

NORWEGIAN CENTER FOR BLOOD PREPAREDNESS

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NO DISCLOSURE

I have no actual or potential conflict of interest in relation to this congress or this presentation

The opinions expressed are my private views and are not to be construed as official or as reflecting the views of the Norwegian armed forces medical services



NEW REALITY

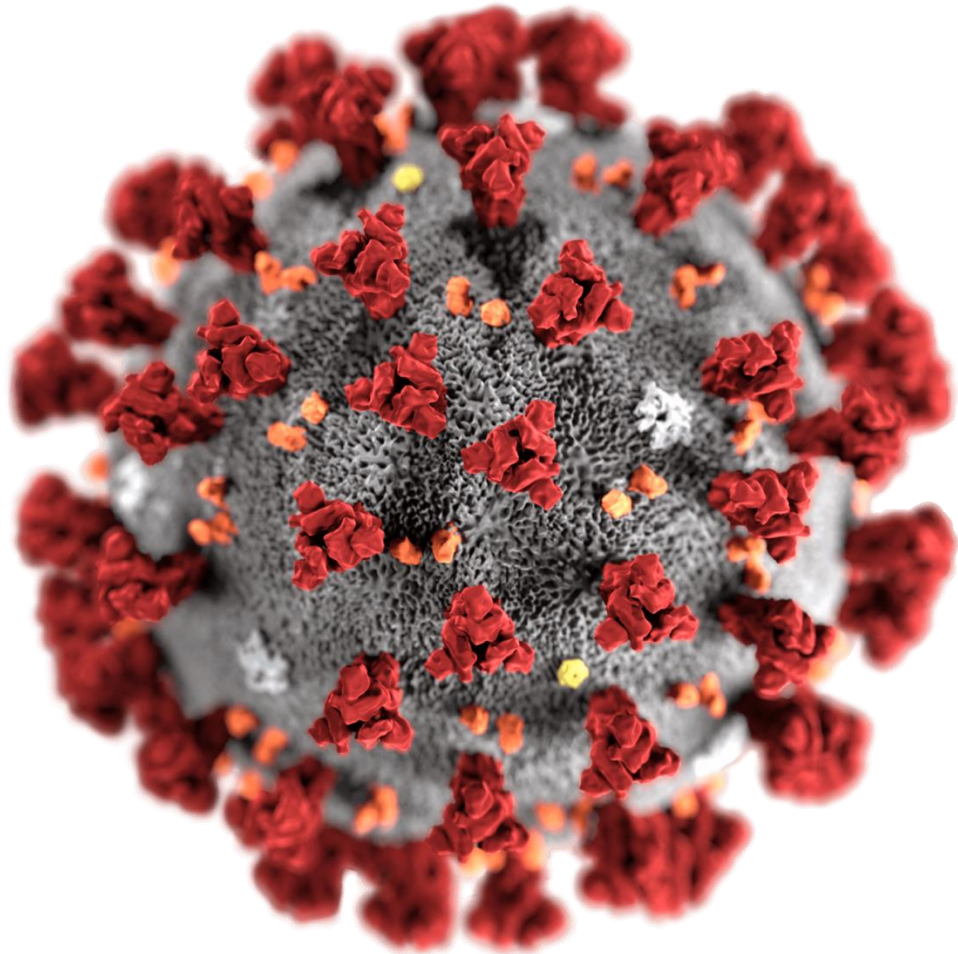


Photo: Public domain



Photo: Kai Pfaffenbach/Reuters/NTB



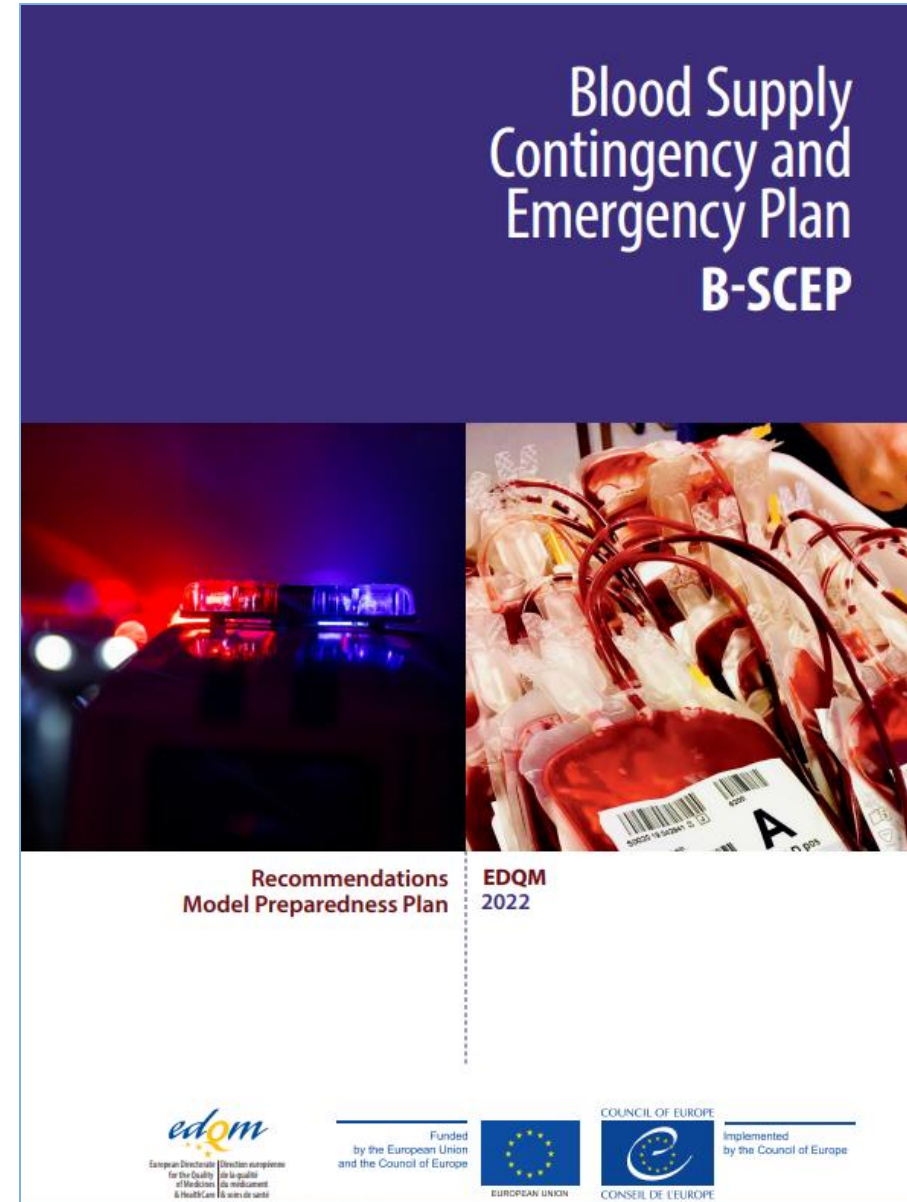
This is what we are used to...



➤ **NEW FOCUS ON
BLOOD PREPAREDNESS**

[https://www.edqm.eu/en/blood-supply-contingency-and-emergency-plan-b-scep-](https://www.edqm.eu/en/blood-supply-contingency-and-emergency-plan-b-scep)

Published May 2022



We need to form resilience with regard to

- Blood donors
- Blood inventory
- Disposables and equipment
- Personnel



Around 100,000 Russian troops have assembled at the border with Ukraine (Picture: AP/Getty)

Russia's presence along its border with Ukraine reportedly now



Et bilde fra 27. mars viser folk som går forbi en ødelagt bygning i Mykolajiv. Byen har forblitt under ukrainsk kontroll, men Russland har siden krigens start bombet den. Foto: Oleksandr GIMANOV / AFP)

Nok blod



Nokblod

Norsk **k**oordineringscenter for **blod**beredskap

The Norwegian Centre for Blood Preparedness





THE NORWEGIAN CENTER FOR BLOOD PREPAREDNESS

Government funded center for national coordination of Civilian-Military blood preparedness

Established June 2022

Stakeholders represented:

- Civilian blood services
- Clinical hospital services
- Prehospital and community health services
- Military medical services

Work tasks:

- Training
- Counselling
- Logistics
- Research and innovation



BLOOD PREPAREDNESS IN NORWAY

SETTING THE SCENE:

Population: 5.4 million

Size: 385, 000 km²

Fjords, mountains and scattered populations.

Larger cities mainly in the coastal areas and southern part of the country.

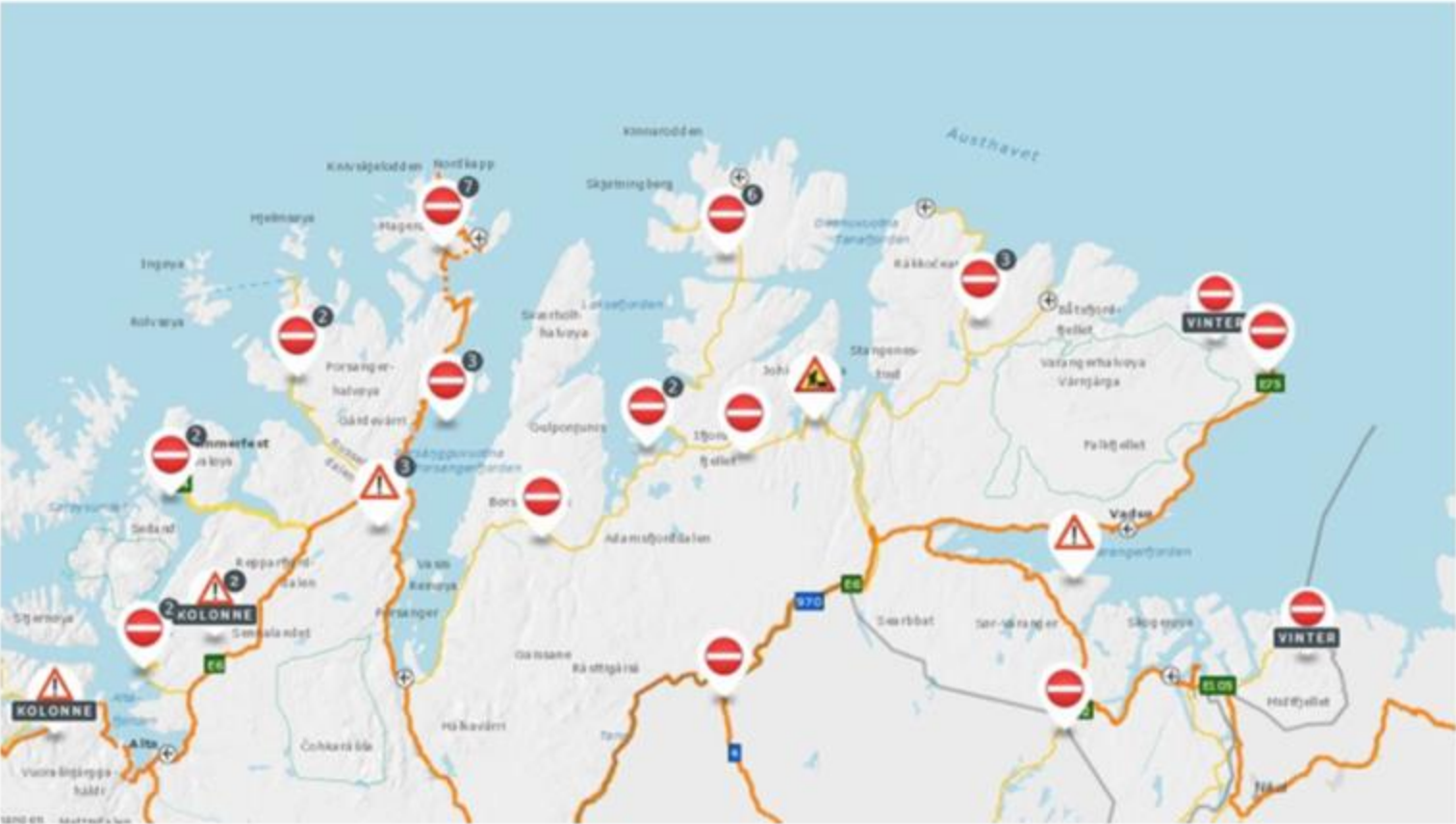
Long distance between Level 1 trauma centers.



(Weather forecast
Feb 12. 2021)



Bad weather conditions may isolate communities for days especially in the Northern parts.



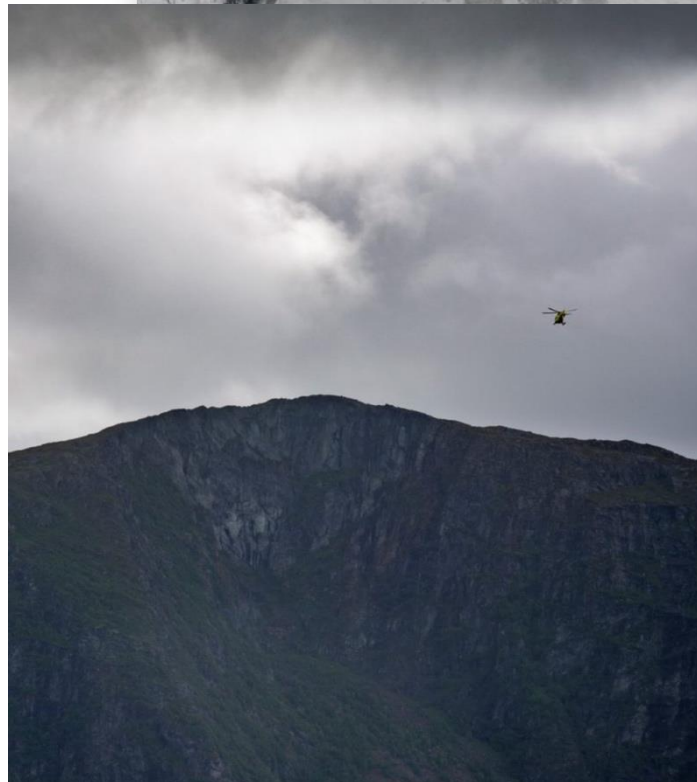
Febr 2021



- Long transport times to hospital
- Ground ambulance transport is challenging in some areas



Decentralized health system.
Government funded.
Regional health authorities administer the hospitals.

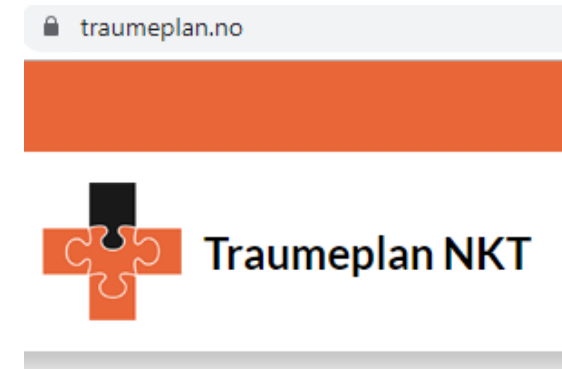


NORWEGIAN GUIDELINES FOR BLEEDING PATIENTS

Norwegian civilian and military guidelines recommend an **early balanced transfusion** therapy for patients with severe bleeding.

➤ Shift in policy towards prehospital transfusion programs and use of whole blood both inside and outside hospitals.

Change has been facilitated by a military-civilian cooperation.



To enable early balanced transfusion in Norway, we need to consider blood supply on all treatment levels.

Level 1 Trauma Centers



Small rural hospitals



Ambulance Services



Municipal Health Care Services



Military
Oil industry



Blood preparedness products for all levels of health care



Municipal Health Care Services

Whole Blood

Dried plasma

Ambulance Services

AMBULANSE

Whole Blood

Dried plasma

Dried plasma

Small rural hospitals

Whole Blood

Cold stored / frozen platelets

Dried plasma

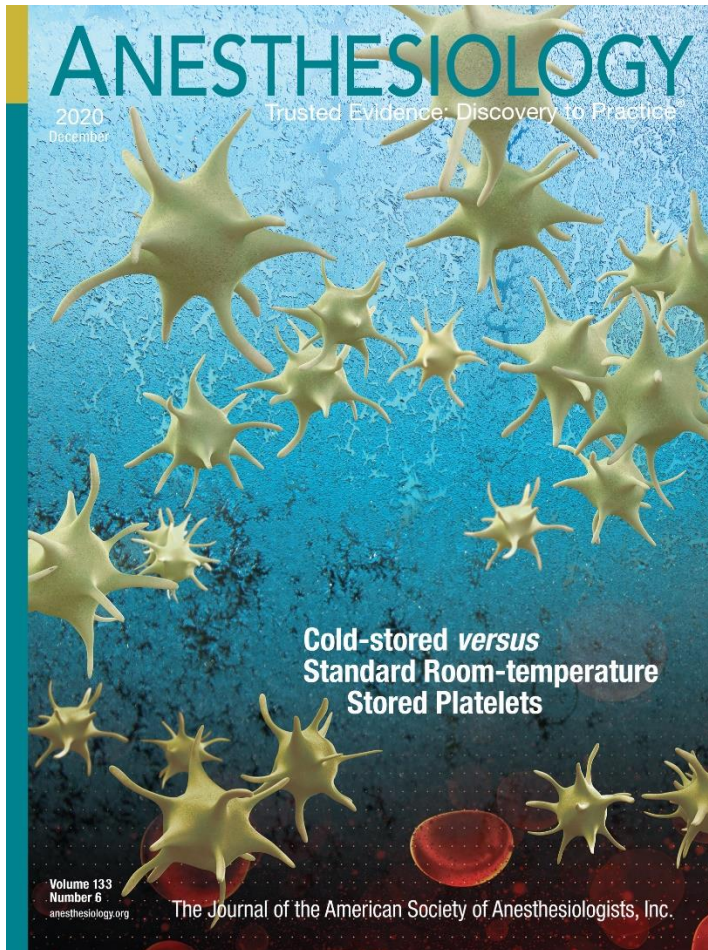
Level 1 Trauma Centers

Fullblood

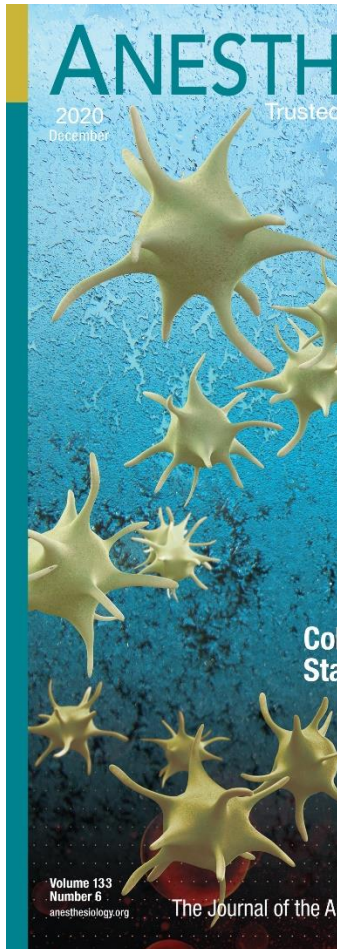
Cold stored / frozen platelets

Whole Blood

Cold stored platelets



Cold stored platelets







Received: 4 February 2022 | Revised: 1 May 2022 | Accepted: 2 June 2022

DOI: 10.1111/trf.16988

ORIGINAL RESEARCH

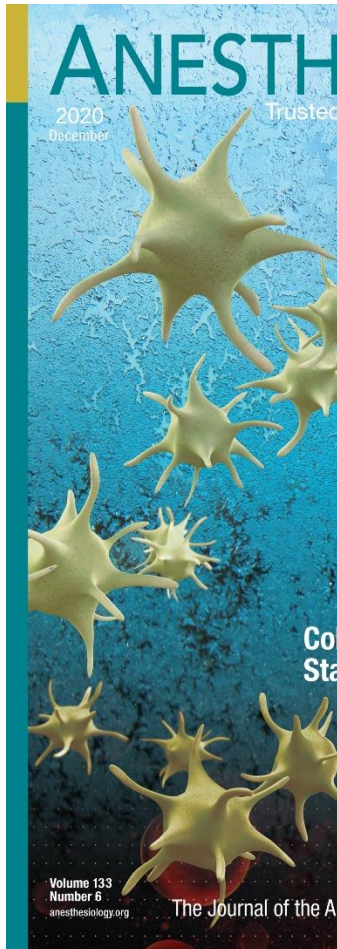
TRANSFUSION

Implementation of a dual platelet inventory in a tertiary hospital during the COVID-19 pandemic enabling cold-stored apheresis platelets for treatment of actively bleeding patients

Hanne Braathen¹  | Kristin G. Hagen¹  | Einar K. Kristoffersen^{1,2}  |
Geir Strandenes¹  | Torunn O. Apelseth^{1,2,3} 



Cold stored platelets



Received: 4 February 2022 | Revised: 1 May 2022 | Accepted: 2 June 2022

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ORIGINAL RESEARCH

Implementation of platelet concentrates in a tertiary care hospital during the COVID-19 pandemic: a retrospective analysis of cold-stored apheresis platelet concentrates in bleeding patients

Hanne Braathen¹ | Einar Klæboe Kristoffersen^{1,3} | Geir Strandenes¹ | Torunn Oveland Apseth^{1,3,4}

Received: 5 January 2023 | Revised: 13 April 2023 | Accepted: 20 April 2023

DOI: 10.1111/vox.13437

ORIGINAL ARTICLE

In vitro quality of cold and delayed cold-stored platelet concentrates from interim platelet units during storage for 21 days

Hanne Braathen¹ | Turid Helen Felli Lunde¹ | Jörg Assmus² | Kristin Gjerde Hagen¹ | Einar Klæboe Kristoffersen^{1,3} | Geir Strandenes¹ | Torunn Oveland Apseth^{1,3,4}

TRANSFUSION

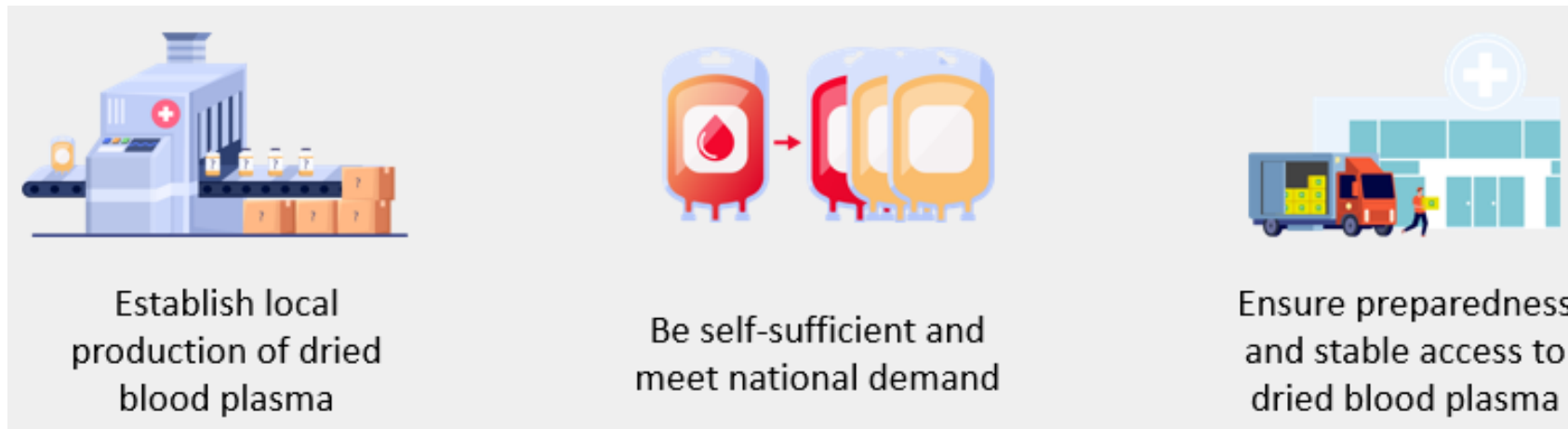
Vox Sanguinis International Society of Blood Transfusion



The Nordic dried plasma project

- Nordic Civilian-Military Collaboration
- Innovation Partnership Program (Innovation Norway)
 - Support development of new technology
 - Funding: 13.5 mill NOK (1.29 mill €) provided for technology providers

Aim of project:



Hospital preparedness plans that include emergency collection of whole blood

Emergency whole blood collection has been implemented in Haukeland University Hospital, Bergen (level 1 trauma center as part our emergency preparedness plan.

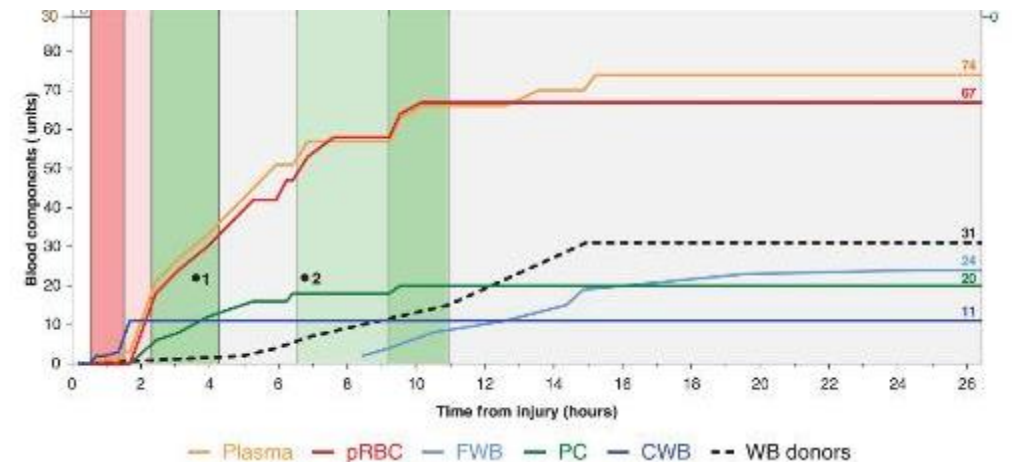


SUPPLEMENT ARTICLE

How do I get an emergency civilian walking blood bank running?

Silje Helland Kaada,¹ Torunn Oveland Apelseh,^{1,2} Kristin Gjerde Hagen,¹ Einar Klebøe Kristoffersen,^{1,3} Stig Gjerde,⁴ Kristian Sønstabo,⁴ Henrik Halvorsen,⁵ Tor Hervig,^{1,3} Geir Arne Sunde,⁴ Geir Olav Dahle,⁴ Mari Christine Johnsen,⁴ and Geir Strandenes^{1,6}

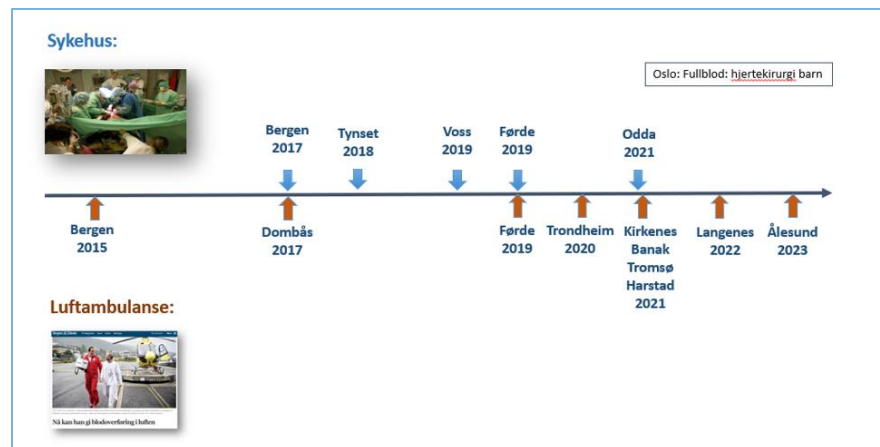
Transfusion, Volume: 59, Issue: S2, Pages: 1446-1452, First published: 13 April 2019, DOI: (10.1111/trf.15184)



Whole blood to provide balanced transfusion in small rural hospitals without a platelet inventory

Whole blood can be stored longer than platelet concentrates, which makes it an excellent alternative to platelet concentrates in hospitals unable to maintain a sufficient inventory of conventional platelet concentrates.

Emergency collection of whole blood can be used in preparedness.






DOI: 10.1111/trf.16057

HOW DO I?

TRANSFUSION

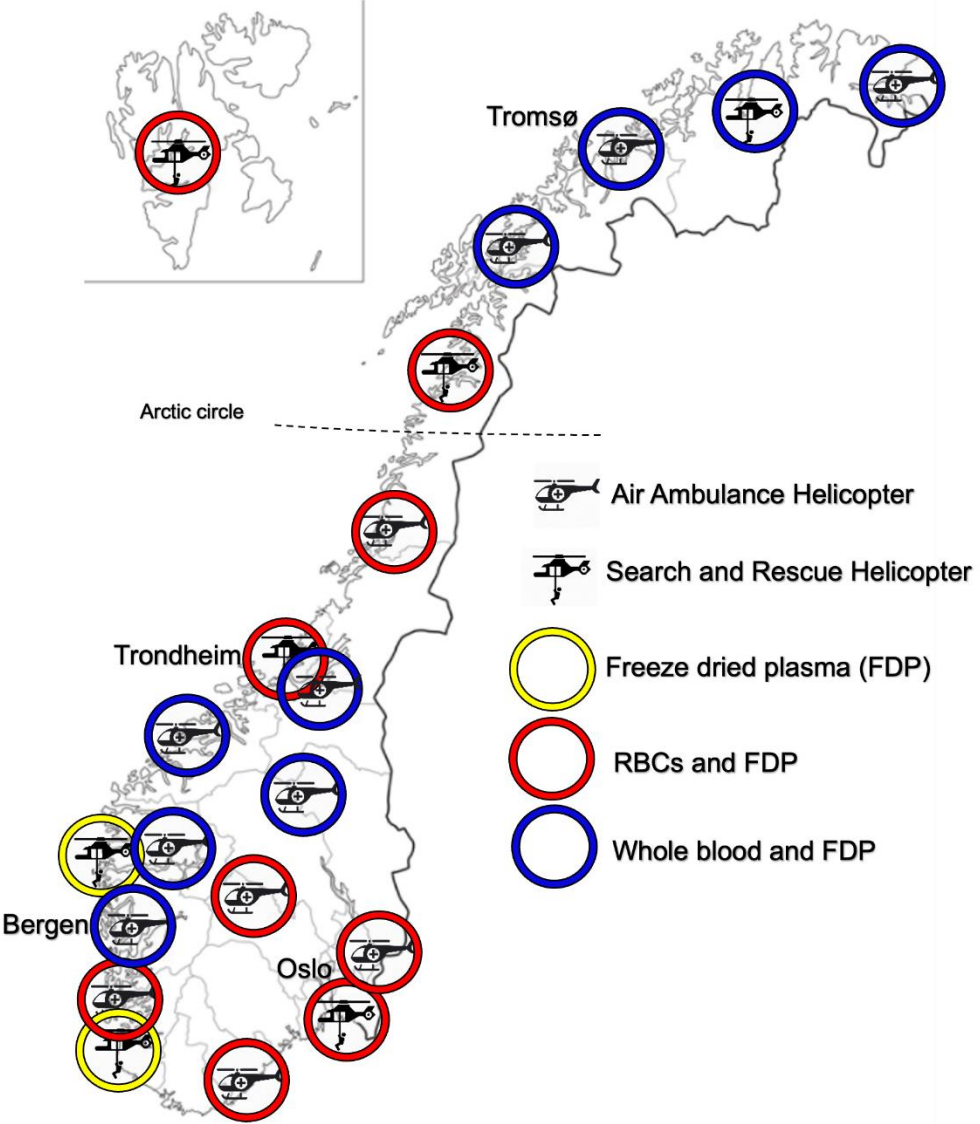
How do I implement a whole blood-based blood preparedness program in a small rural hospital?

Torunn O. Apelseth^{1,2}  | Geir Strandenes^{1,2}  | Einar K. Kristoffersen^{1,3} |
Kristin G. Hagen¹ | Hanne Braathen^{1,3}  | Tor Hervig^{1,3,4}

Ref. Apseth et al. How Do I implement a whole blood based blood preparedness program in a small rural hospital. *Transfusion* 2020; 60:2793-2800



Whole blood in air ambulances



Civilian walking blood banks improve availability of blood transfusion in rural areas

In a walking blood bank, a system is established which allow emergency collection of whole blood performed from prescreened and pretested whole blood donors so that emergency transfusion can be given to patients with life-threatening bleeding.



BLOOD PREPAREDNESS – BACK TO THE FUTURE

1818 First documented Blood transfusion



James Blundell



1900 ABO blood types



Karl Landsteiner



Am dem pathologisch-anatomischen Institute in Wien. Ueber Agglutinationsreaktionen zwischen menschlichen Blute.

1907 ABO cross-match



Reuben Ottenberg



Performed first crossmatched transfusion and recognized the «universal» utility of group O donors.

1915 Citrate anti-coagulant



Richard Lewisohn

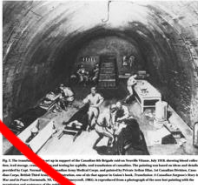


Blood Transfusion by the Citrate Method

1917 First Military Blood Bank



Oswald Hope Robertson



Collected, stored and transfused group O whole blood to wounded soldiers during WWI.

1921 First Civilian Blood Donor Panel



Percy Lane Oliver



1921: FIRST CIVILIAN BLOOD DONOR PANEL

Honorary Secretary in the Camberwell Division of the British Red Cross.

In October 1921 the Red Cross received a call from [King's College Hospital](#) for an emergency blood transfusion.

Oliver, along with three of his colleagues, volunteered to donate blood; one person's blood type was compatible with the patient's, and the transfusion was successful.

This inspired Oliver to establish a panel of individuals with known blood types who were available to donate upon request.

The panel, which initially consisted of 20 of Oliver's colleagues operated out of his home. His model of voluntary unpaid blood donation was adopted throughout Britain and in other countries.

In 1933, the Red Cross in Norway established their blood donor central based on his model.

Percy Lane Oliver – founder of the first voluntary blood donor panel

A Cornishman, Richard Lower, conducted the world's first blood transfusion. It took another Cornishman to set up the blood transfusion service.

Percy Lane Oliver was born in St. Ives in 1878 has slipped into relative obscurity since his death in 1944, but his actions will continue to help save the lives of millions of people worldwide as his pioneering blood donation service went from humble beginnings to a global phenomenon.



BLOOD AND WAR

- Military use of whole blood high in earlier conflicts
- Whole Blood reintroduced as preferred treatment of patients in hemorrhagic shock in Military Health Care

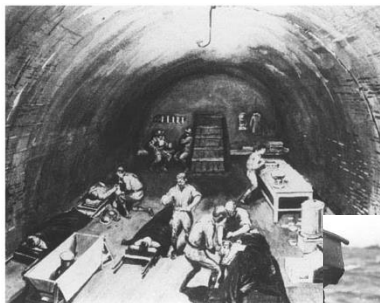


Fig. 2. The transfusion center set up in support of the Canadian 4th Brigade east on Neville-Vines, July 1918. Note food storage, reassembling and treating for sepsis, and transfusion of casualties. The painting was done by Capt. Norman Gates, Canadian Army Medical Corps, and painted by Private Arthur Elton, 1st Canadian Corps, British Third Army. This illustration, one of six that appear in Gates's book, *Transfusion in Canada: War and its Power* (Yarmouth, NS, Canada: Stineycoast, 1983), is reproduced from a photograph of the same in permission and assistance of the publisher.



Military.com Benefits News Veteran Jobs Military Life Spouse & Fam

Military News
Ranger Medics Save Lives in Afghanistan with Blood Transfusions While Under Fire



A screenshot of the NAEMT website. The header includes the NAEMT logo and the tagline "Advancing the EMS profession". Below the header is a navigation menu with links for JOIN, EDUCATION, ADVOCACY, INITIATIVES, PUBLICATIONS, EVENTS, ABOUT NAEMT, and ABOUT EMS. The main content area features a section titled "TCCC-MP Guidelines and Curriculum" with a sub-section for "TCCC for Medical Personnel".



BLOOD PREPAREDNESS – PILOT IN FINNMARK

Commissioned by the Ministry of Health > pilot solutions to ensure adequate access to blood and blood products regionally and locally in North Norway.

The project seeks to establish a blood readiness system based on the following principles:

- Early balanced transfusion must be ensured in accordance with national and international guidelines.
- A system of blood preparedness in crisis and war requires a system of blood preparedness in peacetime
- The self-sufficiency principle: Decentralized system for the provision of blood and blood components

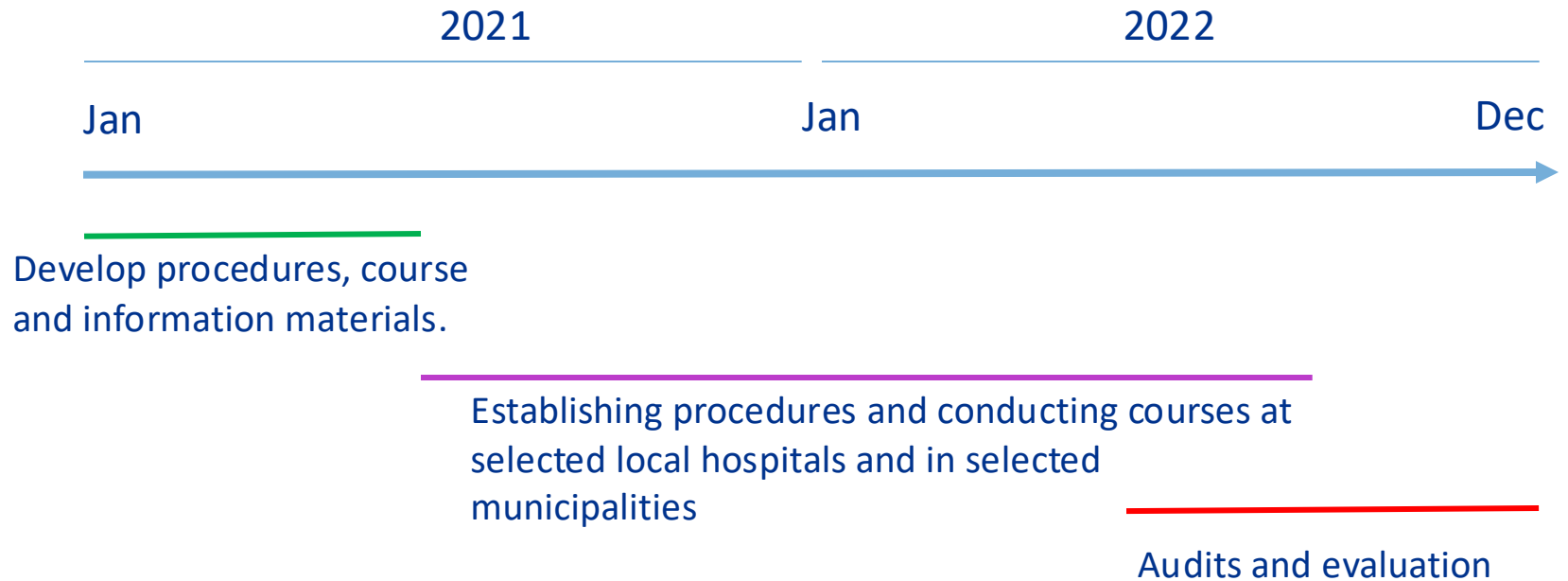


Main objective: Through education and training, local hospitals, the municipal health service and helicopter emergency medical services will be able to start early balanced blood transfusions to patients with life-threatening bleeding.



Project duration is estimated at 2 years with project start 01.01.2021

Extended to 31 Dec 2023



Where does the pilot hit?

Local hospitals:

- Longyearbyen
- Hammerfest
- Kirkenes

Emergency Medical Services (Air Ambulance)

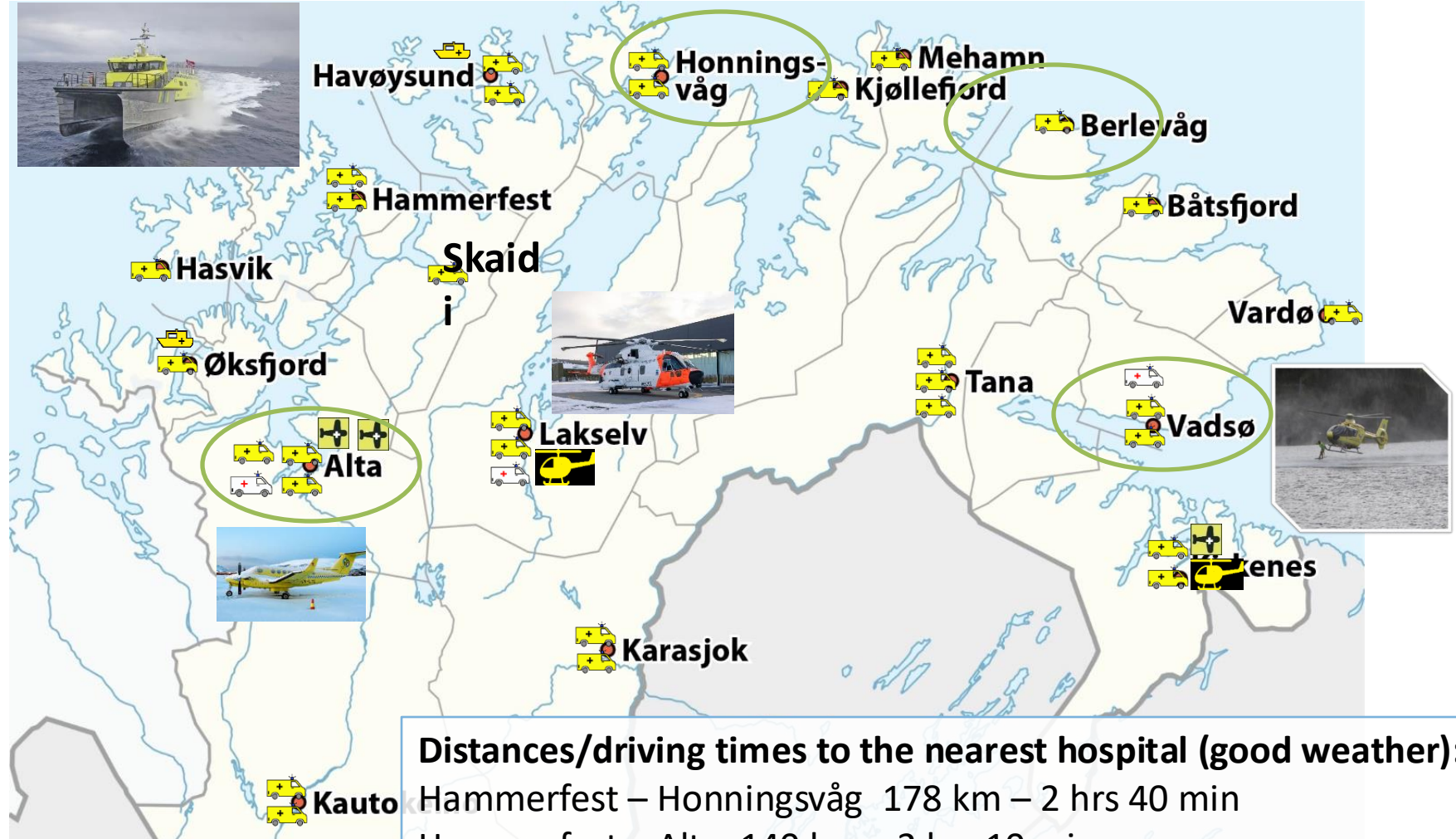
- Banak
- Kirkenes
- Tromsø, Evenes, Bodø, Brønnøysund

Pilot Municipalities:

- Alta 20600 Inhabitants
- Honningsvåg 3000 Inhabitants
- Berlevåg 970 Inhabitants
- Vadsø 5600 Inhabitants

Military Garrisons:

- Porsanger, Kirkenes, Bardufoss



Distances/driving times to the nearest hospital (good weather):	
Hammerfest – Honningsvåg	178 km – 2 hrs 40 min
Hammerfest – Alta	140 km – 2 hrs 10 min
Kirkenes – Berlevåg	274 km – 3 hrs 35 min
Kirkenes – Vadsø	172 km – 2 hrs 25 min

The Norwegian civilian walking blood bank program

Our program includes:

- Training of personnel
- Recruitment of emergency whole blood donors
- Regulatory approval
- Supervision from local civilian hospital blood service



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DISASTER PREPAREDNESS

TRANSFUSION

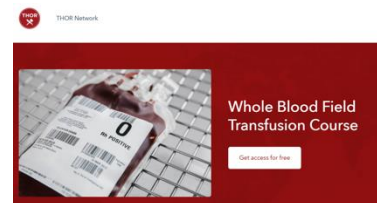
The Norwegian blood preparedness project: A whole blood program including civilian walking blood banks for early treatment of patients with life-threatening bleeding in municipal health care services, ambulance services, and rural hospitals

Torunn Oveland Apelseth^{1,2,3}  | Mirjana Arsenovic⁴ | Geir Strandenes¹ 



Overview of the civilian walking blood bank program

- Complete system for emergency collection of whole blood for treatment of a patient with life-threatening bleeding.
- Emergency Donors are prescreened and pretested low titer group O blood donors, approved by use of the same criteria as ordinary Blood Donors in Norway. They are interviewed and TTID tested every 6th month.
- Whole Blood is transfused immediately.
- Walking Blood Bank is supervised by “Mother Blood Bank” and is under revision by the same regular authority as ordinary blood banks.



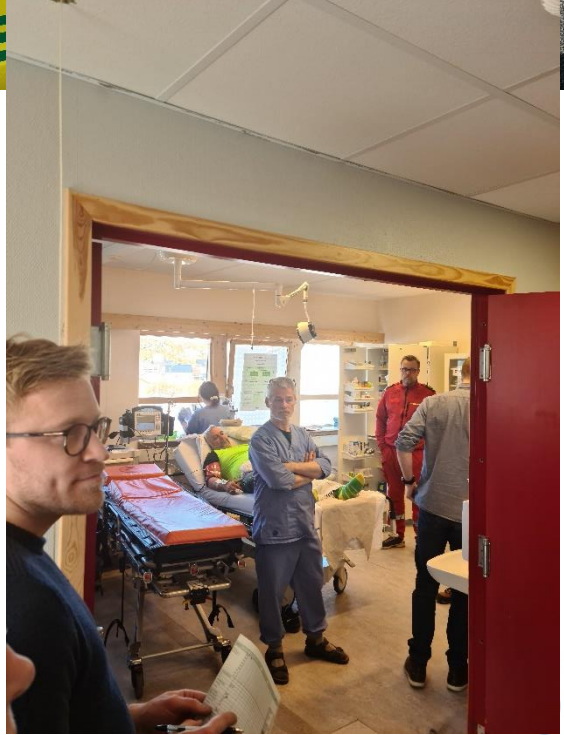
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DISASTER PREPAREDNESS TRANSFUSION

The Norwegian blood preparedness project: A whole blood program including civilian walking blood banks for early treatment of patients with life-threatening bleeding in municipal health care services, ambulance services, and rural hospitals

Torunn Oveland Apelseth^{1,2,3} | Mirjana Arsenovic⁴ | Geir Strandenes¹

Berlevåg municipality executed their certification exercise May 31st 2022 and became the first municipality in Norway to be approved for conducting emergency whole blood transfusions using a local walking blood bank.



Alta became the second municipality to conduct a certification exercise Sept 30th 22 and is also certified for whole blood transfusions from a local walking bloodbank.



3. Emergency donor from the walking blood bank donates blood

2. The physician on duty at the local medical ward decides that the patient needs early balanced transfusion and activates the walking blood bank

1. «Patient» arrives is pregnant and has life threatening bleeding



A nurse transfuse whole blood to the patient

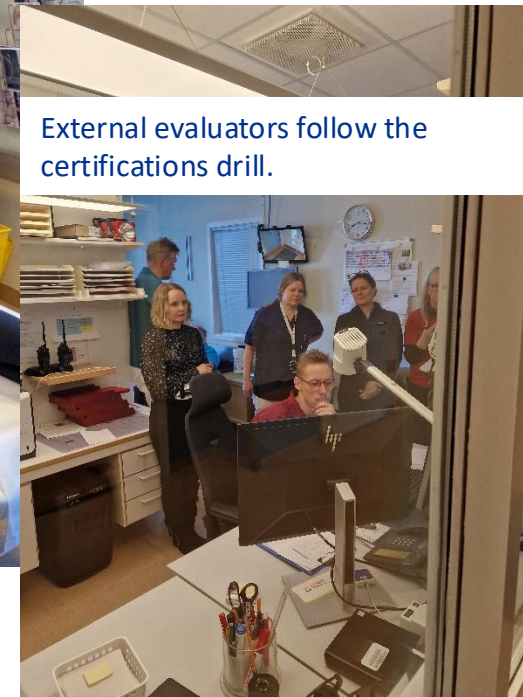
4. Whole blood transfusion from an emergency donor





Svalbard

Longyearbyen were certified as a civilian walking blood bank 25th of April 2023 as the third location.



The Norwegian Minister of Health observes the procedure to learn about civilian walking blood bank programs.

External evaluators follow the certifications drill.

Emergency donor fills out the donor questionnaire



SUMMARY

Geography and large sparsely populated areas creates a challenge for the blood supply chain in Norway as for rural areas in general

- Balanced blood transfusion should be available on all health care levels
- This can be achieved by using a structured system for emergency collection of whole blood in addition to other preparedness blood products like dried plasma and cold stored platelets

A coordinated effort is needed to ensure sufficient blood supply (“nok blod”)

- A collaboration between the civilian blood services, the defense forces and regulatory authorities are needed
- The Norwegian Center for Blood Preparedness (Nokblod) is established to coordinate the national civilian-military blood preparedness efforts



ACKNOWLEDGEMENTS

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Turid Helen F Lunde, MSc

Hanne Braathen, MSc

Joar Sivertsen, MSc

Svein Lindgaard. BSc

Our institutions:

Department of immunology and transfusion medicine, Department of Anaesthesia and Intensive Care,, and Laboratory of Clinical Biochemistry, Haukeland University Hospital, Bergen, Norway Institute of Clinical Science, School of Medicine and Dentistry, University of Bergen, Norway Norwegian Naval Special Operations Commando Norwegian Armed Forces Medical Services

Nokblod



Prosjekt blodberedskap -PILOT FINNMARK



BAKGRUNN FOR PROSJEKTET

Oppdrag fra Helse- og omsorgsdepartementet: Prøve ut løsninger for å sikre adekvat tilgang på blod og blodprodukter lokalt og regionalt i Nord-Norge.

PRINSIPPER:

- Tidlig blodtransfusjon må sikres jamfør nasjonale og internasjonale retningslinjer.
- System for blodberedskap i krise og krig forutsetter et system for blodberedskap i fredstid.
- Selvforsyningsprinsippet: Desentralisert system for fremskaffelse av blod og blodkomponenter.

Det er viktig å starte blodtransfusjon så tidlig som mulig for å redde liv. I en vandrende blodbank tapper man fullblod fra godkjente nødbloedgivere til behandling av pasienter med livstruende blødning. Blodet gis til pasienten umiddelbart etter at det er tappet.

HVEM TREFFER PILOTEN?



Distanser/kjøretider (godt vær):
Hammerfest – Honningsvåg 178 km – 2t 40 min
Hammerfest – Alta 140 km – 2 t 10 min
Hammerfest – Lakselv (Banak) 142 km – 2 t 10 min
Kirkenes – Berlevåg 274 km – 3 t 35 min
Kirkenes – Vadsø 172 km – 2t 25 min

MÅL MED PROSJEKTET

Gjennom utdanning og trening skal lokalsykehus, kommunehelsetjenesten og prehospital ambulansetjeneste bli i stand til å starte tidlig balansert blodtransfusjon til pasienter med livstruende blødning.

HVORDAN ARBEIDER VI?

- Rekrutterer nødbloedgivere til vandrende blodbank
- Trener sivil og militært personell i å tappe og å gi blod
- Gjennomfører øvelser og sertifisering i bruk av vandrende blodbank
- Evaluerer og kvalitetssikrer praksis

GJENNOMFØRTE AKTIVITETER

- Fullblod er nå tilgjengelig på prehospitale tjenester (luftambulans og redningshelikopter): Banak, Kirkenes, Tromsø og Evenes.
- Det er gjennomført kurs i vandrende blodbank i alle pilotkommuner og i Longyearbyen.
- Berlevåg kommune er sertifisert og godkjent.
- Det er etablert samarbeid med Forsvaret lokalt, regionalt og nasjonalt.

Les mer om prosjektet her:



GÓ PÁ BLOD!

VANDRENDE BLODBANK OG NØDBLODGIVERKORPS

I en vandrende blodbank tappes fullblod til akuttbehandling av pasienter med livstruende blødning fra forhåndsgodkjente nødbloedgivere.

- Fullblod transfunderes like etter tapping (nødtransfusjon)
- Forhåndsgodkjente blodgivere, godkjent etter samme krav som vanlige blodgivere
- Blodtype O og lavt titer anti-A og anti-B
- Blodgivere intervjues, screenes og virustestes hver 6 mnd

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