

USS: Whole Blood Transfusions- background and overview of use in military environments

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Disclosures

These views are our own and not reflective of those of the Department of Defense, the United States Navy or the United States Marine Corps. We have no financial disclosures.

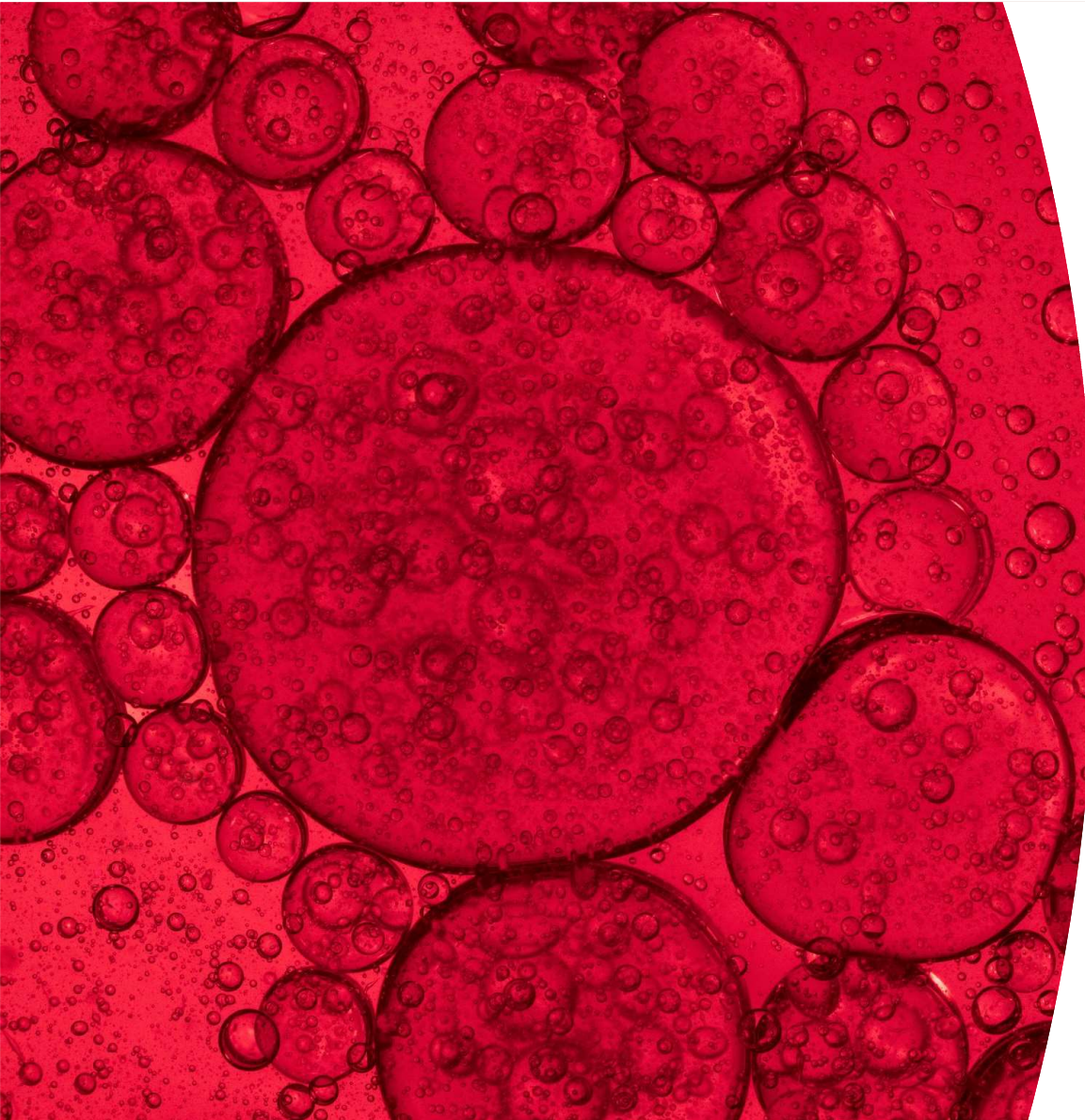


Special Thanks

- CDR Russ Wier for his support as we developed this presentation.

Learning Objectives

1. Define definitions for Whole Blood (WB)
2. Discuss why blood transfusions are necessary in damage control resuscitation
3. Discuss historical uses of blood transfusion products in the military, and in other settings
4. Discuss training and planning guidelines for using fresh blood and stored whole blood in military operations
5. Discuss the way forward and future implications of whole blood transfusion on the Battlefield and in Austere operational environments



Whole Blood

- Definition

Whole blood is simply our blood as it flows in our bodies – with none of its components separated or removed. Whole blood is made up of red blood cells, white blood cells and platelets, all of which are suspended in a liquid called plasma

Where do we get our blood supply?

- Mission is to provide quality blood products and support to military healthcare operations worldwide

ASBP 
Armed Services Blood Program

militaryblood.dod.mil

Available products



Red Blood Cells - Liquid

- Expiration: 35 or 42 days
- Storage Temp: @ 1-6°C
- Shipment Temp: @ 1-10°C



Platelets – Liquid

- Expiration: 5 days
- Store/Ship Temp: @ 20-24°C
- Not available for shipment to theater.
- Performing in-theater platelet apheresis collections (not fully tested).



Liquid Plasma

- Expiration: 26 or 40 days
- Storage Temp: @ 1-6°C
- Shipment Temp: @ 1-10°C



Frozen Red Blood Cells

- Expiration: 10 years frozen
- Storage Temp: @ $\leq -65^{\circ}\text{C}$
- Shipment Temp: @ $\leq -40^{\circ}\text{C}$
- Thawed/deglycerolized 14 days @ 1-6°C
(* only on units frozen since 2005 in closed system)
- Prepositioned in some theaters & shipboard



Plasma (Fresh Frozen / Frozen Within 24 hrs.)

- Expiration: 1 year
- Stored/Ship Temp: @ $\leq -18^{\circ}\text{C}$



Cold Stored Platelets

- Expiration: 14 days
- Storage Temp: @ 1-6°C
- Shipment Temp: @ 1-10°C



Low Titer Group O Whole Blood

- Expiration: 21 or 35 days
- Storage Temp: @ 1-6°C
- Shipment Temp: @ 1-10°C



Cryoprecipitate

- Expiration: 1 year
- Store/Ship Temp: @ $\leq -18^{\circ}\text{C}$
- Infuse within 6 hrs. of thaw/pool

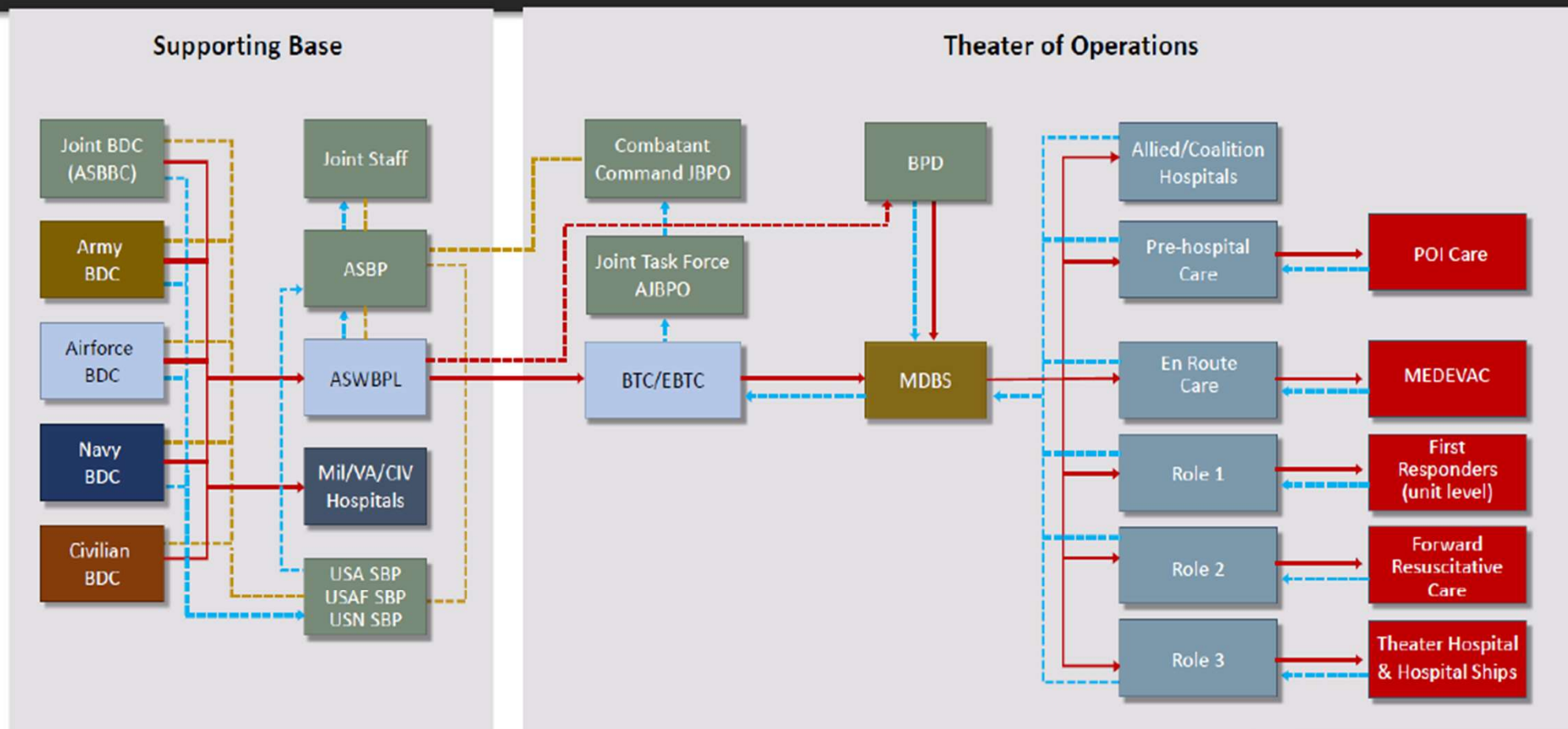


Convalescent Plasma

- Expiration: 1 year
- Store/Ship Temp: @ $\leq -18^{\circ}\text{C}$

Note: All expiration dates are from date of collection.

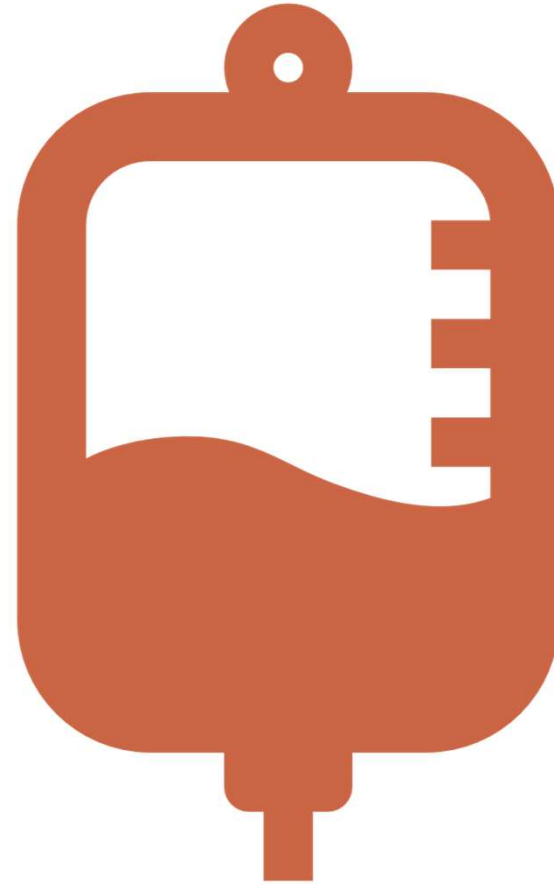
ASBP Blood Coordination & Distribution System



LEGEND

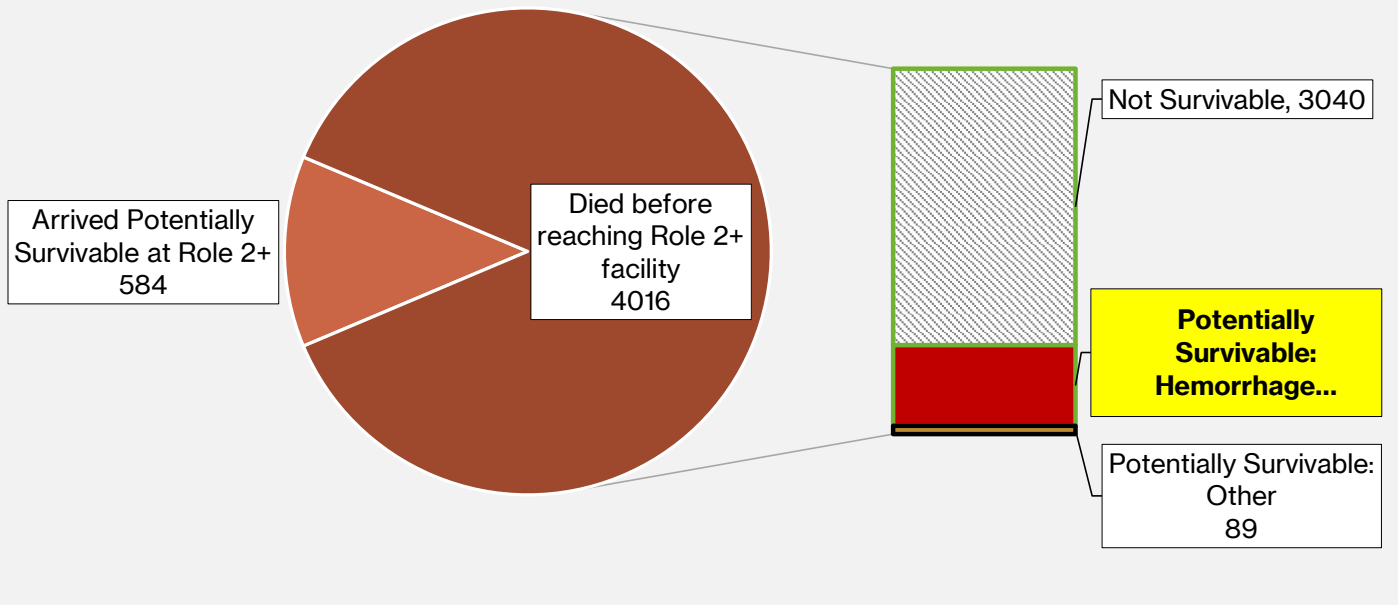
	Blood Flow	BDC	Blood Donor Center	AJBPO	Area Joint Blood Program Office	MDBS	Medical Detachment Blood Support
	Reports	ASWBPL	Armed Services Whole Blood Processing Lab	BTC	Blood Transshipment Center	BPD	Blood Product Depot
	Coordination	JBPO	Joint Blood Program Office	EBTC	Expeditionary Blood Transshipment Center	ASBBC	Armed Services Blood Bank Center
	Prepositioned Frozen Blood					MEDVAC	Medical Evacuation

Why are
blood
transfusions
necessary?

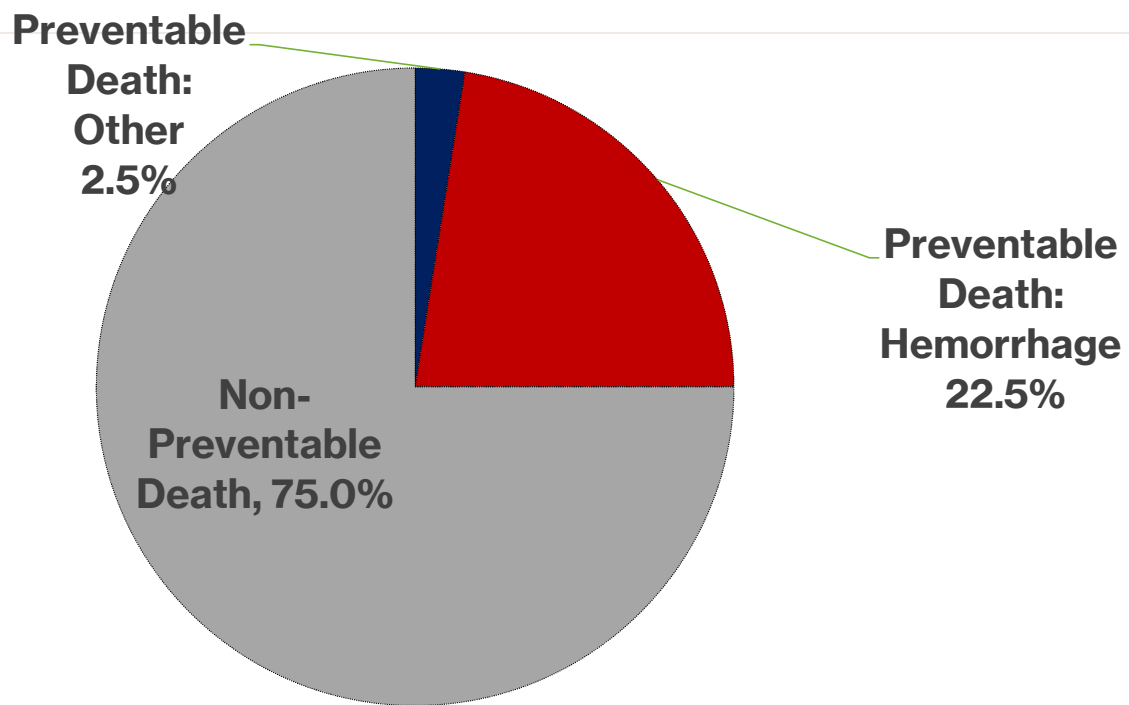


Armed Forces Medical Examiner Service Mortality Surveillance Division

OIF & OEF Casualties 2001-2011
4,596 casualties



Combat Deaths Occurring Prior to Arrival at Role 2+



Prehospital FWBT – A time critical intervention

JAMA | Original Investigation

Association of Prehospital Blood Product Transfusion During Medical Evacuation of Combat Casualties in Afghanistan With Acute and 30-Day Survival

Stacy A. Shackelford, MD; Deborah J. del Junco, PhD; Nicole Powell-Dunford, MD; Edward L. Mazuchowski, MD, PhD; Jeffrey T. Howard, PhD;
Russ S. Kotwal, MD, MPH; Jennifer Gurney, MD; Frank K. Butler Jr, MD; Kirby Gross, MD; Zsolt T. Stockinger, MD

- New blood transfusion capability after 2012 to MEDEVAC units enabled a study on timing and location of the initial transfusion.
- Among MEDEVAC combat casualties in Afghanistan, prehospital blood transfusion or within minutes of injury was associated with **improved 24h & 30-day survival** vs delayed transfusion.

JAMA Nov 2017

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- Casualties not receiving pre-hospital blood:
 - **19%** mortality within the first 24 hours.
- Casualties that did receive pre-hospital blood:
 - **5%** mortality within the first 24 hours.
- Improved mortality rates were found among those that received blood usually within **36 minutes** of injury.

The Evolution of Blood Transfusions



Transfusion History - WWI

L. Bruce Robertson

- Canadian Physician
- First recorded use of battlefield transfusion



Transfusion History – WWII



FIGURE 75.—Medical care on Omaha Beach, June 1944. Note the absence of a litter.

Transfusion History - Vietnam



Emergency Transfusion. Dak To, South Vietnam: During a bloody battle, when a soldier is wounded and needs a transfusion, it takes place there on the spot, in the battle zone. Here, a G.I. gets a transfusion near infamous Hill 875, captured by American forces after some of the most violent fighting of the war in Vietnam. North Vietnamese troops poured heavy mortar

Transfusion History in OIF/OEF

- Blood transfusion capabilities available at **STP/Role II and above**
- When casualties exceed blood supplies, **Fresh Whole Blood** can be harvested by activation of **Walking Blood Banks**.
- Collected blood can be tested on site.



Transfusion History

ROLO

- Ranger “O LOW” Titer Blood
- Roughly 1/3 of general population is Type O “Low Titer”
- Every Ranger Medic conducts FWBT.
- Every Ranger is trained to set up ROLO buddy transfusion.





Training and Planning for Blood Products

Joint Trauma System (JTS) sets the guidelines for the use of fresh whole blood and stored whole blood in military operations

- Treat and reverse hemorrhagic shock to provide warm whole blood as close to the time-of-injury as possible.
- If LTOWB is unavailable, administer pre-hospital DCR fluids from most to least preferred
 1. FDA approved CS-LTOWB
 2. Low titer group O whole blood (LTOWB)
 3. Type O-WB (non-titered)
 4. Component therapy with plasma (dried, liquid, or, thawed), red blood cells (RBCs), and platelets in 1:1:1 ratio

Low Titer O Whole Blood (LTOWB)

What is it?

- Type O whole blood collected from a donor with a “low” quantity of anti-A and anti-B antibodies, reducing the likelihood of adverse reactions.
- LTOWB is the DOD recommended product to treat hemorrhagic shock
 - First option is LTOWB produced as an FDA licensed product and shipped into theater
 - Second option is LTOWB collected in an emergency from prescreened military personnel in deployed locations
 - LTOWB will be exclusively drawn from sites approved by the ASBP, distributed in theater via the ASBP blood distribution system and fully tested in accordance with FDA guidelines.

Countries with FDA approved blood sources (FDA-comparable country)

- Canada
- UK
- Netherlands
- France
- South Korea
- Japan

Emergency Fresh Whole Blood Transfusion Training for Role I in the USMC



- Challenging for conventional forces
- Train like we fight, fight like we train
- “Fairy dust” avoidance
- Not standardized across Services
- Pre-deployment donor screen







Operational Challenges for USN/USMC

- Blood supply and re-supply (equipment, delivery, availability, storage)
- INDOPACOM: “Tyranny of Distance”
- Logistically complex process
- Distribute Maritime Operation (DMO)/ Expeditionary Advanced Base Operations (EABO)

Way Forward

- Lots of work
- Standardization of equipment and training across Services
- Training implementation
- Sustainment
- Freeze Dried Plasma



References

- Joint Trauma System, Clinical Practice Guidelines
- Valkyrietraining.org