COMMENTARY

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Surgical Casualty Care in Contested Distributed Maritime Operations: Lessons Learned From the Falklands War

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ABSTRACT The Falklands Campaign was fought a significant distance from the home base of the British Fleet. The planning and delivery of medical care during this campaign can provide significant lessons for strategic medical planning in other far spread geographic locations, including the Indo-Pacific region. Consideration of doctrine, including Role 1-4 facilities and the golden hour, may need to be reconsidered in light of changing scenarios. New concepts such as the "90-in-90" and "3-in-3" are also discussed as a framework for future planning in the U.S. Indo-Pacific Command area of responsibility.

INTRODUCTION

The Falkland Campaign was fought approximately 8,000 miles from the British Isles and 300 miles off the coast of South America with a short period of indications and warnings (I&W) in advance of conflict. United Kingdom (UK) medical planners faced long sea lines of communication (SLOC) to evacuate war wounded and limited capacity to treat them in local host nation (HN) facilities.[1] Okinawa is similarly remote, lying approximately 300 miles from the Japanese mainland and 5,700 miles from the West Coast of the continental United States (Fig. 1). As a case study, the Falkland Campaign may influence strategic planning for medical care during distributed maritime operations in the First Island Chain (FIC) of the U.S. Indo-Pacific Command (INDOPACOM) area of responsibility (AOR).

BRITISH MEDICAL PLANNING IN THE FALKLANDS WAR

Long SLOCs from the UK to the Falkland Islands and a short period of I&W of kinetic conflict represented critical vulnerabilities in British medical planning. Advanced resuscitative care, definitive surgical care, means to transfer patients, and patient holding capacity had to be forward projected where casualties were either cared for in place or evacuated over an equally long SLOC to domestic Role 4 facilities. The timing of conflict made prepositioning of medical supplies or fixed facilities untenable.

Planners established a continuum of casualty care along evacuation routes from the point of injury to domestic Role 4 UK medical facilities. Though still in its infancy, Advanced Trauma Life Support—the American College of Surgeons' training and doctrine for the treatment of trauma patients—was adapted to the combat theater.[2] Field surgical teams (FSTs) were established as intermediate facilities to provide damage control surgery (DCS) capabilities similar to that of modern NATO Role 2 light maneuver teams or Role 2 forward teams.[3] DCS is limited only to acute operative stabilization of mortally wounded patients through a host of emergency surgical procedures meant to stabilize patients for transport to higher echelons of care.[4] Despite their limited capacity for definitive surgery or prolonged critical patient holding,

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FIGURE 1. Comparison of distances from the United States to Japan and the UK to Falklands.

the mobility and flexibility of these units supported combat operations with access to DCS capabilities within as little as 15 minutes.[1] Independent FSTs were designed to leverage structures of opportunity but were able to operate in tent-based structures if required—this is well is illustrated in Ajax Bay where an abandoned slaughterhouse was converted to house an FST.[2]

Along the continuum of casualty evacuation, definitive surgery and enhanced critical patient holding capacity were accommodated by hospital ships similar in capability to modern NATO Role 3 Casualty Receiving and Treatment Ships (CRTS) supported by three ambulance vessels.[5] Patient movement to this level of care was accomplished almost exclusively by vertical lift. Patients who required care beyond the capabilities of the hospital ship were transferred to Role 4 medical facilities in the British Isles.

FALKLANDS CAMPAIGN LOGISTICS

Two of the four FSTs deployed ashore parachuted alongside combat troops with supplies for approximately 10 Damage Control Resuscitations (DCR) or 10 DCS. Resupply occurred reliably during vertical lift aeromedical evacuation missions between the CRTSs and the FSTs.[6] Lacking refrigeration capacity, a walking blood bank using prescreened donors provided adequate blood products for resuscitation.

The terrain of the Falkland Islands made ground tactical evacuation by ground untenable. In addition, air superiority was not assured throughout the campaign, and sea control was uncertain until the establishment of the total exclusion zone and the sinking of the *Armada de Republica Argentina* "General Belgrano."[7] Uncertain air lines of communication (ALOCs) between FSTs and British CRTSs resulted in variable evacuation, ranging between 1 and 36 hours with the longest helicopter flight totaling 40 minutes.[1]

At the request of the UK Government, Argentina agreed to stage their hospital ships along with UK assets in a roughly 20 nautical-mile wide box known as the "Red Cross Box."[8] In this zone, communication, treatment, and casualty exchange occurred between both parties. This arrangement enabled the efficient transfer of patients from ashore FSTs while facilitating the evacuation of casualties from the CRTSs to permanent Role 4 UK Military treatment facilities.

INDOPACOM PLANNING

Casualty care in INDOPACOM is similarly strained by long SLOC and limited I&W.[9] Islands sprawl hundreds and thousands of miles apart with limited local trauma care capabilities. The islands most likely to be involved in future conflict lie in the FIC, a string of islands parallel to the Chinese coast that includes the Philippines and Japanese Southwest islands within the range of military targeting in an area known as the Weapons Engagement Zone.[10]

Despite a 98.8% survival rate once patients reached Role 1 facilities, the overall Falklands Conflict wounded-to-killed ratio was 3:1 (777 wounded and 255 killed).[11] These results were greatly exceeded in the most recent US conflicts; combat casualty death rates reached a nadir due to the implementation of best practices, some of which were unknown or unavailable at the time of the Falklands Conflict: the promulgation of tourniquets and other adjuncts to treat compressible hemorrhage at the point of injury, forward projection of advanced resuscitative therapies such as whole blood transfusions, and rapid aeromedical evacuation from the point of injury to DCS care and higher to include the Role 4.[12]

Rapid aeromedical transport to Role 1 was achieved within 60 minutes of injury—the so-called "Golden Hour." This concept was first popularized in civilian trauma systems as a means to reduce preventable death following traumatic injury

TABLE I. Comparisons of Casualty Care Timing Standards

Surgical timing standard	Conflict	Description
Golden hour	Operation Enduring Freedom Operation Iraqi Freedom	60 minute standard for transport of a combat casualty from the point of injury to Role 2+ surgical care
90 in 90	INDOPACOM Planning	Logistical standard requiring that 90% of allied forces operate within 90 minutes of Role 2+ Surgical Care
3 in 3	INDOPACOM Planning	Logistical standard requiring that all casualties treated at a Role 2 unit are transferred to a Role 3 unit within 72 hours

through rapid access to damage control resuscitation and surgery.[13] However, when this concept is applied for military use, it lacks the civilian context necessary for its success. Often overlooked is the importance of timely transfer from the Role 2 DCS environment to Role 3 facilities capable of providing definitive surgery.

Given the uniquely distributed geography of the USINDOPACOM AOR, the legacy golden hour cannot be expected as standard throughout the FIC. Instead, the golden hour should be replaced with a pair of concepts adapted to military application: "90-in-90" and "3-in-3." (Table I).

"90-IN-90" AND "3-IN-3"

For the "90-in-90" standard, 90% of allied forces must be located within 90 minutes by land to a Role 2 facility with DCS capabilities. In the "3-in-3" standard, critical casualties treated at a Role 2 are transferred to a Role 3 within 3 days, or 72 hours. Though this standard is unlikely to achieve similar survival rates compared to the most recent US Military conflicts, it represents an attainable goal when developing the in-theater trauma system suitable to this AOR.

Within INDOPACOM, vertical lift aeromedical evacuation remains the vehicle of choice, though the implementation of the expeditionary medical ship platform may shift that paradigm. In situations with uncertain ALOCs, rapid surface transport of dozens of casualties aboard a single vehicle capable of providing en-route critical and surgical care may be preferable. Failing these capabilities, increased holding capacity of Role 2 echelon facilities beyond the doctrinal 72-hour holding expectation will be required. Preparing Role 2 echelon facilities for the contingency of prolonged austere critical care (PACC) will require a thorough reassessment of consumable medical supplies and medical personnel assigned to this role when surgical treatment becomes definitive, versus damage control by necessity in these already austere facilities.

Similar to the Falklands War, expeditionary advanced base operations (EABO) may become a necessity in the event of large-scale conventional warfare in the INDOPACOM AOR. Leveraging health service support within the HNs' medical systems is a critical component of EABO. This involves HN facility interoperability with allied forces, trauma systems development, and coordination of allied casualty movement through the HN hospital system.[14] In the Pacific theater, health service support requires durable and lasting relationships, primarily with the Japanese and Philippine Governments within the FIC.

INDOPACOM CHALLENGES

Of the many successes of the Falklands Campaign, successful vertical lift aeromedical evacuation despite contested SLOC/ALOCs was likely among the most medically significant. The longest wait to evacuate a patient was 36 hours, and it is unclear if this was for patient factors or transportation-specific factors. Uninfringed evacuation out of Role 2 facilities across a geographically isolated AOR cannot be assumed. The 90-in-90 standard conceptualizes the Role 1-to-Role 2 transition well, but the Role 2-to-Role 3 transition is less assured. If patients cannot undergo rapid transportation from the Role 2 to the Role 3, like in the Falklands and Operation Iraqi Freedom/Operation Enduring Freedom, Role 1 and 2 doctrines must rapidly change. If "3-in-3" cannot be assured, then training, equipping, and staffing of Role 2 teams will need to adjust significantly to accommodate PACC and definitive surgical capabilities.

Caring for casualties with large and significant burns is especially time- and resource-consuming. In the Falklands War, burns represented 14% of all injuries, and after one particular bombing, burn patients had to be immediately evacuated to a CRTS Role 3 to avoid overwhelming the Role 2.[1] Burns require large-volume fluid resuscitation and subsequent surgical debridement and skin grating relies heavily upon blood products as well as specialized instruments and post-operative therapies. Without reliable refrigeration capability, walking blood banks must become standard for blood product storage and procurement.[15] This care is typically deferred to a Role 3 hospital, but in a contested AOR that requires PACC, a Role 2 team may be required to perform these interventions to mitigate morbidity and mortality.

Environmental concerns in the INDOPACOM AOR must also be considered when discussing Role 2 facility construction. There are rainy seasons, typhoons, tsunamis, and high heat and humidity, and cold seasons in the northern aspects of the region. Weather may influence patient and resource movement significantly and thus may impact clinical outcomes.

RECOMMENDATIONS

Medical planners should strive to establish medical infrastructure similar to that which was successful in the Falklands Conflict for application within the INDOPACOM AOR. This will include multiple prepositioned Role 2 facilities throughout

the FIC with planned medical evacuation routes to ashore and afloat Role 3 facilities. If medical evacuation cannot be achieved or relied on, Role 2 facilities must be enhanced in resource and in training to accommodate PACC. Teleconsultation capabilities may be leveraged to enable the complexities of PACC.

Enabling training and allowable medical allowance lists must be designed to suit the necessary DCS/DCR capabilities and possible PACC capacity for multiple patients. Doctrinal changes in treatment strategies, logistics planning, and personnel requirements should consider and address these challenges. Burn care must be emphasized and ensured throughout the continuum of casualty evacuation.

Coordination with HN medical systems will allow for the identification of hardened structures and prepositioning of a rotating consumable medical supply. These interventions will ensure that Role 2 assets are in place within the I&W window of any potential conflict and can provide DCS capabilities to operational commanders. During the Falklands War, existing civilian hospital and clinic infrastructure was utilized. Deployed medical forces may be able to provide a mutually beneficial relationship with the local population. Lacking this coordination, Navy Construction Battalion capabilities can be leveraged to establish fixed Role 2 facilities in strategic locations throughout the FIC and INDOPACOM AOR.

The Michaud Role 2 Enhanced Fixed Expeditionary Medical Facility aboard Camp Lemonnier, Djibouti, Africa, is a hallmark example of this concept put into action in the US Africa Command. It is strategically positioned in a central location near the primary regional air and sea ports of debarkation to support ongoing military operations throughout the Horn of Africa by providing organic DCS/DCR capabilities and allowing for prolonged patient holding following traumatic resuscitation. Lacking open conflict, such fixed facilities could represent an opportunity for coordination with a local health system and global health engagement with the local population. This activity will ensure continuous staffing and readiness should a conflict arise.

The INDOPACOM AOR will remain a logistically challenging region given its geography. Planners must adapt to the unique challenges of EABO and DMO to establish a completed chain of casualty care, ideally to meet the golden hour, but at least to meet a 90-in-90 and 3-in-3 standard. Role 2 medical assets will be uniquely taxed in this environment, and ideal education, manning, supply, and employment of these units must be decided and implemented before they are needed to ensure that adequate care continues to be provided to wounded service members.

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INSTITUTIONAL CLEARANCE

Institutional Clearance approved.

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