Successful avalanche resuscitation

Avalanche accident in Wielka Świstówka

Western Polish Tatras, Poland

21 February 2015

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Avalanche accident in Wielka Świstówka

Poland, 21 February 2015

On the day of the avalanche:

-avalanche danger II

-weather conditions: wind predominantly from **southern** direction, gaining force at night 20/21 February, gusts up to 120 km/h, Halny (Foehn type wind)

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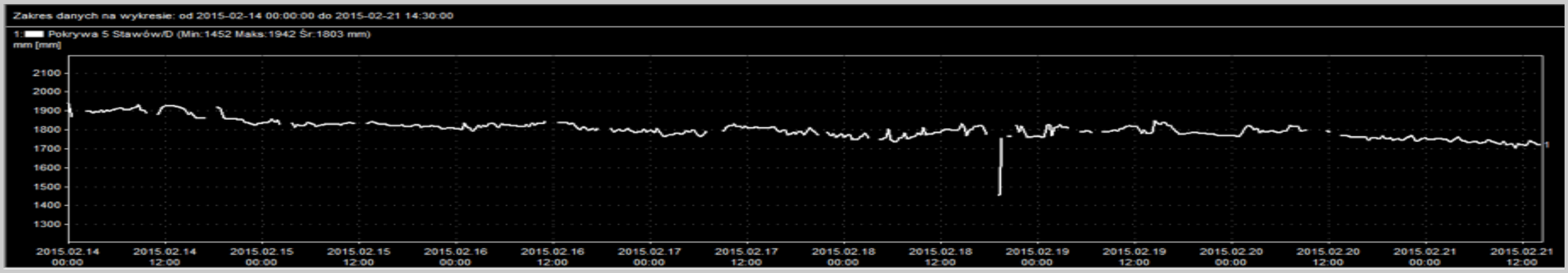
Temperature on the day dropped following a significant rise in the previous days (freezing level above 1900m.)

No snowfall occurred on the preceding days. However, snow was heavily transported.



Avalanche accident in Wielka Świstówka

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14:28 - **avalanche accident** in Wielka Świstówka, Dolina Miętusia reported via mobile phone to TOPR HQ: **cavers buried** while on the way to Komin cave in Ratusz Litworowy massif (no person in the group is equipped with avalanche beacon).

The original call indicated **three** persons under the snow.

Subsequently the information was updated, **four** persons buried:

two recovered, **two** remaining under the snow.

General situation of the avalanche accident

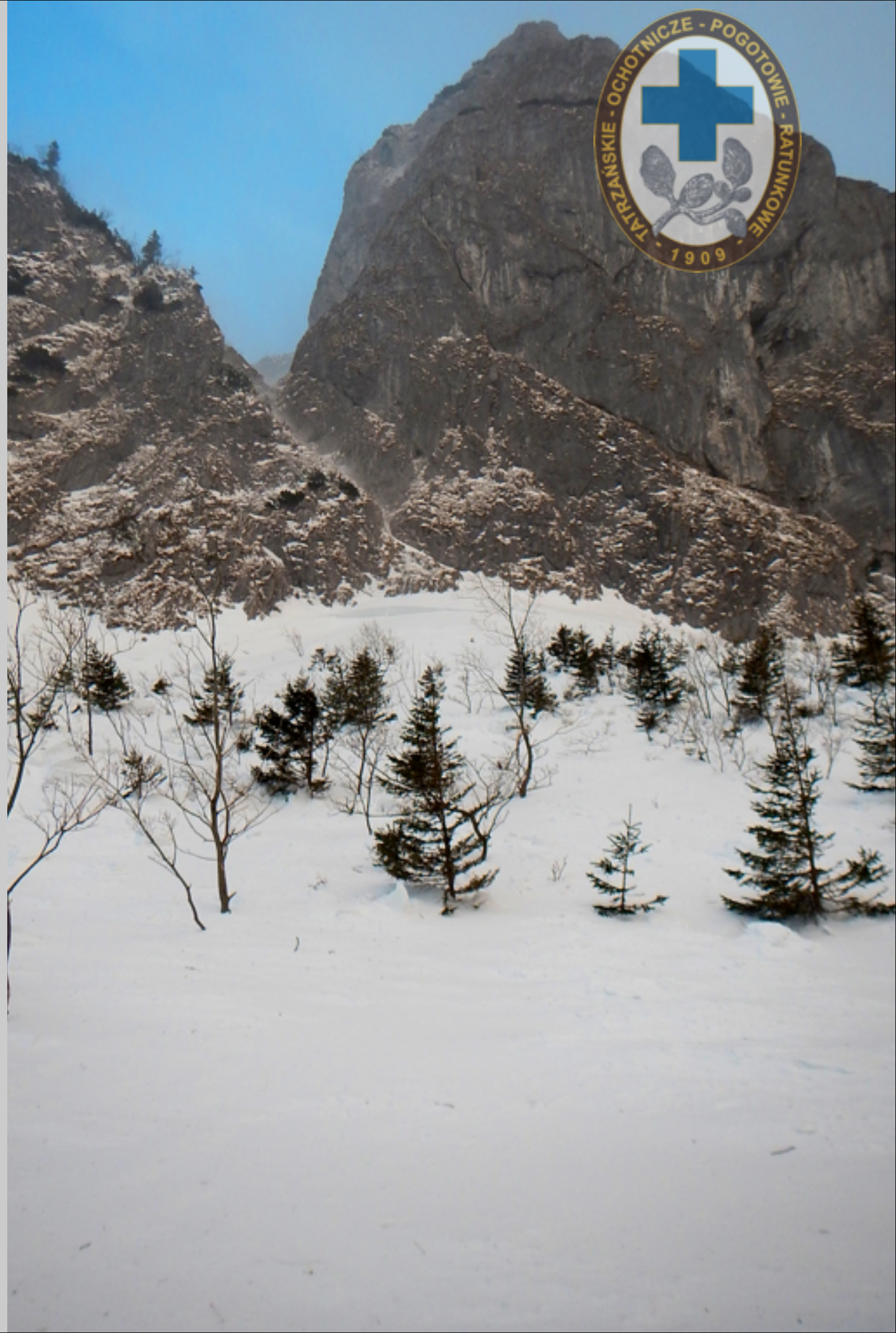
Dolina Miętusia, Western Polish Tatras

Avalanche occurred in a less accessible part of Dolina Miętusia

Wielka Świstówka, Dolina Miętusia

Steep terrain above the avalanche site

Approximate area where the cavers were buried.



Avalanche fracture line close-up

Thickness of snow cover reached 1.2m.

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Positions of the buried subjects

Terrain appearance in summer

Ratusz Litworowy, Dolina Miętusia

The avalanche area in summer

The rescuer stands in the approximate area where the victims were buried

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Extremely unfavourable weather conditions (wind up to 120 km/h, white-out) **ruled out the use of helicopter.** The rescuers had to access the accident site on skis.

16:22 - the first rescuer arrives on the site of accident.

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1st patient:

As reported by one of companions: 1st person is extricated by the companions after 20-25 minutes of burial under 50 cm of snow, buried prostrate (face downwards), **airways blocked** by snow, **no air pocket** present, resuscitation commenced instantly.

As witnessed by the rescuer: the victim **has been resuscitated for 1h 25', not breathing, no pulse,** on AED Laerdal FR2 monitor: **asystole**, **airways filled with water**, no visible trauma.

Decision: In the face of personnel shortage, difficult terrain, another patient with greater chances of survival **the resuscitation was discontinued. Most likely asphyxia case.**

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2nd patient:

As reported by one of companions: 2nd victim was extricated from under the snow after **1h 50'** (16:10), buried in upright position, head upwards, under 40 cm of snow. When retrieved **- conscious**, **no verbal contact** possible, **airways patent**, air pocket present, palms of hands in front of the face, backpack in front of chest.

Avalanche accident in Wielka Świstówka

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As witnessed by the rescuer: 2nd patient in position as described, legs being uncovered from snow by the companions, **conscious**, no verbal contact, agitated, GCS: 10-11 (4/4, 2/5, 4-5/6), **weak pulse** on carotid artery - ca 60 bpm, breaths: 22/min, pupils constricted. No signs of trauma.

Decision: priority patient (likely a hypothermia case)

A hollow in the snow was dug in order to protect the victim from the wind.

Oxygen was administered via face mask (8l/min), **thermal insulation** was implemented by means of **warm, dry clothing** and rescue blanket, **hot packs** were also used.

Oxygenation, thermal insulation of the second buried person

images: W. Cikowski

Avalanche accident in Wielka Świstówka

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AED Laerdal FR2 monitor indicated **bradycardia** ca 50-60bpm.

During the wait for the stretcher heart rate of the patient became irregular (most likely **AF**), subsequently **bradycardia** progressed to 40bpm, respiratory rate: 10-12/min.

The signs observed strengthen a picture of **severe hypothermia (3/4 SSS)**.

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17:30 - **cardiac arrest** in the second patient (**VF**), two defibrillations were delivered - in both cases heart activity quickly reverted to VF. At this point AED electrode pads became unusable due to water from melted snow.

Chest compressions were initiated. Pathological breathing action (gasping) witnessed, endotracheal **intubation** with reinforced 8mm tube followed, patient was **ventilated** with 100% oxygen with manual resuscitator.

AED electrode pads became unusable due to water from melted snow.

image: W. Cikowski

Avalanche accident in Wielka Świstówka

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Patient was placed in SKED stretcher, **chest compressions and ventilation** by BVM were carried out (amidst severe difficulties) **incessantly** throughout the rest of the rescue mission.

(AutoPulse automated chest compression device and AED failed due to weather conditions, rescuers on site demanded replacement devices from TOPR HQ.)

Placement of patient in SKED stretcher enabled the transport.

image: W. Cikowski

Continuous resuscitation and transport presented a considerable challenge.

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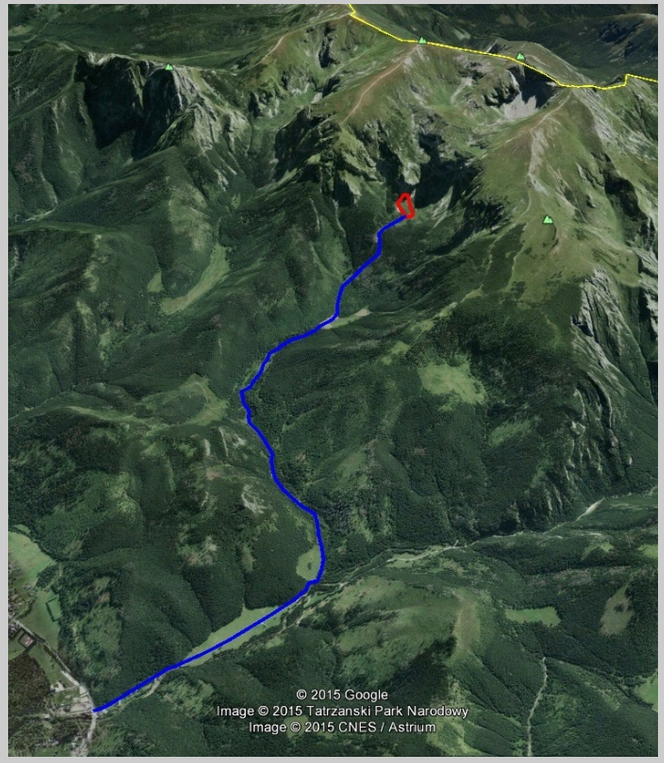
image: W. Cikowski

The route from the avalanche site to the ambulance: valley but difficult terrain

Dolina Miętusia



The terrain in Dolina Miętusia is famously uninviting.

images: R. Szadkowski

Chest compressions and ventilation

image: W. Cikowski

At later stage the snowmobile became available.
CPR continued.

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image: W. Cikowski

20:35 - the patient was delivered to **ambulance** waiting at the entry to Dolina Kościeliska.

LUCAS chest compressions device was implemented.
Core temperature measured in oesophagus was **below 17˚C** (Datatherm II thermometer records temperature down to 17˚C).

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In the ambulance:

HR monitor showed **low voltage VF**, trace of bloody secretion was removed with suction device from the tracheal tube. **Chest compressions, ventilation** (via ventilator) and monitoring of the patient **were continued**. Low voltage VF persisted.

No defibrillations were performed as the low patient temperature rendered defibrillations ineffectual.

Avalanche accident in Wielka Świstówka

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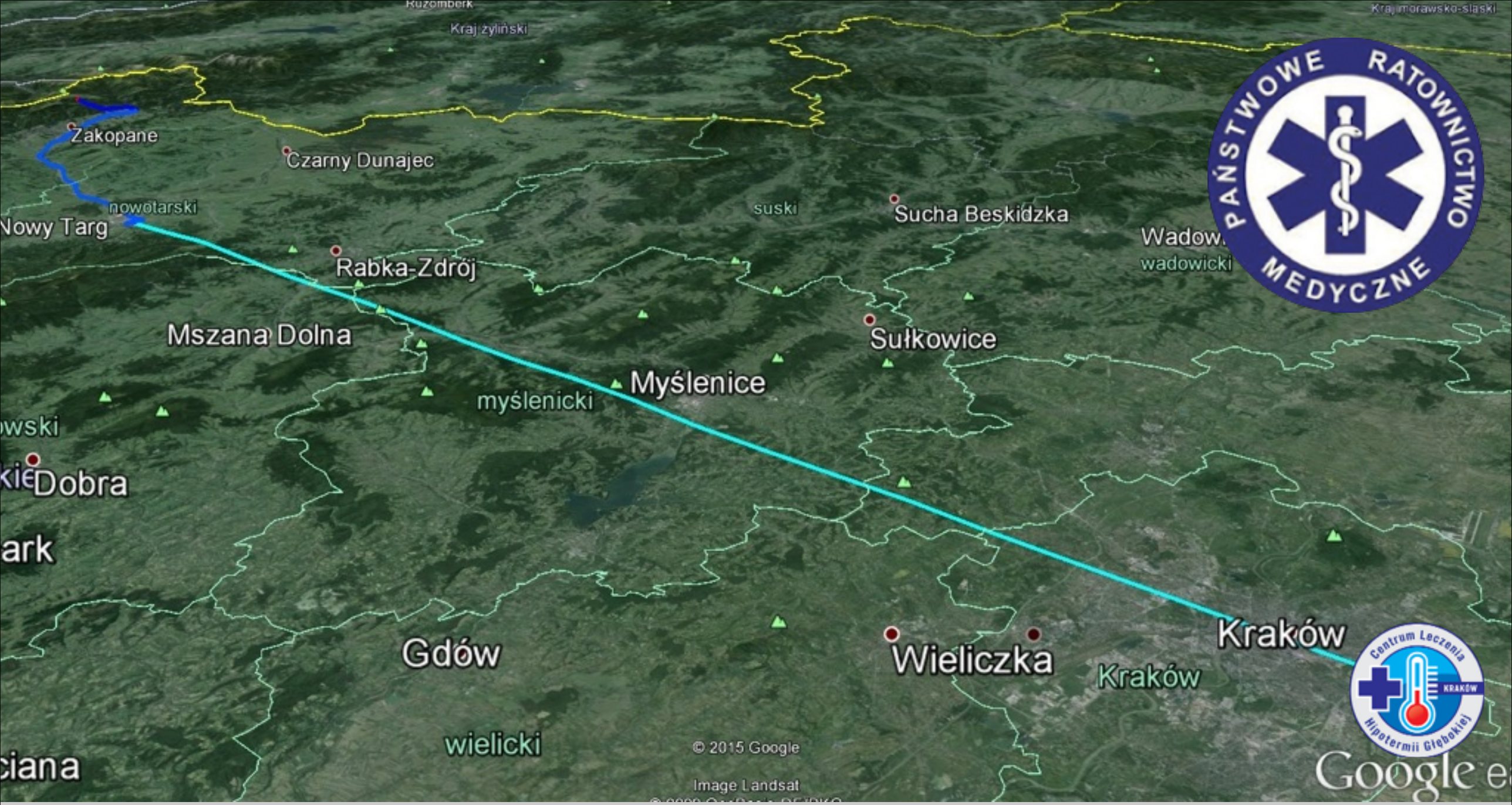
21:30 - the patient was delivered to **LPR (HEMS) helicopter** awaiting on helipad in Nowy Targ.

CPR was continued throughout the whole process of transport.

image: Sebastian Eljasz



Patient was transported in ambulance to Nowy Targ, by helicopter to Kraków

Patient’s route from Tatras to Kraków

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According to an already existing **operating procedure** at 14:35 the Hypothermia Coordinator of **Severe Hypothermia Treatment Centre** in Kraków was notified. From that moment on all clinically important information was passed on and **coordination** of medical treatment was supported by SHTC.

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23:15 - ECMO was implemented in SHTC (John Paul II Hospital) in Kraków, the initial **Tc = 16,9˚C.**

During the treatment in SHTC (John Paul II Hospital, Kraków) the patient

-was **supported with ECMO for total 91 hrs** - until cardiovascular stability achieved

-underwent laparotomy twice due to ACS

-underwent renal replacement therapy due to renal insufficiency…

25 years old female patient survived neurologically intact

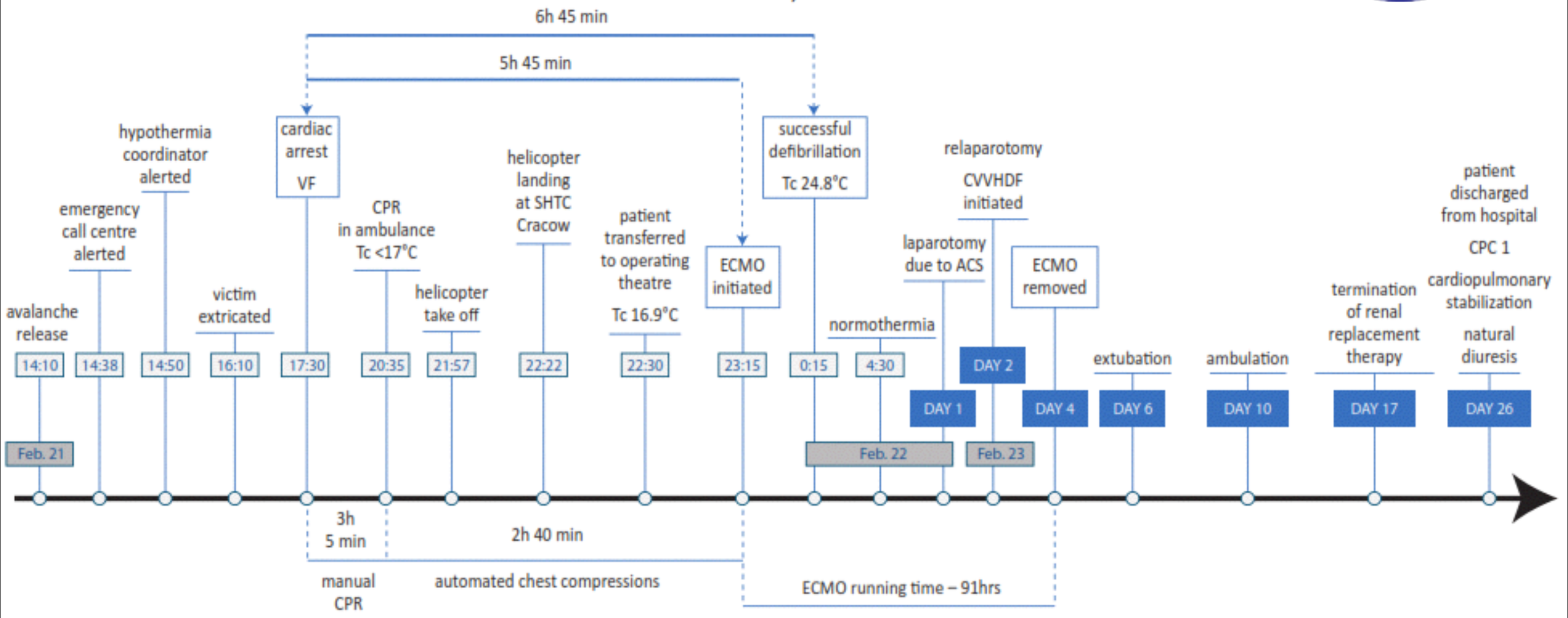
The patient suffered only temporary malfunction of right fibular nerve.

image: T. Darocha

AVALANCHE ACCIDENT

Wielka Świstówka, Tatra Mountains, POLAND

Feb. 21, 2015



CPR has been carried out for total 6h and 45' (from cardiac arrest to ROSC)

Hypothermia cardiac arrest survival.

Avalanche accident in Wielka Świstówka

Conclusions:

-readiness for '**alternative**' techniques in mountain rescue (means of transport, selection of equipment)

-**activating** of up to 35 rescuers (professionals + volunteers)

-**operating procedure** for hypothermia cases ready

-**cooperation** between various institutions

-**continuation of CPR** until the rewarming

Centrum Leczenia Hipotermii Głębokiej KRAKÓW

TATRZAŃSKIE - OCHOTNICZE - POGOTOWIE - RATUNKOWE 1909

PAŃSTWOWE RATOWNICTWO MEDYCZNE

KRAKOWSKI SZPITAL SPECJALISTYCZNY IM. JANA PAWŁA II

Avalanche accident in Wielka Świstówka

Thank you for your attention

Images by:
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Sebastian Eljasz
Tomasz Darocha
Marcin Józefowicz