

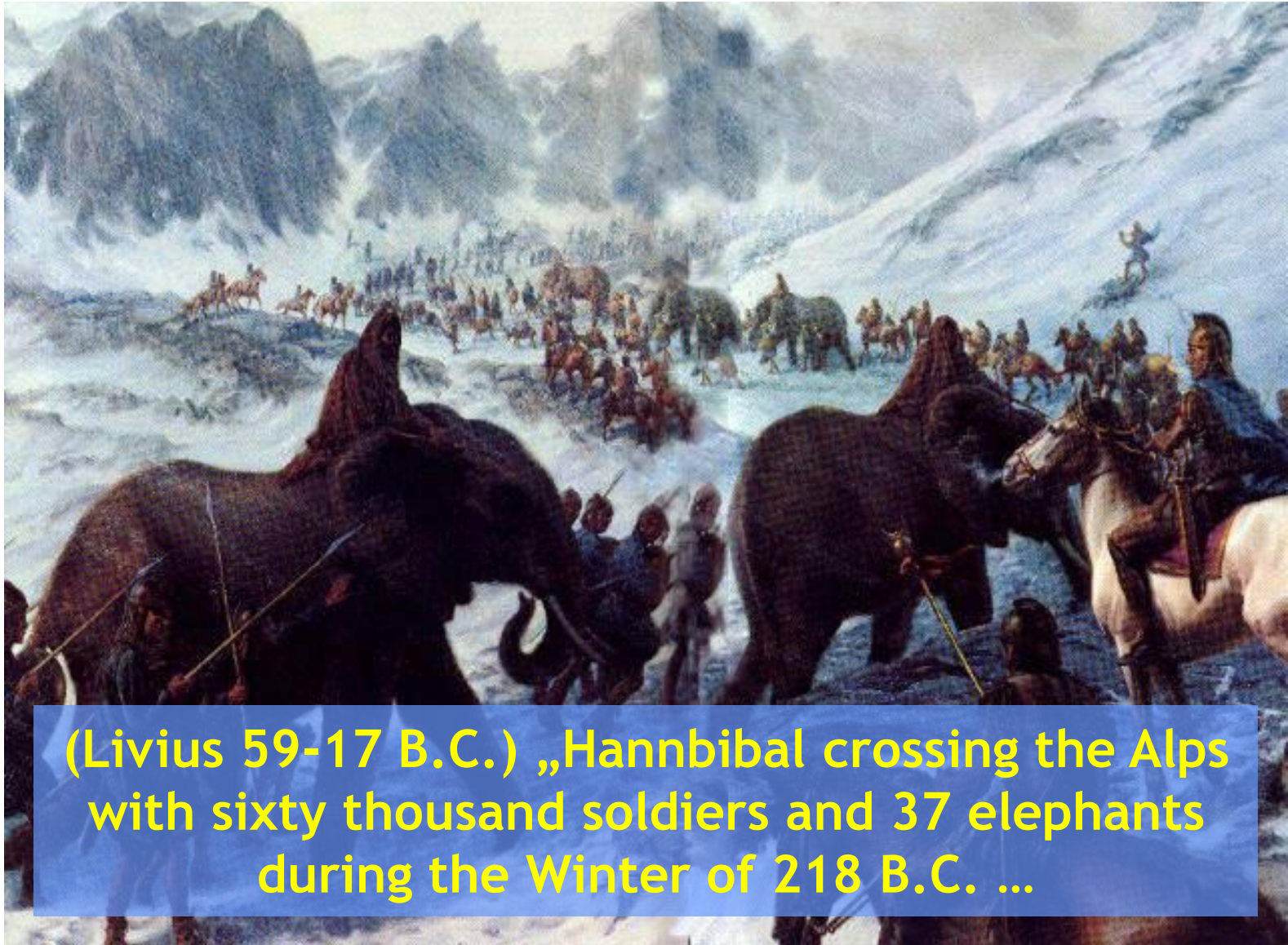
Epidemiology and treatment of cold injuries in remote areas

Giacomo Strapazzon

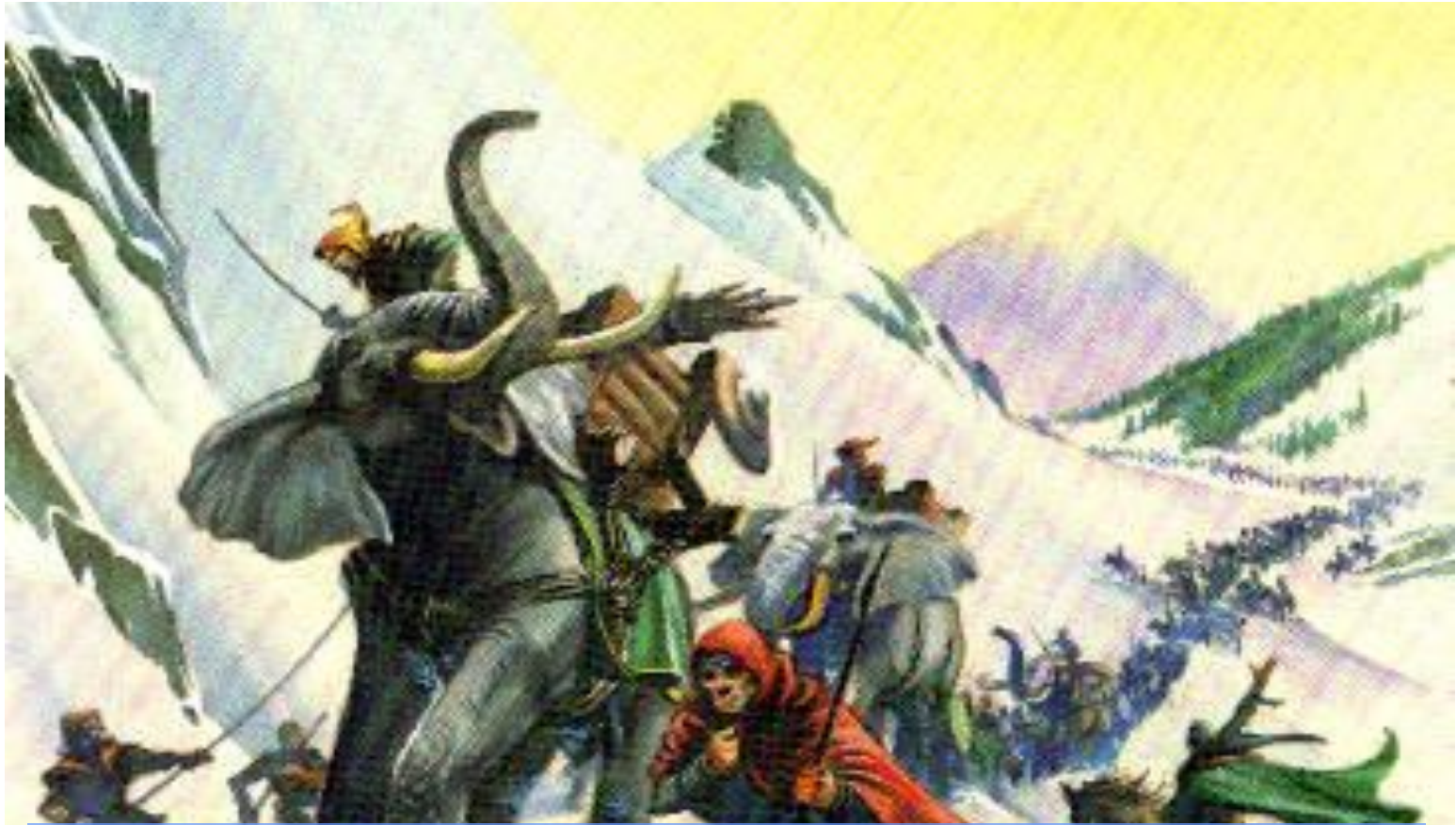
Institute of Mountain Emergency Medicine, EURAC, Italy

CNSAS- Medical School for High Risk Emergency in Alpine Environment, Italy

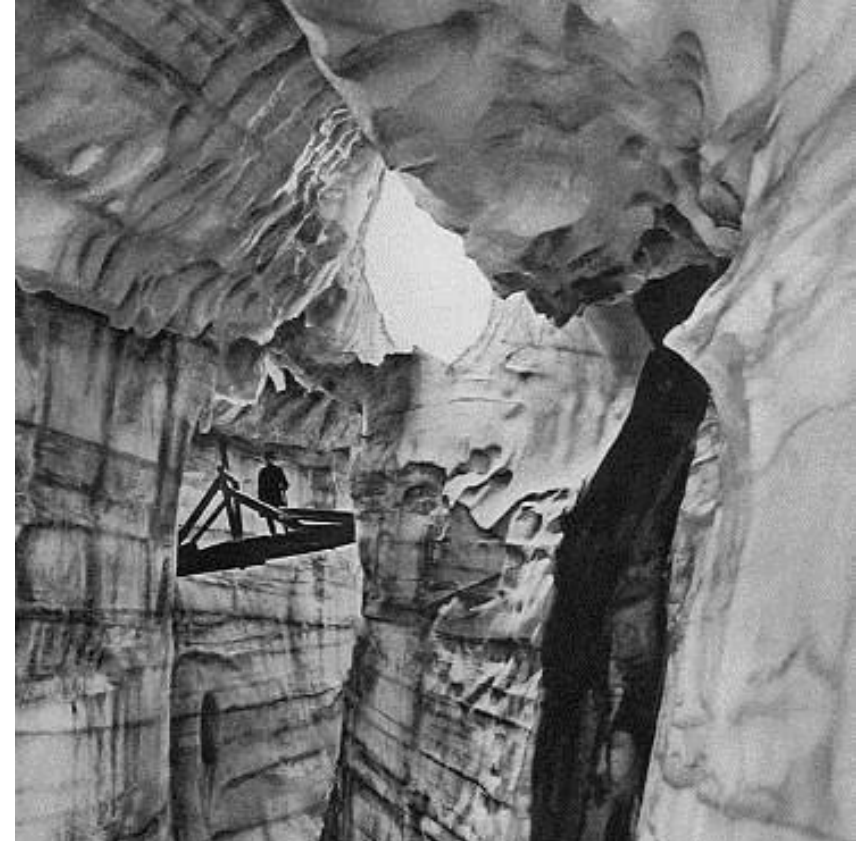
**New insights in emergency medicine:
How can we apply evidence-based medicine
in European mountain areas?
Bolzano 2011**



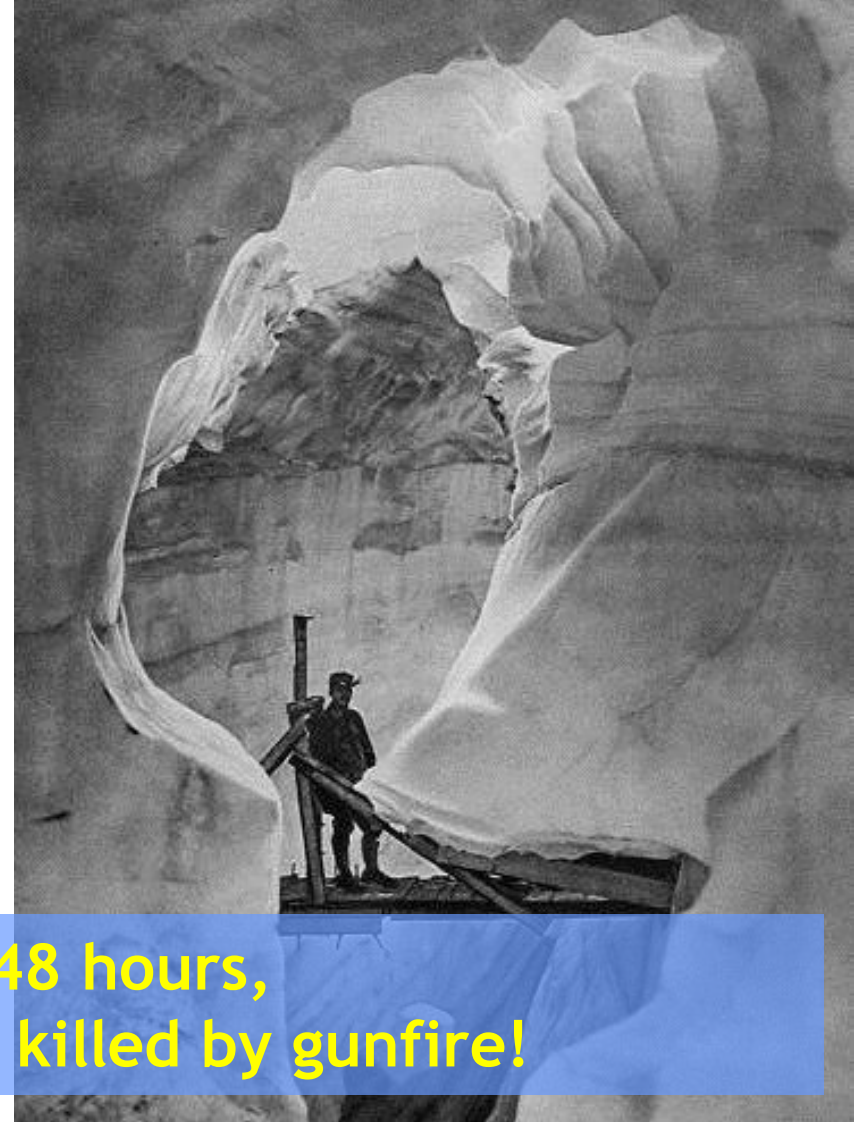
(Livy 59-17 B.C.) „Hannibal crossing the Alps with sixty thousand soldiers and 37 elephants during the Winter of 218 B.C. ...



„... lost half of troupes by snow avalanches
(*moles nivium*) and all elephants died,
except one“

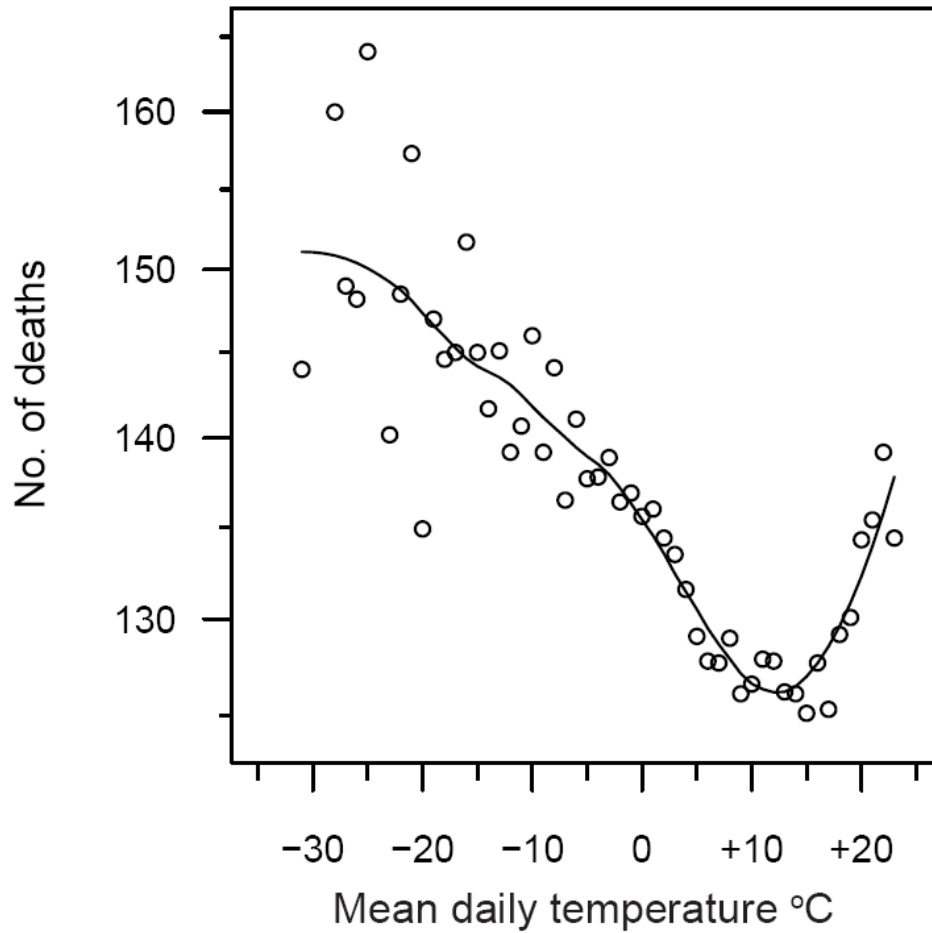


During the 1st World War, the „Great War“
in the Dolomites in December 1916, 6000 Austrian
soldiers lost their lives ...



... within 48 hours,
more than victims killed by gunfire!

Epidemiology



Epidemiology

Primary

hypothermia: accidental

Secondary

hypothermia: natural complication of systemic disorders (i.e. trauma)



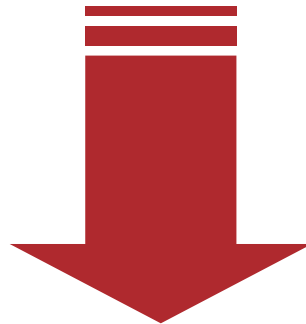
Not defined yet

Epidemiology



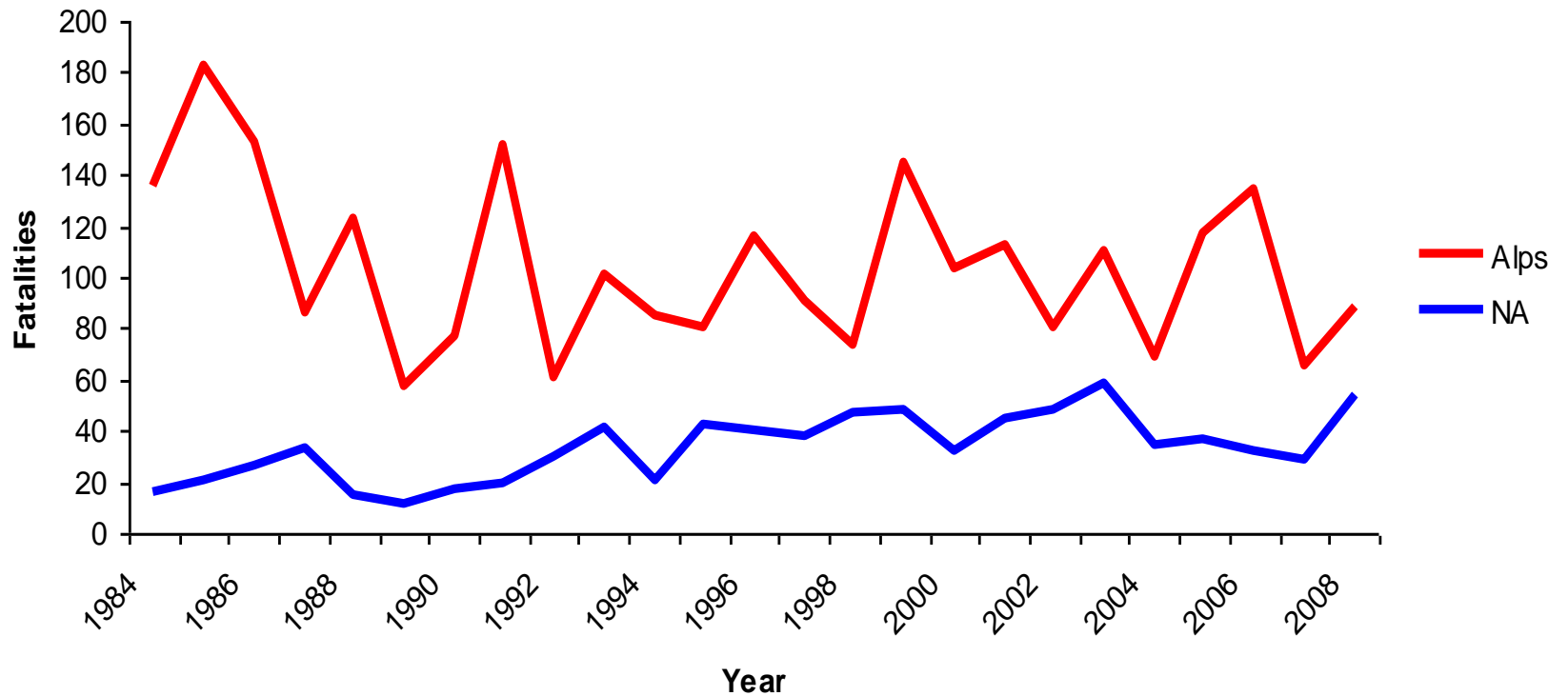
Epidemiology (I)

Difficult to be determined
despite specific situations

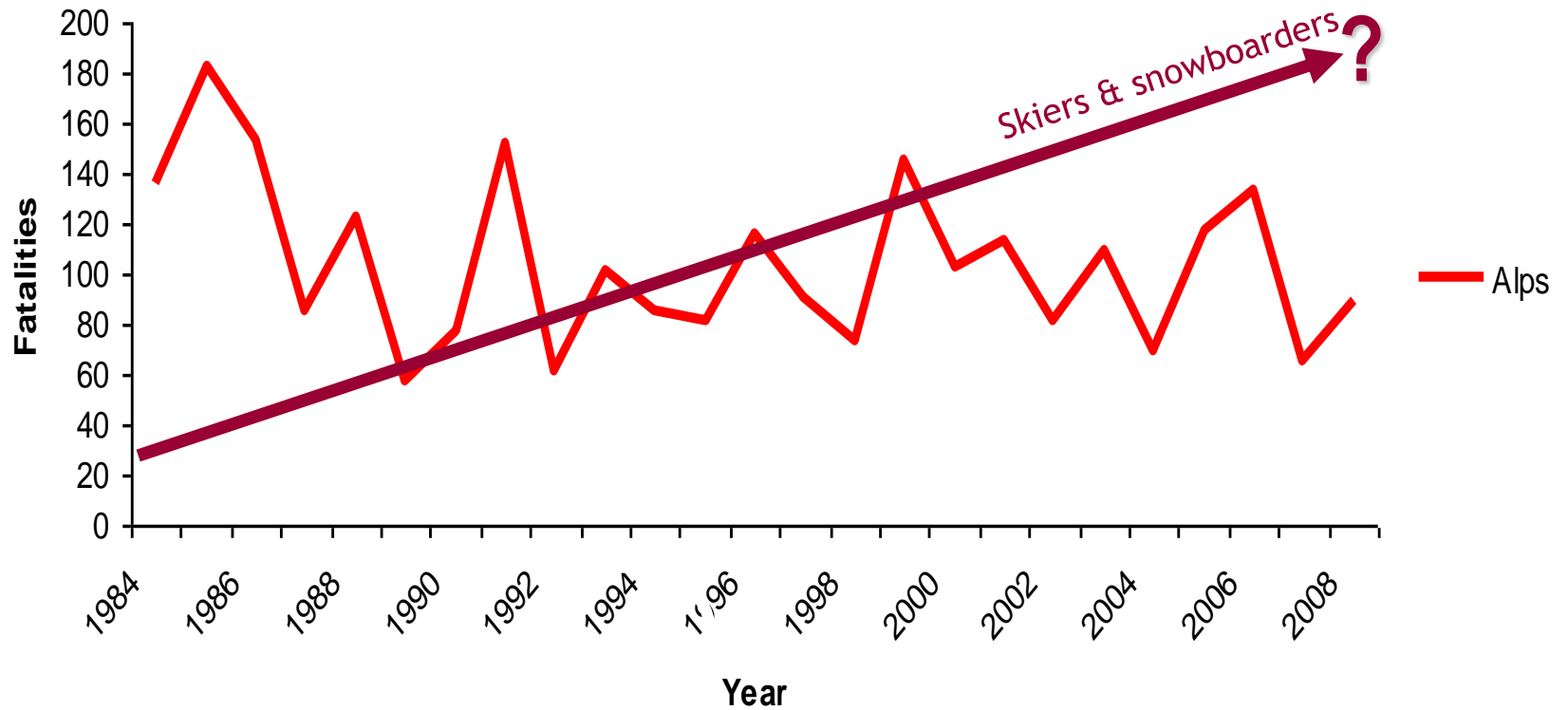


Completely avalanche buried patients

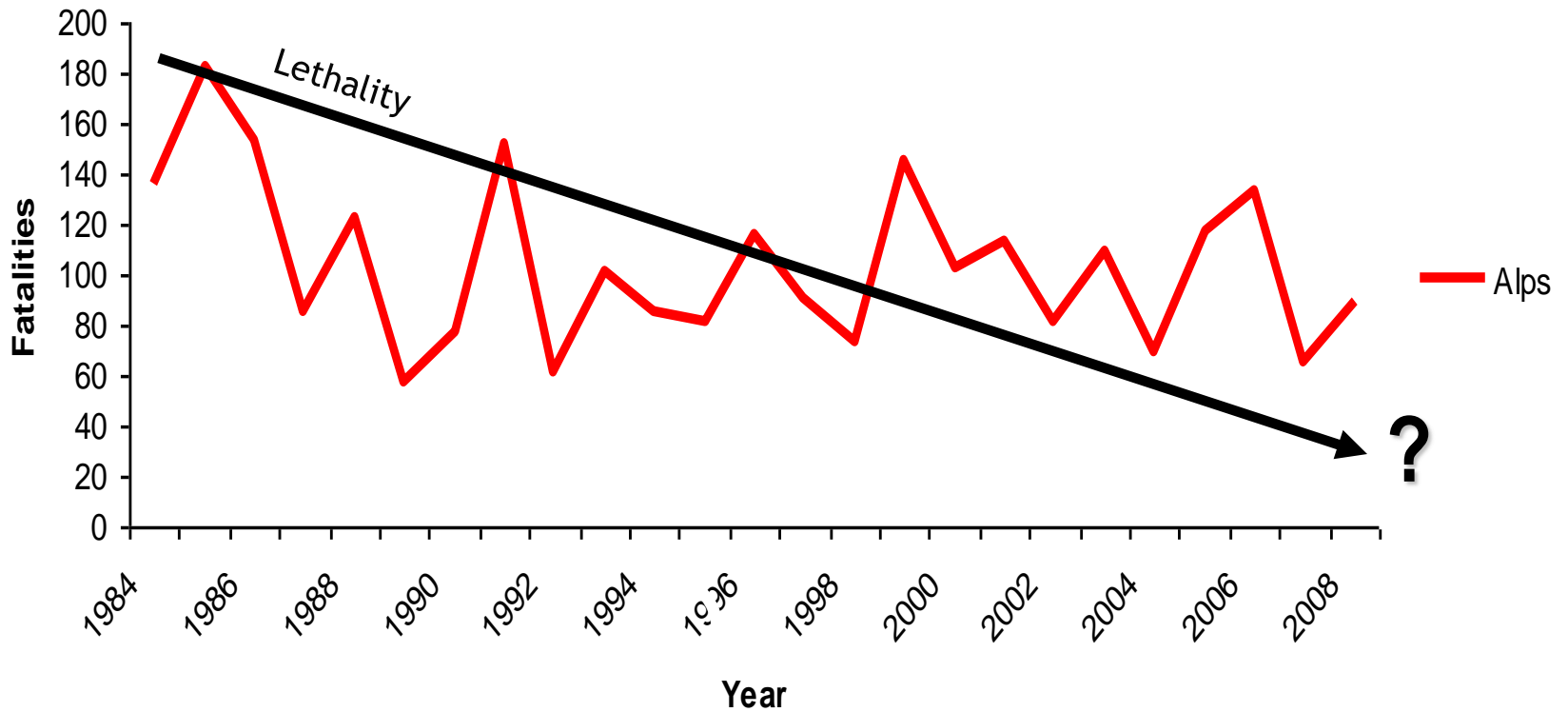
Avalanche Mortality



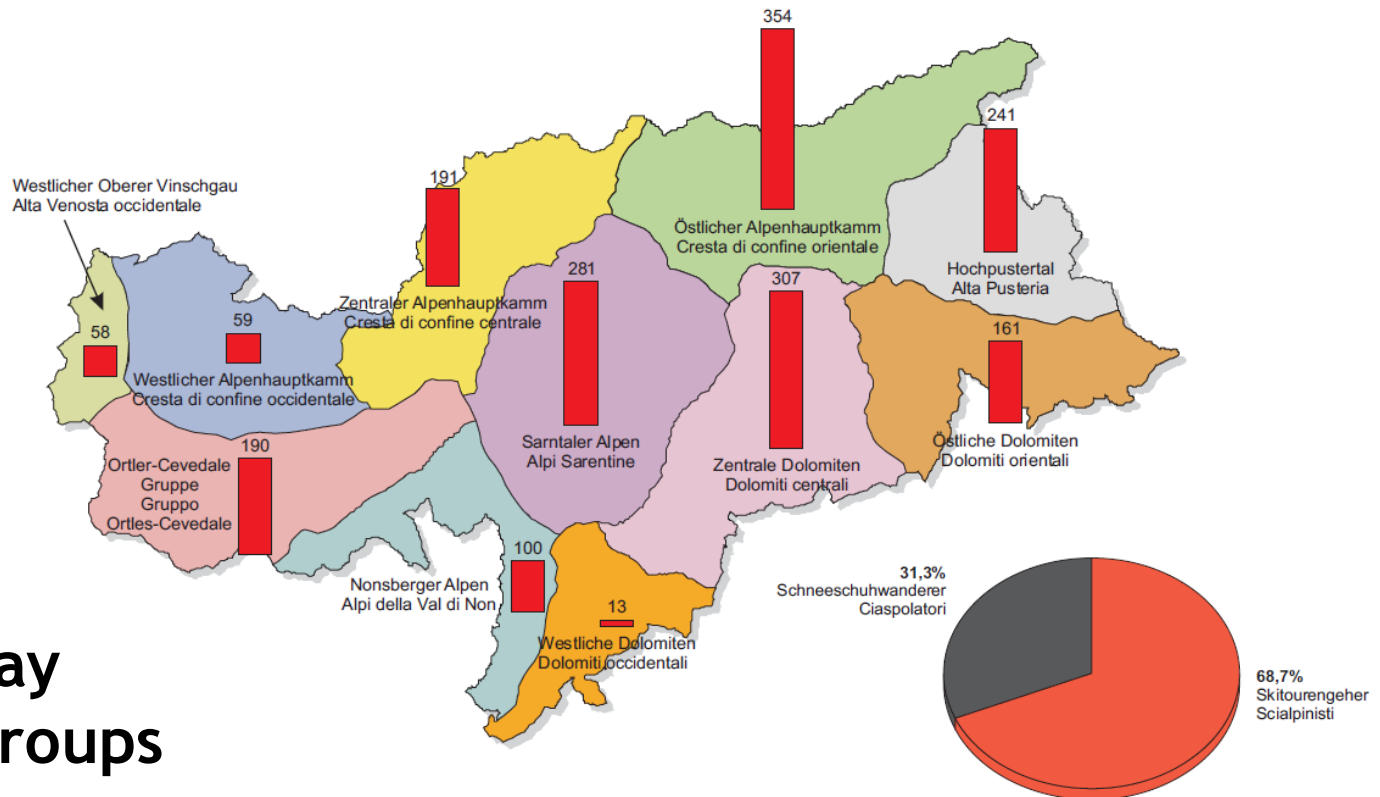
Avalanche Mortality



Avalanche Mortality



Census of backcountry skiing and snowshoeing in South Tyrol



1 day
1955 groups
6010 persons

Epidemiology (II)

Difficult to establish
the real cause of death

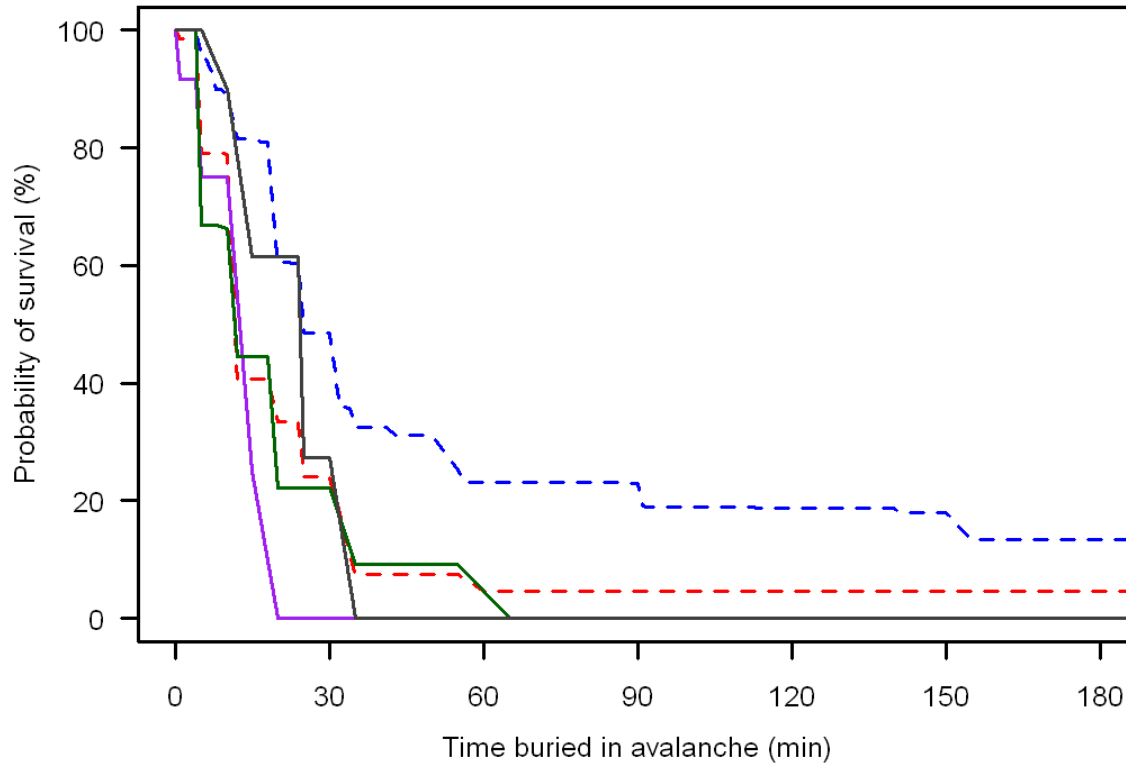


The model of avalanche

Epidemiology (II)

	Trauma	Asphyxia	Hypothermia	Total
Tough 1993¹	1 (6.7%)	14 (93.3%)	0 (0%)	15 (100%)
McIntosh 2007²	3 (5.4%)	53 (94.6%)	0 (0%)	56 (100%)
Hohlrieder 2007³	2 (5.5%)	33 (91.7%)	1 (2.8%)	36 (100%)
Boyd⁴ 2009	48 (24%)	154 (75%)	2 (1%)	204 (100%)
Total	54 (17.3%)	254 (81.7%)	3 (1.0%)	311 (100%)

Avalanche survival patterns Canada vs Switzerland



Epidemiology (II)

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The Triple H Study 2010



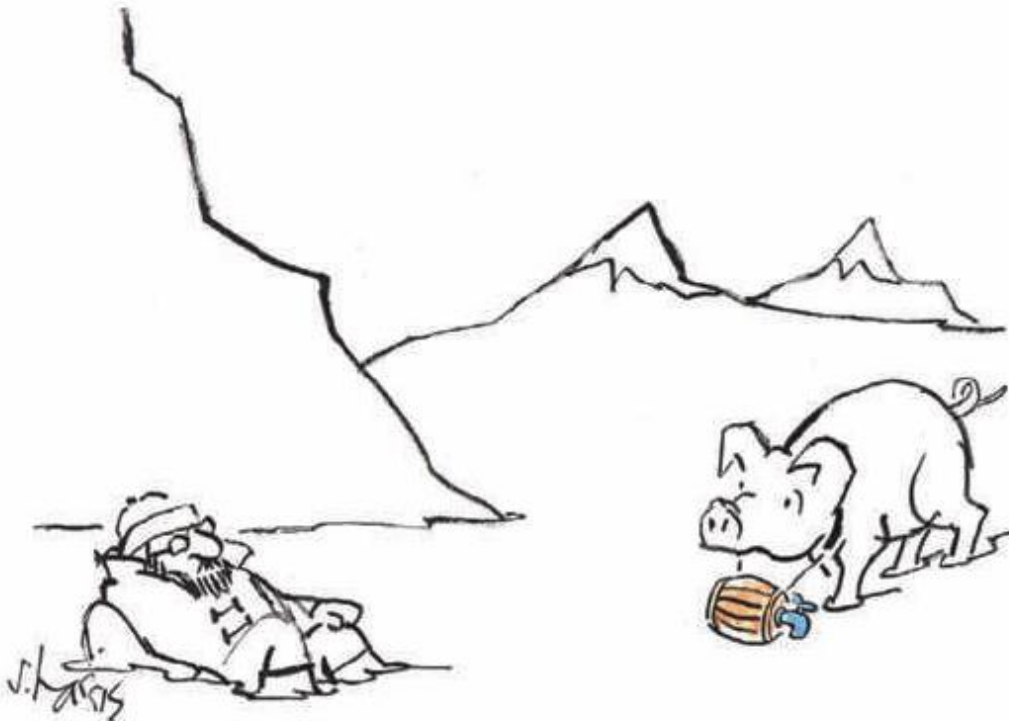
Outcry stopped approved pig study of avalanche survival

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Peter Paal Department of Anesthesiology and Critical Care Medicine, University Hospital Innsbruck, Austria

Markus Falk Inova Q Inc., Brunico, Italy



The Triple H Study 2010

*Oops..
EURAC
scientist!*



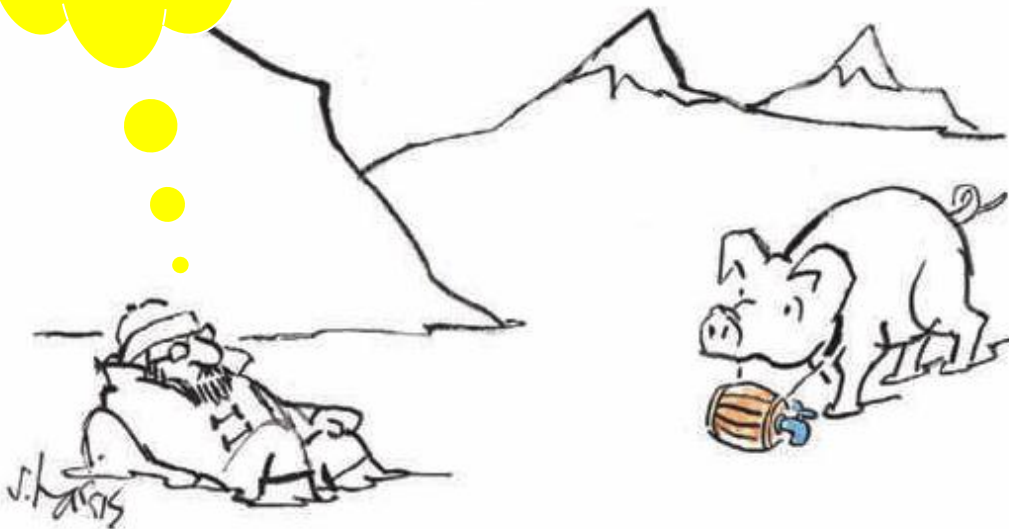
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Epidemiology (II)

Difficult to be measured
out-of hospital



No ideal device

On-site core temperature reading

Only thermistor-based ear thermometer correlate well with oesophageal temperature measurements in a cold environment



On-site core temperature reading

Oesophageal measurement for the
intubated patient

Epitympanic measurement for the
non-intubated patient

On-site core temperature reading “The Double Sensor” for non-invasive measurement

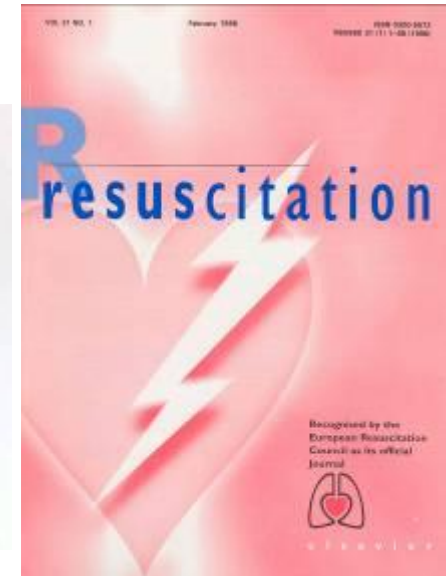
(A)



(B)



AHA & ERC CoSTR Guidelines ILCOR 2010



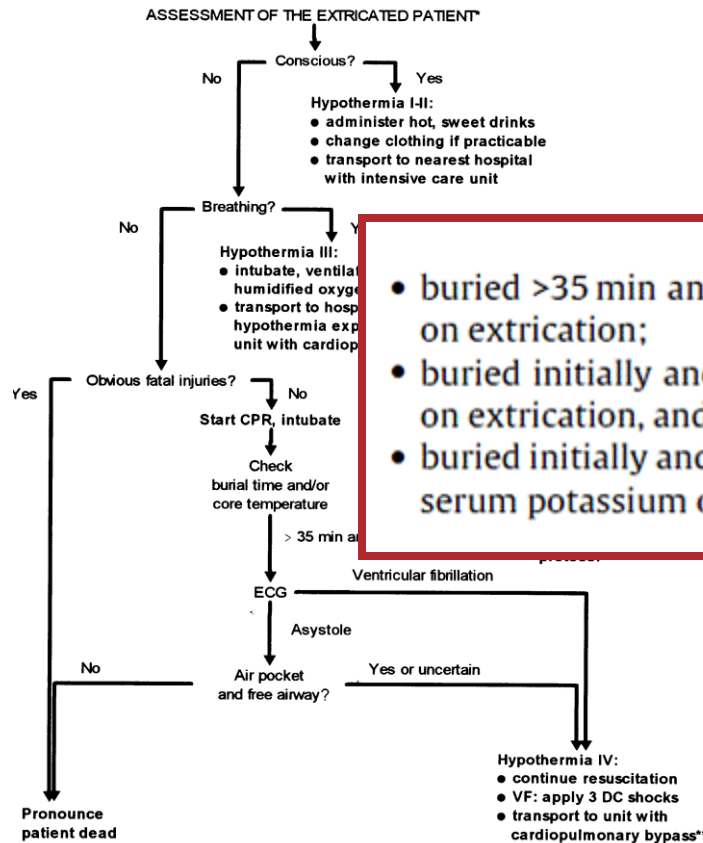
AHA & ERC CoSTR Guidelines ILCOR 2010

In the pre-hospital setting, in patient in cardiac arrest if not:

- lethal injury
- fatal illness
- prolonged asphyxia
- if the chest is incompressible

“no one is dead until warm and dead”

Pre-hospital management of avalanche burial



- buried >35 min and in cardiac arrest with an obstructed airway on extrication;
- buried initially and in cardiac arrest with an obstructed airway on extrication, and an initial core temperature of <math><32^{\circ}</math>;
- buried initially and in cardiac arrest on extrication with an initial serum potassium of >12 mmol.

Frostbite



A controlled Trial of a Prostacyclin and rt-PA in the Treatment of Severe Frostbite

Table 1. Number of Amputated Digits (Fingers or Toes) According to Treatment, Severity of Frostbite, and Time to Treatment.*

Treatment Group	No. of Patients	All Stages of Frostbite		All Stages, ≤12 Hr to Treatment		All Stages, >12 Hr to Treatment		Stage 2		Stage 3		Stage 4 or Higher	
		Digits with Frostbite	Digits Amputated	Digits with Frostbite	Digits Amputated	Digits with Frostbite	Digits Amputated	Digits with Frostbite	Digits Amputated	Digits with Frostbite	Digits Amputated	Digits with Frostbite	Digits Amputated
		<i>no.</i>	<i>no. (%)</i>	<i>no.</i>	<i>no. (%)</i>	<i>no.</i>	<i>no. (%)</i>	<i>no.</i>	<i>no. (%)</i>	<i>no.</i>	<i>no. (%)</i>	<i>no.</i>	<i>no. (%)</i>
All groups	47	407	47 (11.5)	271	13 (4.8)	136	34 (25.0)	155	4 (2.6)	215	31 (14.4)	37	12 (32.4)
Buflomedil	15	106	42 (39.6)	48	11 (22.9)	58	31 (53.4)	31	2 (6.5)	66	31 (47.0)	9	9 (100.0)
Iloprost	16	142	0	79	0	63	0	64	0	75	0	3	0
Iloprost plus rt-PA	16	159	5 (3.1)	144	2 (1.4)	15	3 (20.0)	60	2 (3.3)	74	0	25	3 (12.0)

* Stage 2 frostbite was defined as having at least one digit (finger or toe) with frostbite, with the lesion confined to the distal phalanx; stage 3 as having at least one digit with frostbite, with the lesion extending just past the proximal phalanx; and stage 4 as having at least one digit with frostbite, with the lesion extending proximal to the metacarpal or metatarsal joint.

