Get the Doc

PART II: Marine Corps Role-2 assets, damage control surgery, and medical considerations for operational planning

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From the first recorded description of battlefield care to the current Russo-Ukraine conflict, rapid access to medical care has proven vital to the survivability of casualties with severe trauma. As warfare has evolved, military trauma care has likewise evolved to project forward in the battle space and reduce mortality. Along with changes in mobility and scale, medical personnel adapted their techniques to develop what is now known as damage control resuscitation (DCR) and damage control surgery (DCS).[1] Borrowing "Damage Control" from naval terminology, DCR and DCS form a continuum of care focusing on only essential life and limb-saving procedures. Damage control resuscitation and DCS delay definitive care that corrects anatomy—the body's physical structure—by prioritizing the restoration of physiology: the body's function.

Damage control resuscitation consists of non-operative interventions aimed at stopping hemorrhage, preventing hypothermia, and restoring oxygen delivery to the patient's vital organs. Damage control resuscitation can involve applying tourniquets and pelvic binders, securing the airway by placing a breathing tube, inserting a chest tube to alleviate a pneumothorax, providing external warming, and administering blood transfusions, antibiotics, and pain medications. Damage control surgery follows initial DCR and is the next step in care for more seriously wounded casualties. Damage control surgery involves surgically opening up and exploring parts of the body to stop hemorrhage, clean contamination,

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and repair blood vessels to restore blood flow to vital organs and limbs. Damage control resuscitation continues during DCS; the processes are interdependent. The critically ill patient is then further resuscitated in an intensive care unit (ICU) setting before more definitive surgery is performed later. Conceptually, DCR happens in the field, emergency room, and ICU settings, whereas DCS occurs in the operating room while resuscitation continues.

The cornerstone of DCS in the Marine Corps medical framework is the Role-2 facility. Role-2 facilities are crucial steps in the continuum of medical care that link early DCR at a field Role-1 to more definitive care at Role-3 facilities. There is no garrison equivalent to the operational Role-2. In addition to DCS capabilities, Role-2s have an expanded capacity to perform meaningful DCR and prolonged casualty care (PCC) compared to Role-1s. The Marine Corps doctrinal foundations of the Role-2 can be found in *MCRP 3-40A.52* and *MCTP 3-40A*.[2] However, both publications are dense and dated, written over ten years ago before the *2018 National Defense Strategy* and subsequent *38th Commandant's Planning Guidance* outlining the Force Design initiative. Understanding the current systems involved within a Marine Corps Role-2, its capabilities and limitations, and its interplay with other echelons of care is vital to the success of Marine units and individual Marines' survivability.

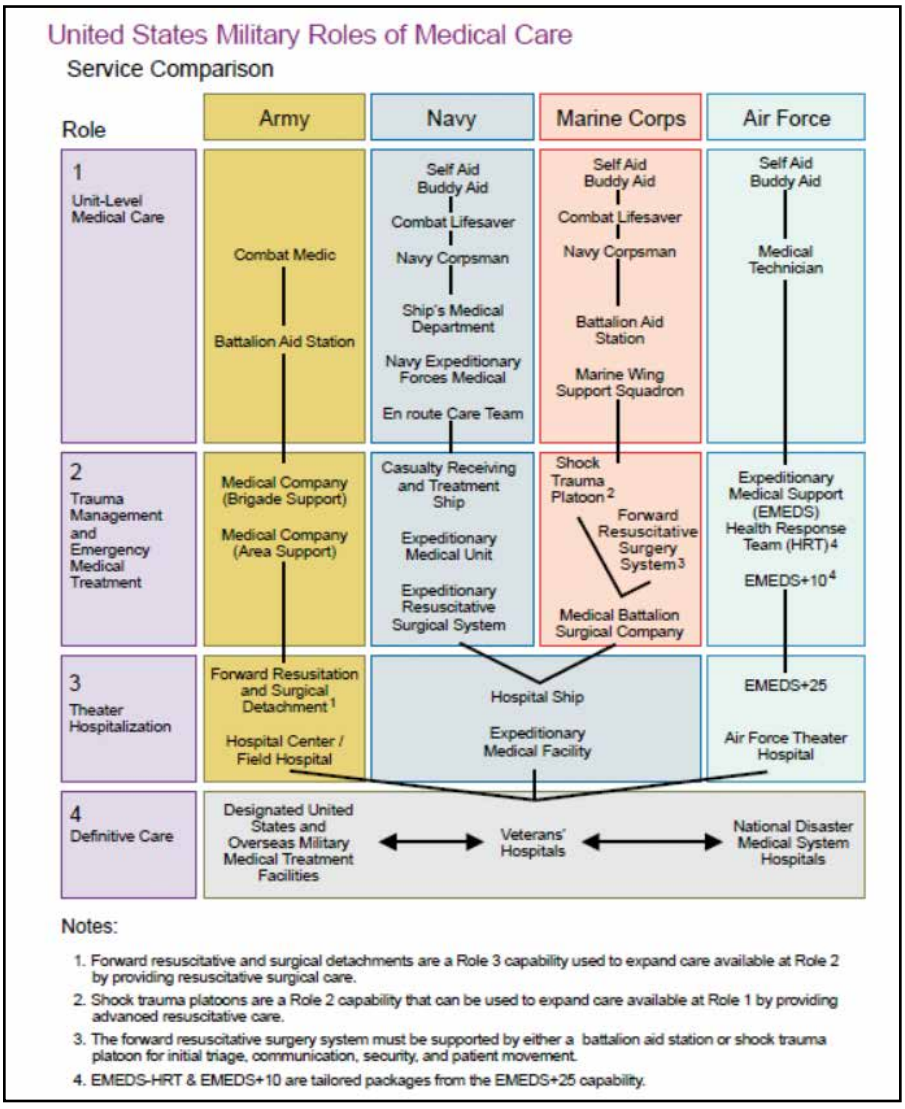

Figure 1. Roles of medical care within different branches of the U.S. military. *(Figure provided by author.)*

The Marine Corps Role-2

The Marine Corps Role-2 is centered around its three main components: the shock trauma platoon (STP), the forward resuscitative surgical system (FRSS), and the holding area. These are the emergency room, operating room, and ward/ICU, respectively. In addition to these components, a doctrinal Marine Corps Role-2 includes a command and control element, organic en-route-care (ERC) capabilities, and ancillary services. In aggregate, the system functions like a small rural hospital with DCR/DCS capability but limited capacity. Within current Marine Corps medical terminology, the term Role-2 implies the presence of a FRSS and DCS capabilities. The Marine Corps construct differs from the definition of Role-2s found in other Services, which may lack surgical capability.[3] Marine combatant commanders must be aware of these definitional differences, as mistakenly identifying an Army Role-2 for a capability that supports Marine Corps casualty evacuation plans could lengthen the time required for an injured Marine to receive surgical stabilization.

Shock Trauma Platoon

The function of an STP at a Role-2 is similar to its task when augmenting a Role-1 or functioning independently as a part of a MEU. Casualties are received and triaged; DCR is initiated or continued from the field setting. Tourniquets can be converted if appropriate. Shock trauma platoons are staffed by two emergency medicine physicians, an emergency medicine nurse, a physician assistant, an independent duty corpsman, and approximately thirteen corpsmen. An STP with its full table of organization present can smoothly perform four DCRs simultaneously and possibly flex to care for six critically ill patients in specific scenarios. Shock trauma platoons can also care for advanced disease and non-battle injuries (DNBI) such as heat stroke, sepsis, or patients in an acute mental

health crisis requiring sedation. Trauma patients who require DCS, or those who need surgery for DNBI purposes such as appendicitis, can quickly be moved to Role-2's core capability: the FRSS.

Forward Resuscitative Surgical System

The FRSS is the essential component of the Marine Corps Role-2 where DCS is performed. Personnel include two surgeons—often one general surgeon and one orthopedic surgeon—an anesthesiologist, a critical care nurse, and four corpsmen.[4] An FRSS can perform approximately 18 surgeries in 48 hours without resupply, though this number is dependent on the type and extent of surgeries performed.[5] Damage control surgery involves abbreviated life-saving surgery for patients with severe injuries, focusing on stopping internal hemorrhage, cleaning contamination, and performing limb salvage in severe orthopedic injuries. Damage control surgery is usually not the final step in patient care, and additional surgery is often necessary. Comprehensive care at a Role-3 or higher should be accessible within 72 hours following initial surgery. Moving patients to definitive care is critical for individual survivability and preserving FRSS effectiveness. Importantly, only one DCS can be performed at a time, creating a potential bottleneck in mass casualty scenarios. Additionally, an FRSS cannot reasonably provide surgical care unless co-located with an STP or equivalent pre-operative evaluation and holding unit. As stated above, DCR is a continuous process that must continue through the DCS step in the FRSS. Finally, an FRSS cannot perform meaningful neurosurgical intervention in the setting of severe head injury.

Holding

Holding is the area within the Role-2 where stabilized patients are sustained until they can be evacuated to a higher echelon of care. Holding is staffed by a family medicine or internal medicine physician, an ICU nurse, a ward nurse, and approximately five corpsmen. Corpsmen from the STP can also assist during patient-holding operations. Holding is an essential module allowing the FRSS to move patients out of the operating area once DCS is completed. Holding also allows for continued resuscitation of critically ill and post-surgical patients. If necessary, a patient may return to the FRSS from holding for a second surgery for further hemorrhage or infection control. The holding area can accommodate approximately ten patients at a time and has enough equipment for approximately 50-bed days.[6] Again, the number and length of patient holding capabilities are subject to the acuity of injuries sustained. Without an adequate holding area or truly immediate patient evacuation, a Role-2 can quickly become overwhelmed and unable to provide further resuscitative or surgical care.

Command and Control

The command-and-control element of a Role-2 consists of a small team of officers and senior enlisted personnel, though a specific table of organization is not defined. Its functions include organizing the constituent parts of the Role-2, assuring interoperability with the supported unit, tracking patient movement through the Role-2, and tracking supply needs within the Role-2. A Role-2 does not have its own organic communications personnel or communications equipment; it relies upon its supported unit to supply these vital components.

En Route Care

En route care (ERC) teams provide care during the transport of two critically injured but stabilized patients for up to two hours of transit by air, land, or sea. One of the two patients can be intubated and breathing on a ventilator. One critical care nurse and one corpsman comprise the ERC team. Nurses qualify to conduct aeromedical operations by completing the Joint En-route Care Course, providing them with a unique skill set compared to other nursing specialties. Without the ERC module, the Role-2 relies on outside care teams to transport casualties. As they travel with lifts of opportunity, ERC teams that evacuate a patient from a Role-2 may only return if another lift of opportunity is available.

Ancillary Services

Ancillary support at a Role-2 includes roughly ten to twelve personnel divided between laboratory, radiology, dental, mental health, and preventative health services. The laboratory section serves as the repository and tracking team for the Role-2's blood supply. The laboratory section can also perform simple blood tests, urine tests, blood typing, and infectious disease screening. The radiology section provides X-ray capabilities that assist in performing DCR, DCS, and critical care. The dental section provides routine and emergent dental care to forward-deployed Marines, as well as triage support during mass casualty events. The mental health team provides support for combat and operational stress casualties. The preventative health section ensures water quality and works to mitigate DNBI from occupational and environmental illness. Dental, mental health, and preventative health are vital aspects to health services support, as they make up a large portion of patients treated at Role-2 facilities as well as patients requiring evacuation to higher echelons of care.[7]

Capabilities and Limitations of Role-2 Care

Role-2s provide a robust environment for DCR and the important ability to perform DCS when significant trauma to the neck, trunk, or extremities is present. The DCR and DCS provided at a Role-2 are temporizing measures that can help save the life of a severely wounded patient in the short term but do not provide the definitive care needed to avoid mortality completely. Further surgical care in a higher-resourced environment and care by specialists is often required.

Marine Corps Role-2s are not organically mobile, requiring heavy mechanized equipment and operators from a supported unit to transport the entire system of approximately 26 Quadcons. Once deployed, six 450-sqft connected tents house the full Role-2, and six generators and environmental control units provide life support. This creates a significant footprint that near-peer adversaries can easily detect. The system

can also be operated in fixed structures when the opportunity presents itself. Once delivered to its target site, the Role-2 can be operational within 40–60 minutes; it can cease operation and prepare for transport with 60 minutes' notice when teams are well-practiced and not providing patient care.

Operational Topics to Consider for Marine Commanders and Planners

Coordination Between Marine Corps Unit and Medical Assets

When requesting medical assets for missions, Marine planners must have a firm understanding of what they need and a familiarity with the nuances of medical terminology to receive the support they desire. A comprehension of key concepts related to damage control medical care is vital (see appendix). Explicit use of terms such as "DCR capable" or "DCS capable" should be used. Anticipated casualty counts, maneuverability needs, ERC availability, blood availability, and resupply ability should be estimated and communicated—as these will drastically change the structure of an appropriate medical team. Bed-side clinical providers should be involved early in the process, as they are subject-matter experts with end-user experience and a complete understanding of the capabilities and restrictions of various platforms. Minimizing the bureaucracy between a supported unit's operations department and the medical team's clinical personnel can dramatically improve the planning process, thereby improving the medical team's function and interoperability with the supported unit. Likewise, health service support personnel must clearly articulate to the supported units' planners what base operating support equipment will be required to conduct the required medical tasks. With a common language and understanding across medical and support functions, commanders can be assured that the required medical capability is present and postured to support their operations.

Scalability

Though doctrinal definitions of Marine Corps medical assets exist, these assets are scalable and adaptable to fit the mission. Each MEF has experimented with various Role-2 schemas to better meet operational needs across different environments (Table 1). These schemas include revising the personnel and standard equipment packing lists to suit the requirements of the mission at hand. Many of these experiments decrease the medical equipment loadout to gain mobility and push resuscitative and surgical capabilities forward. Commanders should be aware of the loss of capacity when considering non-doctrinal setups. For example, III MEF has experimented with "DCR/DCS-light" footprints in which an STP and FRSS can utilize two Quadcons to perform up to fifteen DCRs and six DCSs. An additional holding Quadcon and ERC Quadcon can be augmented if desired. II MEF has experimented with the Tactical Scalable Surgical System, an eleven-person team that utilizes man-portable packs and can perform two DCRs and a single DCS.[8] The Navy has developed a seven to nine-person Expeditionary Resuscitative Surgical System designed to operate ashore or afloat, which may be utilized by Marine Corps commanders in joint scenarios.[9] These smaller packages may allow for quicker initiation of DCR/DCS to injured Marines in remote environments. However, in the absence of resupply and meaningful holding, such setups may lead to rapid resource depletion, rendering the Role-2 ineffective and decreasing overall survivability in large-scale combat operations. This is of particular concern to DCS operations, which require significant equipment and consumable material. Alternatively, modernizing and updating Role-2 equipment, such as the inclusion of sterilizers to allow the re-use of surgical sets, and enhanced walking blood bank capabilities are current initiatives that are more likely to save Marines' lives than field-stripping the current Role-2 DCS organization and equipment. Commanders should also be aware that scalability does not account for high-demand/low-density medical providers; scaling to provide

Schema	T/O	T/E	DCR Capability	DCS Capability	Holding Capability
Doctrinal Role-2 System	55+	26 Quadcons	50	18*	10 patients at a time, 50 total bed days
III MEF DCR/DCS Light	26	4 Quadcons	15	6	2 critical patients 3 non-critical patients 35 total bed days
II MEF Tactical Scalable Surgical System	11	9 man-portable packs	2	1	Limited
Navy Expeditionary Resuscitative Surgical System	7–9	Approximately 1 Quadcon	6	4–5	Limited

**Each additional 646 Authorized Medical Allowance List block utilized by the FRSS can provide enough material to perform approximately 18 DCSs*

Table 1. Previously developed and tested scalable Role-2 systems.

minimal capability may result in degraded capacity across the battlespace.

Blood Products

Contrasted to the limited emergency fresh whole blood programs found in Role-1 environments, which permit the rapid collection and transfusion of a single unit of blood from a pre-selected teammate to a patient (e.g., Marine Corps' Valkyrie or SOCOM's Ranger O Low Titer Whole Blood Program), the Role-2 supports higher volumes of blood for resuscitating severely injured trauma patients. The doctrinal Role-2 blood bank can support cold-chain storage of 280 units of whole blood (450 mL/ea), 420 units of packed red blood cells (250–350 mL/ea), or some combination thereof across seven mobile blood refrigerators. Though this seems like a large amount of blood, it is estimated that about twenty percent of all trauma casualties will require blood transfusion, with an average of eight units transfused per patient.[10] Thus, blood supplies can be quickly drained in multiple casualty situations.

Despite its importance, the deployment and storage of cold-chain blood are among the most significant logistic challenges of any item in the Role-2. Even during peacetime, Marine Corps units have struggled to transport blood to operational areas of need.[11] A near-peer conflict would make the movement of blood to the point of need even more difficult.[12] Blood must be maintained at a target temperature of 1 to 6 degrees Celsius, which current blood refrigeration units can only do for 24 hours unless connected to shore power. Blood has a limited shelf life; whole blood expires 35 days after collection, and packed red cells expire 42 days after collection. Role-2 facilities do not have the equipment to process frozen blood products. Due to blood's limited shelf-life, transportation delays may severely hinder the usable blood supply of forward-deployed units at remote expeditionary advanced bases.

Walking blood bank capabilities at the Role-2 are another means of replenishing the blood supply. However, this is only possible if the blood bank is supplied with the necessary equipment, and there are appropriately pre-screened donors from co-located units. The Role-2 laboratory allows limited screening of infectious diseases among donors, though this testing is not comprehensive. In future exercises, practicing walking blood bank activation is vital to ensuring that the Role-2 and the units it supports can rapidly function in real-world settings.

Obtaining blood from partner nations may also assist in establishing a reliable blood supply chain. The Assistant Secretary of Defense for Health Affairs has the authority to determine whether partner nations' blood donor screening and collection processes meet U.S. standards. Currently, blood products from Canada, the Netherlands, the United Kingdom, France, Japan, the Republic of Korea, and Taiwan are approved for use without follow-up and tracking requirements.[13] Improving multinational interoperability in blood screening processes, collection methods, and storage may help open new avenues of blood supply, mitigating the need to collect and transport blood from U.S. sources across vast distances.

Ultimately, blood is the most vital medicine in providing adequate DCR/DCS in forward environments. Combatant commanders must realize that without a sufficient blood supply chain, the DCR/DCS capabilities of forward-deployed medical assets will quickly degrade, leading to an increase in preventable deaths. Adequately securing blood supply chains and pre-screening Marine units will mitigate risk and ensure this vital tool is available when needed.

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The Importance of En-Route Care

A crucial force enabler for both Role-1 and Role-2 assets is the ability to offload patients via ERC. Rapid movement of critically ill casualties from Role-1s to DCS-capable facilities decreases mortality for critically injured patients and preserves the maneuverability and resuscitative capacity of Role-1 facilities. This is especially critical for small DCR teams attached to the Marine littoral regiments, as these teams will quickly become saturated if they cannot offload patients to surgical assets. Though maneuverability at Role-2s is less of a priority, ERC remains vital in maintaining the capacity of the Role-2 to perform continued DCR and DCS on new patients. ERC at Role-2s is also critical in ensuring severely injured service members receive specialized and definitive care.

En route care can occur in ground vehicles, traditional helicopter or tilt-rotor platforms, aboard sea surface platforms, or via other low-profile evacuation platforms.[14] Despite current international law and customs, these platforms may be targeted by near-peer adversaries, as seen in the Russo-Ukraine conflict.[15] Current Marine Corps ERC air transport relies on CASEVAC using lifts of opportunity or Army MEDEVAC assets. Dedicated MEDEVAC assets are beneficial, as they facilitate ongoing DCR during transport to higher echelons of care. Units stationed on larger landmasses may be able to utilize ground evacuation assets as a part of their MEDEVAC/CASEVAC plan; however, small units on remote islands will not have this luxury. Instead, they must depend on available lifts of opportunity or surface platforms. Increasing the amount of ERC teams and diversifying their locations amongst the logistics, ground, and air combat elements may help expand access to critical care services during MEDEVAC/CASEVAC when lifts of opportunities become available.

In recent conflicts, U.S. military medical systems leveraged robust ERC capabilities to transport critically ill

patients to a DCS-capable unit within the *golden hour*. Effective ERC thus contributed to unprecedented survival rates. However, rapid aeromedical evacuation was only possible due to U.S. dominance of the battle space. A 2023 study showed that 96.9 percent of casualties seen at Role-2 and Role-3 facilities were directly transported from the point of injury.[16] Given the expected contested air and maritime environment of future conflicts, the ability of Marine Corps personnel to rapidly evacuate patients remains conjecture. Interoperability with allied medical and transportation assets will be critical. Marine commanders will also likely have to accept a paradigm that intrinsically carries decreased access to care and a higher mortality rate than in previous conflicts.

For medical teams operating in remote expeditionary advanced bases with limited access to ERC, extensive training in triage and resuscitation, proper resource utilization, adequate forward provisioning, and ensuring means of resupply are paramount. Training aircrew personnel involved in CASEVAC in advanced tactical combat casualty care and practical skills training may allow for an expansion of Role 1 care during transport. This will not replace the vital skill sets held by ERC personnel but may be critical in preventing causalities in areas where ERC transport from Role-1 to Role-2 platforms is limited by dispersion or conflict. Line commanders must also know the risks of increased mortality expected when located remotely from a DCS-capable facility and how that will translate to unit effectiveness and morale. Though ERC may be a challenging puzzle piece in providing medical care in a contested environment, it is one of the lynchpins in keeping the survival chain active.

Prolonged Casualty Care

Doctrinally, a Role-1 battalion aid station (BAS) or flight line aid station (FLAS) can hold patients for up to six hours.[17] However, this reflects an environment where rapid transport to higher echelons of care was feasible. Currently, there is a growing desire for prolonged casualty care (PCC) at the Role-1, with some estimates ranging up to 72 hours.[18] PCC within this timeframe will require significant supply, human resources, electrical power, and physical space, particularly for severely injured patients. Prolonged casualty care represents a substantial drain on resources that hinders the ability to provide acute resuscitation to new casualties. Non-ambulatory patients also prevent a BAS/FLAS from effectively maneuvering with its unit, thus endangering the lives of both line-side units and medical personnel within the BAS/FLAS. Even if augmented by an STP or small damage control resuscitation team, PCC at a BAS/FLAS is only feasible if combatant commanders accept severe degradation in the Role-1's ability to maneuver or adequately stabilize new patients.

Given its expanded equipment and manning, PCC at a Role-2 facility is much more feasible. A fully staffed Role-2 has six board-certified physicians, a physician's assistant, an independent duty corpsman, four or five nurses, and several dozen corpsmen who can divide the tasks of PCC. The laboratory capabilities and blood supply at a Role-2 also afford more resources to maintain critically injured patients. The maneuverability needs of a Role-2 are far less than those of a Role-1. However, the longer a critically ill patient stays at a lower echelon of care, the worse their outcomes will be. Additionally, these patients still require high equipment, power, manpower, and space resources. Just as with Role-1s, decreasing PCC time via rapid offloading of patients from a Role-2 is good for the individual patient and beneficial to future patients requiring DCR/DCS. Combatant commanders must also keep PCC needs in mind when considering scalable Role-2 systems, as these often have decreased PCC capabilities when compared to the doctrinal Role-2.

Conclusion

Role-2 care and the DCR/DCS capabilities it provides are critical components of the survival chain. Until a future adversary's anti-access/area-denial capabilities and their effects on ERC and resupply are known, the optimal Role-2 setup remains speculative. Ultimately, the scale of any medical asset will be best determined by three key factors: the needs of the supported unit, the availability of resources such as prepositioned equipment or forward-provisioned complex structures, and most importantly the availability of ERC and resupply. Marine commanders and planners can enhance the integration of Marine Corps medical assets into their mission sets by understanding their capabilities, needs, and limitations. This will allow them to mitigate risk and increase the survivability of their Marines, thereby maintaining morale and lethality within their units. Additionally, Navy health services providers must remain vigilant for opportunities to innovate these care systems to align with their ultimate mission: bringing Marines home alive.

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Appendix

Key Concepts for Damage Control Resuscitation and Damage Control Surgery

- Hemorrhage Control is the Priority: Massive blood loss is the most immediate threat to life, and rapid intervention is crucial. The survivability of a casualty hinges on the ability of medical teams to stop bleeding. Every minute of uncontrolled hemorrhage significantly reduces the chance of survival.
- Damage Control Resuscitation and Damage Control Surgery: DCR and

DCS co-exist on a spectrum of medical care aimed at providing lifesaving interventions to trauma casualties. Damage control resuscitation and DCS emphasize early hemorrhage control and the restoration of normal physiology. This prevents the development of the lethal triad of coagulopathy (inability of blood to clot), acidosis (low blood pH), and hypothermia. Damage control resuscitation includes interventions performed in the pre-hospital, emergency room, and ICU settings whereas DCS involves operative care performed by a surgeon in the operating theater.

• Stabilization vs. Definitive Treatment: DCS is a tactical intervention aimed at surgically stabilizing a casualty's immediate life-threatening injuries with the primary goal of preventing death. Damage control surgery is not intended to fully repair injuries, but rather to buy time by addressing the most critical physiological threats. The temporary measures employed during DCS, such as placing gauze in the abdomen or using vascular shunts (small plastic tubes) to reconnect blood vessels, are often inadequate for long-term survival.

• Post-surgical care is as important as surgery in survival: While DCR and DCS stabilize immediate threats, the patient remains at risk for complex physiological complications that require advanced care. Further blood transfusions, medication administration, and ventilatory support are often needed. In a previously well-nourished patient, a nutrition strategy must be initiated within seven days. This underscores the need for a seamless evacuation plan to higher echelons where specialized care can address these complications.

• Advanced Care: Advanced care involves surgery to properly close wounds, further repair damaged organs, and restore normal anatomy and function. Additionally, organ systems that may have been temporarily supported during DCS (e.g., with external devices or temporary vascular shunts) require further procedures to restore long-term viability. Role-3 and Role-4 facilities are the traditional echelons for this definitive care.

Damage control surgery is not intended to fully repair injuries, but rather to buy time ...

Notes

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