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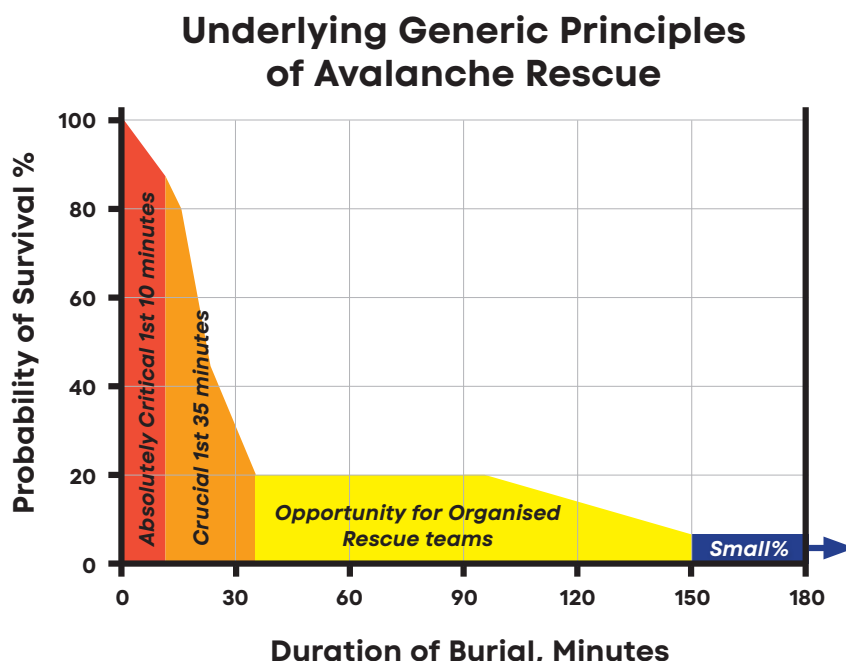
Introduction

These guidelines have been developed as a tool to assist response agencies to readiness plan for an avalanche search and rescue response. They have been designed through consultation with the NZ and international avalanche industry. As these are guidelines they are not prescriptive and represent a flexible approach to readiness planning. This will allow regions to design plans that suit specific circumstances. These are not guidelines to performing avalanche rescue and as such, do not cover technical concepts in detail. SAR managers must recognise that avalanche rescue is a specialist area and the best approach is to engage technical experts in formulating any plans associated with Avalanche Rescue. In order for guidelines to remain current, provision should be given for annual reviews incorporating updates and feedback, where necessary, from the avalanche industry.

Objective

The objective of these guidelines is: To enhance the quality and consistency of avalanche rescue readiness, response and recovery in New Zealand.

Underlying generic principles of avalanche rescue



The survival time chart is indicative of the likely survival probabilities

1st phase – The survival phase. This is the absolutely critical first 10 minutes when most people are still alive. 10 minutes should be the target time that companion rescuers try to achieve.

2nd phase – Asphyxia phase. This is out to 35 minutes where the majority of people who survive the first 10 minutes die from asphyxia. This is caused by a mixture of hypoxia and hypercapnia. This is a crucial phase for companion rescuers as a fast rescue inside this time frame greatly increases survival rates.

3rd phase – The latent phase. People who survived the first 35 minutes tend to survive for a longer period. This period goes to at least 90 minutes post burial and possibly out to 150 minutes. Due to the length of this phase and the environment, mild to severe hypothermia can be expected.

This is the time period when organised rescue teams can still make a significant difference by getting on site fast while the probability of survival is still higher than the small percentage that survive longer term.

4th phase – The final phase. People succumb to hypothermia complicated by hypoxia and hypercapnia (the triple H syndrome). A small percentage of people have survived long term so they should be given the best chance of being found alive by continuing rescue efforts until all hope of finding people have been exhausted.

Source: (Bogie & Hobman, 2012)

Avalanche rescue is time critical

All avalanche rescue readiness guidelines should work to the following generic principles:

- Acknowledging the hierarchy of safety: self, team, bystanders, subjects.
- Avalanche rescue is exceptionally time critical – minutes matter.
- Avalanche Site Command is essential and pre-identified personnel should be transported to site as soon as practicable.
- All efforts must focus on the first response team(s) getting to the site. This includes trained avalanche rescuers and appropriate resources.
- All avalanche burials should be considered medical emergencies and appropriate resources applied as such. Refer to Appendices H, I and J for detailed resuscitation algorithms.
- Effective communications are vital to a successful avalanche rescue.

Development of the readiness guidelines

An effective avalanche rescue readiness guideline should cover the first operational period. The length of the first operational period should be dictated by either the resolution of the situation, or the realisation that the SAR response has exhausted the greatest likelihood of probability of detection and/or survival of the buried subject(s).

Due to the time critical nature of avalanche incidents, the goal in the first operational period should involve full utilisation of the highest probability of detection electronic, visual and physical search methods. Whilst it is important to know how much time has elapsed since burial occurred (T-0), it is also imperative that maximum search effort be expended in the first operational period, regardless of how much time has elapsed since burial. This heightens the chances of survival for buried subjects who have a lower probability of survival as indicated on the survival time chart.

The second and successive operational periods have less urgency. These periods can be dealt with effectively using a conventional SAR Incident Management Team (IMT) operating under the CIMS structure.

Local avalanche readiness plans should be reviewed and/or updated at least annually to ensure currency. Plans should be peer reviewed and fact checked to ensure they are accurate and complete.

Readiness guidelines structure

The structure of your readiness guidelines needs to be simple and succinct as it is designed to be used in a time critical emergency response. It also needs to be designed in such a manner that it can be utilised as a working document to be worked through by potentially unskilled users. Consideration to the generic sections listed in Appendix A should be given. Some of these sections may not be relevant to your region and others not listed may need to be added. Keep the structure simple and to the point.

Vulnerability assessment

Preplanning for SAR purposes is predicated on the 4Rs of emergency management:

The 4Rs of emergency management are [risk] reduction, readiness, response and recovery.

[Risk] Reduction involves identifying and analysing risks to life and property from hazards, taking steps to eliminate those risks if practicable, and, if not, reducing the magnitude of their impact and the likelihood of their occurrence to an acceptable level.

Readiness involves developing operational systems and capabilities before an emergency happens, including self-help and response programmes for the general public and specific programmes for emergency services, lifeline utilities and other agencies.

Response involves actions taken immediately before, during or directly after an emergency to save lives and property, and to help communities recover.

Recovery involves the coordinated efforts and processes used to bring about the short, medium-and long-term holistic regeneration and enhancement of a community following an emergency.

(Reference: CIMS 3rd Edition August 2019)

Organisational and regional response considerations

Successful avalanche rescue depends on a multiple agency response to a single emergency. This therefore relies on each agency or organisation having its own specific avalanche readiness guidelines that dovetails into the overarching incident plan.

Individual operator's avalanche readiness guidelines will have to consider what component of the avalanche response plan caters to the internal needs of the organisation and what is focused on providing a response to an external avalanche incident. Consider under what circumstance and in what capacity could the organisation provide resources and personnel to an external incident.

Within regions, an annual physical meeting should occur involving all SAR agencies and relevant stakeholders. The purpose of this is to ensure all relevant information, particularly in relation to personnel and resources, is accurate and up to date.

Performing an annual regional SAREX provides opportunity for purposes of maintaining inter agency integration, Incident Management Team currency and the refinement of physical avalanche rescue techniques and practices. This would also ensure the pre plan is current and fit for purpose.

Documentation

Avalanche rescue depends on excellent documentation of events and actions starting with the initial callout through to the post incident debriefings. An avalanche rescue plan should facilitate easy, effective and comprehensive documentation of all relevant information.

Communications

Effective communications are essential to any emergency response plan and avalanche rescue is no different. It is vital that a workable communications plan is developed and included in your readiness guidelines. This will involve cell phone numbers, radio channels messaging apps, rescuer callout apps and commercial operators' internal systems

Critical communication elements involve:

- Initial callout phase – A good understanding of getting information to respondents in the most timely manner.
- Incident Management Team to avalanche site communications – Consider all available options for two way communication. Cellphone, radio, satellite calling and messaging.
- Consideration must be given to what challenges might be faced in certain geographic locations and how communications out of and into an avalanche site might be gained as early on as possible in the operation.
- Avalanche site internal communications – A tested system of compatible inter agency communications systems needs to be implemented.
- It is imperative that quick and accurate information gets to and from the coordinating authority regarding avalanche incidents.
- Rescue coordination centre will be the initial coordinating authority in the event of a locator beacon or satellite messaging device activation. It may be difficult to get good initial information as a result of this means of activation.
- Police will be the coordinating authority in the event of a call to 111 from a party in distress. Comprehensive information gathering by call takers will expedite an appropriate time critical response.
- Since Ambulance may be the service requested by an informant, communication with ambulance call centres must be considered within the context of an avalanche response plan.
- Consider what communications means may be available. This includes, but is not limited to: Radio, Satellite Phone, Cell Phone, E-mail, Telephone, online meeting tools.
- Good communications are required before, during and after avalanche search and rescues. Evaluate and plan for as many options and eventualities as possible in order to be more resilient in the event of failure of one or more type.

Public information

Avalanche rescues are newsworthy events and very soon after launching an operation of this nature it should be expected that media will be seeking information from your IMT. The readiness guidelines should provide for this and in larger events it may become necessary to designate a media liaison role within the IMT. All media enquiries should be directed to the coordinating authority who can utilise national media channels to keep the IMT free of this distraction.

Key contacts

As mentioned above, avalanche rescue depends on excellent cooperation between coordinating authorities, commercial operators, LandSAR, AREC, land owners and other organisations. All key contact points for your local agencies need to be listed in a table in the readiness guidelines.

Phone numbers, personnel and radio frequencies need to be updated pre-winter each year to ensure the plan is current. Contacts can be divided up into groups according to the role they are likely to play in an avalanche rescue i.e. Avalanche Site Commander, Team Leader, Incident Management Team.

Agency resources

Each organisation or agency in your region will have different resources and equipment available for avalanche rescue operations. All these resources should be listed in a table for each operator/agency and details should include; resource/quantity/location/contact details.

Risk management

Any avalanche rescue operation will involve risks from various hazards including but not limited to avalanches, exposure, weather events and alpine conditions. A strategy for managing the health and safety of all personnel involved must be in place and summarised in your readiness guidelines.

Considerations include

Leadership – Ensure appropriately qualified and capable people are assuming lead roles.

Training – Ensure rescue personnel have the appropriate level of skill and understanding for what they are being tasked with.

Resourcing – Ensure rescue personnel are adequately provisioned with clothing, personal safety devices, equipment, food and communications whilst on an avalanche site.

Culture – A safety positive attitude incorporating thorough briefings, clear taskings and a 'speak up' culture.

Personnel must be accounted for at all times during an operation. This is part of the Avalanche Site Commanders role and should be duplicated in the Incident Management Team. Part of the recovery phase of an avalanche rescue should include consideration of psychological support following current good practice for those involved in the operation.

Deployment – determining benefit versus risk

This will likely be one of the more important risk management strategies available to teams. All avalanche rescue readiness guidelines must have provision for the assessment of conditions on site and a “No Go” decision by the Incident Controller/Avalanche Site Commander.

Consider the use of a decision support tool for organised avalanche rescue, such as AvaSAR, (Appendix D) to determine an appropriate search strategy commensurate with the level of acceptable risk.

Memoranda of Understandings that are required to allow agencies other than the Police to initiate helicopter callouts should be developed regionally between the Police and relevant agencies.

Avalanche specialists may be required to gather more information prior to sending personnel into the field. As always, the avalanche hazard needs to be constantly assessed to ensure that changes are made clear to the Incident Controller/Incident Management Team and appropriate actions taken.

Avalanche risk

Avalanche risk can be managed by managing the components that make it up; vulnerability, exposure and hazard. In readiness planning for avalanche rescue it is vital that efforts are made to reduce all three of these components of risk at all times possible.

Avalanche Hazard can be reduced through active (explosives etc.) or passive (waiting) avalanche control. Exposure can be reduced by ensuring the safest route to and from the site is identified and used by personnel, managing how many people and resources are placed on the site and for how long and using helicopter search techniques as examples. Vulnerability can be reduced by equipping field personnel with appropriate equipment, training and leadership.

Avalanche search and rescue training

Regular training is critical to successful avalanche rescue as with all other forms of rescue

Avalanche rescue is a specialist skill, therefore it is imperative that rescuers are familiar with, have readily available access to or can be led by people competent in the most current avalanche rescue techniques and patient resuscitation techniques

Rescuers should be training to the standard indicated in the MountainSafety.info rescue literature. This comprises the accepted international evidence based practice in avalanche rescue techniques and patient management.

CIMS roles for avalanche SAR

All avalanche rescues and rescue readiness plans should be managed using the New Zealand Coordinated Incident Management System (CIMS). Apart from the normal roles usually encountered in a SAROP there are some specialist roles required that are unique to Avalanche SAR. These are explained below and need to be included in your readiness plan so that all avalanche readiness plans are using the same terminology.

Avalanche Site Commander (ASC)

The ASC is responsible for overall site operations including safety, search techniques and application of resources on hand to the site and should be at least Avalanche Risk Management Level 6 qualified (or overseas equivalent) or in direct contact with someone who is. The first trained rescuer on site is, by default, considered the ASC until he or she can be replaced by a more suitably qualified person. Alternatively, the initial ASC may remain in that role and delegate other tasks such as searching to other rescuers as they arrive at site. The ASC reports directly to the Operations Manager. Transition of leadership should ultimately be determined by the coordinating authority.

Safety officer

The appointment of a safety officer is an important role, however not always immediately indicated. In a small party rescue, safety is everyone's concern and responsibility. As the structure of a rescue grows, it will become important for an experienced avalanche specialist to be nominated "Safety Officer" by the Incident Controller. This role involves overseeing all aspects of the rescue to ensure any unsafe acts or conditions are rectified as soon as possible. The Safety Officer usually reports back to the ASC or IC directly.

Overview of leadership tasks in organised avalanche rescue operations

The following list, derived from the MountainSafety.info international knowledge base, represents a chronological overview of what tasks should be considered:

- Assess and evaluate accident situation
- Hazard management and risk management
- Determine risk / benefit
- Define search and rescue strategy
- Allocate individual task based on availability of resources, requirements, extent and complexity of the rescue operation
- Request and manage resources
- Assign location and organisational unit-specific leadership tasks based on extent of the accident site, complexity of the rescue operation and workload
- Appoint assistant(s) based on the availability of resources, requirements, extent and complexity of the rescue operation:
 - Leadership assistance and delegation of tasks
 - Documentation
 - Media and public relations
- Liaison with rescue base, rescue coordination centre, Police and / or other relevant Government agencies
- Debrief

In a Leadership position, you may initially perform search and rescue tasks, unless efficiency requires a dedicated leader role from the beginning.

As the number of rescuers, number of responding agencies involved, and complexity of the operation increases, a Leader must focus on Leadership and begin to delegate tasks.

The Leader forms an overview of the accident situation and the rescue operation based on a continuous gathering of acquired information and evaluation of the overall situation.

(Reference: Mountainsafety.info)

These tasks may be occurring concurrently with an organisations reflex tasking response.

Conclusion

These guidelines are not intended to be prescriptive instructions on how to perform avalanche search and rescue. They are designed as a living document to be used as a guideline for readiness planning in avalanche search and rescue and thus should strive to meet or exceed current industry best practice both nationally and internationally. This can only be achieved through ongoing input from the avalanche and search and rescue industries in this country and internationally. For some SAR teams, outdoor activity operators and regions the systems listed in these guidelines will already be in place and for others there may be some concepts that are new and or not applicable. Take what you can from this and use this as a tool each year when reviewing readiness plans. If there are things that need to be changed in this document and or avalanche search and rescue in NZ, the responsibility lies with those that discover this to communicate with the rest of the industry.

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New Zealand Avalanche advisory: www.avalanche.net.nz

Appendix A

Avalanche Rescue Readiness Elements

Listed here are key elements of an avalanche rescue readiness plan.

Using the information provided above and local avalanche practitioners in your area, formulate or check your existing readiness plan against these points to ensure they are considered.

Vulnerability assessment	Assess the need for avalanche rescue in region and identify the most likely scenarios. There may be 2 or 3 key scenarios that need to be planned for. See Appendix B for Avalanche Rescue Vulnerability Assessment sheet example.
Response area	Identify the region or geographical limits of the response area the plan covers.
Documentation	Consider how the initial call shall be received and documented. See Appendix C, initial information summary sheet example. A log sheet should be provided for recording actions that have been undertaken throughout the operation. It is also vital that all personnel involved are logged into and out of the field. See Appendix F, Log sheet example.
Decision support	Consider the application of an avalanche search and rescue decision support tool, such as AvaSAR; see appendix D.
Resources and contacts	Identify the resources that are available to respond to an avalanche rescue – e.g. human, equipment and transport. See appendix E, avalanche rescue resource list example.
Key reflex tasking points	Outline key reflex tasking points to be performed as quickly as possible by initial point of contact. <ul style="list-style-type: none"> · Gathering relevant information from informants. · First response team to site to make appraisal of situation, including risk elements, to provide the Incident Management Team with relevant information · Notification to other response agencies and organisations · Appraisal and deployment of available and suitable transport operations. Consideration must also be given to changing weather and exfil options. · Mobilisation of advanced life support resources; air ambulance helicopter, Doctor, St John paramedics.
Incident management structure	A typical example of the likely incident management structure can be included as a prompt to get the initial operational structure defined. Refer to <i>CIMS Incident, local and regional</i> level response management structure examples.
Communications plan	A comprehensive communications plan needs to be created and included in the plan. See Appendix G, Communications plan example
Ongoing response	Consideration should be given to events that become protracted in nature, specifically involving plans for the provision of catering, lighting, transport, media liason and substitute rescuers / incident management team members
Recovery plan	Demobilising phase, what sort of debriefs and psychological support are needed, what needs improving in the readiness plan, what equipment didn't work or was unserviceable.
Interagency links	Memoranda of Understandings that are required to allow agencies other than the Police to initiate helicopter callouts should be developed regionally between the Police and relevant agencies.
Verification of death	Verification / determination of death, where indicated, should be in accordance to New Zealand law, i.e. by authorised health care practitioners and in accordance with current good practice ICAR 2020 see reference

Appendix B

Avalanche Rescue Vulnerability Assessment

1. What incidents have happened in the past?

2. What incidents are happening currently?

3. What are the trends likely to be in the future?

4. How are avalanche incidents likely to be notified?

6. List the resources that are nearby that will be of use in the event of an avalanche rescue

Appendix C

Example of Initial Information Summary

Record information below then phone:

1. Helicopter operator
2. **Police 111**

Your name	
Your contact phone number	
Your location	
Time of avalanche	
Estimated number of people hurt	
Physical location of avalanche	

Lat/long of avalanche (if available)	
Size of debris (width, length, depth)	
Wearing transceivers (all, some, none)	
How many rescuers on site	

Do they have communications (record contact numbers)	Name	Phone

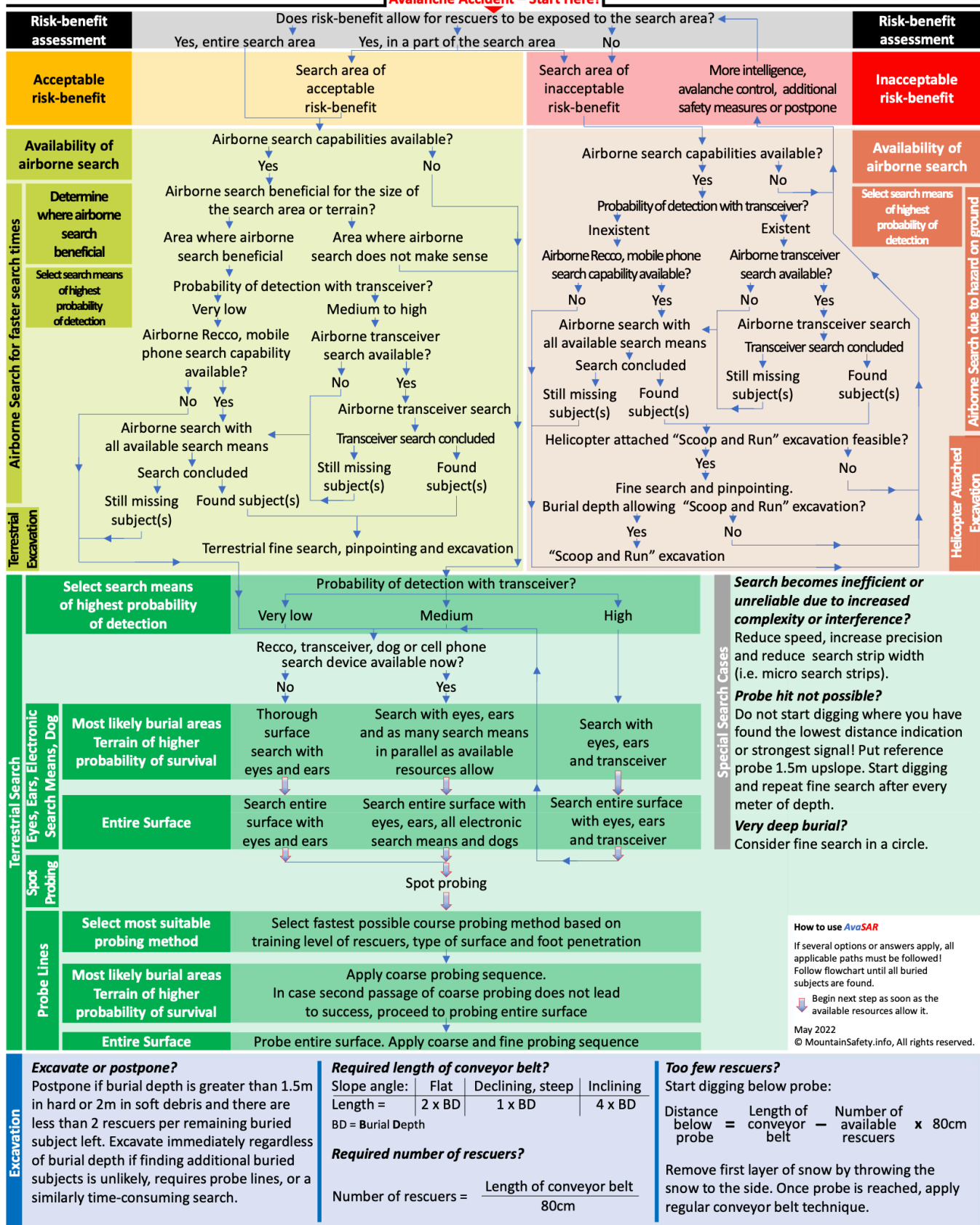
Current weather on site	
What rescue equipment is already on site	
What is currently happening on site	

Appendix D

Decision Support Tool



Avalanche Accident – Start Here!



How to use AvaSAR
If several options or answers apply, all applicable paths must be followed! Follow flowchart until all buried subjects are found.
Begin next step as soon as the available resources allow it.
May 2022
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Appendix E

Avalanche Rescue Resource List

Incident Management Team: including local avalanche advisor(s)			
Name	Phone: Work	Home	Cell

Avalanche Site Commander			
Name	Phone: Work	Home	Cell

Team Leaders			
Name	Phone: Work	Home	Cell

Team Members			
Name	Phone: Work	Home	Cell

Organisations: Helicopters, Ski Areas, Guiding Companies			
Name	Phone	Radio	Equipment

Appendix F

Log Sheet

[illegible]

Appendix G

Avalanche Rescue Readiness Plan Communications

This comms plan should represent a concept of how communications might work at a typical avalanche rescue. Use it as a flexible guideline for assessing possible issues with comms in your area.

Date	Incident		
Location			
Avalanche Site Command: Comms into and out of site			
Radio (repeater?)	Phone	Sat Phone	
Avalanche Site: On site Comms – to be confirmed by ASC			
Radio channel	Voice	Whistle	
Incident Control Point: On site comms – All Comms in/out of ICP			
Radio	Phone	Cell	Fax
Police	Phone	Cell	
Helicopters			
Aircraft name	Phone	Cell	
Medical			
Doctor(s) name	Phone Work	Home	Cell
Medical: Other – District*			Phone
St Johns:			
Hospital:*			

* Nearest suitable hospitals equipped to deal with severe hypothermia should be researched and contacted when readines

Appendix H

Avalanche Management Structure

Example 1: Primary Structure – Incident Controller On-Site (span of control 1:4)



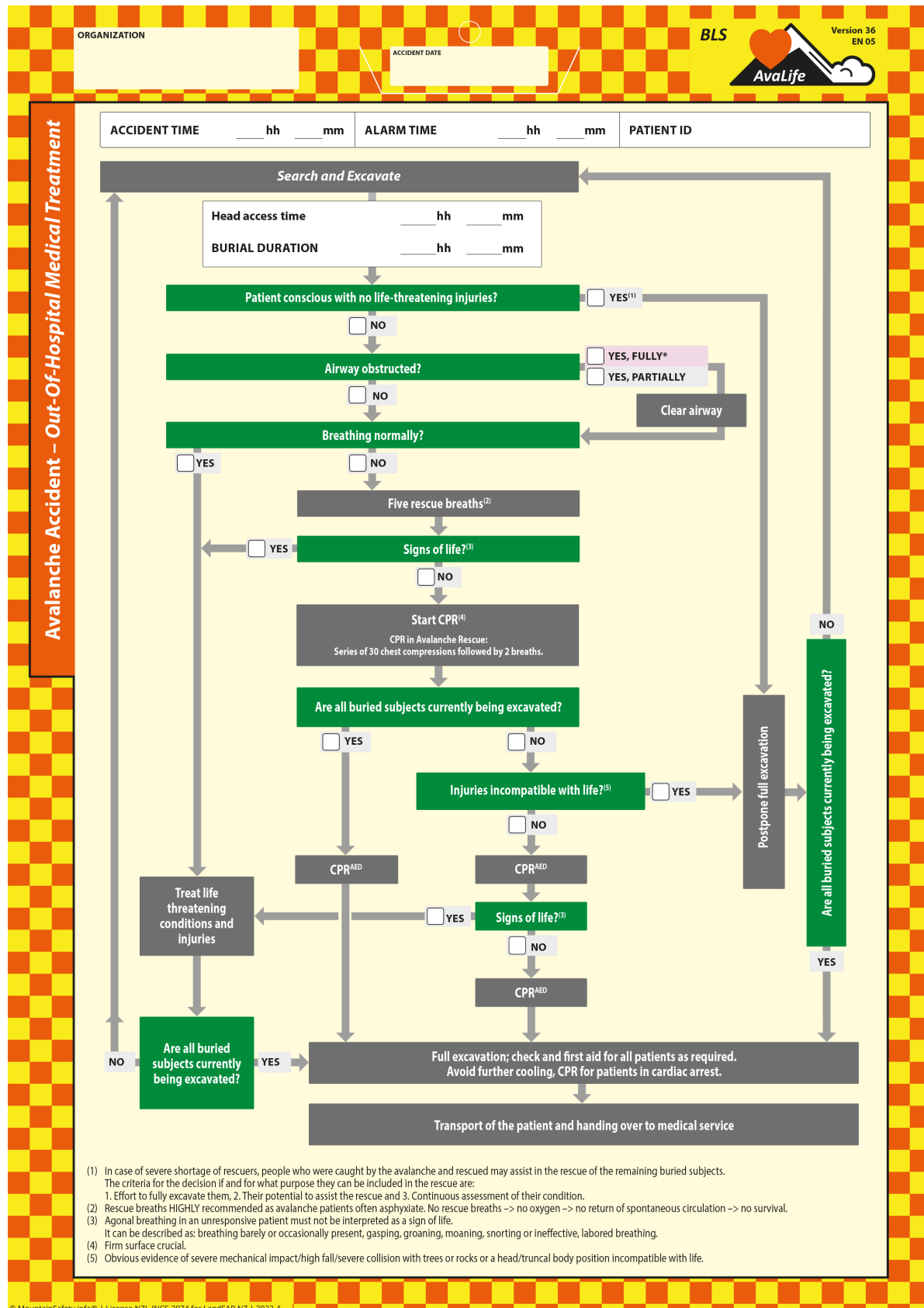
Example 2: Medium – Large Scale Structure – Incident Controller Off-Site (span of control 1:4)



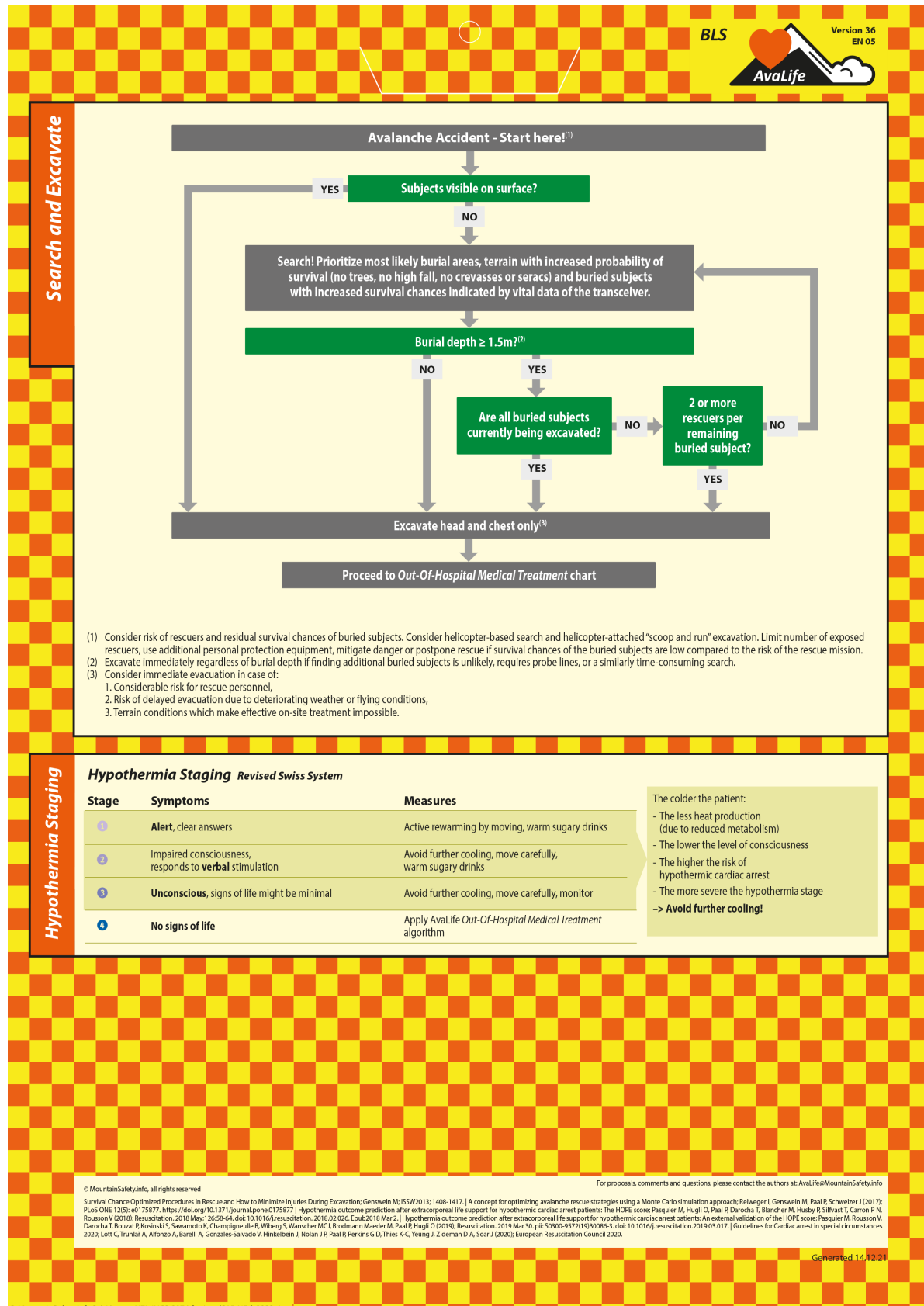
Source: Canadian Avalanche Association, 2010, pp. 72-79

Appendix I

Avalanche Resuscitation Algorithm – AvaLife companion rescue BLS



Avalanche Resuscitation Algorithm – AvaLife companion rescue BLS



Hypothermia Staging

Hypothermia Staging Revised Swiss System

Stage	Symptoms	Measures
1	Alert, clear answers	Active rewarming by moving, warm sugary drinks
2	Impaired consciousness, responds to verbal stimulation	Avoid further cooling, move carefully, warm sugary drinks
3	Unconscious , signs of life might be minimal	Avoid further cooling, move carefully, monitor
4	No signs of life	Apply AvaLife Out-Of-Hospital Medical Treatment algorithm

The colder the patient:

- The less heat production (due to reduced metabolism)
- The lower the level of consciousness
- The higher the risk of hypothermic cardiac arrest
- The more severe the hypothermia stage

-> Avoid further cooling!

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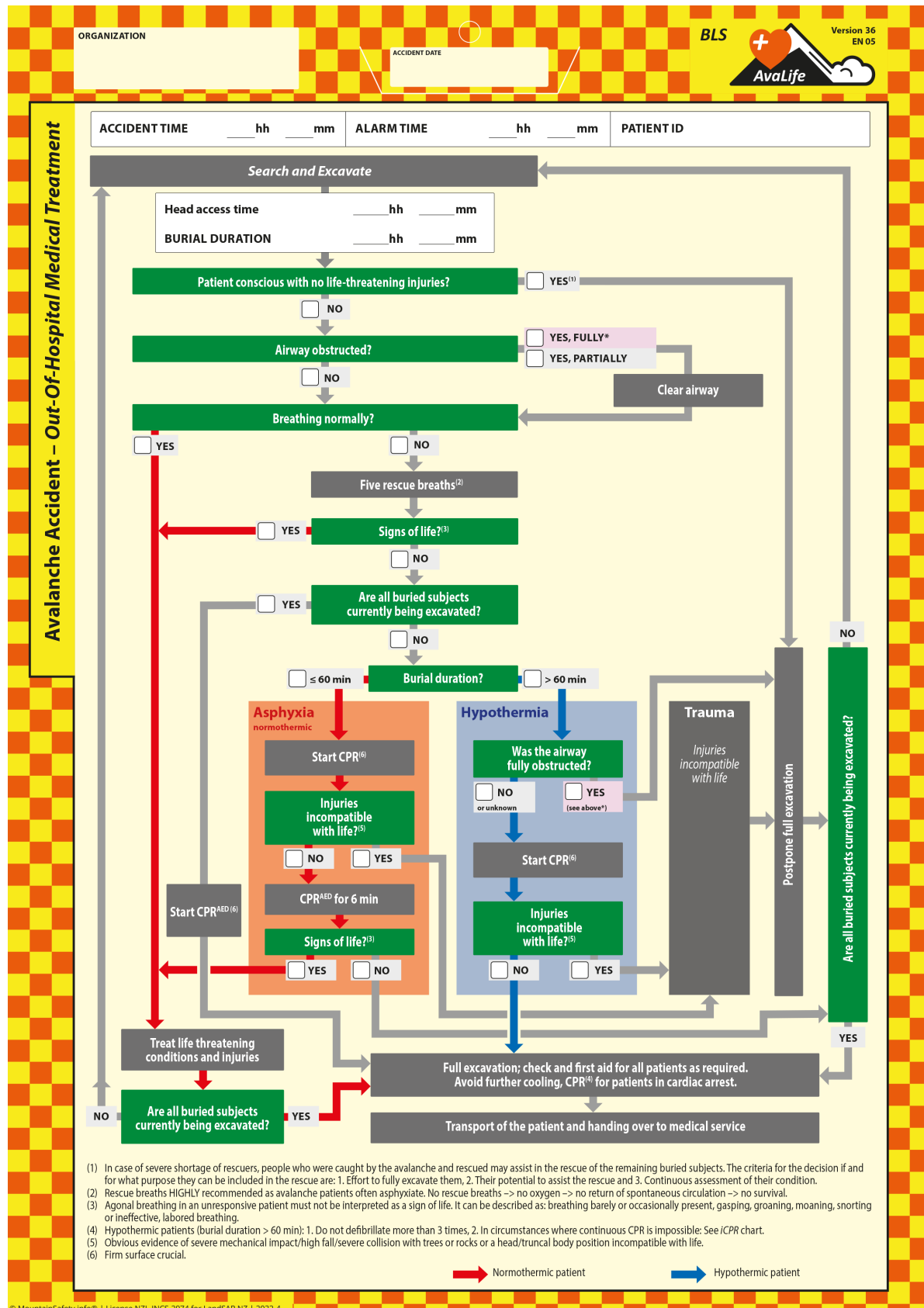
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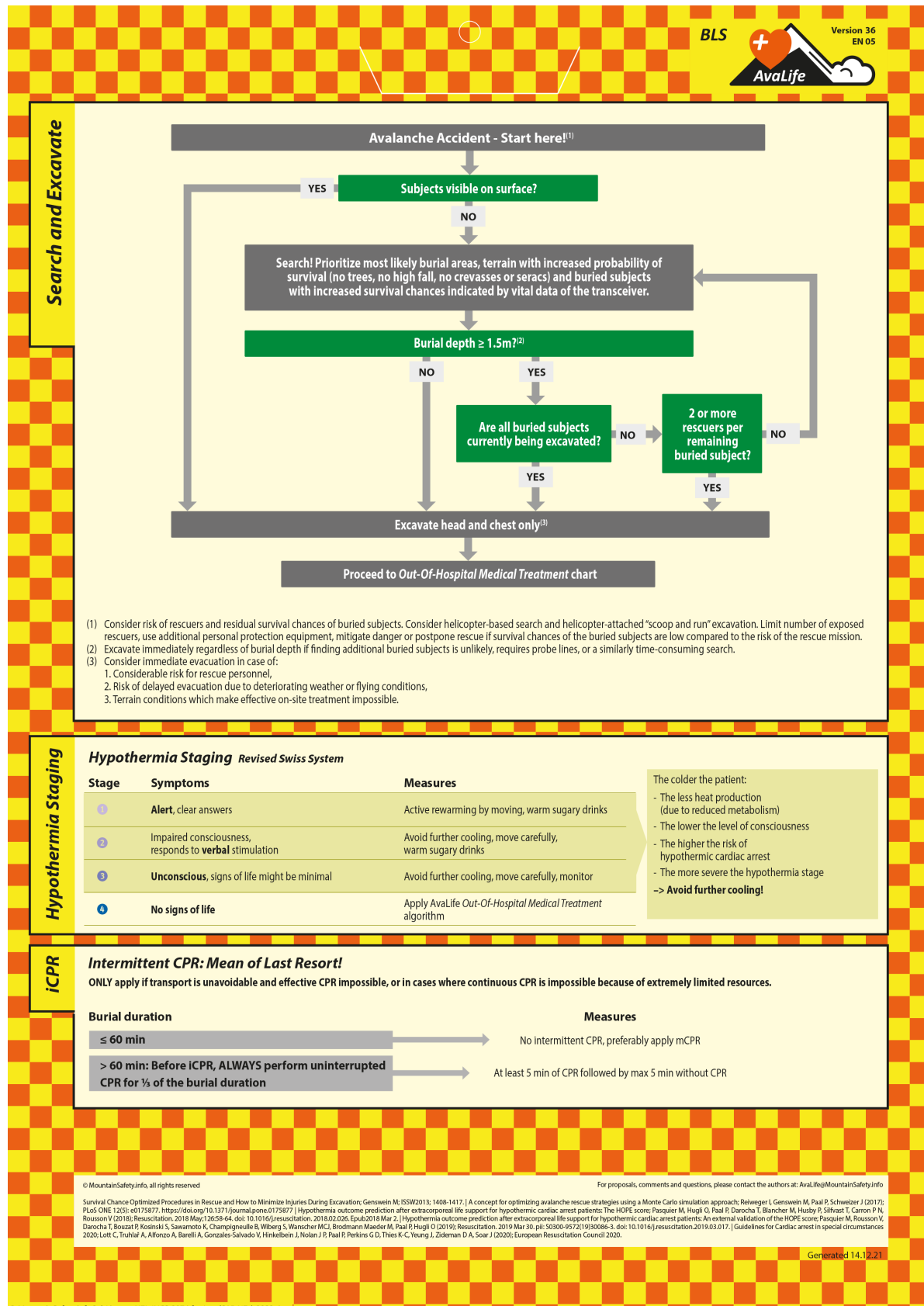
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Appendix J

Avalanche Resuscitation Algorithm – AvaLife advanced companion and organised rescue BLS

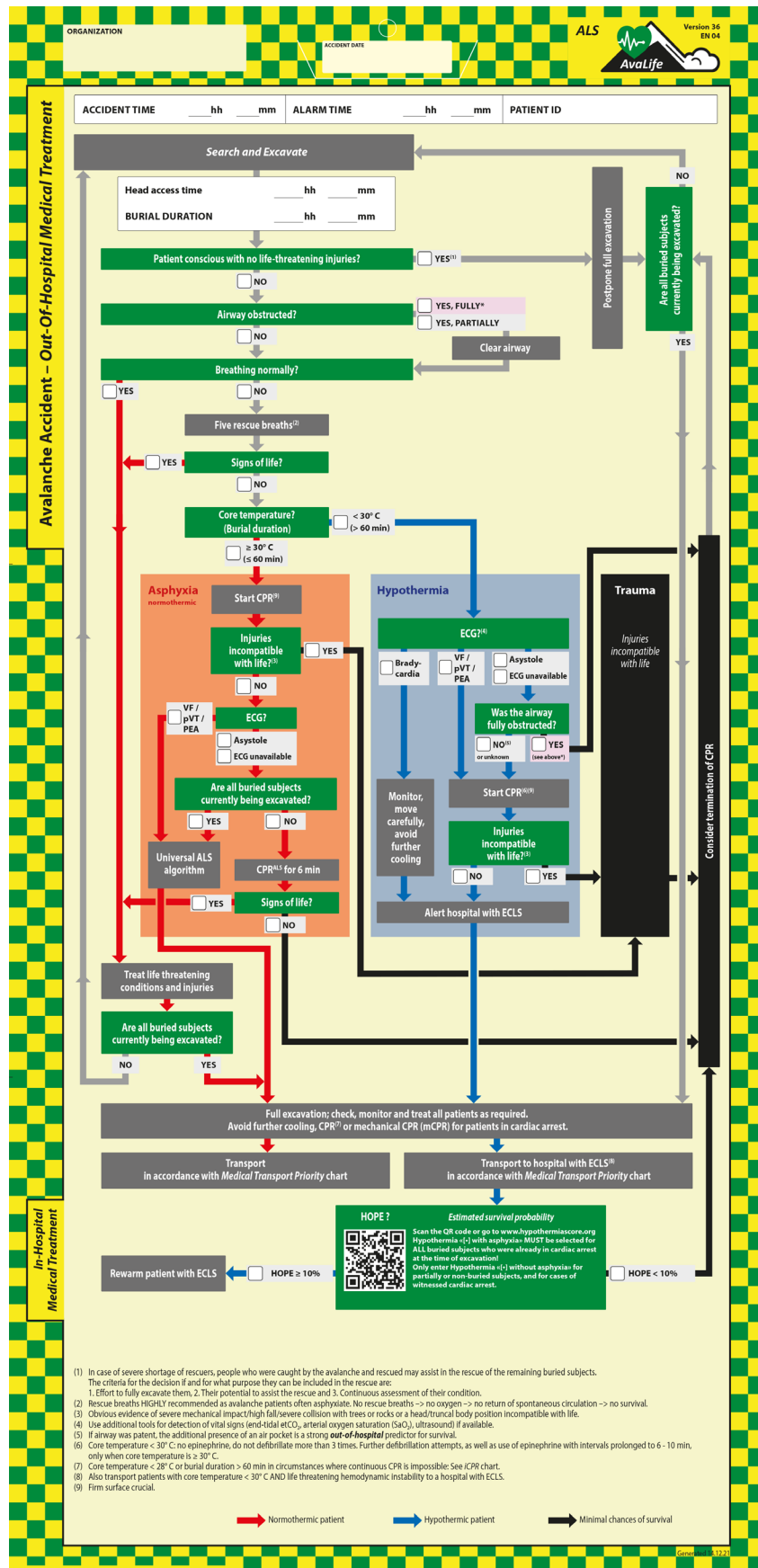


Avalanche Resuscitation Algorithm – AvaLife advanced companion and organised rescue BLS



Appendix K

Avalanche Resuscitation Algorithm – AvaLife organised rescue ALS



Avalanche Resuscitation Algorithm – AvaLife organised rescue ALS

