier could expect to be lifted off an Afghan battlefield by helicopter in less than an hour after an incident and, if necessary, could be undergoing surgery in a hospital in their home country within 24 hours. Such lavish provision of medical support looks like it could be a thing of the past. To keep soldiers alive on future battlefields requires a step change in how armies think about providing combat medicine.

Should NATO find itself in a major conflict with a peer-on-peer opponent, such as Russia and China, its medical support will have to be delivered in a very different way. The big take away from the Ukraine conflict is the need to push medical expertise and capability as far forward as possible, even into frontline trenches. The days of relying on medical evacuation chains to get casualties rapidly off the battlefield may be over.

First of all, this requires a significant doctrine shift, to empower, train and equip battlefield medical personnel to carry far higher levels of care than is the case today. Medical facilities in forward battle areas will also have to treat and support far more casualties for extended periods. So, a major issue is the scale of medical prevision required across combat forces. During previous conflicts of the past 30 years, the ability to rapidly evacuate casualties meant 'high-end' medical support could be concentrated at a few big well equipped hospitals. In future wars, the potential for casualties on the scale of the two World Wars requires a level medical provision that most NATO nations have not seen for 80 years.

Future battlefield medical provision and evacuation chains could look a lot more like that found in World War Two than Afghanistan in 2014. For example, within infantry battalions, this new model could involve personnel having significantly more medical training, more medical equipment and supplies. Company and battalion-level medical staff would also be more highly skilled and equipped to run facilities very near to the frontline so seriously wounded personnel can be attended to for several days, until evacuation is possible.

The range of procedures that they will be required to conduct will be more extensive than at present, up and including operations that require general anaesthetic. This is a level of medical capability that is not currently found in battalion-level medical support units.

Modern technology could be brought to bear to achieve this and ensure more patients, survive for longer, even if they cannot be evacuated to hospitals in rear areas.

Although medical facilities are notionally protected under the Law of Armed Conflict, this might not be enough to protect casualty reception points and field hospitals from attack from cluster munitions and other areas effect weapons. It therefore may be necessary to provide physical protection in cellars, underground car parks or deep bunkers. Camouflage is also essential to prevent these facilities being located by enemy surveillance. A very effective way to reduce the signature of field hospitals is to minimise the use of generators needed to power their equipment. Heat signatures from generators and their exhausts are easily identified by thermal imaging sensors. Resupply convoys are also easily tracked and can give away the position of field hospitals.

So, reducing the size, infra-red signature, power consumption and mobility of medical equipment used in these facilities is a top priority. Small and low power X-ray machines, body scanners and oxygen equipment are crucial to reducing power consumption and enabling the pushing of medical capability into forward battle zones.

A new generation of small portable ultra-sound devices is a critical part of the drive to decentralise medical provision, to allow wounds and injuries to be assessed in a range of settings, including frontline positions, medical stations and field hospitals. These devices require low levels of power, adding to their effectiveness. Personnel with varying levels of training can use these devices to treat or triage casualties.

An important element of forward deploying medical capabilities is digital technology to allow frontline medical staff to 'reach back' to exploit expertise and resources held in a higher echelons. Online medical libraries, remote consultations and telemedicine advice, could give battlefield medical personnel the ability to tap into a wide range of resources to determine the best treatments for patients. By connecting artificial intelligence, the utility of on-line medical resources can grow exponentially.

Frontline medics can be connected via the internet with highly skilled experts over video links, who can talk them through highly complex procedures or offer other advice. This has the potential to transform battlefield medicine and bring high quality medical care to frontline settings.

Sustaining medical operations in combat zones is dependent on a constant supply of consumable items – blood products, sterile equipment, dressings and medicines. Many of these items require specialist storage, such as temperature-controlled environments, to ensure they do not go off or spoil.

In the past, these storage facilities have been maintained in large field hospitals, with reliable power supplies, but it might not be possible to replicate these in smaller field

https://upload.wikimedia.org/wikipedia/commons/a/ab/US_medics_train_with_international_partners_%2810588658046%29.jpg

setting. Solutions to this include low power cooling technology.

Synthetic blood products offer much potential in this area because they have longer shelf lives and do not require refrigeration. Dried plasma is another technology that allows the storage of blood products at room temperature or in a soldiers rucksack. After the addition of sterile water, the dried plasma can be transfused on the field to enable injured soldiers to be eventually moved to safer medical facilities from the battlefield.

Even these technological solutions might not be enough to meet the requirement for blood products in battle zones, which is leading many armies to look to make more use of whole blood from live donors. It has proved very effective during emergency resuscitation when patients have suffered major blood loss.

Providing frontline medics with the equipment and training to carry out emergency transfusions is becoming a high priority.

New ways to deliver oxygen to forward locations that does not need for pressurised metal bottle are also being explored, potentially allowing more resuscitation options for combat medics.

Modern battlefield conditions have forced armies to look again at how they organise and execute their evacuation chains, from the battlefield back to medical facilities in their home nations.

The first phase of the chain is the collection of casualties from the battlefield, which in previous conflicts would have involved soldiers carrying their wounded comrades to cover over their shoulders or on a stretcher. Once behind shelter, immediate first aid could be applied to keep the casualty alive.

Near continuous surveillance of battlefields by aerial drones makes this difficult or impossible. Casualties on Ukrainian battlefields have had to lie unattended for hours or days before it is possible to recover them. One solution to this problem has been the use of load carrying aerial drones to fly to isolated casualties and then recover them.

Load carrying aerial drones, such as the Malloy T-150, also have the potential to move casualties from forward medical facilities in combat zones to field hospitals in safe areas. These drones are small, move faster than ground ambulances and are difficult to detect, so offer a more effective way to evacuate casualties than traditional methods.

In situations, where forward medical facilities are under sustained enemy fire, it may be necessary to resort to heavily armoured ground ambulances

to evacuate critical casualties. These vehicles will need to have the highest level of protection, similar to that found on main battle tanks or infantry fighting vehicles, including applique armour packs and active defence systems.

Armoured ambulances have long been considered 'Cinderella' vehicles, with limited armoured protection and medical equipment. This is approach is being re-assessed by many armies and they are fielding armoured ambulances that are better suited to modern battlefield conditions.

A key ingredient in the successful evacuation chain is the passage of information about casualties as they move back from the frontline to rear hospitals. Many armies are fielding digital patient management systems to allow patient records to be passed seamlessly from the frontline to the rear. Cloud data systems offer a way for medical professionals to upload patient data and then for other personnel further down the chain to access the information, via bar code or QR code technology, tagged to sedated patients.

It is not just armies that are looking at ways of adapting their medical capabilities to new battlefield realities. Navies have a key role in supporting amphibious operations and these involve evacuation chains that brings casualties aboard warships. Many navies are starting to field warships with the ability rapidly switch roles by loading specialist pods into modular mission bays. Medical pods are high up the requirement list of several navies to allow a range of warships to become casualty reception points, field hospitals and evacuation ships.

Underpinning all the issues discussed above, is the sheer scale of the level of medical support that could be needed in future peer-on-peer conflict. NATO armed forces are grappling with the how to up-scale their medical support to the level needed to provide for tens or hundreds of thousands of troops, engaged in high intensity conflict. This endeavour has only just started.

The nature of modern warfare may have changed over recent decades, but the core mission of medical support has not really changed. Soldiers will rarely go into battle without knowing that if they are wounded, they will be rapidly recovered from the battlefield and then provided with the best medical treatment available. While medical treatments and evacuation procedures may have changed over time, the enduring mission of military medical professionals has not changed.

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Be part of the 12th annual Deployed Medical & Healthcare Delivery Conference in London, 24–25 March 2026

This year's event comes at a critical time, with current conflicts underlining the need for faster, more integrated medical responses and the ability to manage casualties on a large scale. Over two days, senior military medics, civilian healthcare leaders and industry specialists will come together to share experience from the field, examine emerging technologies, and consider new ways to strengthen collaboration between defence and civilian healthcare systems.

The conference offers a unique chance to exchange ideas with peers, learn from international partners, and play a role in shaping how deployed medical care is delivered in the years ahead.

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Surgeon General
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Major General Scott Malcolm
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