Medical evacuation and patient care in CWO

- following a user-centered approach to develop a new prehospital hypothermia wrap system

COLD WEATHER OPERATIONS CONFERENCE 2023

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THE PROJECT

Name: Hypoterm 2.0
Project period: 2018-2020
Funding: The Research Council of Norway

The company Thermosaver addressed an unmet need in the marked and wanted to develop an all-in-one hypothermia wrap system with scientifically documented effects. They also wanted a product that met the needs of a wide range of potential users.

Norwegian Defence Research Establishment (FFI) + The Norwegian Special Forces + Innovation Norway

Funded by
The Research
Council of Norway

THERMOSAVER

SINTEF

asap
NORWAY

HAMATEC

Haukeland University Hospital

FOTO: SINTEF

CORE PRINCIPLES OF USER-CENTRED INNOVATION

1) **Build your solutions on deep insight of user needs.** Who will use it, what they will use it for, and under what conditions they will use it.

2) **Design, develop, test and evaluate in iterations.**
The sooner the design is shown to real users and their feedback is gained, the easier it is to find the best solutions.
Test and evaluate continuously and at different levels.

3) **Challenge traditional thinking by creating interdisciplinary teams** where you connect technology and business understanding with the designer's way of thinking and working.

User-centred innovation is about putting the end user at the centre. It's about solving problems and create new solutions by orienting yourself around people.

In our project we established a team of designers, physiologists, medical specialists and material experts

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THE USER-CENTRED PROCESS

DESIGN + PHYSIOLOGY

GAIN INSIGHT

User needs, work environment, context of use, state of the art technology and materials, production possibilities, etc.

Relevant knowledge and standards, insight in work environment, analyse existing products.

TRANSLATE AND DEVELOP

Translate insights into product requirements and design goals. Develop prototypes.

Develop relevant test protocols based in insight on user, work environment, context of use and ergonomic factors.

TEST AND EVALUATE

Test and evaluate until you meet design goals and product requirements. User testing is key!

Test and evaluate prototypes (pilots and full scale)

Verify and document product properties.

CREATE ADDED VALUE!

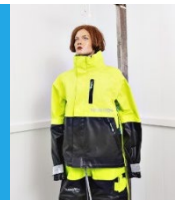
Functional, attractive and profitable products with added value for the end user.

AT SINTEF WE CARRY OUT TESTING AT DIFFERENT LEVELS

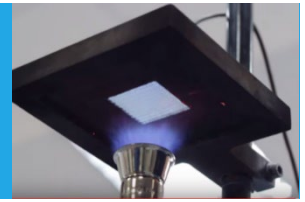
Field tests

Standardized lab-test
(ISO-standards or own protocols)

Measurement of clothing/bag insulation on a thermal manikin (CLO-value)



Textile testing



Field tests: highly relevant and realistic, but limited control over the environments and surroundings.

Lab: Real-life simulations, and complete control over the environment, participants and tasks.

Manikin: using a thermal manikin to measure clothing or bag insulation (CLO-value)

Textile tests: often provided by textile suppliers (standard ISO tests), but you could also design your own test protocols (E.g. using SGHP).

In most projects we utilize the entire range of test methods, depending on purpose and project stage.

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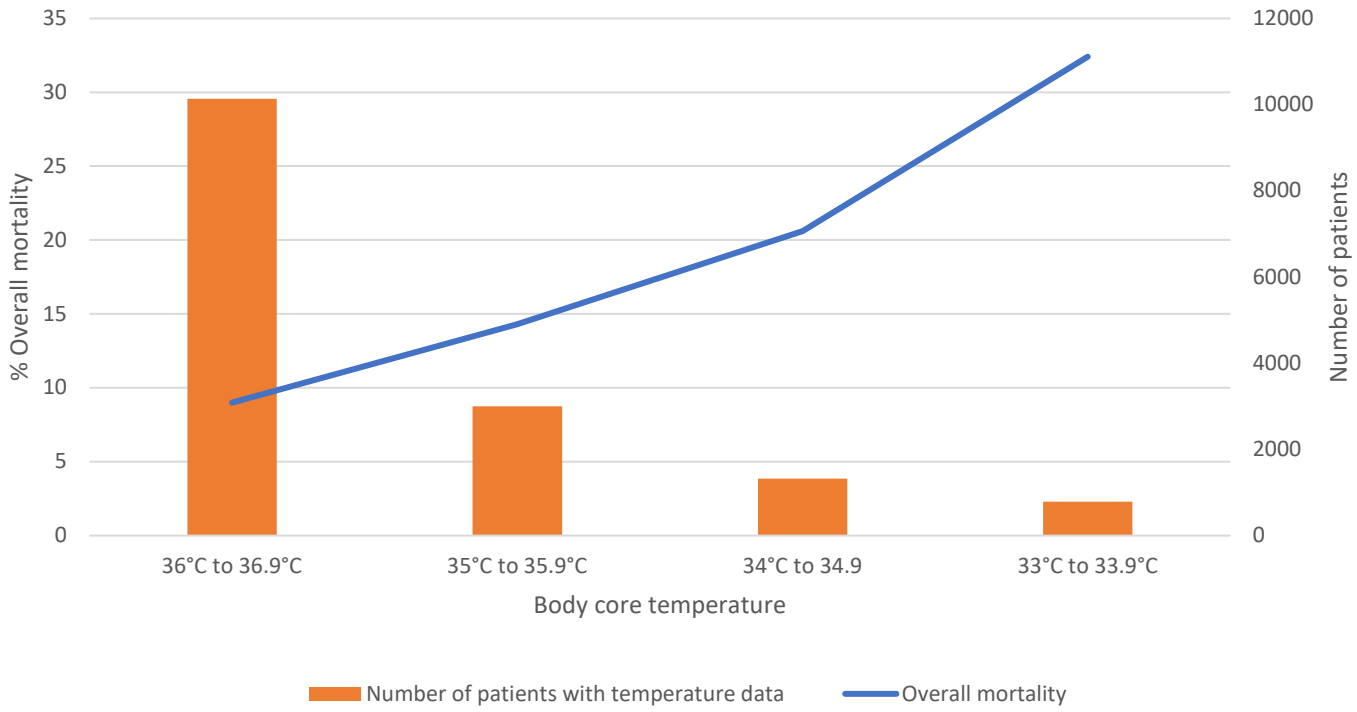
ACCIDENTAL HYPOTHERMIA AND MORTALITY



- ✓ Accidental hypothermia is defined as an unintentional fall in core body temperature to less than 35° C
- ✓ The overall mortality increases drastically when core body temperatures drops.
- ➔ Maintaining (and preferably increasing) core body temperatures is essential to increase survivability!

* Weuster, M., Brück, A., Lippross, S., Menzdorf, L., Fitschen-Oestern, S., Behrendt, P., ... & Klüter, T. (2016). Epidemiology of accidental hypothermia in polytrauma patients: An analysis of 15,230 patients of the TraumaRegister DGU. *Journal of Trauma and Acute Care Surgery*, *81*(5), 905-912.

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REMOTE AND HOSTILE ENVIRONMENTS

In urban areas in Norway, most patients would probably arrive at the hospital within 30 min – 2 hours.

This is not the case in hostile environments and remote areas:
- Lack of infrastructure
- Ongoing battle scenarios
- Challenging weather conditions

➔ Long evacuation times!
➔ Easy evacuation is key
➔ Essential to find good and effective insulation systems to prevent heat loss
➔ Dynamic hypothermia management (step by step improvements for the patient) – how can we speed up and improve this?

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WIDE RANGE OF USERS– DIFFERENT NEEDS (AND EXPERINECE)

- Car ambulance
- Air ambulance

- 330-squadron/HRS (military search and rescue service)
- SAR offshore
- Alpine rescue groups
- Norwegian Red Cross

- The Norwegian Society for Sea Rescue
- The Norwegian Armed Forces
- …

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DEVELOPMENT IN SEVERAL ITERATIONS










FOTO: SINTEF

COMPREHENSIVE USER TESTING

- ✓ We established a wide network of potential end-users and provided them with prototypes for testing; starting out with simple mock-ups in bubble wrap and ending up with fully functional prototypes.
- ✓ The main purpose of this was to get feedback on functionality and ease of use in the field
- ✓ It is only when products are used in it's intended environment and real context that you reveal weaknesses and find areas of improvement.

Forsvarets spesialstyrker · MJK · POLITIET · HELSE BERGEN Haukeland universitetssjukehus · RS(+) · Røde Kors · FFI Forsvarets forskningsinstitutt · SIVILFORSVARET

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PILOT TESTING IN LABORATORIES – DATA AS DESIGN INPUT

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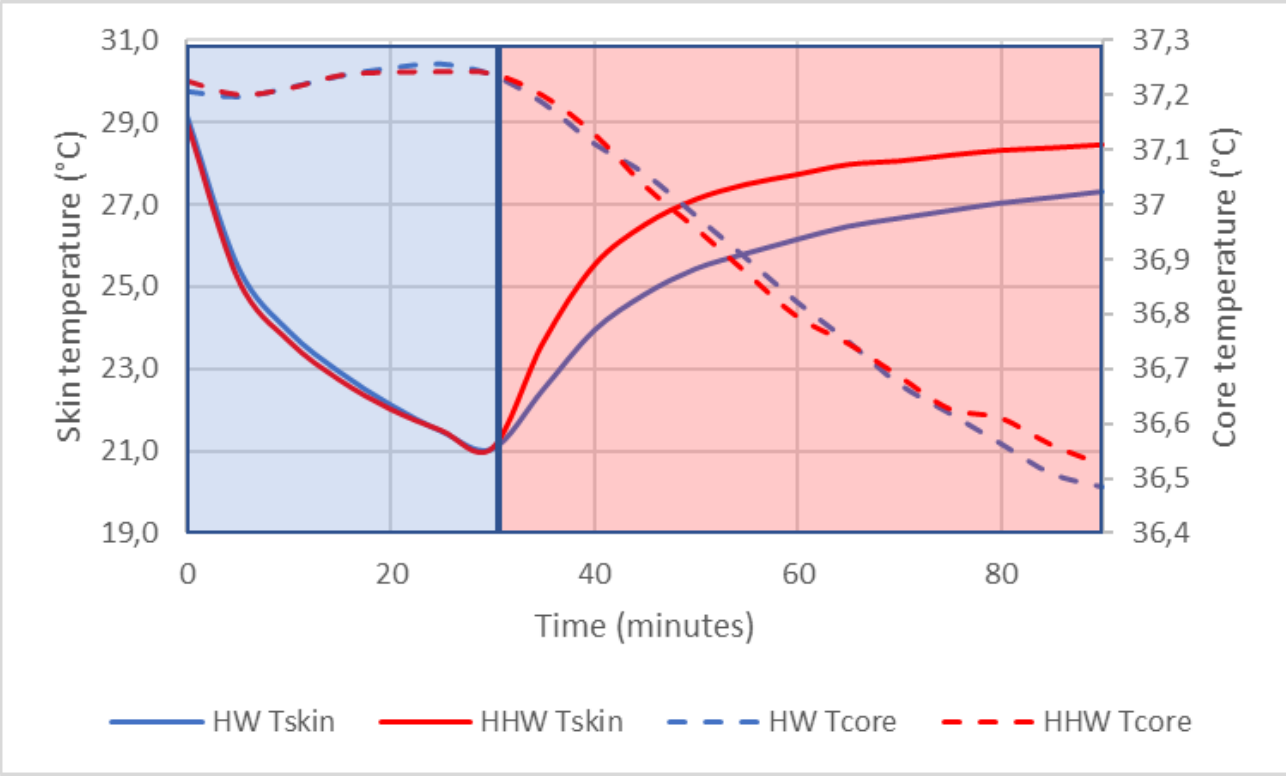
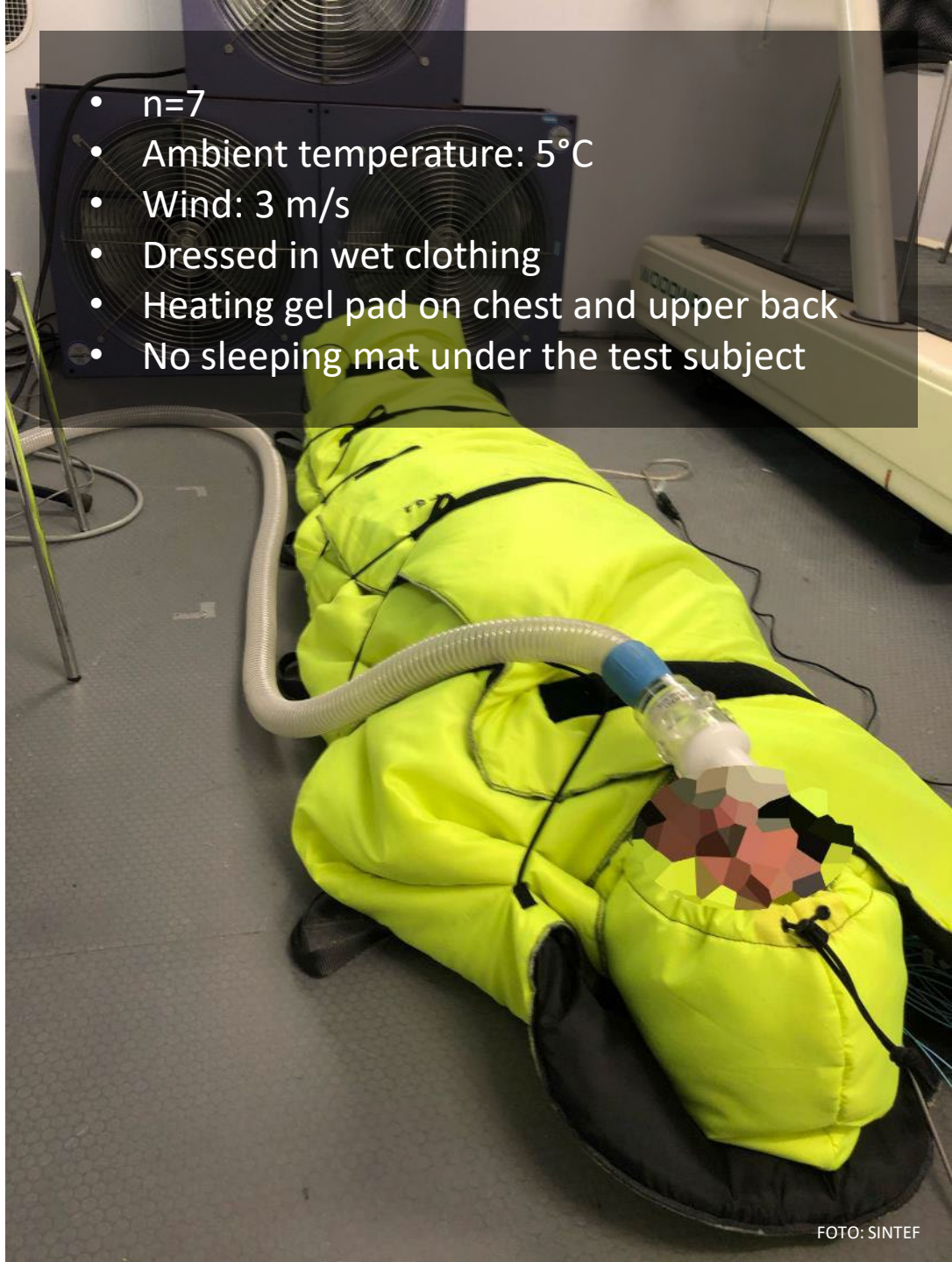
RESULTS FROM LABORATORY TESTING



Hypotermia Wrap (HW), Heated Hypothermia Wrap (HHW)



CORE FUNCTIONALITY OF THE NEW SYSTEM

- The rescue bag is an all-in-one hypothermia wrap system with scientifically documented effects. It is highly compressible.
- It has high thermal protection (4.6 CLO) utilizing a vapor barrier for efficient heat conservation. The use of vapor barrier is in line with international recommendations*.
- The disposable vapor barrier also function as an absorbent. It can absorb up to 10 litres of fluid per m2, extracting water from clothing and reducing mess from body fluids.
- The system consists of:
  - A water repellent and windproof outer layer, an insulating layer and an inner liner
  - A removable hood
  - Vapor barrier with absorbent
  - Compression bag
- 5 color-coded elastic tighteners – allows for variation in body size.
- It has 9 solid carrying handles for easy evacuation.
- It has a Velcro opening at the torso for easy access with medical equipment.

Total weight incl. rescue bag, hood, compression bag and vapor barrier: 4400 g

* Giesbrecht, G. G. (2018). “Cold Card” to guide responders in the assessment and care of cold-exposed patients. *Wilderness & Environmental Medicine*, *29*(4), 499-503.

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LOG ROLL AND "BURRITO"

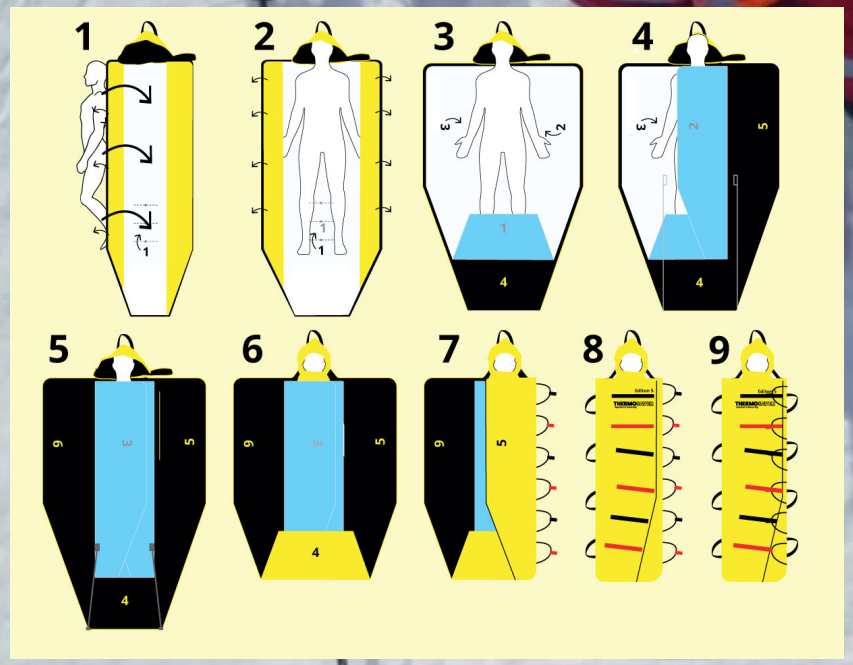

FOTO: MIXMASTER

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THERMOSAVER

Next generation hypothermic rescue bag

Manual compression bag or vacuumed sealed

Burrito-wrapping method using log-roll principle

Hood, moisture-absorbing vapor barrier, insulation and solid carriyng handles

DOGA AWARD

EU-MDR

NATO Stock Number:
6532251635297