The White Death

36th SITEMSH Congress

A.Brunello Kantonspital Graubünden

Intensive Care Unit

M. Kuhnke, Spring Time in Engadin 2017

What you will know in 10’ is…

- **Where and what the KSGR is**
- **What KSGR do for avalanche victims**
- **What the literature say**
- **Conclusions**

Ph. Kastner, with permission


KSGR: Kantonsspital Graubünden
Kantonsspital

KSGR: **K**antons**s**pital **Gr**aubünden

- Tertiary Care Hospital (350 beds) in an alpine area (~17000 emergency admissions/y)
- Level 1 Trauma Centre (~120-130 admission/y with ISS>15, Whole Body CT- Scan)
- Interdisciplinary ICU (11-beds, ~ 1200 admissions/y)



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REVIEW Open Access

Accidental hypothermia–an update

The content of this review is endorsed by the International Commission for Mountain Emergency Medicine (ICAR MEDCOM)

IKAR-Medcom 2012 (Brugger et al.)

Resuscitation 95 (2015) 148–201

Contents lists available at ScienceDirect

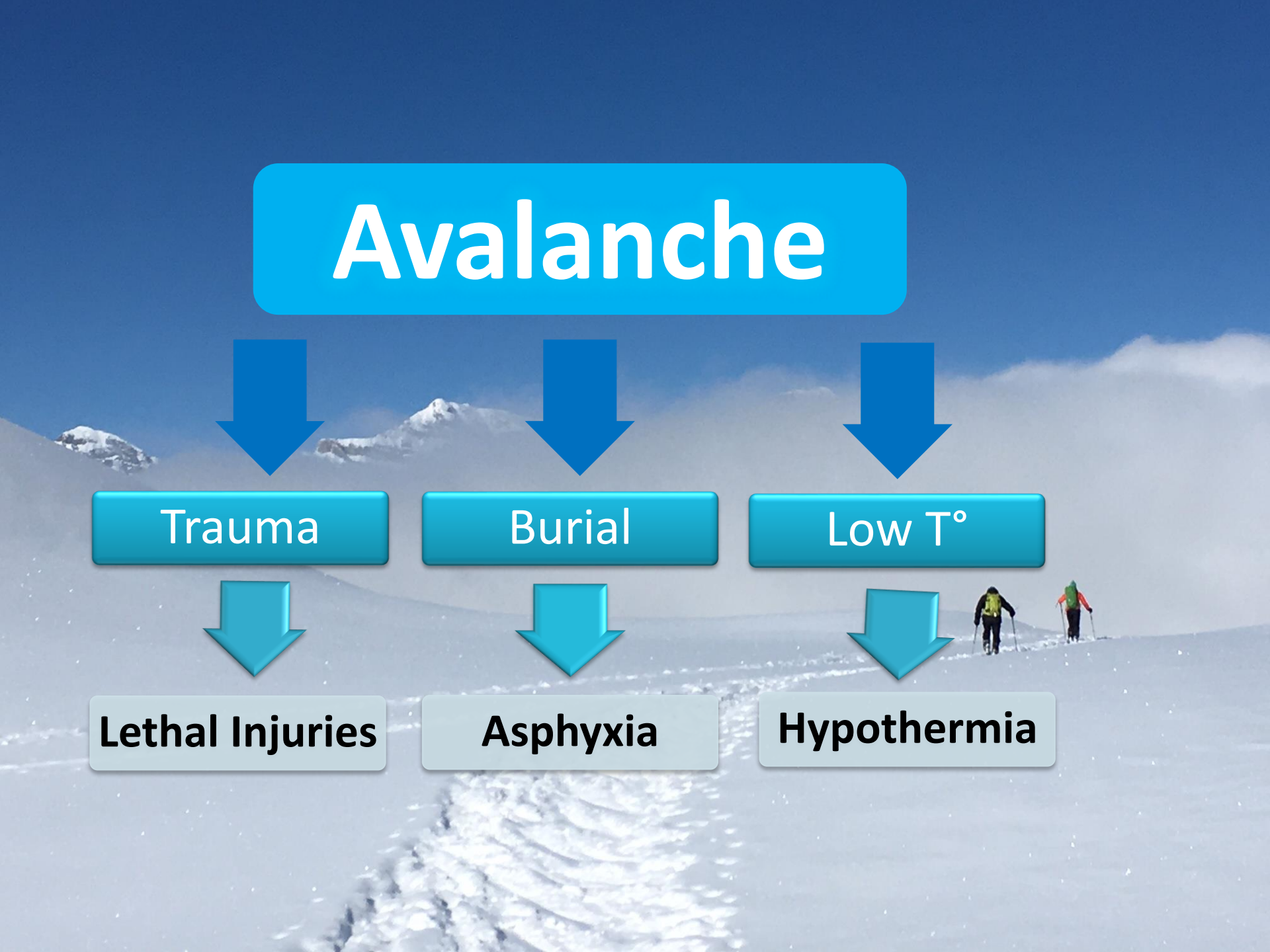
Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

ELSEVIER

EUROPEAN RESUSCITATION COUNCIL

European Resuscitation Council Guidelines for Resuscitation 2015 Section 4. Cardiac arrest in special circumstances


Avalanche
Trauma
Burial
Low T°
Lethal Injuries
Asphyxia
Hypothermia

2012: «The House Recipe»

(Revised in 2017)

Intensive Care Unit, Anaesthesiology and Surgery Departement

Kantonsspital Graubünden

Kantonsspital Graubünden
Departement ANIR
Interdisziplinäre Intensivstation / Anästhesie
Loëstrasse 170
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Kantonsspital Graubünden
Departement Chirurgie
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Behandlungsprotokoll Lawinenopfer

Dr. A. Brunello
OÄ IPS

Dr. M. Bujard
LA-Stv. Anästh.

Dr. Th. Müller
OA Chir.

Dr. Th. Sieber
Dep. Leiter ANIR

Dr. Chr. Sommer
Co-CA Chirurgie

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6.2 Therapie und Überwachung der Hypothermie-Patienten

Stadium	Core T°	Behandlung	Wo
		passive und/oder aktive	Bei T°>34° und keine ngspflichtige en Abteilung sonst IPS
			ion, kardiale ng auf IPS
			(ECMO/ECC) wenn stabilität
			orhythmus

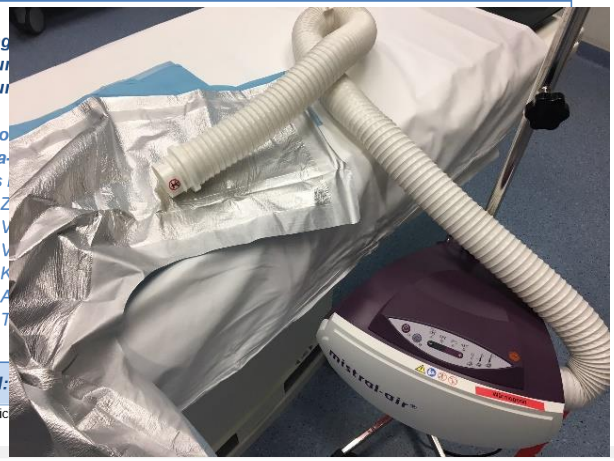
ndet werden um die Effizienz zu

thie begünstigt, scheint gativen Einfluss auf das 1°C führt zu einer erinnungsfaktoren sehr

on bei hypothermen

e-Unfall

- Anmeldung
- Schockraur
- Schockraur
  - Teamvo
  - Trauma
  - Gibt es
    - → Z
    - → V
    - → V K
    - → A
    - → T



Oberstes Ziel:

Checkliste 1 *nach Möglic

Checkliste Vorbereitung Schockraum

- **Pflege-Team:** *Raumtemperatur erhöhen, warme Decken und warme Infusionen im Wärmeschrank überprüfen, Warmluftgebläse vorbereiten und CT Tisch mit*
  at
  e®
  reiten
  IPS konsiliarisch
  hüttung und Befreiung des

ockraum

a KSGR (Evaluation

Röntgen Thorax, Becken,

Ösophagal oder via

hermie")

rad II möglich

Checkliste 3 ROSC= Return of spontaneous Circulation (nach Herzkreislaufstillstand)

Algorithmus CPR bei Lawinenopfer

→ *Tödliche oder lebensbedrohliche Verletzungen:*

ja → **REA-Abbruch**

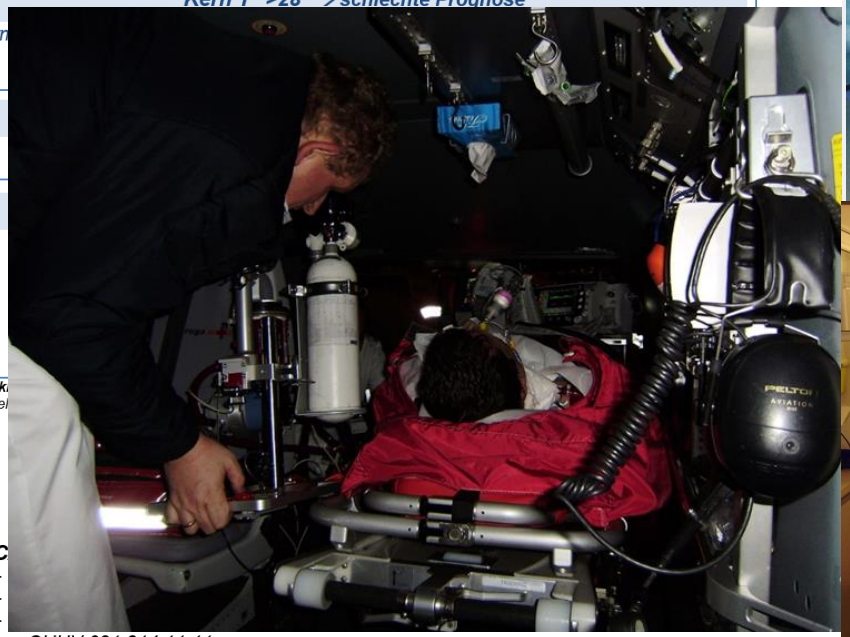
nein

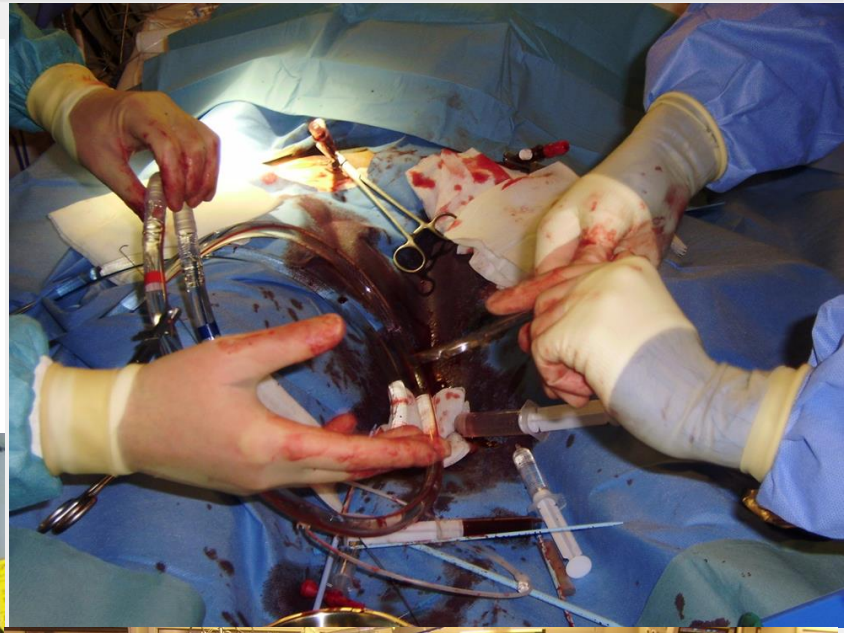
↓

→ *REA bis Kern-T° und Serum-Kalium bekannt*

Kern T° >28° → schlechte Prognose

Warm





Checki
Muskel

ECC

- *CHUV 021 314 11 11*
- *Unispital Genf 022 372 3311*
- *Cardiocentro Lugano 091 805 31 11*
- *Kantonsspital St. Gallen medizinische IPS (nur ECMO, kein ECC) 071 494 11 11*

Beachte: Anschluss an ECMO/Transport muss an **1414** (Rega) gemeldet werden.

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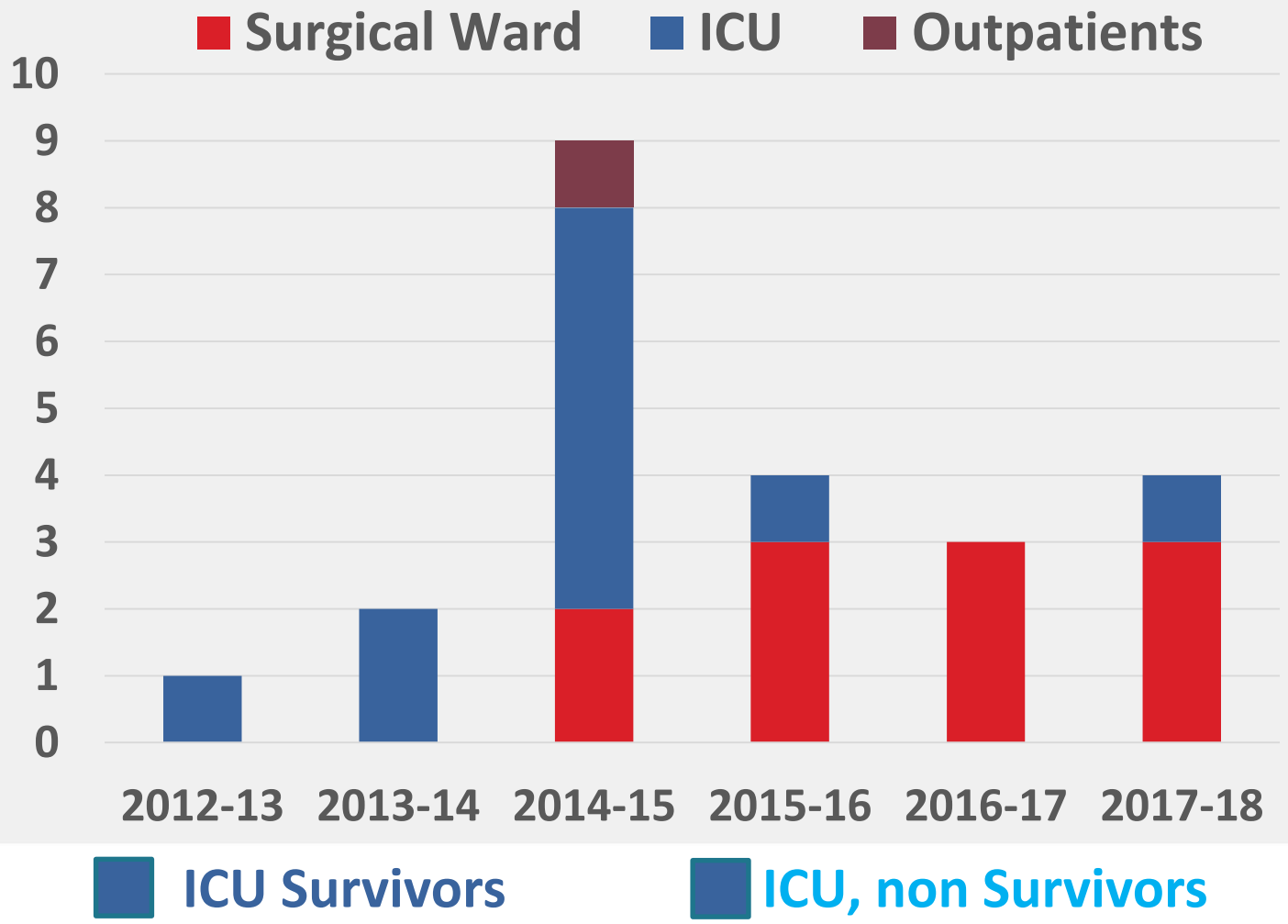
Avalanche Victims 2012-18



Clinical Paper

Kantonsspital Graubünden

Outcome of avalanche victims with out-of-hospital cardiac arrest☆

Q1 Luca Moroder[a], Birgit Mair[a,b], Hermann Brugger[c], Wolfgang Voelckel[b,d], Peter Mair[a,b,*]

[a] Department of Anaesthesiology and Critical Care Medicine, Medical University of Innsbruck, Anichstrasse 35, 6020 Innsbruck, Austria
[b] Christophorus Emergency Medical Helicopter Service, Schubertring 1-3, 1010 Vienna, Austria
[c] Institute of Mountain Emergency Medicine, EURAC Research, Viale Druso 1, 39100 Bolzano, Italy
[d] Department of Anesthesiology and Critical Care Medicine, AUVA Trauma Hospital Salzburg, Dr.-Franz-Rehrl-Platz 4, 5010 Salzburg, Austria

Retrospektive Analyse OHCA 200-2013 Tyrolean Alps, 55 victims; **Resuscitation 2015**

Non-survivors with ROSC after a duration of burial <35 Min

Table 3
Patient characteristics of non-survivors ($n = 4$) with restoration of spontaneous circulation after short duration of burial (up to 35 min).

Patient	Duration of burial (min)	ROSC after	GCS	SBP* (mmHg)	CT* (°C)	pH*	Lactate* (mmol L^{-1})	Total body CT scan*	Outcome	Cause of death
Female, 41 years#	15	ALS	3	90	27	nd	nd	Brain oedema	Died after 5 days	Brain injury
Male, 49 years#	20	ALS	nd	nd	nd	nd	nd	nd	Died after 1 day	Brain injury
Male, 35 years	20	ALS	3	80	25	6.84	14.3	No patho-logical findings	Died after 9 days	Brain injury
Male, 26 years	30	ALS	3	140	30	6.60	21.2	Brain oedema	Died after 7 days**	Brain death

Value of pH and Lactat ?

No victim survived after a duration of burial >35 Min

→ all had pH <7.0 and Lactate >10 mmol/l)

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Non Survivors ICU 2012-18

Age (Year)	Burial Time	CPR (min)	T° (Bladder)	ISS	pH	Lactate mmol/l	Coagulation Disorders
1965	> 35'	20	30.2	38	6.60	13.0	y
1964		15	30.0	38	6.55	17.0	y
1960		7	33.1	34	6.97	13.9	n
1982		17	29.4	41	6.91	13.5	Y
1973*		60	32.5	-	6.59	21.0	y
1941	< 35'	40	30.0	43	7.08	11.0	y

*Potassium > 8 mmol/l

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Clinical paper

Survival after avalanche-induced cardiac arrest☆

Yvonnick Boué[a,b,c], Jean-François Payen[a,b,c], Julien Brun[a], Sébastien Thomas[a], Albrice Levrat[d], Marc Blancher[e], Guillaume Debaty[e], Pierre Bouzat[a,b,c,*]

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[b] *Université Joseph Fourier, Grenoble Institut des Neurosciences, Grenoble F-38043, France*
[c] *INSERM, U836, Grenoble F-38042, France*
[d] *Service réanimation, Centre Hospitalier Région d'Annecy, Metz-Tessy, F-74370, France*
[e] *Service Urgences-SAMU-SMUR, Hopital Michallon, Grenoble F-38043, France*

Retrospective observational Study, OHCA, 1994-2013 Northern French Alps, 48 Patients CA on scene. **Resuscitation 2014**

Normal blood coagulation on admission:
→ favourable Outcome?

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Non Survivors ICU 2012-18

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1941	***< 35'***	*40*	*30.0*	*43*	*7.08*	*11.0*	***y***

*Potassium > 8 mmol/l

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Original Contribution

Serum potassium concentration predicts brain hypoxia on CT after avalanche-induced cardiac arrest

Julien G. Cohen, MD [a], Yvonnick Boué, MD [b], Bastien Boussat, MD [c,d], Emilie Reymond, MD [a], Sylvie Grand, MD [a,e,f], Marc Blancher, MD [g], Gilbert R. Ferretti, MD, PhD [a,f], Pierre Bouzat, MD, PhD [b,e,f,*]

Retrospective study, 2002-2014, French Alps, 19 victims (8 CA, 11 ROSC)

American Journal of Emergency Medicine 2016

Serum Potassium > 4.35 mmol/l

→ Predicts Anoxia in Brain CT Scan

Conclusions

- No ECLS needed in the past 6 years
- Value of potassium to predict outcome?

- Low pH and high lactate are common in non survivors **(Acidosis)**
- Coagulation test to predict outcome? **(Coagulopathy)**

(Lethal Triad of Trauma)

R. Morotti