

Avalanche Survival After Rescue With the RECCO Rescue System: A Case Report

Giacomo Strapazzon, MD, PhD^{1*}; Katharina Grasegger MD¹;
Emily Procter, MSc¹; Hermann Brugger, MD¹;
Inigo Soteras, MD²

¹Institute of Mountain Emergency Medicine, EURAC Research, Bolzano, Italy;

²Cerdanya Hospital, Puigcerdà, Spain

Disclosure of any financial relationships

I have not had any financial relationship
or conflict of interest to disclose





Avalanche burial

Prognostic factors are severity of injury,
duration of complete burial,
airway patency, core temperature and serum potassium.

Avalanche burial

Prognostic factors are severity of injury,
duration of complete burial,
airway patency, core temperature and serum potassium.

Case Reports

February 2, 2015: 4 skiers outside the secured ski area in Baqueira Beret, Spain triggered an avalanche (60m wide, 80m long, 1m average depth).

2 completely buried.

Ski patrollers arrived quickly (3 min) called by an uninjured companion; they started to search with transceivers and the RECCO detector.



Case Reports

One victim was detected by the RECCO detector and extricated alive, uninjured and conscious after less than 35min (burial depth 1.3 to 1.5m).

Case Reports

Second victim was found by a probing team and extricated alive, conscious, in mild hypothermia and with several contusions after 45 to 50min (burial depth 1.3m).

Case Reports

Neither skier was equipped with standard rescue equipment (avalanche transceiver, shovel and probe).

The signal of the victim found by the RECCO detector came from a mobile phone in his chest pocket.

The RECCO Rescue System

Detector transmits a radar signal on the 800-MHz frequency band that is received by the reflector (and reflect it doubled back).

The detector can identify a signal reflected from several electronic devices such as cell phones, cameras, radios and avalanche transceivers.

Selected cases involving the RECCO Rescue System

<i>Location</i>	<i>Activity</i>	<i>Transceiver</i>	<i>Group size (n)</i>	<i>Completely buried (n)</i>	<i>Burial depth (cm)</i>	<i>Burial duration (min)</i>	<i>Method of localization</i>	<i>Reflector type</i>	<i>Status after extrication</i>
Hinterstein, Germany	Snowshoeing	No	2	1	150	45	RECCO	Camera	Conscious
Val-Frejus, France	Off-piste snowboarding	No	1	1	150	18	RECCO	Walkman	Conscious
La Plagne, France	Off-piste skiing	No	3	1	150	22	RECCO	RECCO reflector	Conscious
St. Moritz, Switzerland	Off-piste skiing	No	2	1	100	30	RECCO	RECCO reflector	Conscious
Valmorel, France	Off-piste skiing	No	2	1	150	20–30	RECCO	RECCO reflector	Slightly responsive
Porté-Puymorens, France	Off-piste skiing	Yes	5	1	20	—	RECCO	RECCO reflector	Conscious
Reutte, Austria	Off-piste skiing	Yes	2	1	150	60	RECCO ^a	Transceiver	Conscious
Tignes, France	Off-piste skiing	No	2	2	150	20	Probe	NA	Conscious
					150	40	RECCO	Electronic device	Cardiac arrest
Speikboden, Italy	Off-piste skiing	No	5	1	50	25–30	RECCO	RECCO reflector	Cardiac arrest
Banff, Canada	Ice climbing	No	2	1	270	6 days	RECCO	Headlamp	Dead
Cervières, France	Snowshoeing	No	2	2	150	1 day	RECCO	RECCO reflector	Dead
					170	2 days	Probe	NA	Dead
Zakopane, Poland	Hiking ^b	No	2	2	100	4 days	RECCO	Mobile phone	Dead
					250	4 days	RECCO	Mobile phone	Dead
Orelle, France	Off-piste skiing	No	4	1	40	13	RECCO	Mobile phone	Unconscious
Baqueira Beret, Spain	Off-piste skiing	No	4	2	130–150	<35	RECCO	Mobile phone	Conscious
					130	45–50	Probe	NA	Conscious

NA, not applicable.

These data were provided by RECCO AB, Sweden.

^a The victim could not be located with the transceiver due to interfering signals from other skiers in the area.

^b No information on whether the victims had snowshoes.

7 of the 14 cases with known duration of Burial were located by RECCO Rescue System within 35 min; 6 of them (86%) presented with vital signs at extrication. In contrast, of the remaining 7 victims only 2 (29%) had vital signs, which reflects the poor survival after 35 min.

Location	Activity	Transceiver	Group size (n)	Completely buried (n)	Burial depth (cm)	Burial duration (min)	Method of localization	Reflector type	Status after extrication
Hinterstein, Germany	Snowshoeing	No	2	1	150	45	RECCO	Camera	Conscious
Val-Frejus, France	Off-piste snowboarding	No	1	1	150	18	RECCO	Walkman	Conscious
La Plagne, France	Off-piste skiing	No	3	1	150	22	RECCO	RECCO reflector	Conscious
St. Moritz, Switzerland	Off-piste skiing	No	2	1	100	30	RECCO	RECCO reflector	Conscious
Valmorel, France	Off-piste skiing	No	2	1	150	20–30	RECCO	RECCO reflector	Slightly responsive
Porté-Puymorens, France	Off-piste skiing	Yes	5	1	20	—	RECCO	RECCO reflector	Conscious
Reutte, Austria	Off-piste skiing	Yes	2	1	150	60	RECCO ^a	Transceiver	Conscious
Tignes, France	Off-piste skiing	No	2	2	150	20	Probe	NA	Conscious
					150	40	RECCO	Electronic device	Cardiac arrest
Speikboden, Italy	Off-piste skiing	No	5	1	50	25–30	RECCO	RECCO reflector	Cardiac arrest
Banff, Canada	Ice climbing	No	2	1	270	6 days	RECCO	Headlamp	Dead
Cervières, France	Snowshoeing	No	2	2	150	1 day	RECCO	RECCO reflector	Dead
					170	2 days	Probe	NA	Dead
Zakopane, Poland	Hiking ^b	No	2	2	100	4 days	RECCO	Mobile phone	Dead
					250	4 days	RECCO	Mobile phone	Dead
Orelle, France	Off-piste skiing	No	4	1	40	13	RECCO	Mobile phone	Unconscious
Baqueira Beret, Spain	Off-piste skiing	No	4	2	130–150	<35	RECCO	Mobile phone	Conscious
					130	45–50	Probe	NA	Conscious

NA, not applicable.

These data were provided by RECCO AB, Sweden.

^a The victim could not be located with the transceiver due to interfering signals from other skiers in the area.

^b No information on whether the victims had snowshoes.

All victims with a short duration of
burial (35 min) were off-piste skiers.

the RECCO Rescue System

Location	Activity	Transceiver	Group size (n)	Completely buried (n)	Burial depth (cm)	Burial duration (min)	Method of localization	Reflector type	Status after extrication
Hinterstein, Germany	Snowshoeing	No	2	1	150	45	RECCO	Camera	Conscious
Val-Frejus, France	Off-piste snowboarding	No	1	1	150	18	RECCO	Walkman	Conscious
La Plagne, France	Off-piste skiing	No	3	1	150	22	RECCO	RECCO reflector	Conscious
St. Moritz, Switzerland	Off-piste skiing	No	2	1	100	30	RECCO	RECCO reflector	Conscious
Valmorel, France	Off-piste skiing	No	2	1	150	20–30	RECCO	RECCO reflector	Slightly responsive
Porté-Puymorens, France	Off-piste skiing	Yes	5	1	20	—	RECCO	RECCO reflector	Conscious
Reutte, Austria	Off-piste skiing	Yes	2	1	150	60	RECCO ^a	Transceiver	Conscious
Tignes, France	Off-piste skiing	No	2	2	150	20	Probe	NA	Conscious
					150	40	RECCO	Electronic device	Cardiac arrest
Speikboden, Italy	Off-piste skiing	No	5	1	50	25–30	RECCO	RECCO reflector	Cardiac arrest
Banff, Canada	Ice climbing	No	2	1	270	6 days	RECCO	Headlamp	Dead
Cervières, France	Snowshoeing	No	2	2	150	1 day	RECCO	RECCO reflector	Dead
					170	2 days	Probe	NA	Dead
Zakopane, Poland	Hiking ^b	No	2	2	100	4 days	RECCO	Mobile phone	Dead
					250	4 days	RECCO	Mobile phone	Dead
Orelle, France	Off-piste skiing	No	4	1	40	13	RECCO	Mobile phone	Unconscious
Baqueira Beret, Spain	Off-piste skiing	No	4	2	130–150	<35	RECCO	Mobile phone	Conscious
					130	45–50	Probe	NA	Conscious

NA, not applicable.

These data were provided by RECCO AB, Sweden.

^a The victim could not be located with the transceiver due to interfering signals from other skiers in the area.

^b No information on whether the victims had snowshoes.

Comments

The vicinity of the accident sites of most of these cases could explain the fast localization and extrication and the high survival rate.



AVALANCHE BULLETIN - SOUTH TYROL

AUTONOME PROVINZ BOZEN - SÜDTIROL

Abteilung 26 - Brand- und Zivilschutz
Amt 26.4 - Hydrographisches Amt
Lawinenwarndienst



PROVINCIA AUTONOMA DI BOLZANO - ALTO ADIGE

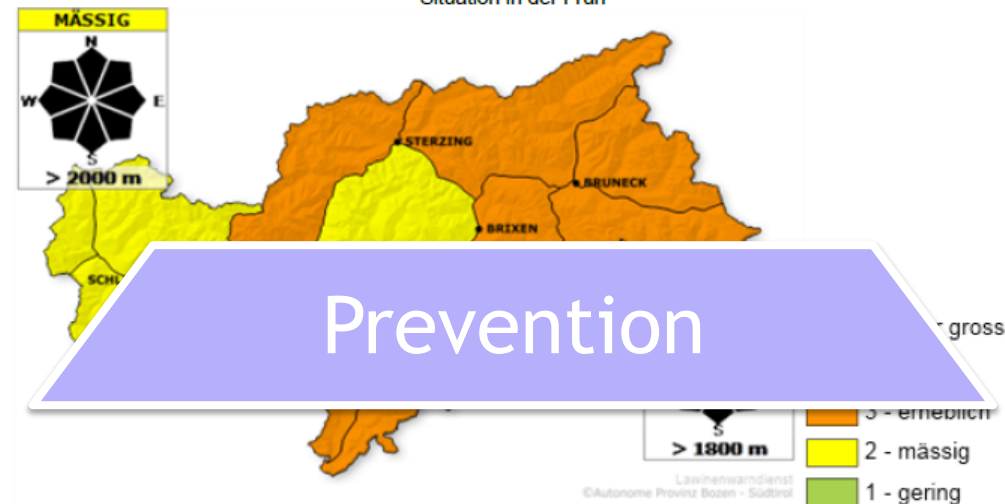
Ripartizione 26 - Protezione antincendi e civile
Ufficio 26.4 - Ufficio idrografico
Servizio prevenzione valanghe

LAWINENLAGEBERICHT Nr. 21 vom Mittwoch 16. Januar 2013

Ausgabezeitpunkt 16.00 Uhr - Gültigkeit 48h

ACHTUNG: NEU- UND TRIEBSCHNEE!

Situation in der Früh



1-WEEK SURVEY, 22 POINTS

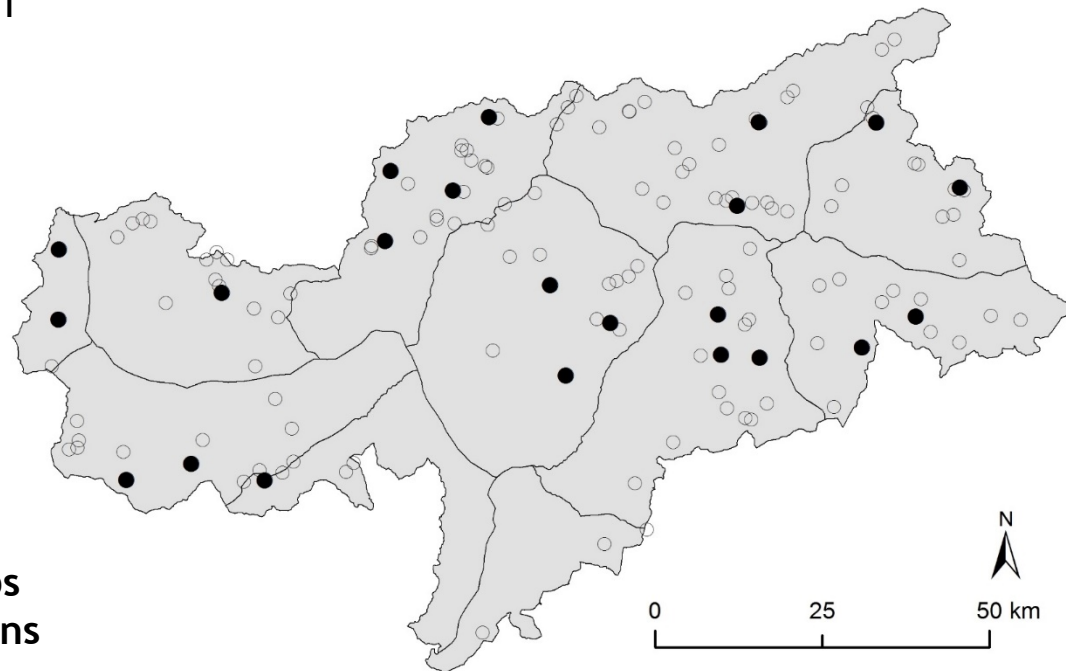
South Tyrol

February 2011

2010

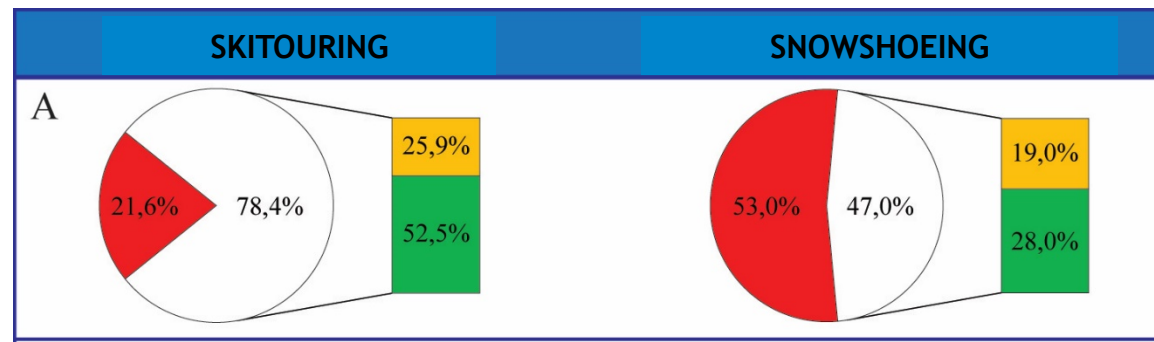
2011

1927 groups
5576 persons



Procter, Strapazzon et al. SJMSS 2013

1-WEEK SURVEY 2011, South Tyrol
n=1927 groups



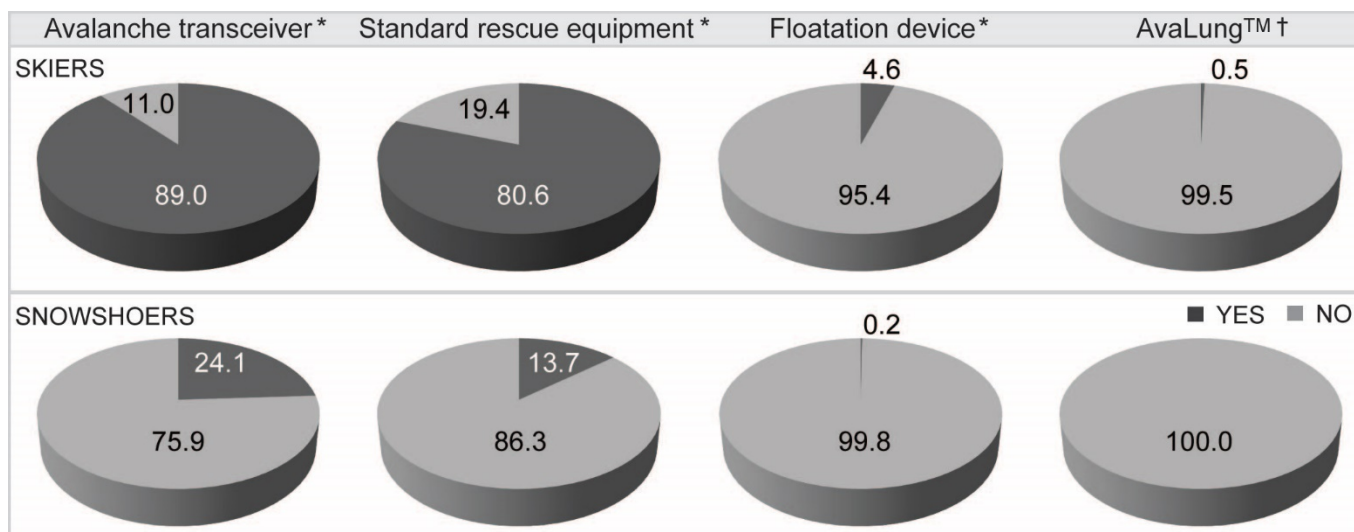
- Avalanche bulletin „correct“
- Avalanche bulletin „not correct“
- Avalanche bulletin not consulted

Procter, Strapazzon et al. SJMSS 2014



SAFETY EQUIPMENT - PREVALENCE

1-WEEK SURVEY 2011, South Tyrol
n=5576



Procter, Strapazzon et al. SJMSS 2014

AVALANCHE FLOATATION DEVICES



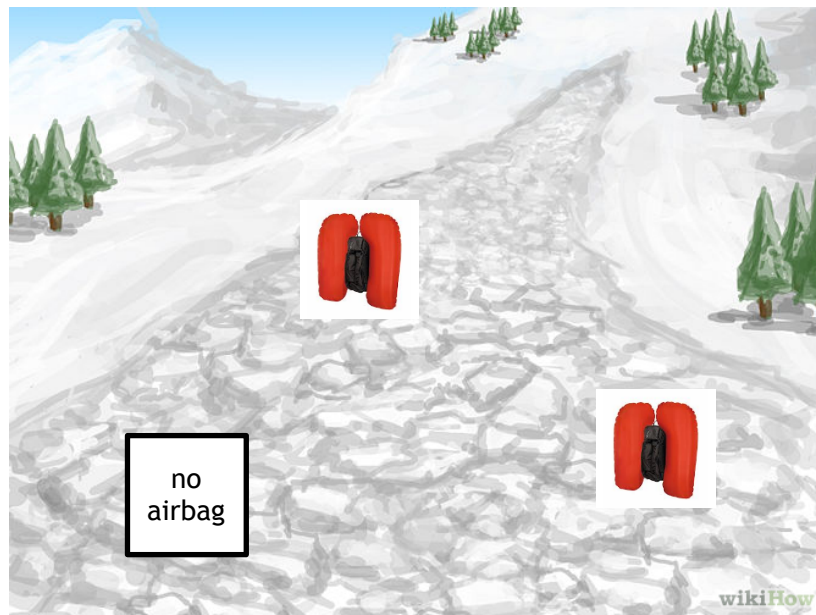
Decrease grade of burial

Statistical evaluation of the effectiveness of airbags

Retrospective

Data sources: Austria, Canada, France, Italy, Norway, Switzerland, USA, others
1994-2012

n=425 victims in n=245 accidents



Effectiveness of airbags on

- **CRITICAL BURIAL**
- **MORTALITY**

Relator's name

Haegeli, Brugger et al. Resuscitation 2014

05.11.16

...and so...
How effective are avalanche airbags?

AIRBAG USERS

+ non-inflated

2.1% + 12.2%

14.3%

AIRBAG NON-USERS

1.5% + 20.6%

22.2%

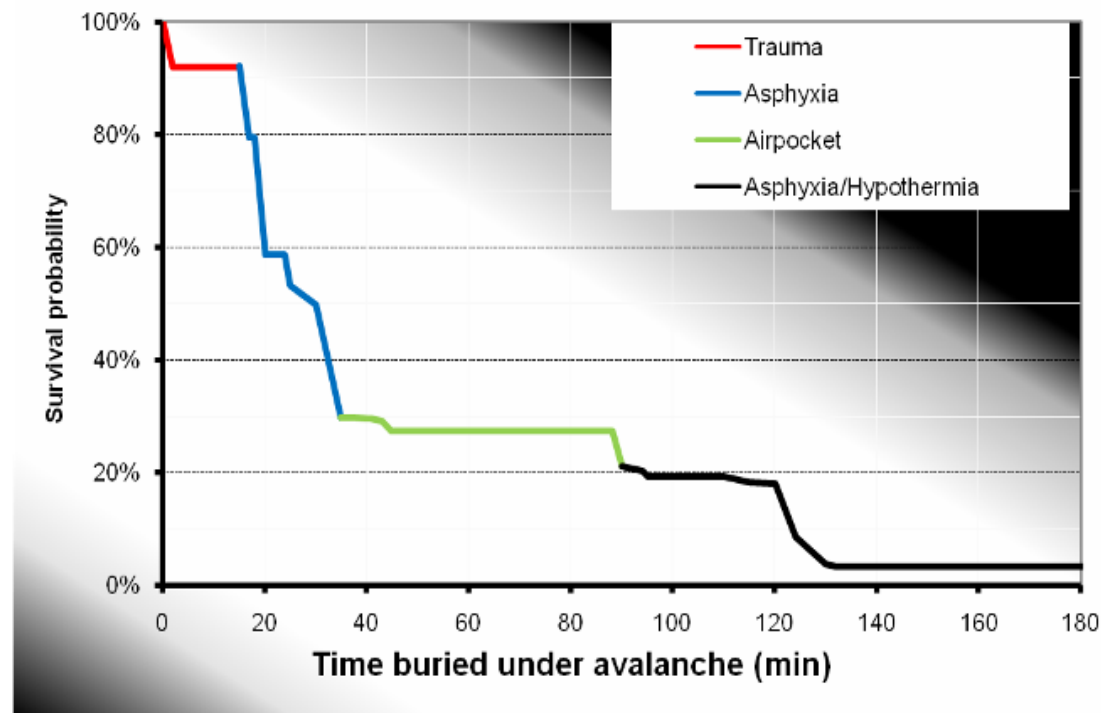
Adjusted
mortality

-8%

(95% CI: -2 to -14%)



Avalanche survival function: a matter of hypoxia, hypercapnia and hypothermia



Falk et al. Nature 1994

Survival rates for totally buried avalanche victims extricated before and after helicopter arrival (n = 56)

Type of rescue	Number of victims	Survival rate
Bystander rescue before helicopter arrival	35	26 (74%)
Organized rescue after helicopter arrival	21	4* (19%)

* Survival significantly lower ($p = 0.0002$) when compared to bystander rescue.



Comments

A systematic data collection of cases rescued with the RECCO Rescue System, or even a comprehensive international avalanche registry, will be needed to estimate its effect on survival.

A high-altitude snowy mountain landscape under a clear blue sky. The scene shows rugged, snow-covered peaks and slopes, with some ski tracks visible. The text is overlaid in a bold, red, serif font.

**Thanks to Bernat Carola
and Bombers GRAE
Generalitat de Catalunya, Spain**

giacomo.strapazzon@eurac.edu