



THE "SWISS" STAGING SYSTEM

IMPROVING INITIAL HYPOTHERMIA ASSESSMENT

Presentation by Peter Symons EMT-P

Pic by Pete

MY DISCLOSURE

- No financial conflicts of interest
- No known other conflicts of interest
- I am at risk of hypothermia in the recreational environments that I use

WHO I AM

- Peter Symons EMT-P, Alberta, Canada
- Field Medic (R), Jasper and Banff National Parks.
- Mineral Springs Hospital, Banff Alberta Canada
- Instructor ACLS, ACLS-EP, ITLS and WEC
- Northern Alberta Institute of Technology
- WEC Instructor - Rescue Dynamics



OBJECTIVES

- Review of Hypothermia (HT)
- Compare existing HT assessment methods and terminology
- Explain HT assessment using the "Swiss Staging System"
- Explore the advantages of the "Swiss Staging System" in 3 Case reviews



HYPOTHERMIA (HT) DEFINED

- Involuntary drop in core temperature below 35 C (95F)
- Primary Hypothermia
- Secondary Hypothermia



HYPOTHERMIA STATISTICS

- ~Difficult to get world wide consistent statistics
- reporting not mandatory
- Difference between cause and contributing factor
- conflicting Data
- some reports are based on "Excessive Winter Deaths"

HYPOTHERMIA STATISTICS

- ~1500 deaths per year in USA
- Primary or Secondary

Accidental Hypothermia

Douglas J.A. Brown, M.D., Hermann Brugger, M.D., Jeff Boyd, M.B., B.S., and Peter Paal, M.D.

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DOI: 10.1056/NEJMra1114208

HYPOTHERMIA DEATHS PER YEAR

- Primary or Secondary
- UK: ~ 300
- Canada: ~ 8000
- Tokyo: 157 (1974-1983)

<http://bestpractice.bmj.com>

KEY PRINCIPLES

- Getting appropriate treatment is key to survival
- Getting an accurate initial assessment with the Swiss Staging System will help in determining appropriate treatment and transport decisions

Swiss Staging System

TEMPERATURE ESTIMATION TOOL BASED ON S/S

“Hypothermia can be staged clinically on the basis of vital signs with the use of the Swiss staging system of hypothermia (stages HT I to HT IV)¹⁰ (Table 2); this system is favored over traditional staging (mild, moderate, severe, and profound hypothermia) whenever the core temperature cannot be readily measured.”

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HOW DO WE MAKE AN INITIAL ASSESSMENT

- Actual Core Temperature
- Estimate Core Temperature




ESTIMATING THE PATIENT CONDITION

- Descriptive Terminology
- all attempt to give a temperature estimation
- Accurate ?
- Helpful ?

TRADITIONAL ASSESSMENT TERMINOLOGY

STANDARD NAME	TEMP °C	TEMP °F
MILD	35-32	95.0-89.6
MODERATE	32-28	89.6-82.4
SEVERE	< 28	82.4

A COMPARISON CHART OF ASSESSMENT SYSTEMS

Temp (Noted under number) Normal= 37C/98.6F		Swiss Staging System	Sample - EMS Model	AHA - ACLS-EP Based on actual Temp	ERC Based on actual Temp	Cold Water Boot Camp	Wilderness Medical Society	Alaska State Guidelines	
36						Normal	Cold Stressed	Not Hypothermic	
35				Mild					
34		HT-1 Conscious /c Shivering	Mild		HT-1/Mild	Mild	Mild	Mild	
33			Moderate Based on S/S	Moderate					
32	Shivering almost stopped								Shivering
31	Shivering - rare cases	HT-2 Consciousness impaired /s Shivering			HT-2 Moderate	Moderate	Moderate	Moderate	Stopped
30	Increased Risk of VF								
29									
28									
27		HT-3 Unconscious /c s/s of Life			HT-3 Severe		Severe	Severe	
26									
25				Severe					
24									
23									
22									
21									
20	Asystole risk high		Severe Based on S/S						
19						Severe			
18						Term Profound not used but noted if < 25	Severe		
17		HT-4 Unconscious no s/s of Life			HT-4		NB: Term Profound if < 24 advocated by some	Severe (term used twice)	
16								Term Profound not used but noted if < 24	
15	lowest intact survival Infant			Profound Based on actual Temp < 20					
14	13.7 lowest survival-Adult								
13									
12									
11									
10									
9	lowest survival-Therapeutic	HT-5 - DOA			DOA				DOA if K+ >12

Swiss Staging System

TEMPERATURE ESTIMATION BASED ON S/S



ICAR

REC M 0014 E

International Commission for Alpine Rescue

Commission for Mountain Emergency Medicine

**Recommendation REC M 0014 of the Commission for Mountain
Emergency Medicine**

of 1998

The Medical On Site Treatment of Hypothermia

Bruno Durrer, Hermann Brugger, David Syme

Intended for First Responders and Emergency Physicians

SWISS STAGING SYSTEM

SWISS SYSTEM	LOC	SHIVERING	VITALS	°C	°F
HT-1	CONSCIOUS	SHIVERING	PRESENT	35-32	95.0-89.6
HT-2	LOC IMPAIRED	NOT SHIVERING	PRESENT	32-28	89.6-82.4
HT-3	UNCONSCIOUS	NOT SHIVERING	PRESENT	28-24	82.4
HT-4	UNCONSCIOUS	NOT SHIVERING	ABSENT	<24~	<75.2
HT-5	UNCONSCIOUS	CHEST NOT COMPRESSIBLE	ABSENT K >12MMOL/L	<10	<50

SWISS STAGING SYSTEM (UPDATED)

SWISS SYSTEM	LOC	SHIVERING	VITALS	°C	°F
HT-1	CONSCIOUS	SHIVERING	PRESENT	35-32	95.0-89.6
HT-2	LOC IMPAIRED	MAY/MAYNOT BE SHIVERING	PRESENT	32-28	89.6-82.4
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SWISS STAGING SYSTEM

SWISS STAGING	STANDARD NAME	~TEMP C	TEMP F
HT-1	MILD	35-32	95.0-89.6
HT-2	MODERATE	32-28	89.6-82.4
HT-3	SEVERE	28-24	82.4
HT-4	PROFOUND	<24	<75.2
HT-5	DEATH	<10	<50

KEY TEMPERATURES

SWISS STAGING	~TEMP C	NOTES
HT-1	35-32	USUALLY CONSCIOUS AND SHIVERING
HT-2	32-28	BY 32 SHIVERING STOPPED OR ALMOST STOPPED
HT-3	28-24	BELOW 28 RISK OF CARDIAC INSTABILITY INCREASED
HT-4	<24	BELOW 24 VITAL SIGNS ABSENT. LOWEST SURVIVAL OF ACCIDENTAL HT 13.7C
HT-5	<10*	LOWEST SURVIVAL OF INDUCED HT 9C

Assessment Treatment Overview

Accidental Hypothermia

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Table 2. Staging and Management of Accidental Hypothermia.*

Stage	Clinical Symptoms	Typical Core Temperature†	Treatment
HT I	Conscious, shivering	35 to 32°C	Warm environment and clothing, warm sweet drinks, and active movement (if possible)
HT II	Impaired consciousness, not shivering	<32 to 28°C	Cardiac monitoring, minimal and cautious movements to avoid arrhythmias, horizontal position and immobilization, full-body insulation, active external and minimally invasive rewarming techniques (warm environment; chemical, electrical, or forced-air heating packs or blankets; warm parenteral fluids)
HT III	Unconscious, not shivering, vital signs present	<28 to 24°C	HT II management plus airway management as required; ECMO or CPB in cases with cardiac instability that is refractory to medical management
HT IV	No vital signs	<24°C	HT II and III management plus CPR and up to three doses of epinephrine (at an intravenous or intraosseous dose of 1 mg) and defibrillation, with further dosing guided by clinical response; rewarming with ECMO or CPB (if available) or CPR with active external and alternative internal rewarming

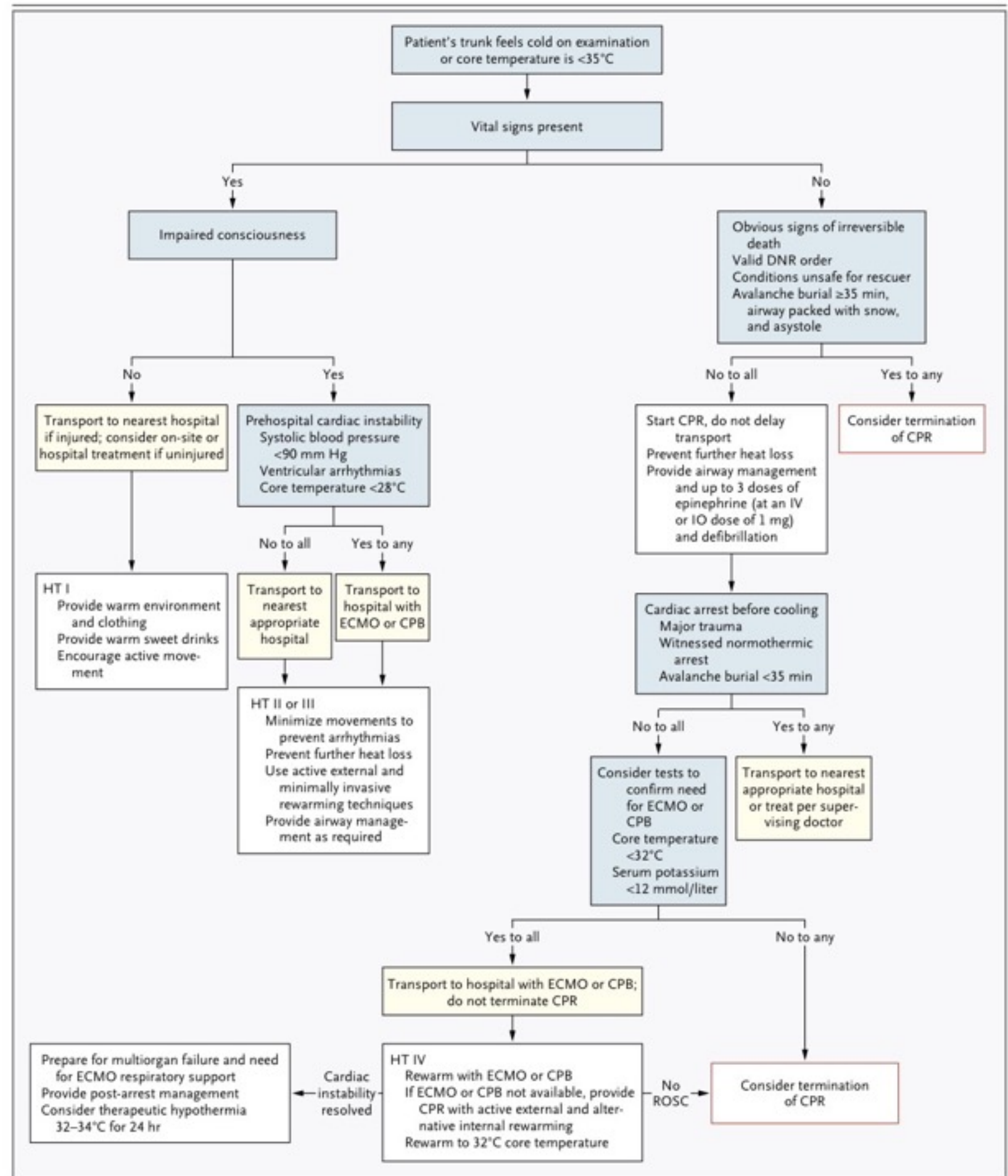
* Hypothermia may be determined clinically on the basis of vital signs with the use of the Swiss staging system.¹⁰ CPB denotes cardiopulmonary bypass, CPR cardiopulmonary resuscitation, and ECMO extracorporeal membrane oxygenation.

† Measurement of body core temperature is helpful but not mandatory. The risk of cardiac arrest increases as the core temperature drops below 32°C and increases substantially if the temperature is less than 28°C.^{12,13} To convert values for temperature to degrees Fahrenheit, multiply by 9/5 and add 32.

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TREATMENT ALGORITHM

- **LOC**
- **A** - Airway
- **B** - Breathing
- **C** - Circulation
- **T** - Treatment
- **T** - Transport
(Nearest Hospital or ECMO/CPB)



THREE CASE STUDIES

- Conscious - Vitals Present -
- Unconscious - Vitals Present
- Unconscious - Vitals Absent



F.A.T.

FIND

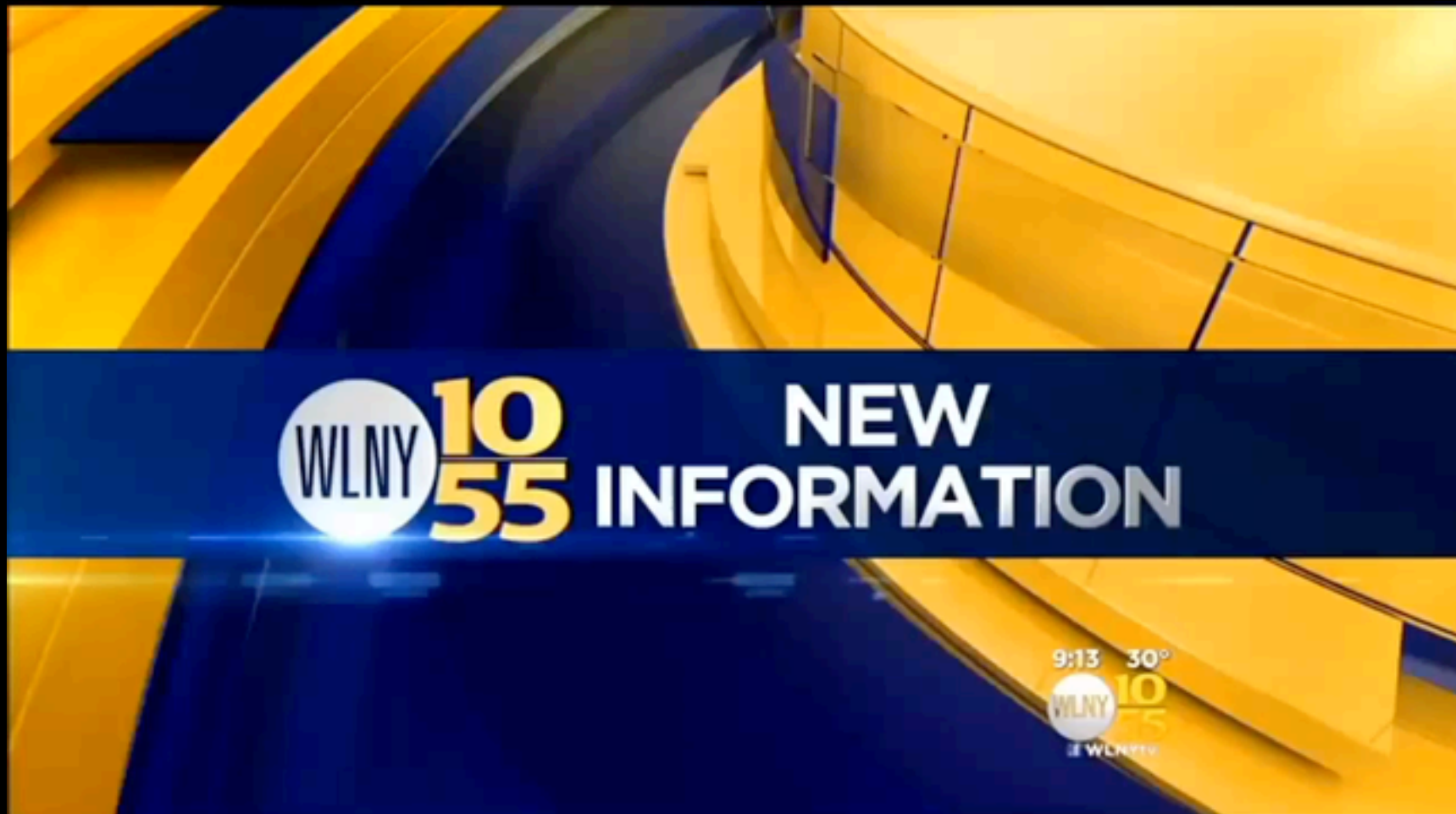
ACCESS

TRIAGE, TREAT, TRANSPORT

- **Step 1...always respond with an appropriate rescue team**



CASE-1, THE "URBAN" AVALANCHE



BURIED IN SNOW/ AVALANCHE

HOW FAST DO WE COOL

- 10C degrees/Hr MAX
- 18F degrees/Hr



PATIENT ASSESSMENT

- Is there Associated Trauma ?
- Is there an Airway Obstruction ?
- Is Hypothermia present ?

WHAT LEVEL OF "HT" ARE THESES KIDS

- **Conscious**
- Burial Time **Long**
- Airway Open & Clear
- **Shivering slightly**
- **Vitals present**
- No Trauma

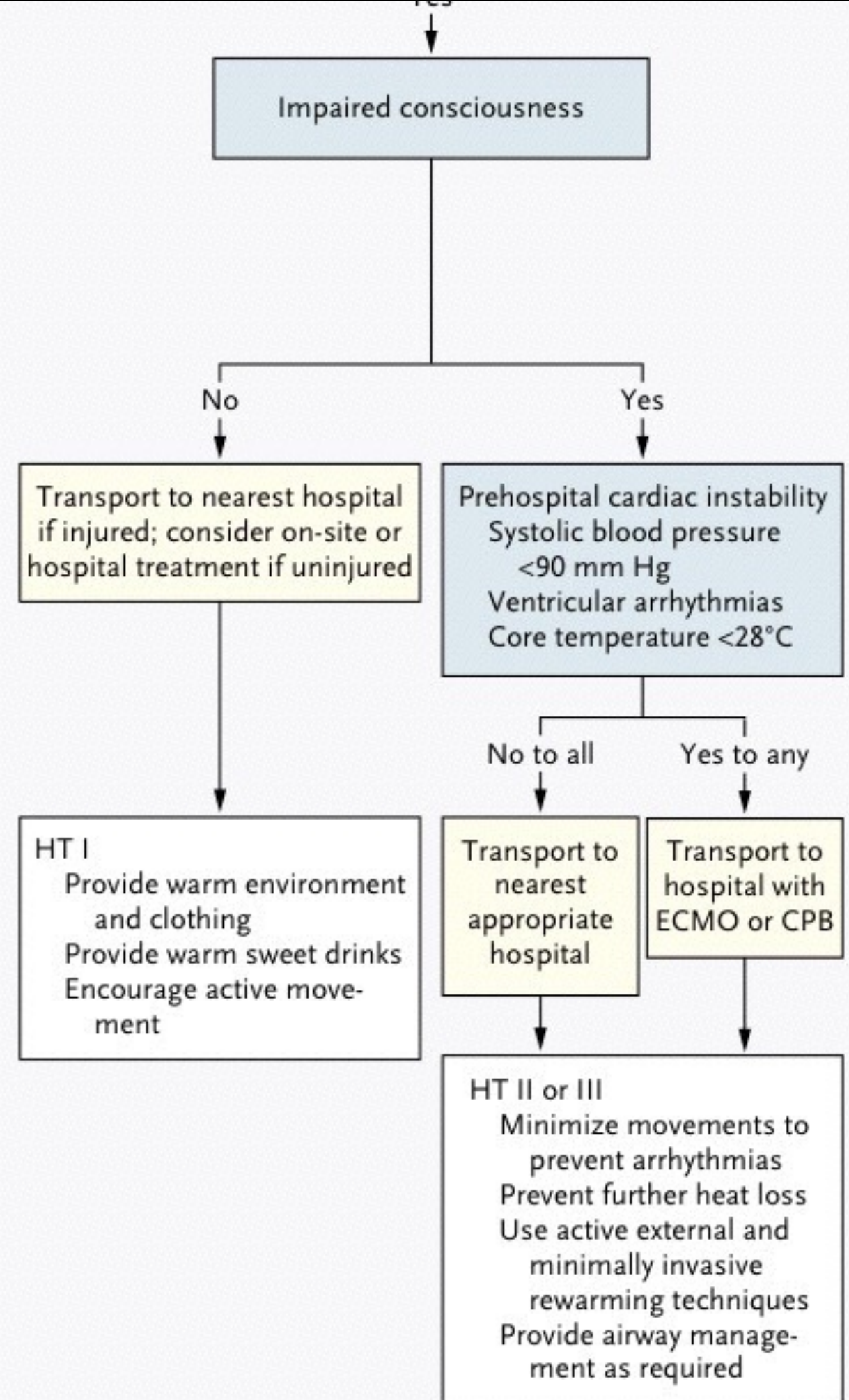
Table. Swiss Staging System of Hypothermia²

Stage	Clinical Findings	Core Temp	Therapy
HT-1	Conscious, shivering	35°C to 32°C	Warm environment, clothing, and liquids
HT-II	Impaired consciousness, not shivering	32°C to 28°C	Cardiac monitoring, full body insulation, and active external and minimally invasive rewarming techniques (eg, heating packs, warm parenteral fluids)
HT-III	Unconscious, but vital signs are present	28°C to 24°C	HT-II plus airway control; if vital signs are unstable, CPB or ECMO
HT-IV	No vital signs		Attempt to restore vital signs with epinephrine, defibrillation, then rewarm with ECMO or CPB

Abbreviations: CPB, cardiopulmonary bypass; ECMO, extracorporeal membrane oxygenation.

HT-1

CONSCIOUS VITAL SIGNS PRESENT



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SHIVERING - IS VERY EFFECTIVE

- IT'sFREE WARMING
- NEW QUESTION: how to manage pain and not effect shivering

Case 2 - Prolonged Cold Exposure

"TINK" NEWMAN



WHAT LEVEL OF "HT" IS CHRISTINA

- **Unconscious**
- **No Movement**
- Airway Open and Clear
- **Vitals Absent**
- **Long** Exposure Time
- No Major Trauma
- Minor Trauma Frostbite
- No obvious S/S of Death

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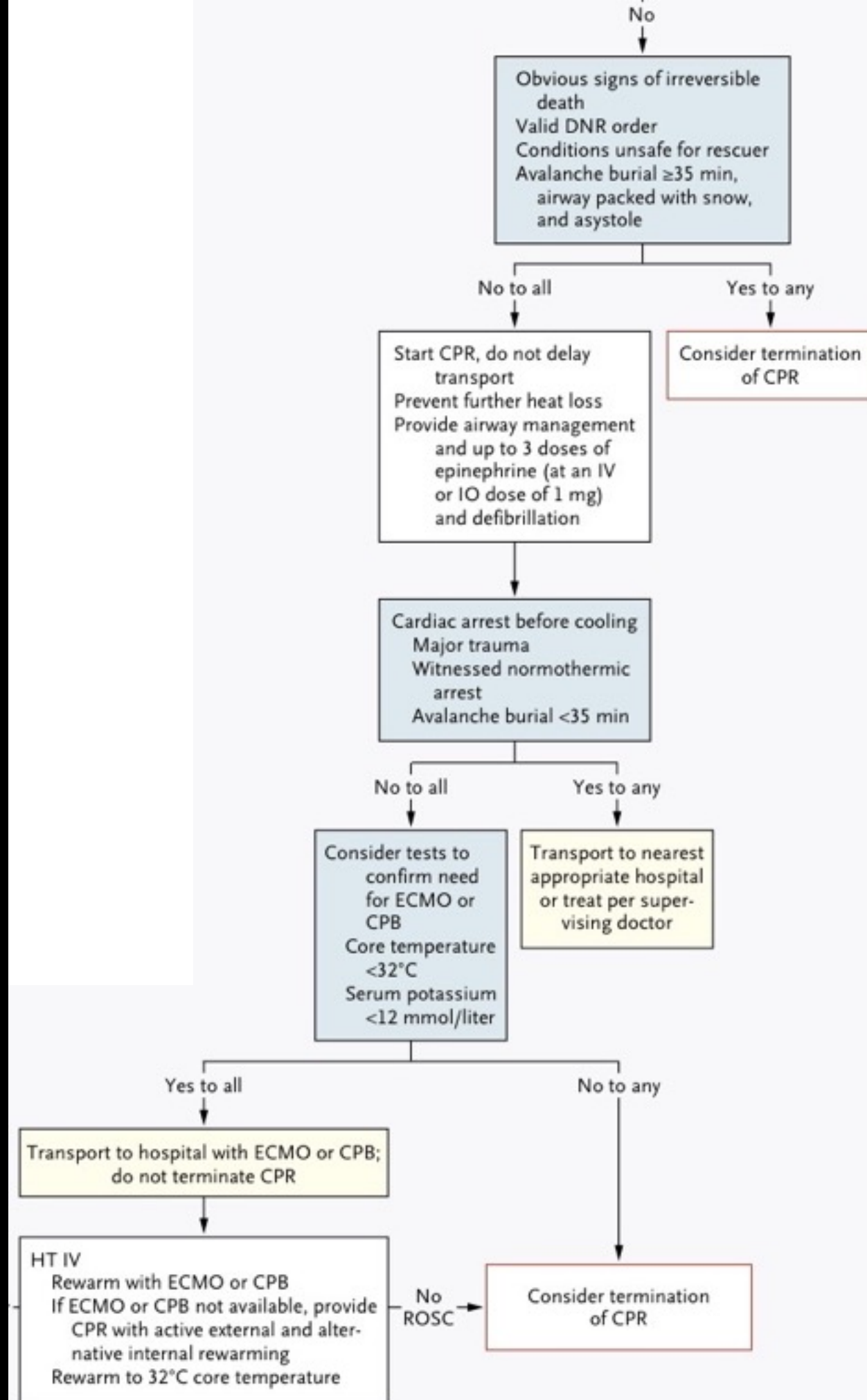
HT-4

UNCONSCIOUS VITAL SIGNS ABSENT

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TO BE...OR NOT TO BE...

- Frozen Solid - chest not compressible
- Obvious major trauma
- $K^+ > 12 \text{ mmol/l}$
- Clear H/x of CA prior to cooling



TRANSPORT AIR OR GROUND

- Transporting the Pulseless HT Patient
- CPR - Considerations
- ACLS - Considerations
- Destination - Decision



CPR, SURVIVAL & TRANSPORTATION

- HQ-CPR Should be started immediately and continued without interruption if safe to do so

HOW LONG CAN WE GO

- Duration of CPR is not a predictor of outcome*

Accidental Hypothermia: Building the Chain of Survival
Dr. Doug Brown, caep 2015 Edmonton

OXYGEN CONSUMPTION

- O₂ consumption reduced by 6% per 1 degree C
- At 28C (82.4F) =
 - Body reduced to 50%
 - Brain reduced to 35%



CPR IS INTERRUPTED !

- Intermittent or delayed CPR
- “Data from surgery during deep hypothermic CA and prehospital case reports underline the feasibility of delayed and intermittent CPR in patients who have arrested due to severe hypothermia”

Resuscitation. 2015 May;90:46-9. doi: 10.1016/j.resuscitation.2015.02.017. Epub 2015 Feb 25.
Delayed and intermittent CPR for severe accidental hypothermia.
Gordon L1, Paal P2, Ellerton JA3, Brugger H4, Peek GJ5, Zafren K6.

WILDERNESS MEDICAL SOCIETY

Guidelines for the Out-of-Hospital Evaluation and Treatment of Accidental Hypothermia: 2014 Update

- “In patients with severe or profound hypothermia, CPR can be delayed (“scoop and run”) and can be given intermittently during evacuation if it is not technically possible or safe to perform continuous CPR (1C). CPR can be given for several hours, if necessary (1B).”

PROPOSED GUIDELINES FOR INTERMITTENT CPR

CORE TEMP	DURATION OF CPR	DURATION OF INTERRUPTION
UNKNOWN HT-3 HT-4	5 MINUTES MINIMUM	5 MINUTES MAXIMUM
28 - 20 (82.4 - 68.0)	5 MINUTES MINIMUM	5 MINUTES MAXIMUM
< 20 (68.0)	5 MINUTES MINIMUM	10 MINUTES MAXIMUM

The study has just been published in the medical journal "Resuscitation" and was conducted by Cumbrian Mountain Rescue doctors, the Glenfield Hospital, Leicester in the UK, EURAC in Italy, the Medical University of Innsbruck in Austria and Stanford University in California, USA.

ACLS Cardiac Arrest Medications

AHA VS ERC

AHA

“It may be reasonable to consider administration of a vasopressor during cardiac arrest according to the standard ACLS algorithm concurrent with rewarming strategies.” (Class IIb, LOE C)

Mike Shuster (he thinks SSS its a good idea.)
He stated ERC did not do a major review of hypothermia in 2015, ERC and AHA now at a major split.

ERC

“Given that defibrillation and adrenaline may induce myocardial injury, it is reasonable to withhold adrenaline, other CPR drugs and shocks until the patient has been warmed to a core temperature $\geq 30^{\circ}\text{C}$. Once 30°C has been reached, the intervals between drug doses should be doubled when compared to normothermia”

ECMO / CPB- Transport Those Who will Benefit

PREVENT OVERUSE

ECMO / CPB



- For Hypothermic CA patients that get ECMO survival is 50%
- For Hypothermic CA patients who don't get ECMO survival is 0% - 37%



Case 3 - Hospital ED



LIFE THREATENING
Hypothermia
EMERGENCY

WHAT LEVEL OF "HT" IS THIS PT.

- **Unconscious**
- **No Movement**
- Airway - On Ventilator
- **Vitals Present**
- Major Trauma Noted

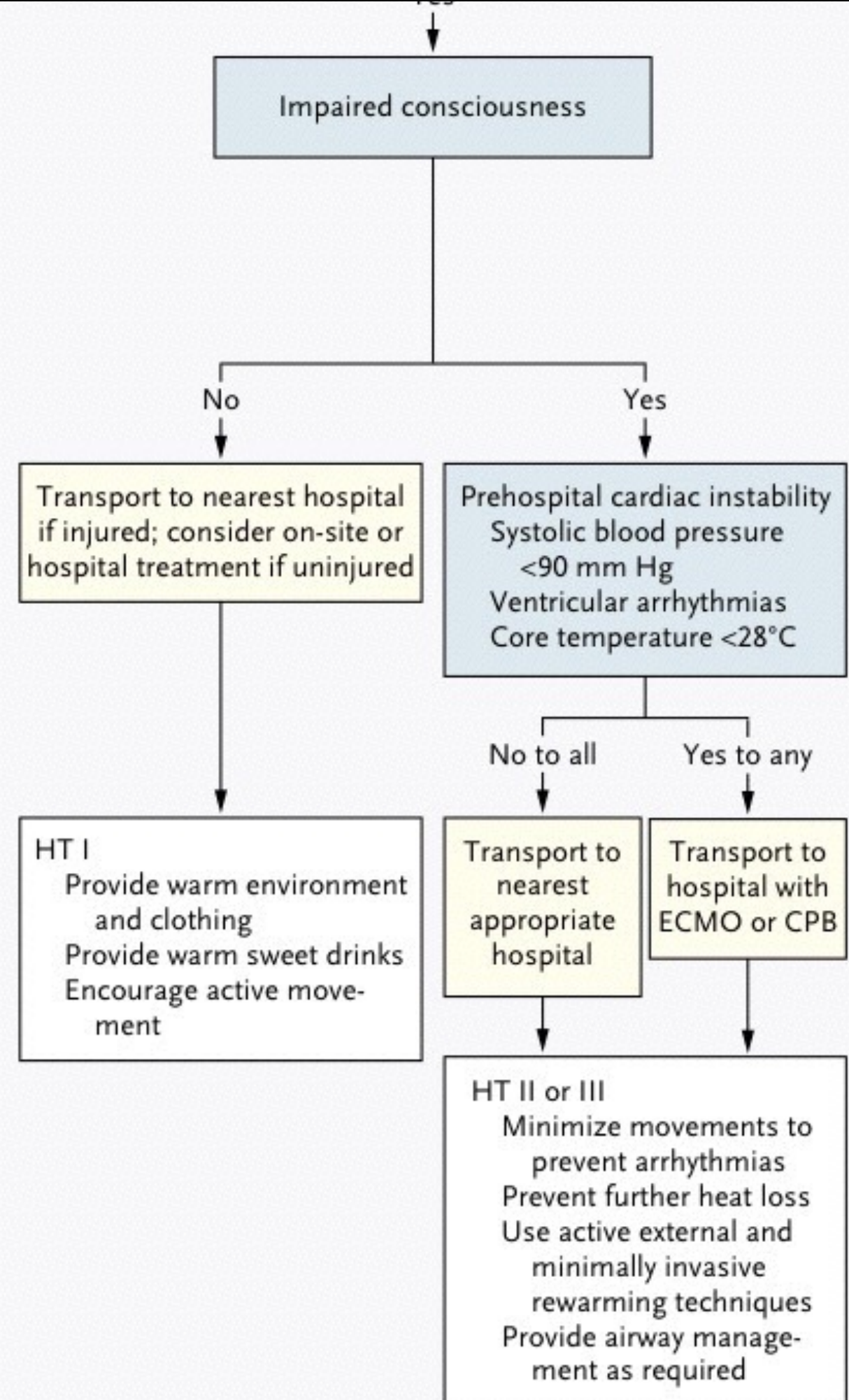
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HT-3

VITAL SIGNS PRESENT



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Accidental Hypothermia & Avalanche Victims

Grand Rounds
June 9, 2016

Dr. Heather White, PGY3
Summarized by Dr. Weersink, PGY1



Hypothermia = core body temp < 35C

Gold standard = esophageal temperature probe
Second best = rectal probe



** At KGH, our std temperature probes do not read < 34C

Pre-hospital

Careful handling! (fragile myocardium)

Start rewarming

ACLS/BLS - check pulse x 60sec

Transport to appropriate center



Swiss Staging System of HT

Core Temp

1	MILD	conscious, shivering	32-35 C
2	MODERATE	altered LOC, no shivering	28-32 C
3	SEVERE	unconscious, no shivering	<28 C
4	PROFOUND	no vital signs	<24 C

SUMMARY

Treatment depends on stage of HT !

HT 1

"Warm them, feed them,
walk them"

HT 2

Active external + min
invasive rewarming

HT 3

Active rewarming +
transport to ECMO
capable center



Atrial irritability is common + resolves with warming
Physiologic bradycardia - NO TV pacing
Cautious use of vasopressors

HT 4

"Not dead until warm + dead"
ACLS algorithm*
+ transport to ECMO/CPB capable center
>> Stop resusc if K+ >12mmol OR if asystole with
core temp >32C

*controversial ACLS:
AHA 2010 - no changes
Brown et al. 2012 - up to 3x
defib + 3x Epi

Invasive rewarming

1. ECMO/CPB is the most effective!
2. Thoracic lavage if no ECMO



Avalanche Victims

Die from trauma, hypoxia, and/or hypothermia

<35min



ACLS/CPR

>35min



+ patent airway



ACLS/CPR
+ ECMO



PETER SYMONS EMT-P ALBERTA, CANADA

QUESTIONS ?



Pic by Peter