



TCCC Adaptation to Arctic Warfare

Martin Rognhaug
Norwegian Armed Forces



A person wearing a white camouflage winter suit and a yellow beanie is seen from behind, pulling a sled through a snowy forest. The person is using ski poles and is walking on a path of snow. The trees are heavily covered in snow, and the overall scene is bright and wintry.

Introduction

- Martin Rognhaug
- Working in Norwegian Armed Forces since 2005 (18 years)
- Civilian prehospital Experience from Nor ambulance, 6 years
- Bachelor Paramedic
- Experience from domestic and international deployments
- Ongoing Msc in Expedition & Wilderness medicine
- Currently running Nor Combat medic education with an Arctic TCCC module



Disclaimer

- The views presented in this briefing are my own, and may not represent those of the Norwegian Armed Forces
- Some of the views presented are based on personal experience and observations
- I do not have any financial ties to the medical industry.



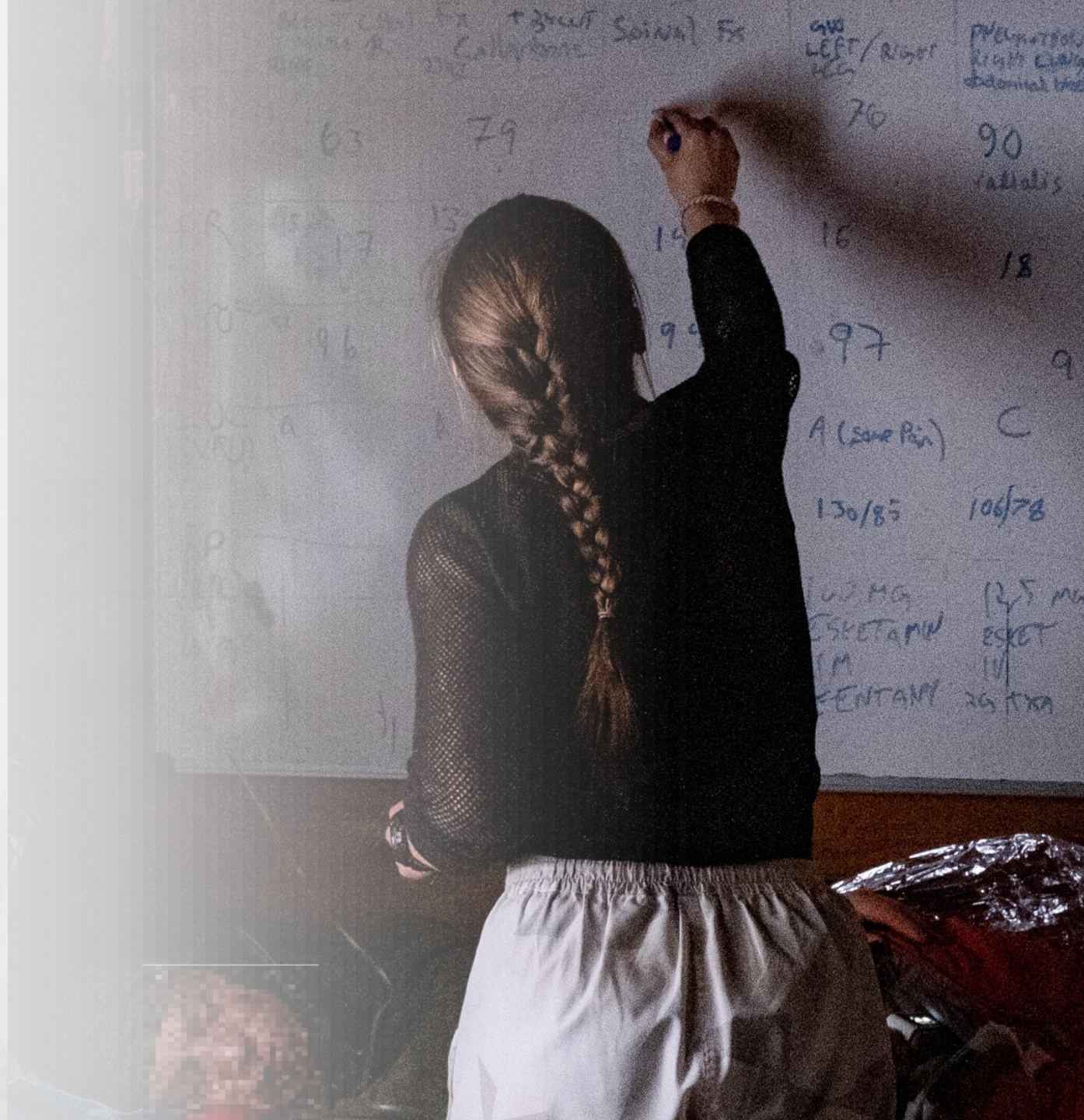
A person wearing a white camouflage winter suit and a yellow beanie is seen from behind, pulling a sled through a snowy forest. The person is using ski poles for stability. The forest is filled with snow-covered evergreen trees, and the ground is a deep, smooth layer of snow. The scene is brightly lit, suggesting a sunny day.

Agenda

- A reminder; The phases of TCCC
- Care under Fire (CUF)
- Tactical Field Care / Prolonged Field Care (TFC/PFC)
- Blood products in arctic conditions
- Evacuation
- The ethical aspect
- Summary

The Phases of TCCC

- **Care under fire (CUF)**
 - High threat environment
 - Only immediate life-saving interventions
 - Massive Hemorrhage
 - Airways
- **Tactical Field Care (TFC)**
 - Lower threat environment
 - More advanced procedures
 - Head to toe examination of casualty – MARCH-ON
- **Prolonged Field Care (PFC)**
 - Starts after TFC and lasts until evacuation
 - Sustained care for the casualty





CUF

Fighting in snow Sucks! Avoid at all cost...



Challenges

- Hard to spot bleeding under winter clothing
- Tourniquets
- Packing wounds
- Patient movement
- Freezing temperatures is a threat by itself



Tourniquets

- We have primarily tested CAT gen. 7
- Can be applied with responder wearing gloves/mitts
- Functions in snow and freezing conditions
- Only one incident with windlass breaking
- Provides sufficient pressure over winter clothing to successfully occlude arteries in both upper and lower ex.
 - Lab testing
 - German study Lechner et al. (2023)



Tactical Field Care / Prolonged Field Care

- Avoid exposing the casualty
 - Shelter
- Cold medical equipment
 - Plastic becomes brittle
 - PVK
 - ETT
- Medications
 - Liquid might freeze, but some do not. Still usable?
 - Pills vs liquid
 - Absorption in the hypothermic casualty





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- Risk c

Blood products in arctic conditions

- Logistical challenge
 - Most transportation containers are designed to keep blood “cool enough” rather than “warm enough”
 - CPDA solution in transfusion bags freezes
 - FDP
- Drawing blood
 - Plastic tubing in collection bag
 - Rapid cooling of blood in tubing → Reduced flow → freezing
 - Exposure of donor → Vasoconstriction
- Transfusing blood products
 - Blood might freeze in tubing. Exacerbated by slow rate
 - Transfusion warmer ↓ battery life



Transportation of blood products

- Tested a battery-powered cooler with integrated heating and external temperature display
- Kept blood within temperature range for 1 week in -15 to -25 C
- Transported on the back of a snowmobile
- Charging did not work on snowmobiles
- Replaceable batteries
- Potential to store liquid medications as well.
- “Heavy” and cumbersome on skis/foot





Evacuation

- Skies or snowshoes with patient on a sled
- Snowmobile/Ski-doo with sled
- Patient monitoring and interventions

The Ethical Aspect

- “Zero preventable death”
- Optimal medical treatment
- Tactical situation and environmental factors

- Is it necessary to adopt a more cynical triage to avoid taking further casualties?



Summary

- There are no magic remedies or kit for TCCC under arctic conditions
 - Be proficient with the gear you bring, and make sure it is usable in the cold
- The principles of TCCC are still valid, but the environment provides an additional threat
- Self-discipline and attention to details are paramount – Be proficient in the basic skills
- Evacuation and patient monitoring is challenging
- Paucity of data on medical challenges under cold conditions
- The provider must be comfortable working in a cold environment – It is impossible to care for others, if one is not able to take care for oneself
- Avoid exposing the patient and use a shelter when you must



Some of the things we don't know..

- The pharmacological properties of “super-cooled” drugs
- Degree of hemolysis in blood transfused under arctic conditions
- Risk attributed to prolonged tq use in the cold
- The effect of breathing cold air through a Cric/ET-tube on the lungs and core temperature

