International first aid and resuscitation guidelines 2011

For National Society First Aid Programme Managers, Scientific Advisory Groups, First Aid Instructors and First Responders

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Health and care
International first aid and resuscitation **guidelines 2011**

Strategy 2020 voices the collective determination of the IFRC to move forward in tackling the major challenges that confront humanity in the next decade. Informed by the needs and vulnerabilities of the diverse communities with whom we work, as well as the basic rights and freedoms to which all are entitled, this strategy seeks to benefit all who look to Red Cross Red Crescent to help to build a more humane, dignified, and peaceful world.

Over the next ten years, the collective focus of the IFRC will be on achieving the following strategic aims:

1. **Save lives, protect livelihoods, and strengthen recovery from disasters and crises**
2. **Enable healthy and safe living**
3. **Promote social inclusion and a culture of non-violence and peace**

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Note

Medical information changes constantly, and, therefore, should not be considered current, complete or exhaustive. You should not rely on the information in the guidelines to recommend a course of treatment for you or any other individual; doing so is solely at your own risk.

These guidelines provide general information for educational purposes only. They are not designed to and do not provide medical advice, professional diagnosis, opinion, treatment or services for you or any other individual. They are not a substitute for medical or professional care, and the information should not be used in place of a visit, call consultation or advice of a physician or other healthcare provider. The IFRC is not liable or responsible for any advice, course of treatment, diagnosis or any other information, services or product you obtain through these guidelines.

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- European Reference Centre for First Aid Education
- European Red Cross Red Crescent First Aid Education Network
- European Resuscitation Council
- IFRC Psychosocial Reference Centre
- International First Aid Science Advisory Board
- International Liaison Committee on Resuscitation (ILCOR)

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Foreword

The members of the International Federation of Red Cross and Red Crescent Societies (IFRC) are among the world's leading providers of first aid training. In 2009, more than 7 million people were trained in first aid by Red Cross Red Crescent societies in countries around the globe. Currently there are more than 36,000 active first aid trainers and 770,000 active Red Cross Red Crescent volunteers serving their communities in first aid education and services, making first aid available for all.

First aid saves lives: first aid trained people taking immediate action and applying appropriate skills can make a major difference in saving lives. Investing in research and learning from good practices are key steps to ensure quality standards and to further improve our first aid training and services into 2020.

In 2008, the IFRC participated in a research process to develop the consensus of science in first aid. This included a thorough review of existing literature, evaluation and grading of level of scientific evidence in specific first aid topics. As a result, we are able to produce this first set of international first aid guidelines.

The guideline is targeted at National Societies' first aid programme managers and their first aid advisory bodies. National Societies can use this guideline to update their first aid materials, training and skills in accordance with the latest evidence-based international standard. Each topic within this document includes an introduction and summary of the scientific findings, evidence-based guidelines and implementation considerations for the National Societies to adapt and make changes according to their local needs, reality and government legislation.

The IFRC's *Strategy 2020* is asking its member National Societies to do more, do better and reach further. First aid remains a key pillar to do exactly that by working with vulnerable populations to build safer and more resilient communities, which in turn are best placed to increase disaster preparedness and reduce risks to health.

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Volunteer Induction Course
FUNAFUTI BRANCH
Bleeding
Shock
Talk.
Touch.
Play...
Independence
Voluntary Service
Unity
Universality

IFRC

01. Introduction

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First aid remains a core area of the International Federation of Red Cross and Red Crescent Societies (IFRC). The IFRC is the major first aid educator and provider in the world. Almost all 186 Red Cross Red Crescent National Societies have first aid as their core activity.

The IFRC believes that first aid is a vital initial step for providing effective and rapid intervention that helps reduce serious injuries and improve the chance of survival. Taking immediate action and applying correct and appropriate first aid measures make a difference when saving lives. Having quality, evidence-based first aid education available to people worldwide will build safer and healthier communities by preventing and reducing risks in daily emergencies and disasters.

The IFRC advocates for first aid to be accessible to all, and that at least one person in each household will have access to learn first aid regardless of socio-economic status or other potentially discriminatory factors.

About this document

This document evaluates and reports on the science behind first aid and resuscitation. It is the first international first aid guideline (referred to as the guideline) produced by the IFRC and is intended to foster harmonization of first aid practices among the Red Cross Red Crescent National Societies and provide a true evidence base to these practices. It is part of quality assurance to ensure that the general public and volunteers are receiving first aid training in accordance with the IFRC standard.

Note: This guideline does not replace first aid manuals and associated educational materials. It aims to help National Society programme managers and their advisory bodies further develop their first aid materials and education programmes based on the latest scientific evidence findings and recommendations. National Societies should adapt the guideline as needed for their local contexts (*see* local adaptation). In addition, these guidelines and evidence review will serve as an excellent reference for first aid instructors and emergency responders and their agencies.

Link to *Strategy 2020*

In *Strategy 2020*, Red Cross Red Crescent societies are asked to do more, do better and reach further. This guideline provides our National Societies a solid base to “do better” in first aid.

With the global trend toward greater urbanisation, the negative impact on health is increasing, particularly among vulnerable communities. Promoting first aid and using proven prevention techniques to address some of these challenges can build the capacity of local communities and the National Societies in both preparedness and response. This effort bridges the initial response of first aid volunteers and the public to the formal health system in saving lives.

Where does the guideline fit in IFRC policy?

The revised first aid policy of 2007 called for quality first aid education and services. First aid must be delivered using up-to-date, evidence-based guidelines and best practice. The IFRC supports the National Societies and participates in the development of harmonized first aid techniques in accordance with scientific research, international standards, good practice guidelines and measures of quality services. To do this, the IFRC sets up alliances with scientific bodies, public health experts and pedagogical specialists. The resulting information includes trend and situation analysis and the latest evidence-based developments in the field of first aid education. This guideline was developed, as well as the consensus of science in first aid, by using this type of process.

Process to develop the guideline

In 2008, the IFRC participated in a strategic collaboration with the International First Aid Science Advisory Board, which is co-chaired by the American Red Cross. The IFRC participating team is led by Dr Pascal Cassan, the coordinator of the European Reference Centre for First Aid Education. Experts were nominated by the different zones. Representatives from the American Red Cross, Austrian Red Cross, Canadian Red Cross, Egyptian Red Crescent Society, Grenada Red Cross Society, Hong Kong Red Cross, Hungarian Red Cross, Norwegian Red Cross and Red Cross Society of China joined the process.

Whereas the Red Cross Movement has been the leader in first aid science, education and practice, National Societies have traditionally worked in partnership with local resuscitation councils and their parent organizations, the International Liaison Committee on Resuscitation (ILCOR) on resuscitation science and education. This document and process represents the IFRC scientific evidence and expertise in first aid, resuscitation and the education of the public in these lifesaving topics, supplemented by the important evidence work of others in this field, including the European Red Cross Red Crescent First Aid Education Network, the American Red Cross Scientific Advisory Council (SAC), the International First Aid Science Advisory Board and ILCOR.

Based on these efforts, the IFRC developed its first international first aid guideline to advance our evidence basis in first aid practice and education. The team conducted a thorough review of the scientific literature, and evaluated and graded the level of evidence in specific first aid topics. This review included past work done by many components of the Red Cross Movement, including evidence-based guidelines created by National Societies, the work of the European Reference Centre for First Aid Education and the Psychosocial Reference Centre.

Red Cross Red Crescent National Societies and scientific partners
A distinction is made between "harmonization" and "standardization". The intention is not to have one technique for each situation, but rather to have a consensus on minimum agreed principles and on critical review of the available evidence and information learned from the experiences of the Red Cross Movement to ensure evidence-based lifesaving techniques are practiced by all first aid providers.

Red Cross Red Crescent National Societies must take into account the environment and the reality of each community. Resuscitation must be in accordance with the local scientific environment, and discussions must be initiated with the local resuscitation council and other scientific organizations. In most situations, even if several different presentations are possible, there are common principles on which lifesaving techniques are defined.

Several parameters guided these harmonization efforts. The major ones consist of the following:
- the promotion and inclusion of evidence-based first aid and resuscitation
- the necessity to further disseminate consistent techniques of first aid and resuscitation, knowledge and practices
- the educational focus on retaining skills and instilling confidence to act
- the on-going cross-border exchanges due to:
    - migrations, which lead to mixing of populations
    - tourism and business travels, putting people in different environments
    - use of the Internet, which can support self-learning and comparison between areas
- the differences between techniques that are not justified by either scientific evidence or field experiences
- the necessary bridging between scientific knowledge and its application in diverse situations that are different from the research condition

Furthermore, the recommendations on techniques in this guideline are a complement to priority efforts of the Red Cross Red Crescent National Societies to harmonize educational contents, methods and certification among countries within each continent. The goal is the creation of an international first aid certificate.

Scope of certification/training that National Societies can provide
First aid is the shared purpose, a basic and clear role that all in the Movement understand. It is core to the founding purpose of the Red Cross Red Crescent. The lifeblood of the organization, first aid is the unifying force that builds the front line of the Red Cross Red Crescent, reinforcing its universality. First aid reflects a unique mind-set across the Movement, capable of embracing diversity for integration. It is energy for cohesion and an incentive for unity.

Harmonization of first aid education worldwide should also be pursued. As the European first aid certificate is delivered across Europe by National Societies, an international first aid certificate must be created. Based on its experience as the leading provider of first aid training, the Red Cross Red Crescent suggests several key areas that should be part of the curriculum worldwide:
- Take safety measures, including calling for help
- Observe vital life signs (from initial assessment to situation monitoring)
- Prioritize the unconscious victim
- Take care of the victim who has breathing difficulties
- Take care of the victim who has circulation difficulties
- Control severe bleeding, and manage burns and wounds

Local adaptation

When using this guideline, National Societies should consider their specific epidemiological profile, prehospital care system and legislation related to first aid. The common health concerns and injuries identified by specific communities or target groups must be addressed with special attention paid to their cultural and religious beliefs as well as the available resources. This should be done in conjunction with a National Society scientific advisory group. As used in this document, a scientific advisory group can include scientists, medical experts, researchers, first aid instructors and practitioners, educators and local community representatives. This can be accomplished through partnership with others, including other National Societies.

This guideline, including the recommendations, is intended to be flexible so that National Societies can adapt it for use in different settings, environments, levels of training (layperson versus those with a duty to act), scope of practice, contexts (e.g., school, workplace, home, travel, sports events, etc.) and personal profiles (age, disability, etc.) without losing its scientific grounding. This guideline provides the foundation for creation of first aid and resuscitation educational programs, education of instructors and messaging for the public. This guideline provides the evidence on how to provide first aid in a cost-effective and safe manner, which should be done in conjunction with existing value-proven traditional and alternative practices.

Reference: 1

IFRC and National Societies

Progress and trend of first aid: community-based health and first aid in action

Almost all 186 Red Cross Red Crescent National Societies provide first aid training and have first aid as their core activity. In 2009, the National Societies trained more than 7 million people in first aid certified courses, and an additional 17 million people in shorter first aid education. The large network of volunteers at the grass roots level provides a strong base for the development of expanded first aid services and training. The continual building of knowledge and skills, together with pooling of additional resources, strengthens the capacity within each community to cope with day-to-day crisis and disasters.

As well as advocating training and basic first aid measures for saving lives, the IFRC strongly believes that first aid should be an integral part of a wider developmental approach. This approach focuses on prevention to build safer and more resilient communities and on improving long-term capacity for improved health programmes and community development. Community-based health and first aid (CBHFA) tools include an implementation guide, facilitators' guide, volunteers' manual and community tools that can be easily used in the field (www.ifrc.org).

Importance of prevention in first aid education

Improving prevention and community information in disaster-prone areas will limit the cost of emergency operations. For every US dollar invested in disaster preparedness, four US dollars are saved in emergency response. Prevention needs to start in first aid training and education by helping people to be more aware of risks.

Overall, the trend of disease patterns is shifting towards non-communicable conditions. By 2020, the leading worldwide causes of death, disease and disability are expected to be heart disease, stroke, traffic accidents, trauma from violence and conflicts, and diarrheal diseases. The scope of our first aid programmes must be wide enough to address the prevention aspects of these conditions.

Citizen preparedness for disasters and daily emergencies

Some surveys show that the citizens often have a broad definition of risks that include social, environmental and economic risks. They feel threatened by unemployment, the high cost of living, aging and taking care of themselves, pollution, etc. Natural and industrial risks are not ignored or devalued but simply are not considered along with the other risks. Certainly, various authorities, professionals and other experts have a different perspective in assessing risks and degree of vulnerability. This important point highlights the fact that citizens, who are the beneficiaries/recipients of emergency awareness and preparedness programmes, often are not fully aware of the priority of these programmes.

Citizens must be prepared to self-protect before, during and after emergency situations in the following ways:

- *Before an emergency* by getting information and identifying relevant risks, adopting suitable behaviour, taking preventive measures, and if necessary corrective ones, obtaining training (e.g., in lifesaving techniques), understanding and respecting security/safety instructions and taking part in the management programmes of emergency situations (such as risk analysis, simulation exercises, etc.).
- *During an emergency* by self-protecting from immediate consequences and any further risk or accident, carrying out appropriate first aid techniques, following instructions (e.g., evacuation), restoring social links (e.g., family, friends, neighbours, members of the local community, etc.) and volunteering and collaborating with rescue, care and assistance services and organizations.
- *After an emergency* by obtaining adequate assistance (care, water, food, shelter, etc.), being psychologically restored and materially compensated, volunteering for assistance operations for the local community and adapting behaviour and equipment based on the experience gained and lessons learned.

See also self-protection by citizens in disasters and daily emergencies.

Future development

The IFRC is committed not only to building first aid skills within vulnerable groups but also to developing safer and healthier communities. The IFRC will continue to work with partners on first aid techniques and on factors that influence a layperson's willingness to provide first aid. For example, the IFRC is interested in learning more effective ways for people to learn first aid, as well as the best methodologies to create behavioural change in preventing injury and adopting healthy living practices.

The ongoing learning of such information among National Societies will further improve their standards and quality of first aid provided. This can be a step forward in realising an international first aid certificate in the IFRC. This would be the next logical extension beyond the existing efforts in providing a regional certificate (as has been done in Europe and has begun in North America).

First aid facts and figures

Definition of first aid

First aid is immediate help provided to a sick or injured person until professional help arrives. It is concerned not only with physical injury or illness but also with other initial care, including psychosocial support for people suffering emotional distress from experiencing or witnessing a traumatic event.

Number of people reached

- Between 2006 and 2009, the number of people trained in first aid by the Red Cross Red Crescent National Societies increased by 90%.
- In 2009, more than 2.3 million people were trained by 21 National Societies in Europe, and 7 million were trained in certified first aid courses worldwide. More than 36,000 trainers and 770,000 volunteers were active in first aid activities, volunteering more than 4.8 million hours in first aid education and services. More than 46 million people were reached with first aid and preventive messages.
- World First Aid Day 2009 was held on 12 September, using the theme "First Aid for Humanity". More than 32 National Societies reached over 20 million people globally, and more than 760,000 volunteers and staff were mobilised.
- Since the dissemination of the CBHFA materials, more than 300 staff and volunteers from 80 National Societies have participated in 9 CBFHA *in action* Master Facilitators' workshops. Workshops have been conducted in many languages, including English, Arabic, French, Chinese, Portuguese and Russian.

See also survey data on first aid and first aid education (in the annex).

Science and practice

This guideline presents the findings based on the review and consensus developed from the scientific evidence. The recommendations have been set forth considering the cross learning and good practices of many National Societies worldwide.

The IFRC believes that everyone has the potential to save lives. In developing first aid practice using evidence-based findings, the techniques should be as straightforward and simple as possible to allow different target audiences in different local situations to learn and use them effectively.

Strength of guidelines and evidence

The strength of all guidelines and conclusions is related to the scientific evidence on which they are based. Therefore, all guidelines have been derived from critical review of the available literature (including the strength of the study designs), standard reference materials, textbooks, and expert opinion.

Based on the source and strength of the scientific evidence, all guidelines are classified as standard (***), recommendation (**) or option (*). A guideline strength is provided both for performing an action and for not performing an action.

Strength of guideline and terms used	Description and strength of evidence	Implications
Standard (***) **Term: must (or must not)**	• The strongest recommendation • High degree of scientific certainty • Supporting evidence is of excellent quality (obtained from well designed, prospective, randomised controlled studies) • Anticipated benefits clearly exceed the harms. *Note:* In some clearly identified circumstances, high-quality evidence may be impossible to obtain, but the anticipated benefits strongly outweigh the harms.	Must be followed unless a clear and compelling rationale for an alternative approach is present
Recommendation (**) **Term: should (or should not)**	• Moderate degree of scientific certainty • Based on less robust evidence (non-randomised cohort studies, case-control studies, retrospective observational studies and/or expert opinion and consensus) • Anticipated benefits exceed the harms, but the quality of evidence is not as strong as above. *Note:* Again, in some clearly identified circumstances, high quality evidence may be impossible to obtain, but the anticipated benefits outweigh the harms.	Prudent to follow, but one should remain alert to new information
Option (*) **Terms: may, could (or not recommended)**	• Results from all other evidence, publications, expert opinion, etc. • The least compelling in terms of scientific evidence • Define courses that may be taken when the quality of evidence is suspect, the level or volume of evidence is small or carefully performed studies have shown little clear advantage to one approach over another	May be considered in decision-making but one should remain alert to new published evidence that clarifies the balance of benefit versus harm

PAKISTAN RED CRESCENT SOCIETY

02.

First aid guidelines

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General principles

Prevention

While these guidelines focus on the education and provision of first aid, from a public health perspective, preventing an injury or illness is always better than needing to treat the victims. Every educational programme addressing first aid should, as appropriate, begin with information on how to prevent the illness or injury that is being discussed.

Personal safety

When first aid is provided, the safety of the first aid providers must always be considered. So when these guidelines are used to create first aid educational programmes, including information on personal safety is imperative. Because information related to personal safety is general and applies to all situations, it was not included in each guideline in order to maintain the focus on the specific information relevant for each guideline (as well as for the sake of brevity).

The two most important areas of personal safety are the overall safety of the providers and the prevention of disease transmission during care. Providers should be reminded that, while they wish to provide care, they should not place themselves in jeopardy, thus potentially creating two victims. Providers should enter areas thought to be unsafe (such as those affected by water, fire, etc.) only if specially trained to conduct rescues in these environments. In addition, if the environment is initially safe for entry, but conditions may change or the site may be safe to enter for only a brief period, first aid providers should remove the victim (as trained to do so) to a safer area before providing care. The second area of personal safety is prevention of disease transmission, which can be accomplished through universal precautions. Although these may vary somewhat from society to society, based on the environment and on available resources, they should be standardized and based on the best available evidence. The single most important aspect of infection control is good hand hygiene, which consists of frequent hand washing and at a minimum before and after rendering care. Washing hands can be done with soap and water; if soap and water are not available, alcohol-based hand sanitizers can be used.

Linkages to other health care

While first aid is the most accessible and provides the quickest care to a victim of an illness or injury, it is only one part of a continuum of care. First aid education must address when first aid care is sufficient, or when discussion with a primary care provider (or the equivalent for the environment and National Society) and/or when immediate transport to definitive medical care (or the equivalent for the environment and National Society) is needed.

Update/re-training

The last section of these guidelines addresses education and some of the current evidence related to pedagogy. While initial education is an important first step in assisting victims and saving lives, keeping skills current and based on the latest information through regular retraining should be stressed. The form of the updates and retraining may vary with the type of first aid education taken, the environment, the skills learned and the resources of the National Society. The level and type of retraining needed will vary, based on the depth and breadth of the first aid education provided. Also, as is discussed in the implication sections that follow the guidelines, certain skills should be used or promoted only with specific training. These skills require not only initial training but also specific emphasis on retraining and updates.

Special populations

With all efforts in first aid education, injury and illness prevention and the advancement of public health, the needs of special and vulnerable populations, including those with access issues and functional needs, must be considered. The needs and issues of these segments of the population need to be considered both as targets for first aid education and training and as the recipients of first aid measures. As National Societies use these guidelines to create first aid educational programmes, it is important to help design programmes targeted for populations that typically are not reached by training. Examples include those with language, socioeconomic or educational limitations, as well as those with a physical disability or other impairment. In addition, when courses are designed, they should include information regarding special needs and vulnerable individuals. If resources allow, courses that specifically target these populations also can be designed.

Ethics

While ethics has not been addressed in this scientific review, it is always important to consider ethical issues related to first aid when designing training programmes. In situations when need exceeds available resources, such as during disasters, acts of terrorism, public health emergencies and humanitarian emergencies, first aid providers may be faced with ethical decisions such as triage and allocation of limited resources.

Self-protection by citizens in daily emergencies and disasters

Introduction

Floods, fires, storms, earthquakes, avalanches, heat waves, industrial accidents, etc. each have disastrous consequences on the population. Such natural disasters and technological risks often affect a large number of victims (causing injury or death) and so tend to receive much attention in the community. However, many dangerous situations affect individuals, families, and communities on a daily basis. These include fainting, burns, falls, intoxications, drowning, road crashes, etc. that happen at home, school, in the workplace, stores, on the road, etc. Their consequences on the victims and their relatives (families, friends, neighbours, work colleagues, etc.) are often both physical and psychological; this is also true for the witnesses of the emergency, the local authorities and the members of the organizations that provide care and assistance.

Summary of scientific foundation

Most of the data on how best to evaluate and monitor citizen preparedness for daily emergencies or disaster risks are reports or expert opinion. Studies with well-defined populations that explored evaluation during resuscitation training used a variety of methods, so no conclusions can be drawn.

Guidelines

There are insufficient data to formally recommend specific training/information for citizen preparedness, but major points can be highlighted for education of the general public: First, it is necessary to recognize that citizens themselves are the centre of prevention and response systems in emergency situations. Therefore, citizens must be active in these systems, alongside authorities and rescue, care and assistance organizations. Citizens can initially contribute to their self-protection by starting to express and identify their risks and their current abilities to control those risks and to manage emergency situations.

Implementation considerations

To explore the efficiency of citizen self-protection, well-designed studies are needed to compare training using simulation or other pedagogical methods, especially those for training of lay people. We also need well-designed studies on the effectiveness of this training in decreasing the impact of the disaster within the community. The Red Cross Red Crescent National Societies may be able to use such studies to explore the efficiency of education in disaster and daily emergency preparedness throughout the world.

General approach to the victim

Certain elements are common to the care of any victim. Although there may be supportive evidence for use of these elements in first aid, these guidelines do not specifically address such evidence. When using these guidelines to create educational programmes, it is important to include the following common items in the care of all victims (which are discussed below in more detail):

- Assessment
    - Scene survey
    - Personal protection
    - Airway, breathing, circulation (A, B, C)
    - Different levels for different first aid programmes from simple questions to *sample* history and vital signs
- Victim position
- Call for help/emergency medical services (EMS)/further help
    - Call first – for help
    - Call fast – emergency service which happens after assessment

Assessment

All victims should be thoroughly assessed to assure that all needs for first aid are correctly identified. For an assessment to be effective, it is important to follow a standard approach that is easy to remember and that follows the priorities of identification and treatment.

For all emergency care including first aid, providers should first survey the scene to assess for mechanisms of injury and to determine whether it is safe for the victims to remain in their current location or if they need to be moved in order to effectively render care. At the same time, first aid providers must be aware of their personal safety and take universal precautions, which may vary somewhat based on the specific National Society and environment. First aid providers may also make other changes when caring for family or friends. The single most important universal precaution is attention to hand hygiene. Hands should be washed with soap and water before and after treating the victim; if soap and water are not available, alcohol-based hand sanitizers can be used.

Next, providers should adopt a standardized approach (at the victim's side) based on two principles: caring for the most time-sensitive problem first and providing care as problems are identified. The common pneumonic ABCDE represents—in order—assessment, airway, breathing, circulation, disability (mental status and peripheral nervous system) and then expose the victim for further assessment and treatment. In many cases, when a problem is found in the ABCDE examination, attention to treatment may preclude proceeding to further assessments. But when resources permit, the victim should be further assessed by taking a history and performing a detailed head-to-toe physical examination.

Patient position

In certain circumstances, victims should remain in the position in which they are found, while in other situations, the victim's position may need to be changed. The latter may be because the victim needs to be moved, or because the first aid provider needs to call for additional help, to get equipment or to better assess and/or treat the victim. *See also* patient positioning.

Call for help/EMS/further help

As previously mentioned, while first aid is vitally important, it is only one piece of a continuum of care. All first aid education should include these two important points:

- How to summon additional help in the environment in which care will be rendered. In certain environments this may be to call a pre-determined national number(s), while in other areas approaches to getting further help may be less standardized.
- Whether to call for further help or to render care first. This may vary based on the National Society, environment, level of first aid training and the specific condition being treated.

Medication administration

Generally, a layperson, or even a skilled first aid provider, is not authorized to prescribe and give medications to anyone. But depending on the scope of practice, target audience for programmes, extent and depth of the educational programme offered and whether the information required for medication assistance or administration can be learned in the course, medication administration may be appropriate and used in select first aid situations.

In some localities, there may be specific medications and/or conditions for which a layperson is allowed to administer medications, such as an epinephrine auto-injector. Also, what is considered a medication that requires a physician order or that may be given by a first aid provider varies from country to country. For example, in some countries any first aid provider can give aspirin or other medication, while in other countries this is prohibited. Therefore, it is crucial that these rules are verified for the particular country to ensure compliance with the law before undertaking any of these activities.

The following are examples of when a first aid provider may be involved with medication administration but this will depend on the particular country, regulatory considerations, local medical protocol, context and responsibilities and capacity of the individual National Society:

- The situation is well-defined (e.g., decompression sickness by a scuba diver, acute chest pain, asthma, etc.), the need for the medication is time sensitive and the first aid provider has the knowledge and experience to:
  - recognize the situation
  - understand the contraindications to and dangers of administering a certain medication
  - administer the medication exactly as prescribed
- The victim is suffering from a deterioration of a known chronic illness (e.g., allergy) and a physician ordered a certain medication for such a situation, the medication is available, and the victim would like (or is supposed) to administer it but needs help.

Use of oxygen

Introduction

Giving oxygen to a person with an acute illness or injury is generally accepted and practiced, although its usefulness is not universally proved. Giving oxygen is mostly indicated for patients having shortness of breath or in special situations such as for scuba divers with a decompression injury.

Summary of scientific foundation

There have been no randomised, controlled trials evaluating the effectiveness of oxygen therapy for victims with shortness of breath or chest pain. Oxygen administration by first aid rescuers was supported in one study for victims of decompression illness and in three studies (two were animal studies) for victims of acute myocardial infarction. One good review found no studies supporting or opposing use of oxygen for victims of acute myocardial infarction, while two studies that found no supporting evidence for benefit both suggested the potential for harm. Another good review found no evidence of benefit or harm when oxygen was provided to victims of chronic obstructive pulmonary disease with shortness of breath.

References: 2-10

Guidelines

- First aid providers may administer oxygen to victims experiencing shortness of breath or chest pain (option*).
- Oxygen may be beneficial for first aid in scuba divers with a decompression injury (recommendation**).

Implementation considerations

The implementation of these guidelines depends on local legal regulation, including National Society influence on regulation, liability protection, capacity of the Red Cross society and the level of education and competency of first aid providers in the national context. Consideration must also be given to maintenance of equipment, storage and care of compressed gas cylinders and local regulatory testing and inspection.

Patient positioning

Introduction

Placing a person having an acute illness or injury in a certain position is one of the simplest and frequently desirable actions that can be done by a first aid provider.

Summary of scientific foundation

There are no studies showing that placing an unresponsive, breathing victim in a recovery position (i.e., lateral recumbent or HAINES position) decreased complications compared with placing the victim in a supine position. Most studies were performed on responsive volunteers and only compared the types of lateral positioning. While two studies recommended the HAINES position for unresponsive victims of potential spinal cord trauma, two other studies showed a greater potential for nerve damage to the arm in the HAINES position. Four studies did support the lateral recumbent recovery position because of comfort of the victim and the ease of teaching. Lastly, in two studies that compared the supine position to moving the victim to a lateral position, there was no difference in two factors often cited as the reason for positioning, heart rate variability or risk of aspiration.

References: 11-20

Guidelines

- An unresponsive, spontaneously breathing person may be placed in any side-lying recovery position versus the supine position (option*).
- If a person with a suspected cervical spine injury must be turned onto his or her side, the HAINES appears to be safer than the lateral recumbent position; therefore, the victim may be placed in the HAINES position (option*).
- If the victim is pregnant, the left lateral position is preferred for side-lying or when HAINES position is used (option*).
- For shortness of breath (use of oxygen), chest pain and shock/fainting, *see* the relevant sections.

Implementation considerations

The specific training and position to use is based on local protocols and, most importantly for trauma victims, on medical direction. In addition, it is important to discuss considerations for pregnant victims, in whom the left lateral position may be preferred.

As a general rule, a victim should not be moved. However, a victim should be moved in certain situations. A few general rules are as follows:

- If the area is unsafe for you or the victim, move the victim to a safe location.
- If the victim is face down and unresponsive, turn the victim face up to check breathing (*see* resuscitation).
- If the victim is unresponsive but has an open airway and is breathing spontaneously, and you suspect that the victim might have a spinal injury, it is best not to move the victim.
- If the injured victim is unresponsive and has difficulty breathing because of bleeding, copious secretions or vomiting, or if you are alone and have to leave the victim to get help, place the victim in a side-lying recovery position.

Medical emergencies

Allergic reactions

Introduction

Allergies are relatively common, but an emergency situation can arise in a small proportion of people with allergies when they develop anaphylactic reactions. An anaphylactic reaction is characterized by swelling (especially of the face), breathing difficulty, shock and even death.

Summary of scientific foundation

Many people with a history of anaphylaxis carry a lifesaving epinephrine auto-injector. Studies have shown with proper training, parents can be taught to correctly use an auto-injector to administer epinephrine to their child. Unfortunately, all too often neither the victim nor family members know how to use an auto-injector correctly.

Knowing when to use an auto-injector depends on being able to recognize and assess the signs and symptoms of anaphylaxis. Evidence from seven studies demonstrates that it is difficult to do so, even for medical providers. But one study demonstrated that parents of children who have had multiple anaphylactic reactions can begin to recognize the signs and symptoms more accurately (leading to the use of an auto-injector), but training and experience are required.

Evidence from one small, retrospective chart review, a patient survey study and expert opinion suggests that some patients suffering an anaphylactic reaction may require a second dose of epinephrine if the first dose is not effective in relieving symptoms. In support of this, one retrospective study demonstrated that anaphylactic reactions are biphasic 20% of the time, with a mean of 10 hours between the onset of symptoms. There have also been four studies that have documented adverse reactions, including fatalities, due to misdiagnosis of an anaphylactic reaction, inappropriate route of administration, or administration of an excessive dose of epinephrine.

References: 21-35

Guidelines

- First aid providers should not be expected to recognize the signs and symptoms of anaphylaxis without training and experience (recommendation**).
- First aid providers should be trained and experienced in recognizing the signs and symptoms of anaphylaxis (recommendation**).
- Epinephrine must be used to treat anaphylaxis with life-threatening features (standard***).
- First aid providers should be familiar with the epinephrine auto-injector so that they can help someone having an anaphylactic reaction self-administer the epinephrine (recommendation**).
- Epinephrine should be given only when symptoms of anaphylaxis are present (recommendation**).
- First aid providers may be allowed to use an auto-injector if the victim is unable to do so, provided that the medication has been prescribed by a physician and state law permits.

- Use of an epinephrine auto-injector for a patient for whom it is not prescribed may be considered with appropriate training (option*).
- An empiric second dose of epinephrine as a first aid measure to treat an anaphylactic allergic reaction is not recommended (option*).
- For shortness of breath and shock, *see* the relevant sections.

Implementation considerations

The use of epinephrine for anaphylaxis depends on local legal regulation, including National Society influence on regulation, liability protection, capacity of Red Cross society and level of education and competency of first aid providers in the national context.

Breathing difficulties

Difficulties of breathing can be a subjective complaint only or can be accompanied by a very high (>29/min in adults) or very low (<10/min in adults) breathing rate, and/or visible efforts and/or noisy breathing. The most common causes are upper airway obstruction (*see* resuscitation), chest injury, heart failure and (bronchial) asthma.

Asthma

Introduction

The incidence of acute asthma is increasing, especially in urban populations and industrialized nations. Many victims with asthma have been prescribed and can self-administer bronchodilator medication. Inhaled bronchodilator medications have been shown to be safe with few untoward effects.

Summary of scientific foundation

Bronchodilators improve respiratory function and peak flow and reduce respiratory distress. There are many studies of bronchodilator use, but one randomised, double-blind study showed that bronchodilators significantly improved airway function, and one study in children has shown early administration in the emergency setting reduces severity of attack and the subsequent need for hospitalization. Additionally, studies have demonstrated that those trained at the basic level can effectively recognize and administer albuterol to acute asthma patients. The improvement of peak expiratory flow rate demonstrates the efficacy of albuterol treatment for bronchial asthma in the prehospital setting.

References: 36-40

Guidelines

- First aid providers are not routinely expected to make a diagnosis of asthma, but when a person is experiencing difficulty breathing, they must assist the person with a bronchodilator under the following conditions (standard***):
  - The victim states that he or she is having an asthma attack and has medications (e.g., a prescribed bronchodilator) or an inhaler.
  - The victim identifies the medication and is unable to administer it without assistance.
- First aid providers may be trained and may administer a bronchodilator to a victim experiencing breathing difficulties (option*).
- Victims with any breathing difficulty may be moved to a position of comfort, with loosening of any restrictive clothing (option*).

Implementation considerations

The use of a bronchodilator or inhaler for asthma depends on local legal regulation, including National Society influence on regulation, liability protection, capacity of Red Cross society and level of education and competency of first aid providers in the national context.

Administration of bronchodilators or use of inhalers by first aid providers requires training and specific competencies in bronchoconstriction recognition, nebulizer use and availability of this equipment. One of the cited references (above) describes the training required to allow first aid providers to provide treatment with a bronchodilator.

Hyperventilation

Introduction

Hyperventilation can appear like a serious breathing difficulty often caused by an accident, traumatic event or psychological stress.

Summary of scientific foundation

A rebreathing bag has traditionally been used for hyperventilation, and its use has been supported by case reports, case series and expert opinions, as well as a few controlled trials on healthy volunteers or on participants with self-induced overbreathing. However, its usefulness has not been supported by randomised controlled trials. In fact, use of a rebreathing bag for hyperventilation was shown to be an unreliable method of achieving an elevated level of carbon dioxide. In addition, case series showed that the use of a rebreathing bag could lead to sudden deterioration and death if mistakenly used in people who are hypoxemic or have myocardial ischemia.

References: 41-46

Guidelines

- If unclear whether the victim is experiencing hyperventilation or other breathing emergency, first aid providers should treat the victim as if there is a breathing emergency (recommendation**).
- For confirmed hyperventilation, a rebreathing bag may be used (option*).

Implementation consideration

All breathing emergencies should be assumed to require medical care. Hyperventilation should be considered only after excluding all other diagnoses.

Foreign body airway obstruction

Introduction

Foreign body airway obstruction (FBAO) is one of the more common life-threatening emergencies that is seen and can be treated by the lay public.

Summary of scientific foundation

It is unclear which method of removal of FBAO should be used first. Well-controlled studies are limited to absent, and most data come from case reports and case series.

For conscious victims, case reports have shown success in relieving FBAO with any one of several techniques, including back blows/slaps, abdominal thrusts and chest thrusts. Frequently, more than one technique is needed to relieve the obstruction. However, there have been reported life-threatening complications associated with the use of abdominal thrusts. Rosen et al. cited case reports of abdominal thrust injuries but found no evidence indicating if these injuries were caused by faulty application of the Heimlich maneuver. Wolf, citing the work of Haynes and Yong, and Agia and Hurst noted that correct administration of the Heimlich maneuver could lead to intra-abdominal injuries. A concern was noted that the incidence of complications might be greater in unconscious drowned persons than in conscious choking persons. The Heimlich maneuver/abdominal thrusts have shown efficacy in removing documented solid-body airway obstructions. However, repeating the maneuver until no water or liquid flows from the person's mouth may increase the possibility of paradoxical visceral or vascular effects. Severe complications from the use of this technique have been cited in the medical literature. Desai et al. reported a case of traumatic dissection and rupture of the abdominal aorta after a forceful Heimlich maneuver. In addition to this complication, these authors cite reports of other complications occurring with the use of the Heimlich maneuver. These injuries include retinal detachment, rib fractures, and ruptures of abdominal organs. Additional injuries included rupture of the diaphragm, jejunum, liver, esophagus and stomach. Other reported injuries of vascular structures consisted of aortic stent graft displacement, rupture of the aortic valve, acute aortic regurgitation, laceration of a mesenteric vessel, and acute aortic thrombosis in both an aneurysmal and non-aneurysmal aorta. In addition, other studies have shown that often more than one technique is needed and that when one technique fails, there is success when moving to another technique.

For unconscious victims, case reports have shown success in relieving FBAO with two approaches: chest thrusts and abdominal thrusts. In one randomised trial in cadavers that were thought to be similar to an unconscious victim and in two prospective studies in anesthetized volunteers, higher airway pressures were generated by using the chest thrust rather than the abdominal thrust. These higher airway pressures were presumed to indicate better clearance of an FBAO. In two studies, standard chest compressions demonstrated robust efficacy in removing solid FBAOs. Skulberg, in a single case study, cited an instance in which a tracheal foreign body was removed with a single chest compression after 3-4 Heimlich maneuvers to the epigastrium failed to remove the object. This author theorized that because a standard chest compression created greater thoracic pressure, it might be an alternative to the Heimlich maneuver. Lanhelle et al. conducted a study of the airway pressure generated by chest compressions and abdominal thrusts in 12 recently dead cadavers with simulated complete airway obstructions. In this study, chest compressions created a greater mean airway pressure than subdiaphragmatic thrusts. Airway pressure from chest compressions were 40.8<>16.4 cm H_2O, while abdominal thrust yielded pressures of 26.4<>19.8 cm $H_2$0. These values had a 95% confidence interval with a mean difference of 5.3-23.4 cm $H_2$0. One can derive from Skulberg's case report and Lanhelle's study that chest compressions for a hypoxic patient generate greater force for removing solid FBAOs than subdiaphragmatic thrusts. Lanhelle further theorized if a solid FBAO can be removed by chest compressions, this will reduce the time without circulation for a patient in cardiac arrest. These patients will be treated identically whether or not there is an FBAO.

Case series have reported the finger sweep as effective for relieving FBAO in unconscious adults and children >1 year old, but four case reports documented harm to the victim's mouth or biting of the rescuer's finger.

References: 47-61

Guidelines

- Combination of back blows followed by chest compression should be used for clearance of FBAO in conscious infants ≤1 year old (recommendation**).
- Chest thrusts, back blows or abdominal thrusts are equally effective for relieving FBAO in conscious adults and children >1 year old (recommendation**).
- Although injuries have been reported with the abdominal thrust, there is insufficient evidence to determine whether chest thrusts, back blows or abdominal thrusts should be used first in conscious adults and children >1 year old (recommendation**).
- These techniques should be applied in rapid sequence until the obstruction is relieved; more than one technique may be needed in conscious adults and children >1 year old (recommendation**).
- Unconscious victims should receive chest compressions for clearance of the foreign body in adults and children >1 year old (standard***).
- Unconscious infants ≤1 year old should receive either a combination of back blows followed by chest compression, or chest compressions alone for clearance of FBAO (recommendation**).
- The finger sweep can be used in unconscious adults and children >1 year old with an obstructed airway if solid material is visible in the airway (option*).
- There is insufficient evidence for a different treatment approach for an obese or pregnant victim with FBAO (option*).

Implementation considerations

The following signs of FBAO should be included in all training materials.
Signs of choking include:
- coughing, either forcefully or weakly
- clutching the throat with one or both hands
- inability to cough, speak, cry or breathe
- making high-pitched noises while inhaling or noisy breathing
- panic
- bluish skin color
- losing consciousness if blockage is not removed

In addition, while these are signs of choking, the first aid provider should *not* interfere unless the airway is completely obstructed, because the body's mechanism to clear the obstruction may be more effective than other techniques.

A person whose airway is completely blocked cannot cough, speak or breathe. Sometimes, the person may cough weakly or make high-pitched noises, which indicates he or she is not getting enough air to stay alive. First aid providers must act at once! If a bystander is available, have him or her call for EMS while beginning to give care.

FBAO is an uncommon but potentially treatable cause of accidental death. Often, there is an opportunity for early intervention while the victim is still responsive. The most common cause of choking in adults is airway obstruction caused by food. In infants and children, reported cases of choking occur while eating or with non-food items such as coins or toys during games.

In all cases, recognition of airway obstruction is the key to successful outcome. It is important not to confuse this emergency with fainting, heart attack, seizure, an anaphylactic allergic reaction or other conditions that may cause sudden respiratory distress, cyanosis or loss of consciousness. Foreign bodies may cause either mild or severe airway obstruction. It is important to ask the conscious victim "Are you choking?"

For adults and children >1 year old

If the victim shows signs of mild airway obstruction:
Encourage continued coughing, but do nothing else. Aggressive treatment, with back blows, abdominal thrusts and chest compression, may cause potentially serious complications and could worsen the airway obstruction. Victims with mild airway obstruction should remain under continuous observation until they improve, because severe airway obstruction may develop.

If the victim shows signs of complete airway obstruction and is conscious:
Apply up to five back blows as follows:
1. Stand to the side and slightly behind the victim.
2. Support the chest with one hand and lean the victim well forward so that when the obstructing object is dislodged, it comes out of the mouth rather than further down the airway.
3. Give up to five sharp blows between the shoulder blades with the heel of your other hand.
4. Check to see if each back blow has relieved the airway obstruction. The aim is to relieve the obstruction with a blow/slap, not to necessarily give all five.

If five back blows fail to relieve the airway obstruction, give up to five abdominal thrusts as follows:
1. Stand behind the victim and put both arms around the upper part of the abdomen.
2. Lean the victim forward.
3. Clench your fist and place it between the umbilicus and xiphisternum.
4. Grasp this hand with your other hand and pull sharply inwards and upwards.
5. Repeat up to five times.
6. If the obstruction is still not relieved, continue alternating five back blows with five abdominal thrusts.

If the victim becomes unconscious:
1. Support the victim, while carefully lowering him or her to the ground.
2. Immediately call for EMS.
3. Begin cardiopulmonary resuscitation (CPR) at the compression part of the sequence.

The finger sweep:
Avoid use of a blind finger sweep. Manually remove solid material in the airway only if it can be seen.

For Infants (≤1 year old)

If the victim shows signs of mild airway obstruction:
Continue to watch the infant, but do nothing else. Aggressive treatment with back blows and chest compression may cause potentially serious complications and could worsen the airway obstruction. Victims with mild airway obstruction should remain under continuous observation until they improve, because severe airway obstruction may develop.

If the victim shows signs of complete airway obstruction and is conscious:
Apply up to five back blows as follows:
1. Lay the infant face down along your arm with the head lower than the body. Support the infant in a head downward, prone position, to enable gravity to assist removal of the foreign body.
2. A seated or kneeling rescuer should be able to support the infant safely across his or her lap.
3. Support the infant's head by placing the thumb of one hand at the angle of the lower jaw, and one or two fingers from the same hand at the same point on the other side of the jaw. Do not compress the soft tissues under the chin.
4. Give up to five sharp blows between the shoulder blades with the heel of your other hand.
5. Check to see if each back blow has relieved the airway obstruction. The aim is to relieve the obstruction with a blow/slap, not to necessarily give all five.

If five back blows fail to relieve the airway obstruction, give up to five chest thrusts as follows:
1. Turn the infant into a head downward, supine position. This is achieved safely by placing the free arm along the infant's back and encircling the back part of the head with the hand. Support the infant along your arm, which is placed down (or across) your thigh.
2. Find your landmarks, two fingers below the nipple line.
3. Give chest thrusts (compress approximately 1/3 of the depth of the chest). These are similar to chest compressions but sharper and delivered at a slower rate.
4. Repeat up to five times.
5. If the obstruction is still not relieved, continue alternating five back blows with five chest thrusts.

If the victim becomes unconscious or is found unconcious:
1. Support the victim, while carefully lowering him or her to a firm surface.
2. If EMS has not arrived or been called, immediately call for EMS.
3. Open the airway.
4. Give 2 to 5 rescue breaths. During the first attempts at rescue breaths, if a breath does not make the chest rise, reposition the head before making the next attempt.
5. Begin cardiopulmonary resuscitation (CPR) at the compression part of the sequence.

The finger sweep:
In general, finger sweeps are not used in infants. Solid material in the airway can be manually removed only if it can be seen.

Aftercare and referral for medical examination:
After successful treatment for FBAO, foreign material may nevertheless remain in the upper or lower respiratory tract and cause complications later. Victims with a persistent cough, difficulty swallowing or the sensation of an object being still stuck in the throat should be referred for a medical examination. Another reason for medical examination is the possibility of serious internal injuries resulting from abdominal thrusts or injury to the airway from the object that was lodged and removed.

Poisoning

Introduction

A large number of poisonous substances are found in the home and worksite. It is important to understand the toxic nature of chemical substances in the environment and the proper protective equipment and emergency procedures in case of toxic exposure. Most frequently, intoxication happens through inhalation or ingestion of poisonous material. Most countries have a poison control centre (or equivalent institution), which serves as an excellent resource for advising on the treatment of ingestion of, or exposure to, a potential poison. It is important to inform the poison control centre of the nature of the exposure, the time of exposure and the name of the product or toxic substance; all instructions provided by the centre should be followed.

Summary of scientific foundation

External contact

Water irrigation: Irrigation of the skin and eye after exposure to caustic agents can reduce the severity of tissue damage and has been a mainstay of first aid treatment. Evidence from multiple studies examining alkali and acid exposure of both the eye and skin showed that outcomes were improved when water irrigation was rapidly administered in first aid treatment. In one non-random case series of immediate (first aid) versus delayed (health care provider) skin irrigation, the incidence of full-thickness burns was lower and length of hospital stay was decreased by 50% with immediate and copious irrigation of skin chemical burns. Animal evidence also supports water irrigation to reduce exposure of the skin and eye to acid. In a study of rats with acid skin burns, water irrigation within 1 minute of burn prevented any drop in tissue pH, whereas delayed irrigation allowed a progressively more significant fall in tissue pH.

Internal contact

Dilution with milk or water: There are no human studies on the effect of treating oral caustic exposure with dilution therapy. Five animal studies demonstrate histological benefit to animal tissue representative of the esophagus when diluent was administered after exposure to an alkali or acid. One in vitro chemistry study demonstrated no benefit from the addition of large volumes of diluent to either a strong base or a strong acid.

References: 62-67

Syrup of ipecac: Studies examining clinically relevant outcomes found no advantage to administering syrup of ipecac to a suspected poisoning victim. Additional studies demonstrated effects, such as intractable emesis and delayed activated charcoal administration, when syrup of ipecac was given. One nonclinical but epidemiologic study showed that administration of syrup of ipecac is not associated with decreased use of health care resources.

References: 68-73

Activated charcoal: No evidence has been found to suggest that activated charcoal is efficacious when used as a first aid measure, although two small studies suggest that it may be safe to administer. The published data on experience with activated charcoal administered by first aid providers to victims of suspected poisoning are limited. Also of note is a study that demonstrated that most children will not take the recommended dose of activated charcoal.

References: 74-76

Guidelines

- In rendering first aid to a poison victim, the first priority is the safety of the rescuer/first aid provider, meaning that any direct contact with gases, fluids or any other material possibly containing poisons should be avoided (recommendation**).
- For victims who have ingested a caustic substance, administration of a diluent by a first aid provider is not recommended (option*). But in remote areas where further care is delayed or when advised to do so by a poison control centre, EMS or local equivalent, giving a diluent (milk or water) may be appropriate (option*).
- Activated charcoal should be used as a first aid measure only on the direction of a poison control centre or equivalent agency (recommendation**).
- Ipecac syrup must not be used by the lay public as a first aid treatment in acute poisoning (standard***).
- To treat skin or eye exposure to acid and alkali, first aid providers should immediately irrigate the skin or eye with copious amounts of tap water (recommendation**).

Implementation considerations

For a toxic substance exposure, the preferred action is to call and follow instructions of a poison control centre or EMS if these resources are available.

In general, the first step is to stop or limit further effect of the poison by stopping continued exposure.

- In the case of inhalation of a toxic gas, the victim should be removed from the area, but this should be done only while maintaining rescuer safety.
- In the case of external or internal contact with a toxic material:
    - Dry chemicals/powders should be removed before the victim is rinsed.
    - The body surface should be rinsed.
    - The (caustic) toxin should be diluted.
    - The poison in the stomach or bowel should be removed or bound (usually done by health care professionals).

Personal protective equipment (e.g., gloves, glasses) should be worn during removal of toxins.

Mouth-to-mouth resuscitation should be avoided in the presence of toxins such as cyanide, hydrogen sulfide, corrosives or organophosphates.

Carbon monoxide

Introduction

Frequent sources of carbon monoxide (CO) are gas engines, fires, furnaces and space heaters, especially in badly ventilated spaces. Typical symptoms of CO poisoning are headache, nausea, vomiting, muscle weakness (especially in lower limbs), unconsciousness and seizures.

Summary of scientific foundation

A formal scientific evidence review was not done for this topic, but it is important in first aid education, and the following guidelines are based on expert opinion.

Guidelines

- First aid providers may attempt rescue if trained and able to perform safely (option*).
- All doors and windows should be opened (recommendation**).
- Move the victim out of the area with the gas, but only if this can be done without endangering the first aid providers (option*).
- First aid providers if trained should administer oxygen to victims of CO poisoning (recommendation**).
- If the victim is unconscious, maintain a patent airway and perform rescue breathing if needed (option*).

Implementation considerations

National Societies will need to determine whether the education on providing assisted ventilation should include the use of a barrier device and/or the use of a bag-valve-mask (BVM) resuscitator. This decision should be based on level of provider being trained, resources, medical direction, infection control standards, the approaches of local emergency services, public health input and national circumstances (i.e., ethical considerations, customs, local practices, etc.).

Chest pain

Introduction

Chest pain can be a symptom of a wide variety of conditions (heart, lung, chest wall, etc.). For the first aid provider, the most important consideration is heart attack, usually caused by atherosclerosis. Smoking, high blood pressure, diabetes and overweight are important risk factors. Important complications include cardiac arrest, shock and shortness of breath.

Summary of scientific foundation

Evidence from two large randomised trials clearly demonstrates that administration of aspirin within the first 24 hours of onset of chest pain in patients with acute coronary syndromes reduces mortality. Evidence from a retrospective registry shows an association between early prehospital administration of aspirin and lowered mortality in patients with acute myocardial infarction. There is evidence from a retrospective study that prehospital administration of aspirin is safe; this study suggested that prehospital aspirin might facilitate early reperfusion and suggests the value of early aspirin administration during acute myocardial infarction.

There are no studies evaluating the safety and efficacy of having first aid providers or lay people administer aspirin to victims of chest pain. But one could extrapolate from studies with EMT-Basic, whose ability to diagnose the cause of chest pain would be no different than that of a first aid provider. Based on this extrapolation and expert opinion, this practice appears to be safe and effective.

References: 77-80

Guidelines

- Victims experiencing chest pain must be assisted with taking their prescribed aspirin (standard***).
- If the victim experiencing chest pain believed to be cardiac in origin has not taken an aspirin, the first aid provider should give him or her aspirin as either one adult tablet (325 mg or other adult tablet dosage) not enteric coated, or two low-dose "baby" aspirin (81 mg), unless there is a contraindication, such as an allergy or bleeding disorder (recommendation**).
- The first aid provider should assist the patient with administration of his or her prescribed nitrate (recommendation**).
- If trained, the first aid provider may administer a nitrate to a victim experiencing chest pain (option*).
- The first aid provider may bring a victim experiencing chest pain to a comfortable position (usually semi-sitting based on local protocols) and ask the victim to refrain from physical activity (option*).
- A first aid provider may administer oxygen to a victim with chest pain if the first aid provider is trained and oxygen is available, but use of oxygen should not delay other actions (option*).

Implementation considerations

The administration of aspirin for chest pain depends on local legal regulation, including National Society influence on regulation, liability protection, capacity of Red Cross society and level of education and competency of first aid providers in the national context.

The following information may be helpful in assessing and recognizing chest pain.

Warning signs of a heart attack may include the following:

- **Chest discomfort**
  Most heart attacks involve discomfort in the centre of the chest that lasts more than a few minutes or that goes away and comes back. It can feel like uncomfortable pressure, squeezing, fullness or pain.
- **Discomfort in other areas of the upper body**
  Symptoms can include pain or discomfort in one or both arms, the back, neck, jaw or stomach.
- **Shortness of breath**
  Chest discomfort may or may not be present.
- **Other possible signs**
  These include paleness, breaking out in a cold sweat, nausea or lightheadedness.

Some heart attacks are sudden and intense, but many start slowly with mild pain or discomfort. Often, affected people are not sure what is wrong and wait too long before getting help. Even if a first aid provider is not sure it is a heart attack, he or she should *not wait more than 5 minutes* before calling the emergency response number for requesting rapid treatment and transport to the emergency room. EMS staffs are trained to revive someone whose heart has stopped.

Stroke

Introduction

Stroke is an acute disturbance of cerebral circulation (commonly diminished circulation, less frequently bleeding). Early admission to a stroke centre greatly improves the prognosis for a stroke victim, highlighting the need for first aid providers and the lay public to be able to quickly recognize stroke symptoms. The goal is for the victim to receive definitive treatment in time to benefit from newer therapies. In most cases, this means receiving clot-busting treatment within 3 hours of the onset of stroke symptoms, and in cases caused by bleeding, an intervention or surgery as soon as possible.

Summary of scientific foundation

A formal scientific evidence review was not done for this topic, but it is important in first aid education, and the following guidelines are based on expert opinion.

Guidelines

- First aid providers should be able to recognize early signs of stroke and call EMS as soon as possible (recommendation**).
- For a victim experiencing stroke symptoms, first aid providers can bring the victim to a comfortable position (usually semi-sitting or semi-prone, based on local protocols), ask the victim to refrain from physical activity, and regularly check consciousness and breathing (option*).

Implementation considerations

The possibility/probability of stroke can be recognized easily by the following warning signs:

- Sudden numbness or weakness of the face, arm or leg, especially on one side of the body
- Sudden confusion, trouble speaking or understanding
- Sudden trouble seeing in one or both eyes
- Sudden trouble walking, dizziness, loss of balance or coordination
- Sudden, severe headache with no known cause

Stroke-like symptoms that are mild and temporary may indicate a transient ischemic attack (TIA), which is a warning or mini stroke that results in no lasting brain injury. The short duration of the symptoms and lack of permanent brain injury are the main differences between TIA and stroke. Nevertheless, recognizing the possibility of a TIA is important because it allows early treatment to reduce the risk of a major stroke.

The probability of stroke is strongly supported if the victim shows any of these signs when asked to perform the following:

- when showing the teeth, the corner of the mouth is dropped
- when lifting both arms with palms turned upwards while eyes are closed, one arm is drifted or dropped
- when repeating a simple sentence, speech is unclear or slurred, or the words do not come easily

In terms of first aid, the most important actions are to:
- recognize the warning signs of stroke
- note their time of onset
- immediately call for expert help (an ambulance, ideally with advanced life support)

See also unconsciousness and seizures, which can be complications of stroke.

Dehydration/gastrointestinal distress

Introduction

Dehydration can be a consequence of a wide variety of illnesses (vomiting and diarrhea, heat stress or exhaustion, fever, etc.). Common symptoms of gastrointestinal (GI) distress include abdominal pain, nausea and/or vomiting, and/or diarrhea and sometimes fever. Dehydration may result, especially in prolonged or severe vomiting or diarrhea, or in children and older adults.

Summary of scientific foundation

The overall scientific merit of many articles in the literature related to exercise- or environmental-induced dehydration is generally weak. But there are well-reported studies on the method and treatment of GI-based dehydration. Most studies had a small number of participants, typically six to eight adult men. An exercise model in an environment with elevated temperature typically results in dehydration, with a target level of <2%. This level of dehydration is typically less than the level that makes a particular person symptomatic.

Two studies have shown that oral strategies of fluid resuscitation are as effective as IV routes for people with dehydration. In a model of mild exercise- and heat-induced dehydration, ten studies have demonstrated that carbohydrate or electrolyte solutions are more effective than water in restoring intravascular volume after experimental, exercise-induced dehydration. One study suggested that a 12.5% carbohydrate solution containing glucose and fructose resulted in a more rapid fluid delivery than solutions containing only glucose. One study demonstrated that hypertonic glucose solutions may be more effective in maintaining hydration status after sweat loss. In one study, sodium content was more important than total osmotic content to increase plasma volume while at rest. In another study, milk was more effective than water for fluid replacement in the dehydrated individual. The volume of fluid administered needs to exceed the volume of estimated sweat loss or other losses by 150%. Per a recent World Health Organization monograph on oral rehydration therapy, “Dehydration from diarrhea can be prevented by giving extra fluids at home, or it can be treated simply, effectively and cheaply in all age groups and in all but the most severe cases by giving patients by mouth an adequate glucose electrolyte solution called Oral Rehydration Salts (ORS) solution.”

The literature has also shown differences in composition between commercially prepared sports electrolyte solutions and oral rehydration solutions.

About fluids:
- Administration of electrolyte solutions rehydrates with a lesser increase in urine output than water, indicating that a greater volume remains intravascular.
- Hypertonic glucose and electrolyte solutions are more effective in restoring and maintaining intravascular volume than water.
- A carbohydrate concentration of >6% may have a limited role in increasing fluid retention; however, increasing electrolyte concentration may still be beneficial.

- Oral fluids are as effective as IV fluids when supplemented with electrolytes or carbohydrates.
- The proportion of oral fluids retained in the intravascular space is directly related to their sodium concentration.
- The volume of oral fluids ingested typically must exceed the volume of sweat and other losses. Unless the sodium content of the fluid is high enough, the fluids will not remain intravascular.

References: 81-93

Guidelines

- For dehydration, first aid providers should rehydrate using an oral rehydration solution (recommendation**).
- Either a commercially prepared oral rehydration solution or a pre-prepared salt package for oral rehydration that complies with World Health Organization recommendations for ORS solutions should be used (recommendation**). In the absence of pre-prepared solutions, a homemade solution may be used (option*).
- For diarrheal illness, first aid providers may place the victim in a horizontal position. If there is considerable abdominal pain, bending the hips and knees may be helpful (option*).

Implementation considerations

Knowing the symptoms of dehydration and GI distress is helpful.

Symptoms of dehydration include the following:

- pale and dry skin
- dry mouth and tongue
- weakness

Symptoms of GI distress include the following:

- nausea/vomiting
- diarrhea
- abdominal pain
- eventually signs of dehydration and/or fever

If symptoms appear suddenly, are serious or are accompanied by dehydration (or the latter appears alone), emergency treatment may be necessary. Even mild cases of GI distress may require a medical examination although the need is not necessarily urgent.

Prepare oral dehydration solution using oral rehydration salt (ORS) packets:

- Wash hands with water and soap or ask before preparing solution.
- Follow preparation direction on the ORS packet.
- Put one litre of safe water in a clean pot.
- Empty packet of ORS into the water while stirring.

In the absence of pre-prepared packets , a homemade solution can be formulated with the following ingredients (although many alternative formulations exist):

- 1/2 teaspoon of salt
- 6 teaspoons of sugar
- 1 litre of water

See also shock.

Acute complications of diabetes

Introduction

Diabetes is frequently complicated by serious events such as heart attack or stroke (*see the relevant chapters*), but significant or extreme alterations of blood sugar level (hyper- or hypoglycemia) are also important.

Summary of scientific foundation

The literature, which focuses primarily on adult patients with diabetes, suggests a well-established and generally accepted standard of practice for treatment of hypoglycemia via administration of glucose tablets or a carbohydrate-containing food or beverage, or IV glucose for severe hypoglycemia when oral administration is not possible. The long history of acceptance of glucose administration for hypoglycemia treatment has likely contributed to the lack of clinical research. In 2008, a consensus statement by the American Diabetes Association (ADA) recommended that glucose is preferred in the conscious individual with hypoglycemia and stated that any form of carbohydrate that contains glucose may be used. However, this recommendation, as well as the instruction to prescribe glucagon for all individuals at significant risk of severe hypoglycemia, is based on "expert consensus or clinical experience" rather than on well-conducted studies. The ADA also suggested that although pure glucose is preferred, any carbohydrate containing glucose will also raise blood glucose, and goes on to recommend that emergency glucagon kits be used in cases of severe hypoglycemia that cannot be treated orally because of confusion or unconsciousness.

Again, no evidence level or supporting references were provided for these statements. An earlier review (2003) published by the ADA had also recommended IV glucose as the preferred treatment for severe hypoglycemia but that glucagon was useful for use by family members. The ADA also stated that most episodes of symptomatic hypoglycemia can be effectively self-treated by ingestion of glucose tablets or carbohydrate. An initial glucose dose of 20 g was suggested, based on a small study of 17 patients (both insulin-dependent diabetes mellitus and non-diabetic patients) in which oral glucose (10- and 20-g doses) was compared with glucagon (given subcutaneously) and placebo. The 10-g dose of oral glucose provided a more rapid rise (30 minutes) in glucose but a lower peak than the 20-g dose. Both doses maintained serum glucose similarly for about an hour. In those treated with glucagon, peak glucose concentration took longer to achieve but the delay in fall of glucose levels also took longer, resulting in hyperglycemia. This study was not intended to identify an ideal dose of glucose and did not indicate whether the difference in outcome between the 10-g and 20-g dose was significant. Alanine and terbutaline have also been studied as potential treatments for hypoglycemia, but neither has been compared directly to oral glucose or glucagon.

In a study of 41 patients with type 1 diabetes mellitus, hypoglycemia was induced with IV insulin until the desired low blood sugar was obtained. Patients self-reported symptoms of hypoglycemia and asked for treatment, which was given and suggested that 15 g of glucose was effective.

Treatment with seven different carbohydrates was compared. All seven carbohydrates (glucose tablet, sucrose [sugar lumps], glucose tablet dissolved in 150 ml water, sucrose dissolved in 150 ml water, dextrose gel, cornstarch, and orange juice) were equivalent to 15 g of glucose. Dextrose gel and orange juice were the least effective in achieving a rapid rise in glucose in the first 10 minutes, a result that was statistically significant. Sucrose achieved a statistically higher glucose level at 15 and 20 minutes than sucrose tablets dissolved in water. There was no difference between glucose tablets and glucose tablets in water. A dose of 20 g corrected hypoglycemia without rebound hyperglycemia, leading the authors to suggest 20 g as an effective dose

Another study compared a 20-g carbohydrate intake of milk, orange juice or D-glucose as well as 40 g of orange juice to correct insulin-induced hypoglycemia in an inpatient setting. The D-glucose tabs produced a faster and higher response to hypoglycemia than milk or 20 g of orange juice, but 40 g of orange juice produced a similar peak response with a delay in achieving the peak glucose. (Of note is that the glucose content of 40 g of orange juice is equal to that of 20 g of D-glucose.) Regardless of the similar peak response, the delay makes treatment with orange juice less desirable than treatment with D-glucose. This study also looked at isolated cases of spontaneous hypoglycemia and treated patients with D-glucose; a rise in glucose concentration of at least 20 mg/dl was seen within 20 minutes in all patients.

References: 94-98

Guidelines

- A person with diabetes who is experiencing a diabetic emergency must be instructed to test his or her blood glucose level (standard***).
- If trained, first aid providers may check the blood glucose level of a victim experiencing a diabetic emergency (option*).
- A victim experiencing a diabetic emergency due to hypoglycemia or if it is unknown whether the emergency is due to hypo- or hyperglycemia must be encouraged to treat themselves with sugar containing food or drink (standard***).
- In a diabetic emergency, the victim must be given 20 grams of glucose, preferably using an oral glucose tablet (20 g); if a tablet is not available, less effective methods (in priority of effectiveness) include glucose gel, orange juice (340 g or 1/3 L) or granular table sugar (20 g) (standard***).
- First aid providers should administer glucose (as a sugar containing food or drink) to a person with diabetes who is experiencing hypoglycemia or if it is unknown whether the emergency is due to hypo- or hyperglycemia (recommendation**).

Implementation considerations

Hyperglycemia evolves gradually and can be asymptomatic over a longer period (even days), but hypoglycemia is usually a sudden and life-threatening event with typical symptoms (appearing frequently in this sequence):
- hunger, headache
- agitation, tremor
- psychotic behaviour (often resembling drunkenness)
- loss of consciousness
- seizures (eventually)

Recognizing the possibility of hypoglycemia is most important because the victim requires rapid treatment. If consciousness can be preserved and the victim can eat and drink, self-treatment (ingestion of sugar-containing food or drink) is possible, perhaps with the assistance of a first aid provider. If the victim becomes very disturbed or unconscious, and eating/drinking becomes dangerous because of the possibility of aspiration, calling the emergency response number for immediate emergency treatment is of vital importance. *See also* unconsciousness/altered mental status and seizures.

Shock

Introduction

Shock is a spontaneously deteriorating process mainly affecting the peripheral circulation frequently caused by sudden loss of body fluids (bleeding), serious injury, heart infarction, pulmonary embolism, etc. While the primary treatment is usually directed at the cause of shock, support of circulation is important. Advanced life support providers have many means of supporting circulation at their disposal, while fewer options are available to basic life support providers. One treatment that historically has been taught is raising the legs of a victim in shock. In addition, maintaining body temperature has been considered important in management of shock.

Summary of scientific foundation

Evidence from five studies demonstrates that passive leg raising (horizontal lying position with supported legs in elevated position) and/or the modified Trendelenburg (leg up-head down) position does not significantly increase mean arterial pressure and/or cardiac output. But evidence from two non-controlled studies and two animal/model studies have demonstrated that passive leg raising can increase cardiac output and/or volume responsiveness. In addition, one study that was non-controlled and limited did show potential harm from the Trendelenburg position. Of all of these studies, none showed any improvement in patient outcome. In summary, the evidence on leg raising is weak with conflicting results in that some studies show benefit, some show no effect and none show improved outcome with only one possibly showing harm with one position.

A formal scientific evidence review was not done for maintaining temperature in shock, but it is important in first aid education, and the following guidelines are based on expert opinion.

References: 99-108

Guidelines

- Victims showing signs and symptoms of shock should be placed in a supine position if tolerated (recommendation**).
- For victims experiencing shock, body temperature should be maintained and heat loss prevented (recommendation**).
- For victims experiencing shock without evidence of spinal injury, the legs may be raised 6-12 inches (option*).

Implementation considerations

Shock is a complex emergency condition that requires prompt medical treatment. The main tasks of the first aid provider are to call for medical assistance and to:
- place the victim in a proper position and maintain body temperature
- eliminate the cause if possible (e.g., stop the bleeding)
- prevent cooling down if relevant (e.g., a victim on the street)

Unconsciousness/altered mental status

Introduction

Loss of consciousness means that the victim is unresponsive to verbal and physical stimuli.

Summary of scientific foundation

A formal scientific evidence review was not done for this topic, but it is important in first aid education, and the following guidelines are based on expert opinion.

Guidelines

- For the unconscious victim, first aid providers should ensure a patent airway, determine if breathing is present, position the victim and call for EMS (recommendation**).

Implementation considerations

Unconsciousness can happen suddenly (as a consequence of cardiac arrest, stroke, head injury, electrocution, etc.) or gradually (as a consequence of intoxication, hyperglycemia, also stroke, etc.). Along with a gradual loss of consciousness, the victim can show an altered mental status, but the latter can also last a long time without any loss of consciousness.

Sudden loss of consciousness can result in a fall and injuries. In prolonged unconsciousness, the airways can be obstructed; in this case, the airway needs to be opened and airway patency maintained by placing the victim in recovery position (*see* patient positioning).

When evaluating a victim with altered mental status it is important not to assume this is mental illness but to assess for more serious illness or injury, e.g., hypoglycemia, stroke, head injury, poisoning, etc. (*see the relevant chapters*).

Beyond the quite limited interventions mentioned above, it is essential to call immediately for EMS.

Convulsions and seizures

Introduction

When the normal functions of the brain are disrupted by injury, disease, fever, poisoning or infection, the electrical activity of the brain becomes irregular. The irregularity can cause a loss of body control known as *seizure*. Seizures may be caused by a condition called *epilepsy*, which is usually controllable with medication. Some children and infants have seizures that are caused by a sudden high fever.

Summary of scientific foundation

A formal scientific evidence review was not done for this topic, but it is important in first aid education, and the following guidelines are based on expert opinion.

Guidelines

- First aid providers may place a seizure victim on the floor and prevent him or her from being injured (option*).
- Once the seizure has ended, first aid providers should assess the airway and breathing and treat accordingly (recommendation**).

Implementation considerations

When assessing the victim, look for:

- unusual sensation or feeling such as a visual hallucination (patient is experiencing an aura)
- irregular or no breathing
- drooling
- upward rolling of the eyes
- rigid body
- sudden, uncontrollable, rhythmic muscle contractions (i.e., convulsions)
- decreased level of responsiveness
- loss of bladder or bowel control

To provide care:

- Reassure the victim that you are going to help.
- Remove nearby objects that might cause injury.
- Protect the victim's head by placing a thinly folded towel or clothing beneath it. Do not restrict the airway doing so.
- Do not hold or restrain the patient.
- Do not place anything between the victim's teeth or put anything in his or her mouth. The victim will not swallow his or her tongue.
- If the seizure was caused by a sudden rise in body temperature, loosen clothing and fan the victim. Do not immerse in cold water or use rubbing alcohol to cool.
- When the seizure is over, be sure that the victim's airway is open, and check for breathing and injuries.
- Comfort and stay with the victim until he or she is fully conscious.

Call EMS (national number or the local emergency number) immediately if:

- A seizure lasts longer than 5 minutes or is repeated.
- A seizure is followed by a quick rise in the child's temperature.
- The victim does not regain consciousness.
- The victim has diabetes or is injured.
- The victim has never had a seizure before.
- Any life-threatening condition is found.

Call your doctor if:

- A child has a fever with a seizure
- The victim has a known seizure disorder, but the seizure is a different type or is occurring more frequently

Injuries

Burns

Introduction

Immediate cooling of thermal burns (chemical, electrical, etc.) with cold tap water, which has been a common remedy for many years, is also supported by a large number of observational clinical studies and controlled experiments in animals.

Summary of scientific foundation

Cooling may relieve pain and reduce oedema, infection rates, depth of injury and need for grafting. It may also promote more rapid healing. One small, controlled human volunteer study, several large retrospective human studies, and multiple animal studies document consistent improvement in wound healing and reduced pain when burns are cooled with cold water (10°-25°C [50°-77°F]). Several studies indicate that cooling of burns should begin as early as possible and continue at least until pain is relieved.

There is no clear, evidence-based consensus on the treatment of burn blisters. Many recommendations are based on low-level studies and common practice. Although many first aid guidelines recommend that burn blisters be left intact, some researchers suggest that burn blister fluid may retard healing, particularly when blisters are large (>2.5 cm) and thin-walled. In one case control study that looked at wound healing rates for burn blisters, blisters in which the fluid was drained had better healing than intact blisters. In contrast, most animal data document faster healing rates, significantly lower infection rates, and less scar tissue formation when burn blisters were left intact versus when they were debrided.

When current traverses the body, thermal burns may be present at the entry and exit points and along its internal pathway. Cardiopulmonary arrest is the primary cause of immediate death from electrocution. Cardiac arrhythmias, including ventricular fibrillation, ventricular asystole, and ventricular tachycardia that progresses to ventricular fibrillation, may result from exposure to current even if low voltage. Respiratory arrest may result from effects on the respiratory centre in the brain or contractions followed by paralysis of respiratory muscles.

Irrigation of the skin and eye after exposure to caustic agents can reduce the severity of tissue damage. Evidence from multiple studies examining alkali and acid exposure of both the eye and skin showed that outcomes were improved when water irrigation was rapidly administered in first aid treatment. In one non-random case series of immediate (first aid) versus delayed (health care provider) skin irrigation, the incidence of full-thickness burns was lower and length of hospital stay was decreased by 50% with immediate and copious irrigation of skin chemical burns. Animal evidence also supports water irrigation to reduce exposure of the skin and eye to acid. In a study of rats with acid skin burns, water irrigation within 1 minute of burn prevented any drop in tissue pH, whereas delayed irrigation allowed a progressively more significant fall in tissue pH.

Guidelines

- Burns must be cooled with cold water (15-25°C [59-77°F]) as soon as possible, and the provider should continue to cool the burn until pain resolves (standard***).
- First aid providers should avoid cooling burns with ice water for longer than 10 minutes, especially if burns are large (>20% total body surface area). Ice should not be applied to a burn (recommendation**).
- Because the need for blister debridement is controversial and requires equipment and skills that are not consistent with first aid training, first aid providers should leave burn blisters intact and cover them loosely (recommendation**).
- To treat skin or eye exposure to acid or alkali, first aid providers must immediately irrigate the skin or eye with copious amounts of tap water (standard***).
- All electrical burns should have a medical evaluation (recommendation**).

References: 109-166

Implementation considerations

None.

Bleeding

Introduction

Control of bleeding is a core first aid skill.

Summary of scientific foundation

Direct pressure
Although bleeding is a common first aid emergency and control of hemorrhage can be lifesaving, only two studies reported the efficacy of direct pressure to control hemorrhage in the prehospital or field hospital settings, and in both studies the pressure was applied by trained medical personnel. One case series described a technique of hemorrhage control by highly trained ambulance workers. Hemorrhage control was achieved by wrapping an adhesive elastic bandage applied directly over a collection of 4 × 4-inch gauze pads placed on the wound surface. The roll was wrapped around the body surface over the bleeding site until ongoing hemorrhage ceased. The pressure effectively stopped bleeding in all cases with no complications. In a second case series from a field hospital, the efficacy of direct pressure applied by trained providers with an elastic bandage to control hemorrhage in 50 successive victims of traumatic amputations was compared with the effectiveness of tourniquets used for 18 previous victims with traumatic amputations from mine explosions. Less ongoing bleeding, higher survival rates, and higher admission hemoglobin were observed in the 50 victims in whom bleeding was controlled with direct pressure than in the 18 earlier victims in whom bleeding was controlled with a tourniquet.

Four studies from cardiac catheterization experience, one animal study, and clinical experience document that direct pressure is an effective and safe method of controlling bleeding.

Elevation and pressure points
The efficacy, feasibility and safety of use of pressure points to control bleeding have never been subjected to any reported study, and there have been no

published studies to determine if elevation of a bleeding extremity helps to control bleeding or causes harm. No effect on distal pulses was found in volunteers when pressure points were used. Most important, using these unproven procedures has the potential to compromise the proven intervention of direct pressure by diverting attention and effort from direct pressure.

References: 167-181

Tourniquets

The use of tourniquets by first aid providers to control bleeding has been controversial, and tourniquets have fallen out of use in first aid programmes. Despite this, tourniquets are routinely and safely used for hemostasis in surgical procedures in operating rooms, where applied pressure and occlusion time are strictly measured and controlled, and on the battlefield when occlusion time is carefully documented. But these results cannot be extrapolated to the first aid setting. In addition, in the past few years the use of tourniquets in military environments has increased. The effectiveness, feasibility and safety of tourniquets to control bleeding by first aid providers are unknown. Tourniquets are routinely used in operating rooms under controlled conditions, and they have been effective in controlling bleeding from an extremity, but potential undesired effects include temporary or permanent injury to the underlying nerves and muscles, as well as systemic complications resulting from limb ischemia, including acidemia, hyperkalemia, arrhythmias, shock, limb loss and death. Complications are related to tourniquet pressure and occlusion time. Pressure has been found to be superior to tourniquets in controlling bleeding, although tourniquets may be useful under some unique conditions (e.g., the battlefield, when rapid evacuation is required and ischemic time is carefully monitored). The method of application and the best design of tourniquets are under investigation.

In the more recent military studies, including a retrospective military field case series, 110 tourniquets were applied to 91 soldiers by medical (47%) or non-medical (53%) personnel. The tourniquets controlled bleeding in most (78%) of the victims, typically within 15 minutes. Penetrating trauma was the most common mechanism of injury, and ischemic time was 83 ± 52 minutes (range: 1 to 305 minutes). The rate of success was higher for medical staff than for non-medical personnel, and for upper limbs (94%) than for lower limbs (71%, $P<0.01$). Neurologic complications of the tourniquet were reported in seven limbs of five victims (5.5%) who had an ischemic time of 109 to 187 minutes. Complications included bilateral peroneal and radial nerve paralysis, three cases of forearm peripheral nerve damage, and one case of paresthesia and weakness of the distal foot.

In the non-randomised report of victims of traumatic amputation from mine explosions cited in the previous section, tourniquet use resulted in more bleeding, lower survival rates, and lower hemoglobin levels at admission than did use of direct pressure with an elastic bandage.

Tourniquet complications range from minor and self-limiting to a long-lasting disability to death. Complications can occur as a result of crush injury to the underlying nerves and muscles. In an animal study, the degree of muscle impairment was directly related to the pressure applied. The muscle impairment may be reversible or permanent. In addition to these local effects, systemic complications can result from limb ischemia. These complications appear to be related to occlusion time and pressure. Safe limits of time, pressure, and the advisability of intermittent tourniquet release are still controversial. Most authorities agree that occlusion for <2 hours appears to be safe. Surgical experience is that amputation of the limb is mandatory without removal of the tourniquet if it has been in place for ≥6 hours. Long ischemic times may lead to gas gangrene and systemic effects that can prove fatal. However, none of the studies addressed the focal complications versus loss of life due to uncontrolled bleeding that might support the use of tourniquets when other methods to control life-threatening bleeding either fail or are not feasible.

References: 182-199

Hemostatic agents

One scientific review indicated hemostatic agents have efficacy in controlling hemorrhage that cannot be controlled with direct pressure alone. Implementation by military and civilian EMS-trained responders demonstrated varying effectiveness secondary to appropriate use of the hemostatic agent. Little discourse and no studies were identified for civilian laypeople using hemostatic agents. Evidence from four studies in adults showed a significant improvement in control of bleeding after the use of topical hemostatic agents by trained individuals in victims with life-threatening bleeding that was not controlled by standard techniques in an out-of-hospital setting. This beneficial outcome is supported by 20 animal studies. Effectiveness varied significantly between different agents. Adverse effects of certain agents included tissue destruction with induction of a pro-embolic state, and potential thermal injury. In addition, recent military case reports have shown the possibility of a pulmonary embolus with certain agents. A number of hemostatic agents are on the market, and some have been shown to be effective.

References: 200-224

Guidelines

- First aid providers must control external bleeding by applying direct pressure (standard***).
- The use of pressure points and elevation is not recommended (option*).
- When direct pressure fails to control life-threatening bleeding or is not possible (e.g., multiple injuries, inaccessible wounds, multiple victims), tourniquets should be used in special circumstances (such as disaster, war-like conditions, remote locations or specially trained first aid providers) (recommendation**).
- Cooling of the distal limb should be considered if a tourniquet needs to remain in place for a prolonged time (recommendation**).
- The out-of-hospital application of a topical hemostatic agent to control life-threatening bleeding not controlled by standard techniques could be considered with appropriate training (option*).

Implementation considerations

The method of application and best design of tourniquets is still under investigation. Tourniquets may be useful under some unique conditions (e.g., battlefield conditions when rapid evacuation is required and ischemic time is carefully monitored). The evidence does stress the importance of using a commercially manufactured and tested tourniquet versus an improvised device. There is insufficient evidence to determine how long a tourniquet can remain in place safely, and local protocols and medical direction should be followed. Cooling of the distal limb should be considered if a tourniquet needs to remain in place for a prolonged period of time.

Different forms of topical hemostatic agents are available, and knowledge of each and their risks is needed to know which is best to use. In addition, proper training in the use of topical hemostatic agents is necessary for use by first aid providers.

Head and spinal injuries

Introduction

Minor head injury and concussions are common in children, youth and adults. Concussion has many signs and symptoms, some of which overlap with other medical conditions. Loss of consciousness is uncommon in most head injuries, and if it lasts longer than 30 seconds, it may indicate more significant intracranial injury. Although the evidence is questionable as to the ability of first aid providers to identify a spinal injury, they should have a high index of suspicion based on events that have occurred and treat as if a spinal injury was present.

Summary of scientific foundation

The literature on mild head trauma does not provide a sufficient scientific basis on which clinical management decisions can be made with certainty. The field remains burdened by inconsistent definitions of case severity, inadequate specification of the population base, and varied and incomplete definition of outcome. Nonetheless, the published data do indicate that 1) a small proportion of children with minimal and mild head injury will have significant intracranial injury; 2) the presence of either loss of consciousness or amnesia increases the probability that an injury is present in many, but not all studies; 3) long-term outcomes for children with minimal or mild head injury, in the absence of significant intracranial hemorrhage, are generally very good, with a suggestion of a small increase in risk of subtle, specific deficits in particular cognitive skills.

Approximately 2% of adult victims of blunt trauma evaluated in the emergency department suffer a spine injury; this risk is tripled in patients with craniofacial injury or a Glasgow Coma Scale score of <8. EMS and emergency department personnel can correctly identify injury mechanisms that may produce spinal injury in adults and children. EMS personnel can properly apply spinal immobilization devices in such circumstances, although they may not accurately detect signs and symptoms of actual spinal injury. Results of these health care provider studies constitute only extrapolated evidence for first aid actions. There are no studies showing that first aid providers can recognize potential or actual spinal injury.

There is also no evidence that first aid rescuers can correctly use spinal immobilization devices. Although the failure to detect and immobilize cervical spine injury in hospitalized patients is associated with a 7- to 10-fold risk of secondary neurologic injury, it is not clear if the secondary injuries occur in the prehospital setting and can be prevented by spinal immobilization devices. In a 5-year retrospective chart review with a multivariate analysis, all patients with blunt traumatic spine or spinal cord injuries admitted to a trauma hospital in Malaysia were compared with patients with similar injuries admitted to a US trauma hospital. Physicians blinded to hospital origin found less evidence of neurologic disability in the Malaysian patients, who were transported without spinal immobilization, than in the US patients, who were transported with spinal immobilization devices in place.

There is some evidence that spinal immobilization devices can be harmful. A retrospective chart review found that spinal immobilization devices masked life-threatening injuries. In addition, immobilization on a spine board restricted pulmonary function in healthy adults and children. Application of a cervical collar increased intracranial pressure in healthy individuals and in victims with traumatic brain injury.

References: 225-283

Guidelines

Concussion

- Persons with concussion should rest, both physically and cognitively, until their symptoms have resolved both at rest and with exertion (recommendation**).
- Any person who sustains a concussion should be evaluated by a health care professional, ideally with experience in concussion management, and receive medical clearance before returning to athletics or other physical activity (recommendation**).
- Persons with a concussion should never return to athletics or physical activity while symptomatic at rest or with exertion (recommendation**).
- Athletes also should not be returned to play on the same day of the concussion, even if they become asymptomatic (recommendation**).

Head trauma

- Any head trauma with loss of consciousness greater than 1 minute must have emergency medical evaluation and care (standard***).
- Victims of minor closed head injury and brief loss of consciousness (1 minute) should be evaluated by a healthcare professional and be observed (recommendation**).
- Observation should be done in the office, clinic, emergency department, hospital or home under the care of a competent caregiver (recommendation**).
- Victims of minor closed head injury and no loss of consciousness may be observed in the home, under the care of a competent caregiver (option*).
- Attention should be paid to airway and breathing in all victims with a head injury (recommendation**).

Spinal injury

- Considering the serious consequences of spinal cord injury, most experts agree that spinal motion restriction should be the goal of early treatment of all victims at risk of spinal injury. First aid providers should restrict spinal motion by manual spinal stabilization if there is any possibility of spinal injury (recommendation**).
- Because of the absence of any evidence supporting the use of immobilization devices in first aid and with some evidence suggesting potential harm even when these devices are used by health care providers, first aid providers should not use spinal immobilization devices unless specifically trained (recommendation**).
- Spinal immobilization devices may be used by specially trained providers or in remote locations where extrication is necessary (option*).
- First aid providers cannot conclusively identify a victim with a spinal injury but should suspect spinal injury if an injured victim has any of the following risk factors: (recommendation**)
  - Age ≥65 years old
  - Driver, passenger or pedestrian, in a motor vehicle, motorized cycle or bicycle crash

- Fall from a greater than standing height
- Tingling in the extremities
- Pain or tenderness in the neck or back
- Sensory deficit or muscle weakness involving the torso or upper extremities
- Not fully alert or intoxicated
- Other painful injuries, especially of the head and neck
- Children <3 years old with evidence of head or neck trauma

- First aid providers should assume all victims with a head injury may have a spinal cord injury (recommendation**).

Implementation considerations

It is important to account for local protocols, medical direction, response of EMS and distance of transport and extrication, which may dictate specific actions for suspected spinal injury.

Head injuries range from minor without loss of consciousness to major injuries. Regardless, first aid providers should assume that all injuries are serious unless proved otherwise and act accordingly. In addition, all head injuries should be evaluated by qualified medical personnel. It is important to remember and include in training programs (as appropriate) that not all head injuries require an EMS response and emergent transport to an emergency department. Evaluation may be via communication with a victim's primary health care provider, with observation possibly done at home.

Chest and abdomen injuries

Introduction

Involvement of the chest and abdomen in traumatic injuries is common. It is important for first providers to recognize these potentially life-threatening injuries. In addition to the management of these injuries, shock must also be addressed (*see* shock).

Summary of scientific foundation

A formal scientific evidence review was not done for this topic, but it is important in first aid education, and the following guidelines are based on expert opinion.

Guidelines

- For open chest wounds, first aid providers may apply either a simple dressing or a three-sided occlusive dressing (option*).
- For chest and abdomen injuries, first aid providers should manage shock and place the victim in a comfortable position (recommendation**).
- For open abdominal wounds, first aid providers may place moist dressings on the wound and maintain body temperature to prevent heat loss (option*). First aid providers should not push back viscera (recommendation*).
- First aid providers should stabilize impaled objects (option*).

Implementation considerations

It is important to account for local protocols and medical direction, because the management of chest and abdominal injuries can vary between countries.

Injured extremity

Introduction

While not always life-threatening, extremity injuries have the potential for loss of the limb. In addition, extremity fractures are often painful, and there may be associated bleeding. Such bleeding can be internal at the fracture site, or external in the case of open fractures; if large bones are involved, such as the femur or pelvis, the associated bleeding can be life threatening. Lastly, depending on the position of the extremity and the nature of the injury, there may be challenges for moving the victim. The goals of treating extremity fractures are to preserve the extremity, to limit pain and bleeding and to seek further medical assistance.

Summary of scientific foundation

There are numerous reports of the benefits of stabilization of extremities by trained providers, but it is impossible to extrapolate this data to first aid providers. In addition, while it is not only common practice but also required for trained providers to straighten an angulated fracture (which is also a time-dependent activity when neurologic and/or circulatory function is compromised), there is no evidence to support or refute the hypothesis that realignment of a fractured bone in an extremity by a first aid provider is safe, effective or feasible. One prehospital study and six hospital studies and reviews showed no evidence that straightening of an angulated suspected long bone fracture shortens healing time or reduces pain before permanent fixation. However, in these studies, several authors commented that only fractures that needed fixation (as opposed to fractures that after straightening were casted and allowed to heal) were addressed. One study showed reduced pain with splinting without straightening. One study on cadavers suggested that straightening angulated fractures decreases compartment size and might increase compartment pressure, but the relevance in actual victims is questionable. In a single study of traction splints in children with isolated long bone fractures, hemodynamic compromise, when it occurred, was not prevented by the splints.

There is no evidence to support the hypothesis that compression of an injured extremity is safe, effective or feasible when performed by a first aid provider. Although it is widely accepted that compression of an injured extremity decreases oedema, this concept has not been subjected to randomised trials. One small study with Doppler evaluation of blood flow to the toes of ten healthy female volunteers suggested that moderate circumferential compression may compromise distal (toe) blood flow, but this information must be extrapolated to the first aid setting. In addition, there were no studies of the effects of compression on an undiagnosed fracture, but expert opinion presumes that doing so would increase pain at a minimum.

The basic principle in first aid for soft-tissue injuries is to decrease hemorrhage, oedema and pain. Cold therapy has reduced oedema in both animal and human studies; experimentally, it has also reduced the temperature of various tissues, including muscles and joints in healthy and postoperative subjects. Ice therapy also contributes to reduced arterial and soft-tissue blood flow along with bone metabolism, as shown in nuclear medicine imaging studies; in addition, it appears to be time dependent. These effects have also been seen in soft-tissue injuries associated with fractures.

The application of ice effectively reduces pain, swelling and duration of disability after soft-tissue injury. There is good evidence to suggest that cold therapy reduces oedema. One postoperative study evaluating anterior cruciate ligament reconstruction suggested that cold therapy contributed to no objective benefit in the postoperative period related to length of hospital stay, range of motion, use of pain medication and drain output. However, there was a trend for a decrease in oral pain medication in the group of patients treated with ice bags. Other types of cold therapy, including cold gel, frozen pea bags and other cold therapy delivery systems, may also be beneficial. Some studies showed that refreezable gel packs are inefficient. Cold therapy modalities that undergo a phase change seem to be more efficient in decreasing tissue temperature.

References: 284-304

Guidelines

- First aid providers should assume that any injury to an extremity can include a potential bone fracture and manually stabilize the injured extremity in the position found (recommendation**).
- For remote situations, wilderness environments or special circumstances with a cool and pale extremity, straightening an angulated fracture may be considered by trained first aid providers (option*).
- A sprained joint and soft-tissue injury should be cooled, preferably with a cold therapy that undergoes a phase change (recommendation**).
- Cold should not be applied for >20 minutes (recommendation**).
- There is insufficient information to make recommendations on optimal frequency, duration and initial timing of cryotherapy after an acute injury (option*).

Implementation considerations

There is insufficient information to make recommendations on optimal frequency, duration and initial timing of cryotherapy after an acute injury. Many textbooks are not consistent in their recommendations related to duration, frequency and length of ice treatment.

Understanding the meaning of phase change is important. To prevent cold injury to the skin and superficial nerves, the application of ice is best limited to periods of ≤20 minutes at a time with a protective barrier. The evidence has shown that something that goes through a phase change is best (most commonly ice going to water). A damp cloth or plastic bag barrier may be ideal, whereas cold is not conducted as well through padded elastic bandages. Caution should be exercised when applying ice to an injury in a victim with little subcutaneous fat, especially over areas of superficial peripheral nerves.

Straightening angulated fractures require specific training, and first aid providers should be aware of specific conditions related to EMS and the distance for further medical care as well as compliance with local protocols and medical direction.

Wounds and abrasions

Introduction

One of the most common injuries seen by first aid providers, especially in the family environment, is wounds and abrasions. These often can be cared for by first aid providers in the home, without the need for emergent treatment but discussion with a health care provider. Simple evidence-based treatments can be used.

Summary of scientific foundation

Wound irrigation is often used in the prehospital and hospital setting to clean wounds. There is strong evidence from human and animal studies that wound irrigation using clean, running tap water is at least as effective as wound irrigation with normal saline and may be better. In one Cochrane meta-analysis, one small randomised human study and one human case series, irrigation with running tap water was more effective than irrigation with saline in improving wound healing and lowering infection rates. In one small randomised human study, irrigation with tap water resulted in a wound infection rate equivalent to that observed after irrigation with normal saline. Although many of these studies were performed in health care settings, running tap water is generally readily available to first aid providers in the out-of-hospital setting.

Evidence from seven clinical trials, one meta-analysis of simple traumatic lacerations in the emergency department, and six animal studies demonstrated that irrigation is beneficial; the determining factors appeared to be both higher volume and higher pressure versus lower volume (ranges under 1000 mL) and lower pressure. In one additional small study, irrigation solutions at body temperature were better tolerated than cold solutions. In addition, these studies showed that tap water was equal to other irrigation solutions in terms of the occurrence of infection.

In addition, one clinical trial demonstrated no benefit from soap and water applied to an open wound. Also, several studies and one isolated cell experiment demonstrated possible toxicity to cells when exposed directly to soap and water. This may have application for soap being used directly on an open wound. Significant literature also supports the benefit of soap and water for decreasing skin bacterial counts when applied to closed wounds.

Two prospective, randomised controlled studies compared the effectiveness of triple antibiotic ointment with that of single antibiotic ointment or no ointment in conditions comparable to those seen in first aid situations. In one human volunteer study in which ointment was applied to intradermal chemical blisters inoculated with *Staphylococcus aureus*, contaminated blisters treated with triple antibiotic ointment healed significantly faster and with a lower infection rate than blisters treated with either single antibiotic ointment or no ointment. Both triple and single antibiotic ointments were superior to no treatment in promoting healing of contaminated blisters. Several of these studies were complicated by initial cleaning with antiseptic solutions that may have biased the results obtained for antibiotic ointment but that may also support the value of antiseptic solutions. In a study of 59 children in a rural day care centre, application of triple antibiotic ointment to areas of minor skin trauma (e.g., mosquito bites, abrasions) resulted in lower rates of streptococcal pyoderma (a skin infection) than in children who received applications of placebo ointment (15%

versus 47%). Antibiotic ointment can eliminate coagulase-negative staphylococci underlying the skin surface, but its impact on wound contamination and healing cannot be extrapolated from these studies

Results of three human and two animal studies showed significantly shorter healing time of abrasions treated with any occlusive dressing or topical antibiotic than with no dressing or topical antibiotic. While questionable whether the same would be true of actual injuries, there were studies reviewed of surgically created wounds that also supported the use of topical agents. Two of these studies demonstrated that triple antibiotic had better outcome than no ointment with regard to scarring and pigment changes. However, one does have to question whether similar results would be obtained with actual wounds versus surgically created wounds under sterile conditions.

References: 305-333

Guidelines

- Superficial wounds and abrasions should be irrigated with clean water, preferably tap water because of the benefit of pressure (recommendation**).
- First aid providers should apply antibiotic ointment to skin abrasions and wounds to promote faster healing with less risk of infection (recommendation**).
- First aid providers should apply an occlusive dressing to wounds and abrasions with or without antibiotic ointment (recommendation**).
- The use of triple antibiotic ointment may be preferable to double- or single-agent antibiotic ointment or cream (option*).
- If antibiotic is not used, antiseptic could be used (option*).
- There is some evidence that traditional approaches, including honey, are beneficial and may be used on wounds by first aid providers (option*).

Implementation considerations

The implementation of these guidelines in the use of topical antibiotic ointment depends on local legal regulation including National Society influence on regulation, liability protection, capacity of Red Cross society and level of education and competency of first aid providers in the national context. Alternatives to an occlusive dressing should be discussed in training programmes.

Dental injuries

Introduction

Dental injuries, particularly in children, are common problems seen by first aid providers.

Summary of scientific foundation

An expert opinion review article and extrapolated evidence from a study of survival of lip fibroblasts in various media supports placement of avulsed teeth in milk until reimplantation or other definitive care can be provided. Expert consensus is that the potential harm from attempted reimplantation of an avulsed tooth outweighs the potential benefit.

References: 334-337

Guidelines

- It is not recommended for first aid providers to reimplant an avulsed tooth (option*).
- Avulsed teeth may be stored in milk and transported with the injured victim to a dentist as quickly as possible (option*).

Implementation considerations

First aid treatment for an avulsed tooth includes the following:
- Clean bleeding wound(s) with saline or tap water.
- Stop bleeding by applying pressure with gauze or cotton.
- Handle the tooth by the crown not the root; i.e., do not handle the part that is below the gum line.
- Place the tooth in milk, or if milk is not available, in water.
- Have victim evaluated by dentist as soon as possible.

Eye injuries

Introduction

Eye injuries are not common but may be seen by first aid providers. For chemical eye injuries, *see* burns (chemical).

Summary of scientific foundation

A formal scientific evidence review was not done for this topic, but it is important in first aid education, and the following guidelines are based on expert opinion.

Guideline

- Any object impaled in the eye may be left in place, and eye movement minimized (option*).

Implementation considerations

The implementation of these guidelines in regard to minimising eye movement (e.g., covering one eye versus two) depends on local legal regulation, including National Society influence on regulation, liability protection, capacity of Red Cross society and level of education and competency of first aid providers in the national context.

Environmental health problems

The environment can have a dramatic impact on health and life, especially the young, elderly and people with chronic illness. First aid courses must guide participants on coping with environmental factors and need to include local considerations and adaptations that may be needed for remote locations and wilderness situations.

Health problems caused by cold

Exposure of the body to cold can cause either direct harm to tissues, such as frostbite, or can lead to general hypothermia.

Frostbite

Introduction

In frostbite, local damage is caused to skin and other tissues due to extreme cold. Frostbite is most likely to happen in body parts farthest from the heart and those with large exposed areas. At or below 0°C (32°F), blood vessels close to the skin start to constrict. The same response may also result from exposure to high winds. This vessel constriction helps to preserve core body temperature. In extreme cold, or when the body is exposed to cold for long periods, this protective strategy can reduce blood flow in some areas of the body to dangerously low levels.

Summary of scientific foundation

Scientific review showed that rapid re-warming with water baths between 37° and 42°C [98.6°F and 107.6°F] for 20-30 minutes improved outcome. This was supported by multiple animal models and several case series in which the outcome was reduction in tissue loss. Of note, model studies of chemical heat–generating devices for hand and foot warming generated temperatures significantly above this range (69°-74°C [156°-165°F]). Lastly, two case series indicated caution as to the danger of re-warming once warmed.

Several studies in which either topical anti-inflammatory application or general drug therapy was given did not find clear evidence of treatment benefit.

References: 338-357

Guidelines

- When providing first aid to a victim of frostbite, re-warming of frozen body parts should be done only if there is no risk of refreezing (recommendation**).
- For severe frostbite, re-warming should be accomplished within 24 hours (recommendation**).
- Re-warming should be achieved by immersing the affected part in water between 37°C (i.e., body temperature) and 40°C (98.6°F and 104°F) for 20-30 minutes (recommendation**).
- Chemical warmers should not be placed directly on frostbitten tissue, because they can reach temperatures that can cause burns and exceed the targeted temperatures (recommendation**).
- After re-warming, efforts can be made to protect frostbitten parts from refreezing and to quickly transport the victim for further care (option*).
- Affected body parts may be dressed with sterile gauze or gauze placed between digits until the victim can reach medical care (option*).

- The use of non-steroidal anti-inflammatory drugs for treatment of frostbite as part of first aid is not recommended based on potential side effects of these drugs (e.g., allergies, gastric ulcer bleeding) (option*).

Implementation considerations

Photos of frostbites should be used for teaching purposes because frostbite is infrequent, even in alpine regions.

Hypothermia

Introduction

Hypothermia can occur if the whole body is exposed to cold and is defined as a condition in which core temperature drops below that required for normal metabolism and body functions, i.e., 35°C (95°F).

Summary of scientific foundation

One study supported the use of active re-warming using a heating blanket in non-shivering hypothermic patients versus using a metallic foil. One study supported the use of active re-warming devices over passive re-warming in non-shivering hypothermic patients. However, in another study, there was not much difference in the rate of re-warming in patients with mild hypothermia whether a blanket or one of the two active devices were used.

References: 358-360

Guidelines

- Victims of hypothermia who are responsive and shivering vigorously should be re-warmed passively with a polyester-filled blanket (recommendation**).
- For victims of hypothermia who are not shivering, active warming should be started, with a heating blanket if available (recommendation**).
- For passive re-warming, if a polyester-filled blanket is not available and the victim is responsive and shivering, other options can be used, including any dry blanket, warm dry clothing or reflective/metallic foil (option*).
- For active re-warming, if a heating blanket is not available and the victim is not shivering, other options can be used, including a hot water bottle, heating pads or warm stones. Do not apply directly to the skin to prevent burning the person (option*).
- In all cases, victims should be treated gently, removed from the cold stress and have their wet clothes removed; if the patient is moderately to severely hypothermic, clothes should be cut off to minimize movement (recommendation**).
- Care should then be taken to insulate the victim and provide a vapour barrier if possible to minimize conductive/convection and evaporative heat loss, respectively (option*).

Implementation considerations

First aid courses may benefit from including information on the following material:

- safe behaviour in the mountains and while participating in winter sports to prevent hypothermia and frostbite
- safety in avalanche terrain to reduce the risk of experiencing an avalanche by familiarizing participants with local avalanche warning signs and safe behaviours (e.g., do not enter closed ski slopes)
- how to call for emergency support in the mountains

If the whole body is exposed to cold, hypothermia can result, in which core body temperature drops below that required for normal metabolism and body functions, defined as 35°C (95°F). If exposed to cold and the body's internal mechanisms are unable to replenish the lost heat, core temperature drops. As body temperature decreases, characteristic symptoms occur such as shivering, tachycardia and tachypnea, which are all physiological responses to preserve heat. Mental confusion may also be present. Later, a lack of coordination becomes apparent, as movements become slow and labored and are accompanied by a stumbling pace and mild confusion. The victim becomes pale, with lips, ears, fingers and toes possibly becoming blue. In later stages, amnesia may start to appear as well as an inability to use the hands. The exposed skin becomes blue and puffy, muscle coordination becomes very poor, walking becomes almost impossible, and the victim exhibits incoherent/irrational behaviour, including terminal burrowing or even a stupor.

Health problems caused by heat

If the body is exposed to heat or heat is generated without the ability to release it, several health-related problems can develop, including changes in mentation, loss of electrolytes caused by intense sweating, e.g., heat cramps, or by direct influence of the sun, and dehydration due to fluid loss.

Heat stroke

Introduction

Heat stroke is a form of hyperthermia, an abnormally high body temperature and loss of ability to regulate temperature with accompanying physical and neurological symptoms. The body may not be able to dissipate the heat, and body temperature rises, sometimes up to 41.1°C (106°F) or even higher.

Summary of scientific foundation

Evidence from clinical trials supports cooling a heat stroke victim. Evidence from several trials supports the use of water immersion, regardless of temperature, in treating heat stroke victims. Other cooling methods (air, ice bags, water spraying) are not as well supported due to studies showing cooling rates that are significantly lower than those in water immersion. A note of caution is raised by several of these studies, which showed an ability to cool below normal body temperature.

References: 361-375

Guidelines

- Heat stroke victims must be immediately cooled by any means possible (standard***).
- First aid providers should immerse the victim in water as cold as possible up to the chin (recommendation**).
- Circulating water should be used over static water (recommendation**).
- For a victim of heat stroke, if water immersion is not possible or delayed, the victim should be doused with copious amounts of cold water, sprayed with water, fanned, covered with ice towels or have ice bags placed over the body (recommendation**).

Implementation considerations

Dehydration can worsen heat emergencies and accelerate progression to heat stroke. A dehydrated person may not be able to sweat fast enough to dissipate heat, which causes the body temperature to rise.

Signs and symptoms of heat stroke include:
- strange behaviour, headache, dizziness, hallucinations, confusion, agitation, disorientation, coma
- high body temperature
- the absence of sweating, with hot red or flushed dry skin
- rapid pulse, difficulty breathing
- nausea, vomiting, fatigue, weakness

Heat exhaustion and heat syncope

Introduction

Heat exhaustion is a milder form of heat-related illness that can develop after exposure to high temperatures and inadequate or unbalanced replacement of fluids.

Summary of scientific foundation

Evidence from five controlled trials supports the use of oral rehydration. Ten observational case studies and expert opinion support rehydration with saline solution to address water and sodium depletion in heat exhaustion. Ten observational case studies and expert opinion also support evaporative cooling, lying the patient down and elevating feet to address circulatory insufficiencies. Even though these treatments have not been evaluated in controlled studies, they are benign in nature and can be safe to use in heat exhaustion and heat syncope.

References: 376-395

Guidelines

- Heat exhaustion should be treated by oral rehydration with a salt-containing beverage (recommendation**).
- Victims of heat exhaustion should be removed from the hot environment if possible and/or cooled with a fan, ice bags, or water spray (recommendation**).

Implementation considerations

Oral rehydration solutions for heat or exercise loss may have different compositions than solutions used for diarrheal losses.

Warning signs of heat exhaustion include the following:
- heavy sweating
- paleness
- muscle cramps
- tiredness, weakness
- dizziness
- headache
- nausea or vomiting
- fainting
- cool, moist skin
- fast, weak pulse rate

If heat exhaustion is untreated, it may progress to heat stroke.

Heat cramps

Introduction

Heat cramps are painful involuntary muscle cramps that can occur during and after exercise or work in a hot environment. Muscles most often affected are those of the calves, arms, abdominal wall and back, although heat cramps may involve any muscle group involved in exercise. Heat cramps result from loss of large amounts of salt and water through heavy sweating caused by exercise or work, especially when the water is replaced without also replacing salt or potassium.

Summary of scientific foundation

Evidence from three controlled trials and eight case series demonstrates relief of cramps with rehydration with a salt-containing beverage. Six studies without adequate controls showed that cramps can be relieved with stretching and application of ice.

References: 396-410

Guidelines

- Victims experiencing heat cramps should be encouraged to drink a salt-containing beverage (recommendation**).
- While victims of heat cramps are drinking, the affected muscle may be stretched. Cooling and massaging of the muscle during the stretch might also be useful (option*).

Fluid therapy for dehydration (not environmental unless due to heat)

Introduction

Dehydration may be caused by heat and/or exercise, and treating dehydration from these causes is an important concept for first aid providers.

Summary of scientific foundation

The studies reviewed included retrospective reviews and exercise-induced and mild dehydration induction due to exercise in healthy volunteers. The use of carbohydrate beverages is supported by multiple studies, including 12 controlled studies. These studies and others indicate that the volume required should be at least as much as the volume lost if not greater. Additional studies have shown that carbohydrate electrolyte beverages are superior to water in terms of intravascular volume and urine output alteration. That being shown, water is still effective at rehydration. Further studies have shown that exercise-induced dehydration requires a slightly different composition of carbohydrate electrolytes than does diarrheal losses. In addition, in five studies, the oral route was as effective as the intravenous route.

References: 411-428

Guidelines

- Rehydration after exercise-induced dehydration is best treated with oral fluids (standard***).
- The best fluid for rehydration is a carbohydrate electrolyte beverage, but if one is not readily available, water should be used (recommendation**).

- The amount of fluid provided for oral rehydration should exceed fluid losses (recommendation**).

Implementation considerations

The types of fluids available for oral rehydation vary from country to country. Therefore, it is important for educational materials to reflect the locally available prepared solutions and how to create solutions in the absence of pre-prepared fluids. In addition, it is important to recognize that oral rehydration fluids are generally constituted for diarrheal losses and they differ from "sports drinks", which are primarily designed for perspiration and insensible loss during exercise.

- Give advice to prevent dehydration, e.g., do not expose head and body to excessive heat, especially if not used to the warm climate (such as a tourist originating from a country with moderate temperatures going on holiday in the tropics).
- Wear a hat (especially small children and babies).
- Wear cool clothing that allows air circulation.
- Drink enough during the day; increase normal liquid intake by at least 1-2 litres.
- Avoid extensive sport activities around noon time/mid-day.
- Protect skin with high protection sunscreens.
- Give the body time to adapt to the environment, especially for people not used to a hot, humid climate.

Health problems caused by high altitude

Introduction

While not commonly thought about as a danger, high altitude can pose health problems. The group of problems is referred to as altitude illness, which include acute mountain sickness (AMS), high altitude pulmonary oedema (HAPE) and high altitude cerebral oedema (HACE). These conditions represent the pathological effect of high altitude caused by acute exposure to low partial pressure of oxygen at high altitude.

Summary of scientific foundation

A formal scientific evidence review was not done for this topic, but it is important in first aid education, and the following guidelines are based on expert opinion.

Guidelines

- Victims of AMS should descend or stop ascent and wait for improvement. Continuing ascent with symptoms is not recommended (recommendation**).
- Victims of HACE and HAPE should descend as soon as possible (recommendation**).
- Continued ascent by experienced climbers or other victims if extrication requires ascent before descent may be done after symptoms have resolved, but if illness progresses descent is mandatory (option*).
- For first aid providers trained in its usage, oxygen may be administered to victims of AMS, HACE and HAPE (option*).
- First aid providers may assist victims with their prescribed medication for altitude illness, such as acetazolamide or dexamethasone, based on label instructions (option*).
- First aid providers should keep victims of altitude illness from becoming chilled or overheated (recommendation**). This is especially important for victims of HAPE.

Reference: 429

Implementation considerations

If tourists, especially those with medical preconditions, go to a high altitude quickly (e.g., when using cable cars to reach the peaks of high mountains), they can develop acute mountain/altitude sickness. Symptoms can also develop in experienced and trained mountaineers when they reach very high altitudes, such as in the Himalaya region. Concurrent physical exertion or chronic medical conditions increases the danger of acute mountain/altitude sickness.

Altitude illnesses occur when people at a high altitude do not have enough oxygen in their blood (hypoxia) because the barometric air pressure is too low. As altitude increases, air becomes "thinner" and less oxygen is inhaled with each breath. The most common altitude illness is AMS. AMS commonly occurs in a person who has recently reached an altitude of around 6500-8000 feet (approximately 1980-2440 metres). If signs and symptoms of AMS appear at lower altitudes, they may be the result of other conditions, such as dehydration or heat illness. Left untreated, AMS may progress to more severe conditions, such as HACE or HAPE. HACE is caused by fluid accumulating in brain tissue. If untreated, it can result in death. HAPE is caused by fluid collecting in the air spaces of the lungs. If enough fluid collects, the person cannot breathe adequately, and death may result.

In most cases of altitude illness, the symptoms are mild and may include the following:
- dizziness or light-headedness, fatigue, headache
- nausea or vomiting
- rapid pulse, increased heart rate
- shortness of breath that worsens with exhaustion

In more severe cases of altitude illness, fluid collects in the lungs (pulmonary oedema) and causes extreme shortness of breath. Brain swelling (cerebral oedema) may also occur. This can cause confusion, coma and if untreated, death. Symptoms generally associated with more severe altitude illness include the following:
- bluish discoloration of the skin (cyanosis)
- chest tightness or congestion
- cough and coughing up blood
- confusion
- decreased consciousness or withdrawal from social interaction

When assessing the victim, look, listen and feel for the following signs and symptoms.

Signs and symptoms of AMS include:
- recent arrival at an altitude of about 6500-8000 feet (approximately 1980-2440 metres) or higher
- headache
- loss of appetite
- nausea with or without vomiting
- insomnia
- lassitude (unusual weariness or exhaustion)

Signs and symptoms of HACE include:
- loss of coordination, or ataxia (An ataxic person cannot walk a straight line or stand straight with their feet together and eyes closed.)

- severe headache that is unrelieved by rest and medication
- bizarre changes in personality
- possible seizures or coma

Signs and symptoms of HAPE include:
- a dry cough initially, with shortness of breath even at rest
- shortness of breath that becomes more pronounced
- possible chest pain
- cough that becomes more productive, first producing frothy sputum, later producing reddish sputum.

Victims of HAPE and HACE may need hyperbaric therapy, which is a treatment and not to be used as a method of allowing climbers to continue.

With all altitude illness, the hallmark of therapy is descent. Even in severe conditions such as HAPE or HACE, a descent of even 1000-1500 feet (approximately 305-460 metres) may resolve the illness or result in drastic improvement.

Animal-related health impairments

Animals can cause multiple health impairments, and first aid courses should consider this topic according to epidemiological aspects of the local area. For example, training on ticks and tick-borne encephalitis and borreliosis is needed only if these diseases have a real local impact. However, because there are many myths about snakebites, teaching proper first aid treatment might be useful to avoid potentially harmful and unnecessary first aid interventions, even if no dangerous snakes are common in the area.

Animal bites

Introduction

The management of animal bites includes prevention, local wound treatment and prevention of wound infection (e.g., *Clostridium tetani*, the bacteria that causes tetanus, and *Staphylococcus aureus*, which is responsible for most skin infections).

Summary of scientific foundation

Irrigation of bite wounds is supported by animal studies for the prevention of rabies and by one human study for the prevention of bacterial infection. Tap water, saline and soap and water solutions were among the irrigants that showed benefit, although no direct comparisons were made between these interventions. Despite multiple recommendations in review literature and common clinical practice, no evidence was found for povidone-iodine use in bites. In addition, the literature reviewed in the previous section of wounds also supports wound irrigation to prevent infection.

References: 430-432

Guidelines

- Human and animal bite wounds should be copiously irrigated to minimise risk of bacterial and rabies infections (recommendation**).

- The victim should be taken for further medical care as soon as possible for surgical intervention, vaccination, or drug therapy as needed (recommendation**).

Implementation considerations

An essential element of animal bite management is rabies prophylaxis. The need depends on the animal involved and the local prevalence of rabies in different animal populations. Educational materials should reflect discussions with local public health authorities regarding the need for rabies prophylaxis.

Snakebites

Introduction

In many countries, bites by venomous snakes are a serious health problem. In addition, many people are extremely afraid of snakes and snakebites. Even in countries where only harmless snakes are found, people often panic after a snakebite and may possibly provide first aid measures that may be harmful rather than beneficial.

Summary of scientific foundation

Suction

Most data have shown that suction either provides no benefit or may cause harm in management of snake envenomation. While in the past, there was a belief that suction would remove the venom, studies have shown that not to be true; at most and in only one study, an insignificant volume was removed (0.04%). Both case series and animal study have shown a lack of benefit, and an additional animal study demonstrated early onset of death in victims in whom suction was performed versus in those in whom it was not. Further studies using devices have shown either visual evidence of tissue damage or the possibility of damage.

References: 433-437

Compression

The use of compression assisted by immobilization of an extremity with snakebite has been commonly taught to prevent systemic dissemination or further systemic dissemination of venom. Unfortunately, two studies with volunteers showed that retention of this skill is poor.

This approach of compression and immobilization is supported by two animal studies and one human study. One of these studies showed the benefit of a compression bandage at approximately 55 mmHg of pressure, and one of the animal models and a human study using mock venom demonstrated that compression reduced lymphatic flow and venom uptake. In several of these studies, compression was done in combination with immobilization of the extremity, and in fact in one study compression or immobilization used independently was not helpful. One study showed no adverse outcome when pressures were kept between 40 and 70 mmHg, which was shown to be approximated by the ability to insert a finger under the compression bandage. A possible concern regarding use of a compression bandage is that the venom could result in only local effects or in local effects that are greater than systemic effects, theoretically leading to increased local injury. But this premise was not supported by at least two animal studies.

References: 438-443

Elevation
There are no controlled studies in either people or animals evaluating the practice of limb elevation after snake envenomation. The only evidence that could be identified was retrospective studies without a control that looked at supportive care after a snakebite, all of which used different techniques but did include elevation. All studies found that the victims did well with simple supportive care (rather than antivenin) but none specifically looked at elevation alone or as compared with other interventions.

References: 444-447

Guidelines

- Suction should not be applied to snake envenomation, because it is ineffective and may be harmful (recommendation**).
- Properly performed compression and immobilization of extremities should be applied in first aid after snakebite envenomation (recommendation**).
- When performing compression for a snakebite, the pressure applied should be between 40 and 70 mmHg (recommendation**). This can be determined by a compression bandage that will allow a finger to be inserted underneath (option*).
- There are no studies to recommend for or against limb elevation after snakebite envenomation.

Implementation considerations

First aid providers should contact local biological centres for advice on the types of snakes living in the area, including their venom capacity. Most people have very little knowledge on snakes and their risk potential. Showing pictures of the most common snakes, both harmless and dangerous, in the region is helpful.

In regions where very venomous snakes are found:
- Contact the local biological centre to find out where and how to get antivenin for victims of poisonous snakes and what specific treatments are needed.
- Include in the first aid course information on how to reach these centres and/or hotlines if available and where people can get additional information and advice.

Jellyfish

Introduction

Contact with jellyfish can result in painful stings and allergic reactions. This problem is common on many beaches worldwide, where aquatic sports activists come in contact with jellyfish. In most cases, only minor, itching reactions (that often appear similar to burns) are caused, but very dangerous species, e.g., the Portuguese man-of-war (*Physalia physalis*), box jelly (*Carybdea alata*), sea nettle (*Chrysaora quinquecirrha*) are found in some parts of the world.

Summary of scientific foundation

Topical agents: Topical agents in general have been evaluated for preventing further nematocyst discharge and for reducing pain from acute jellyfish stings. Evidence has shown that certain topical agents, specifically vinegar in two animal studies and baking soda slurry in another study, prevent or decrease further nematocyst discharge. Vinegar (active ingredient 4-6% acetic acid) in water has also been shown to be an effective nematocyst inhibitor for the box jellyfish and the Irukandji group of animals, which can have lethal effects. Additional studies have shown that commercial sprays, meat tenderizer and fresh water failed to reduce pain, and another study showed that papain, meat tenderizer (usually papain or bromelain) or vinegar are less effective than heat in relieving pain. Further studies have shown that for "bluebottle" (*Physalia utriculus*), vinegar triggers further envenomation from nematocysts.

Hot or cold water immersion: The benefit of hot water to reduce pain after a jellyfish sting is supported by four studies. The benefit of cold water was demonstrated by only one study, but two studies reported no significant relief of pain due to cold.

Pressure immobilization: Evidence supports avoiding the use of pressure, which has been shown in two animal studies to cause further release of venom, including in already fired nematocysts.

References: 448-473

Guidelines

- For areas with lethal jellyfish, first aid providers should immediately summon EMS, and assess and treat airway, breathing and circulation while providing other therapies (recommendation**).
- All jellyfish stings should be washed with a large volume of vinegar (4-6% acetic acid solution) to both prevent further envenomation and inactivate nematocysts. If vinegar is not available, a baking soda slurry may be used instead to both prevent further envenomation and inactivate nematocysts (recommendation**). This should be done as soon as possible and continue for at least 30 seconds. If the jellyfish is positively identified as "bluebottle" (*Physalia utriculus*), vinegar should not be used because it triggers further envenomation (recommendation**).
- Topical application of aluminum sulfate, meat tenderizer or water is not recommended for the relief of pain (recommendation**).
- If vinegar is not available after a jellyfish sting, any adherent tentacles may be picked off with fingers with proper protection of the rescuers, and the stung area rinsed well with seawater to remove stinging cells that are seen (option*).
- After treatment to remove and/or deactivate nematocysts, hot water immersion should be used to reduce pain (recommendation**). The hot water immersion should continue until pain is resolved or at least 20-30 minutes (recommendation**).
- In the absence of hot water, dry heat or cold packs may be used for pain (option*).
- In certain regions based on the species of jellyfish, cold therapy may be instituted instead of hot water immersion for pain relief (option*).
- The victim should be instructed in hot water immersion, consisting of the following:
    - Take a hot shower or immerse the affected part in hot water as soon as possible.
    - Use water at a temperature as hot as can be tolerated, or at 45°C (113°F) if the water temperature can be regulated.
    - Continue for at least 20-30 minutes or for as long as pain persists.
- If hot water is not available, dry hot packs or, as a second choice, dry cold packs may also be helpful in decreasing pain (option*).
- Pressure bandages are not recommended for the treatment of jellyfish stings (recommendation**).

Implementation considerations

Envenomation (stinging) by jellyfish, stinging hydroids and stinging corals is caused by the simultaneous discharge of many thousands of microscopic stinging capsules called nematocysts. Each nematocyst contains a tiny dose of venom, and on contact with the victim "fires" into the skin. The effects of the venom can range from sharp pain to life-threatening complications after stings from species located in certain parts of the world such as tropical Australia.

Two jellyfish species can cause potentially fatal envenomation:
- The large box jellyfish (*Chironex fleckeri*) is a large estuarine and coastal animal that produces large stings with severe immediate skin pain and has caused cardiac arrest within a few minutes.
- Irukandji jellyfish (including *Carukia barnesi*, *Malo* species, *Alatina* species, *Gerongia* species and *Morbakka*) produce a minor sting on the skin followed in 5-40 minutes by severe generalised pain, nausea and vomiting, difficulty breathing, sweating, restlessness and a feeling of "impending doom" followed by possible heart failure, pulmonary oedema and hypertensive stroke.

Due to variations between jellyfish, and even within the same genus of jellyfish, it is difficult to develop a simple treatment algorithm that can be applied globally. In many cases, the first aid provider will be unable to identify the jellyfish responsible for the sting, which further complicates the treatment process. First aid providers should know the marine animals in their region. Therefore, National Societies should use the guidelines but apply them based on the types of jellyfish found locally and may even need several options for different regions of their countries. In areas where dangerous tropical jellyfish are prevalent (e.g., box jellyfish or Irukanji) or if the species causing the sting cannot clearly be identified as harmless, it is safer to treat the victim with vinegar. For teaching purposes, it is helpful to contact local marine/water safety organisations to obtain the following:
- photos of local jellyfish and basic biological information, e.g., where the jellyfish are found in the region, which kinds are common, specific information on allergic potential, etc.
- photos from jellyfish stings

Insects

Introduction

Some insects are not harmful themselves but function as vectors for transmitting diseases such as malaria or tick-borne encephalitis.

Summary of scientific foundation

A formal scientific evidence review was not done for this topic, but it is important in first aid education, and the following guidelines are based on expert opinion.

Guidelines

- To remove a tick, grab the tick as close to the skin as possible with a very fine forceps/tweezers and pull it gradually, but firmly, out of the skin. The bite site should be thoroughly disinfected with alcohol or another skin antiseptic solution. Avoid squeezing the tick during removal, because squeezing may inject infectious material into the skin (option*).
- Use of gasoline, petroleum, and other organic solvents to suffocate ticks, as well as burning the tick with a match, should be avoided (recommendation*).
- If a rash develops, the patient should see a physician in case antibiotics or vaccinations are indicated (option*).

Implementation considerations

First aid providers should align with their local medical centres to find out which of these insect related diseases are common in the region as well as preventive measures such as:

- Use repellent.
- Use bednets.
- Wear long sleeves and long pants, especially at dawn, when these insects are active.
- Get in touch with medical personnel on how to prevent these diseases, e.g., vaccination for tick-borne encephalitis and pharmaceuticals for malaria prevention.
- Get pictures of these insects and the medical problems they can cause, e.g., borreliosis, as well as information on where these problems are found.

Additional information on tick-borne diseases may be helpful in educational materials. In Europe and North America, several species of *Ixodes* ticks are vectors for tick-borne infections. One major infection is Lyme borreliosis, or Lyme disease, which is caused by the bacterium *Borrelia burgdorferi*. Typical symptoms include fever, headache, fatigue and a characteristic skin rash called erythema migrans. If left untreated, infection can spread to the joints, heart and nervous system. Most cases of Lyme disease can be treated successfully with antibiotics.

Steps to prevent Lyme disease include using insect repellent, removing ticks promptly, landscaping and integrated pest management.

The ticks that transmit Lyme disease can occasionally transmit other tick-borne diseases, including a tick-borne encephalitis.

Drowning and scuba diving decompression illness

Health problems as a consequence of aquatic sports are common to many beaches and sport centres. Therefore, first aid providers should be knowledgeable in this area.

Drowning is the process of experiencing respiratory impairment from submersion/immersion in liquid, usually water. Drowning outcomes are classified as death, morbidity or no morbidity. The "drowning process" is the continuum that begins when the victim's airway lies below the surface of the liquid, at which time the victim voluntarily attempts to hold his or her breath. This may be followed by an involuntary period of laryngospasm secondary to the presence of an irritant (i.e., not air) in the oropharynx or larynx. This begins a cascade of hypoxia that most often results in the victim actively aspirating liquid and swallowing larger amounts of liquid into the gastrointestinal system. If there is no rescue and/or reverse of this cascade, the hypoxia increases and multi-system failure ensues.

Drowning process resuscitation

Introduction

Maintaining an open airway to allow oxygen to reach some functional lung tissue and minimizing aspiration obstruction of the airway improve resuscitation outcomes. Several methods to remove water, debris and vomitus from the upper respiratory system (oropharynx) have been introduced, debated, and included in drowning process resuscitation protocols over time. In the drowning process resuscitation, upper abdominal thrusts pose a greater risk of precipitating gastroesophageal regurgitation and subsequent aspiration. Upper abdominal thrusts do not expel sufficient water from the airway or lungs to assist in resuscitation. In addition, upper abdominal thrusts may delay and complicate the start of effective cardiopulmonary resuscitation (CPR). During the drowning process, the priority is to establish an airway and provide ventilations. Although it is intuitive from a physiologic standpoint that oxygen is necessary in the inspired air, what is not known is whether supplemental oxygen is required and whether giving supplemental oxygen would produce any detrimental effects during the drowning process resuscitation. Despite this lack of research evidence, some experts have written that drowning victims may need a higher concentration of oxygen than the 16%-21% usually given during rescue breathing or when using the bag-valve-mask (BVM) resuscitator without supplemental oxygen.

Summary of scientific foundation

Airway management

Evidence from nine retrospective observational case series and case review studies and eleven peer review consensus papers supports that upper airway management is a significant challenge in drowning process resuscitation. Resolving any upper airway obstruction may be the most important step in reversing the hypoxic cascade, which is often complicated by regurgitation and vomiting either spontaneously or as a result of triggers in the rescue, resuscitation and transportation process. The literature supports opening the airway and beginning ventilations as soon as possible.

Suction

The effectiveness of suction in submersion victims has not been well studied. There is general consensus that little, if any, fluid can be expelled from the lungs by drainage techniques, including suctioning, abdominal thrusts or postural drainage; this is because after just a few minutes of submersion, water is absorbed into the circulation. There is general consensus that resuscitation should begin before attempting to remove fluids from the airway or lungs; victims can even be “oxygenated and ventilated effectively through copious pulmonary oedema fluid”. If the airway is completely obstructed, the literature supports treating as a foreign body airway obstruction.

Abdominal thrusts

An evidence review found no study that demonstrated the Heimlich maneuver can remove fluid from the lungs of drowned persons. Because water in the airways or lungs of drowned victims is not considered a solid-object airway obstruction, subdiaphragmatic abdominal thrusts should not be performed on drowned victims by a first responder. Several researchers have cited concerns that an abdominal thrust may cause regurgitation.

Positioning

Several studies and consensus opinions have supported the following for positioning:

- The victim should be in as near a true lateral position as possible, with the head dependent to allow free drainage of fluids.
- The position should be stable, and any pressure on the chest that impairs breathing should be avoided.
- It should be possible to turn the victim onto the side and return to the back easily and safely, having particular regard to the possibility of cervical spinal injury.

In-water resuscitation

The literature has shown that in-water resuscitation provided the victim a 4.4 times better chance of survival. Early rescue breathing is a priority in reversing the hypoxic cascade and may prevent cardiac arrest. It is safe and effective to provide rescue breathing in shallow water. It may be helpful to provide rescue breathing in deep water if the conditions are safe; a single, trained rescuer is supported by a flotation device; or there are two or more trained rescuers. One small mannequin model study showed the ability to perform in-water resuscitation using a modified second-stage (mouthpiece) of a standard scuba regulator to permit intermittent positive-pressure ventilation using either a mask or an esophageal obturator airway.

Oxygen

Evidence and physiologic mechanisms support that during the drowning process, resuscitation victims require physiologic levels of oxygen; however, no research studies support a need for supplemental oxygen in the drowning process resuscitation to achieve normal oxygen levels. There are published studies that have shown that using exhaled air (16% oxygen) or room air (21% oxygen) for resuscitation achieves physiologically normal blood oxygen levels in the patient. These studies, however, addressed many types of resuscitation patients, and none exclusively who were victims of the drowning process. In addition, studies using supplemental oxygen in resuscitation have shown that patients achieve supra-physiologic blood oxygen levels. These and others studies have shown that these supra-physiologic blood oxygen levels are associated with poorer neurologic outcome. Although there are no studies on supplemental oxygen use by lifeguards in the drowning process resuscitation, there are published expert opinions and professional organization policy statements and guidelines that advocate the use of supplemental oxygen in the drowning process resuscitation.

Compressions
The limited studies on compression in water have shown that compressions cannot be effectively delivered in the water. There was one study using a mannequin and one small report of compressions being performed by rescue scuba divers or trained lifeguards who encircled the victim with their hands and compressed the victim's chest while holding the victim on his or her chest. While theoretically possible, this technique cannot be extrapolated to other settings because the rescuer was supported by scuba equipment, including a buoyancy control device or other flotation device, and the victim was able to be ventilated using a regulator with positive pressure and seal.

References: 474-539

Guidelines

- Airway management skills must be included in first aid training for drowning process rescue and resuscitation (standard***).
- Drowning process resuscitation must have as the priority upper airway management and early rescue breathing (standard***).
- In-water resuscitation consisting of airway and ventilation management is recommended under the following circumstances: shallow water, a trained rescuer with a flotation aid in deep calm water, or two or more trained rescuers (recommendation**).
- In-water resuscitation consisting of airway and ventilation management should not be attempted in deep water by a single rescuer without flotation support. In this case, the priority should be rescue to shore (recommendation**).
- In-water ventilations may be delivered using a scuba regulator or modified demand valve for in-water usage (option*).
- Compressions should not be performed in water (standard***).
- Compressions may be performed on the way to shore if the victim can be placed on a solid object such as a rescue board (option*).
- For unconscious or recovering victims, or during transport of drowning victims, the victim may be in as near a true lateral position as possible, with the head dependent to allow free drainage of fluids (option*).
- Routine oropharyngeal suctioning should not be done in the drowning process resuscitation (recommendation**).
- In a submersion victim, suction and manual methods should be used when the oropharynx is blocked by vomitus or debris that is preventing ventilation (recommendation**).
- Supplemental oxygen for the drowning process resuscitation can be used, but doing so should not delay resuscitation, including opening the airway and providing ventilation and compressions as needed (option*).

Cervical spine injury of drowning victims

Introduction

Information on cervical spine injury of drowning victims regarding recognition of spinal injury and motion restriction in suspected spinal injury is included in this review as extrapolated evidence, with citation of limitations. *See also* risk of cervical spine injury in general trauma victims.

Summary of scientific foundation

Most of the evidence on spinal immobilization is extrapolated from all spinal injuries, not just those related to drowning. The occurrence of spinal injuries in aquatic activites is low. Drowning victims are unlikely to have a spinal injury, unless they have a history of high-impact/high-risk activity (e.g., diving, water skiing, assault, use of a motorized vehicle or location on a beach with moderate to severe shore breaks) and clinical signs of injury or obvious neurologic deficit. Conversely, drowning victims with a history of high-impact/high-risk activity and victim unreliability (including intoxication) or obvious signs of injury are those at higher risk of spinal injury, and these can be reliably identified for spinal motion restriction and immobilization. No cervical spinal injuries occurred in submersion victims who were reportedly engaged in low-risk/low-impact activities, such as swimming, bathing, wading, fishing and scuba diving. Although a single case-control study did not demonstrate the effectiveness of first aid immobilization for patients with spinal injury, in the absence of a prospective controlled trial, the consensus opinion is to recommend spinal motion restriction and immobilization for selected submersion victims.

References: 540-549

Guidelines

- If resuscitation is required and cannot be effectively provided in the water, drowning victims should be removed from the water and resuscitated by the fastest means available (recommendation**).
- Spinal motion restriction and immobilization during transport should be used only for victims whose injuries were incurred via a high-impact/high-risk activity (e.g., diving, water skiing, surfing, and being on beaches with moderate to severe shore breaks) and who have signs of unreliability (including intoxication) or injury (recommendation**).
- If effective airway and ventilation cannot be provided in the water, even the victim with possible cervical spinal injury should be rapidly removed from the water (recommendation**).
- If the victim is at risk of cervical spinal injury, first aid providers should use manual spinal motion restriction during initial assessment, provided such restriction does not prevent establishing a patent airway and effective ventilation (recommendation**).
- First aid providers may use spinal immobilization if properly trained (option*).

Scuba diving decompression illness

Introduction

Scuba diving has become a very popular sport in the last 20 years in many parts of the world. As with most sports activities, scuba diving can cause health problems.

Summary of scientific foundation

One large retrospective case study showed that scuba divers experiencing decompression injury require fewer decompressions and have a greater likelihood of complete recovery if first aid includes normobaric oxygen.

Reference: 550

Guidelines

- In cases of decompression illness (DCI, *see below*), first aid providers should administer oxygen (if available), which may reduce the symptoms substantially (recommendation**).
- First aid providers should call for EMS immediately and indicate the likelihood of DCI so that transport of the victim to a decompression chamber can be arranged as soon as possible, because the only real treatment for DCI is recompression in a decompression chamber (recommendation**).

Implementation considerations

First aid providers should have information on local resources for diving emergencies and access to hyperbaric therapy if indicated. **Diver Alert Network (DAN) can be reached 365 days a year, 24 hours a day, at +1-919-684-9111.**

Decompression illness (DCI)

DCI results from a reduction in the ambient pressure surrounding a body. It encompasses two conditions: decompression sickness (DCS) and arterial gas embolism (AGE). DCS is thought to result from bubbles growing in tissue and causing local damage, while AGE results from bubbles entering the circulation, traveling through the arteries and causing tissue damage at a distance by blocking blood flow at the small vessel level.

The main risk factor for DCI is a reduction in ambient pressure, but other risk factors include deep or long dives, cold water, hard exercise at depth and rapid ascents.

Decompression sickness (DCS):
Decompression sickness is the result of inadequate decompression after exposure to increased pressure. During a dive, the body tissues absorb nitrogen from the breathing gas in proportion to the surrounding pressure. As long as the diver remains at pressure, the gas presents no problem. But if the pressure is reduced too quickly, the nitrogen comes out of solution and forms bubbles in the tissues and bloodstream. This commonly occurs as a result of violating or approaching too closely the diving table limits, but it can also occur when accepted guidelines have been followed.

Signs and symptoms usually appear within 15 minutes to 12 hours after surfacing, but in severe cases, symptoms may appear before surfacing or immediately afterwards. Symptoms include the following:

- unusual fatigue
- skin itch
- pain in joints and/or muscles of the arms, legs or torso
- dizziness, vertigo, ringing in the ears
- numbness, tingling, paralysis
- shortness of breath

Arterial gas embolism (AGE):
If a scuba diver surfaces without exhaling, air trapped in the lungs expands on ascent and may rupture lung tissue (called pulmonary barotrauma), which releases gas bubbles into the arterial circulation. The bubbles are distributed throughout the body tissues in proportion to blood flow. Because the brain receives the highest proportion of blood flow, it is the main target organ where bubbles lodged in small arteries can interfere with circulation.

Symptoms of AGE include the following:

- dizziness
- chest pain
- disorientation
- bloody froth from mouth or nose
- paralysis or weakness
- convulsions
- unconsciousness

Oxygen is recommended by most diving associations worldwide as a first aid measure in cases of DCI, and the availability of oxygen by professional diving operations (e.g., diving training institutions, professional diving operations) is required by law in some countries—so the likelihood of oxygen being available is high at dive sites. Therefore, first aid providers should actively ask for it.

By contacting local scuba training providers and/or decompression chamber services, first aid course participants should be informed on the national first aid guidelines for DCI, including the local procedures for care.

Resuscitation

Introduction

The International Liaison Committee on Resuscitation (ILCOR) was formed in 1993 to provide a forum for liaison between principal resuscitation organizations worldwide. At present, ILCOR comprises representatives of the American Heart Association, the European Resuscitation Council, the Heart and Stroke Foundation of Canada, the Australian and New Zealand Committee on Resuscitation, the Resuscitation Councils of Southern Africa, the InterAmerican Heart Foundation and the Resuscitation Council of Asia. A rigorous evidence evaluation worksheet process, full disclosure and management of potential conflicts of interest, and focus on science rather than treatment guidelines enabled the international participants at the 2010 Consensus Conference in Dallas (USA) in January ultimately to achieve consensus constructively and transparently. Experts from all over the world, including from Red Cross Red Crescent National Societies, gave their input to obtain the best consensus in resuscitation as well as in first aid.

These recommendations are methodically developed proposals that help define a harmonization of lifesaving measures, by providing a synthesis of existing scientific evidences, field experiences of communities and the opinion of experts. These resuscitation guidelines cover a limited number of situations. This limitation was deliberated in order to ensure common understanding and consensus, as well as to validate an international harmonization approach. But for the Red Cross Red Crescent Movement, resuscitation is clearly part of first aid. These recommendations address some emergency situations that concern first aid providers taking care of one adult victim. Other situations that will require adjustments in approach include situations with different characteristics (e.g., a case of a child), an unbalance between needs (e.g., the number of victims) and responses (e.g., the number of first aid providers), or a situation when usual resources or the environment has changed (e.g., an overwhelmed health care system during a crisis).

Summary of scientific foundation

Since the beginning of the 2010 ILCOR process, experts from Red Cross Red Crescent have been involved. Adaptation in the Red Cross Red Crescent environment was necessary, taking into account the huge role of the Red Cross Red Crescent in the training of lay people all around the world. The 2020 Strategy voices the collective determination of the International Federation of Red Cross and Red Crescent Societies to move forward in tackling the major challenges that confront humanity in the next decade and give first aid to everybody. Our heritage includes a powerful and diversified range of first aid practices and expertise developed in the service of local communities.

Guideline

Because basic life support (BLS) and basic pediatric life support (BPLS) are included in first aid training for the lay public, this guideline also includes the pediatric level for each situation.

Airway obstruction

See foreign body airway obstruction.

Cardiac arrest

Introduction

Checking the carotid pulse is an inaccurate method of confirming the presence or absence of circulation. Agonal gasps are common in the first few minutes of a cardiac arrest (present in up to 40% of victims) and are associated with higher survival, if recognized as a sign of cardiac arrest (and treatment is begun). Agonal gasps are an indication for starting CPR immediately. Therefore, first aid providers should begin CPR if the victim is unconscious (unresponsive) and not breathing normally.

Summary of scientific foundation

There is one prospective randomised trial in which 9-1-1 telephone dispatchers were randomised to give instructions for compression-only CPR (n=241) or compressions plus ventilations (n=279) for apparent cardiac arrest. The primary outcome was survival to hospital discharge, which was similar in the two groups (compression-only [14.6%] and compression plus ventilations [10.4%]) (P=0.18). The study was designed to detect a 3.5% absolute improvement in survival, which was demonstrated; however, it was not statistically significant in the final analysis.

Eight observational studies also supported the concept of compression-only CPR. In a retrospective study of all non-traumatic cardiac arrests in Oslo, Norway, between 2003 and 2006, survival was similar in patients receiving compression-only CPR (n=145; 10% survival) and in patients receiving standard CPR (n=281; 13% survival). There was no difference in the subgroup that had witnessed ventricular tachycardia/ventricular fibrillation arrest. However, the lack of a difference in clinical outcome in this group does not necessarily imply that there is no statistical difference in outcome. The study did not include any power calculation on the number of events that would be necessary to reliably conclude that the differences in treatment are no different. For example, a quick power calculation assuming a 15% survival with standard CPR and wanting to determine if continuous chest compressions (CCC) was associated with a worse (10%) survival with a power of 0.8 and a *P* value of 0.05 would require 726 subjects in each group (1452 total). This study was an observational study, not a trial, but the principle is the same. This limitation applies to essentially all the observational studies described below that found no difference in outcomes.

In a prospective observational study in Singapore from 2001 to 2004, compression-only CPR (n=154) had results similar to those of standard CPR (n=287) in return of spontaneous circulation (ROSC) (17.5% versus 16.7%), survival to hospital admission (7.8% versus 10.5%) and survival to hospital discharge (2.6% versus 2.8%) (P=1.0). Among patients with ventricular tachycardia/ventricular fibrillation, compression-only CPR had higher initial ROSC, but no difference in survival to hospital discharge. Patients who received standard CPR (OR 5.4, 95% CI 2.1-14.0) or CCC-CPR (OR 5.0, 95% CI 1.5-16.4) were more likely to survive to discharge than those who had no bystander CPR.

The SOS-KANTO study, a prospective observational study in the KANTO region of Japan (2002-2003), described a survival with favorable neurological outcome (cerebral performance category 1 or 2 at 30 days after arrest) and benefit of compression-only CPR (n=439) compared with standard CPR (n=718) among patients with apnea, shockable rhythm and resuscitation started within 10 minutes of the arrest. There was no benefit of ventilations in any of the subgroups. The frequency of favorable neurological outcome at 30 days did not differ between the cardiac-only resuscitation (6%) group and the conventional CPR (4%) group for the whole cohort on univariate analysis (P=0.15). However, the adjusted odds ratio for a favorable neurological outcome after cardiac-only resuscitation was 2.2 (95% CI 1.2-4.2) in patients who received any resuscitation from bystanders. In the same region, 1-year survival with favorable neurological outcomes was reported for arrests from 1998 to 2003. In this cohort, 1-year survival with favorable neurological outcomes was similar for those who received compression-only CPR (n=544; survival 3.5%) and those who received CPR with ventilations (n=783; survival 3.6%), and better than those who did not receive CPR (n=4902; survival 2.1%). For arrests >15 minutes, CPR with ventilations had improved survival (2.2%) over compression-only CPR (0%) and no CPR (0.3%).

In a prospective observational study in Amsterdam from 1995 to 1997, in the 41 patients who had compression-only CPR performed by bystanders, the survival to hospital discharge was similar to those receiving compressions (15%) and ventilations (14%). Again, any CPR was found to be better than no CPR (6%) in terms of survival to hospital discharge. Another large prospective observational study in Sweden between 1983 and 1995 found that of 9877 arrests, 3% (n=228) were given compression-only CPR by bystanders. In this study, compression-only CPR was lumped with ventilation-only CPR (n=620) for analysis, and complete CPR (compressions and ventilations) was found to be superior. However, compression-only CPR was not evaluated as a separate group. There are two prospective observational studies from Belgium, one from 1983 to 1987 and one from 1983 to 1989. The earlier study found that CPR with or without ventilations (n=998) was superior to no CPR (n=2005). Compression-only CPR (n=258) had an overall survival at 14 days after arrest of 9%, and 15% if the quality of compressions was high. However, compression-only CPR did not have a survival benefit if the quality of CPR was poor. The latter study found that compression-only CPR (n=263) had a 14-day survival (10%) similar to that of standard CPR (16%), which was superior to no CPR (7%).

There are three case control studies before and after implementation of a protocol for prehospital responders to perform CCC without ventilations on arriving at a patient. These studies did not evaluate lay bystander performance of CCC, but rather use of CCC as a component of the resuscitation protocol by professionals. In Wisconsin, a protocol for resuscitation instituted in 2004 calls for EMS personnel to perform 200 compressions followed by rhythm analysis with or without shock. CCC resumed immediately after rhythm analysis/shock. Airway management is delayed until arrival of a second rescuer, and consists of ensuring a patent oral-pharyngeal airway and delivering oxygen by non-rebreather mask. If the arrest is witnessed and down time is less than 12 minutes, rescue breaths and assisted ventilations are not performed until after the return of spontaneous circulation or until after three cycles of chest compressions followed by rhythm analysis/shock are completed. The first study evaluated survival of victims the first year after this protocol was instituted (2004 to 2005), in which there were 33 arrests with shockable rhythm, versus survival of victims in the two years before the protocol was instituted (2001-2003), in which there were 92 arrests with shockable rhythm and EMS personnel followed the 2000 American Heart Association guidelines. In patients who had a *witnessed arrest and shockable rhythm*, survival (20% versus 57%) and neurologically intact survival (cerebral performance category 1) (15% versus 48%) were improved in the CCC group. The same group was evaluated again during the period 2004-2007 and, again, in those patients who had a *witnessed arrest and shockable rhythm* (n=89), survival favored the CCC group (39% versus 15% neurologically intact survival). It is important to note that these studies did not evaluate CPR performed by bystanders or laypersons and did not include all cases of cardiac arrest.

A similar protocol was used in Arizona. In this study, cardiac arrests were evaluated in two metropolitan cities. Additional analyses were performed on compliance with the protocol, which included an additional 60 fire departments. Prehospital personnel delivered 200 uninterrupted compressions followed by rhythm analysis with or without shock, followed by 200 chest compressions and then pulse check and rhythm analysis. Intubation and delivery of high-flow oxygen was delayed until three cycles of compressions were performed. Overall survival to hospital discharge was better after the protocol (36/668, 5.4% versus 4/218, 1.8%) and for witnessed ventricular fibrillation (23/131, 17.6% versus 2/43, 4.7%). In the compliance analysis, 1799/2460 (73%) were not compliant with protocol, although 50/62 (81%) fire departments had not been trained in the protocol. Survival was also higher when EMS personnel were compliant with the protocol.

Seventeen animal studies were identified that evaluated outcomes with compression-only CPR. Most of these studies were from one group and used a swine model of ventricular fibrillation arrest. Ventricular fibrillation was untreated for varying duration; the animals were then randomised to CPR consisting of CCC or compressions with ventilations for varying duration, followed by advanced cardiac life support. Twenty-four hour survival and neurologically normal survival were similar in the CCC groups. In one study, CCC for 4 minutes followed by a compression-to-ventilation ratio of 100:2 had higher neurologically intact survival than CCC alone. In another study with the same swine model of ventricular fibrillation arrest designed to simulate a single rescuer by stopping compressions for 16 seconds for ventilations in the standard CPR group, neurologically intact survival was improved in animals given 12 minutes of CCC. Neurologically intact survival was also improved in animals given CCC followed by a compression-to-ventilation ratio of 30:2. CCC was also evaluated in the presence of an occluded endotracheal tube. The neurologically intact survival was still similar to that of standard CPR. The model was altered to include occlusion of the left anterior descending coronary artery followed by ventricular fibrillation. In this study, survival was similar among animals receiving CCC and compressions with ventilations. Both groups fared better than animals receiving no CPR for 10 minutes. A different model using dogs evaluated the gas exchange that occurs during 20 minutes of CCC and giving oxygen through the pharyngeal lumen of a pharyngeal-tracheal intubated airway. PCO_2 and PO_2 values were similar to pre-arrest values, and 73% of the animals were resuscitated successfully. A piglet model of asphyxial cardiac arrest from the same laboratory found that when CPR was started when the aortic pressure was <2 mmHg, 24-hour survival and neurologically normal survival were higher in the compression plus ventilations group than in the CCC group. However, when CPR was started with higher aortic pressures (<50 mmHg), 24-hour survival was similar in CCC, compression and ventilations, and ventilation only. All three groups fared better than no resuscitation groups.

Additional animal studies include a swine model of ventricular fibrillation arrest in which CCC was compared with a compression-to-ventilation ratio of 30:2. More pigs in the 30:2 group had ROSC at 2 minutes, but no difference on overall ROSC. Hemodynamic data were similar between groups, but oxygenation was higher in the 30:2 group. Immediate results in a swine model of 10 minutes of untreated ventricular fibrillation followed by CCC (100 compressions per minute) versus CPR with a compression-to-ventilation ratio of 30:2 showed that the CCC group had improved ventricular fibrillation termination (0.5 versus 0.8), ROSC (0.3 versus 0.59) and 20-minute survival (0.19 versus 0.4). A different result was reached from another laboratory, also in a swine model of ventricular fibrillation arrest with 8 minutes of untreated ventricular fibrillation followed by 8 minutes of CCC or 10 ventilations per minute. At 24 hours, the ventilation group had better neurologically intact survival than the CCC group (71% versus 44%). Another pediatric swine model of asphyxial arrest found higher pH and lower PCO_2 in ventilated animals than in those that received CCC.

Additionally, there are several simulation studies on compression-only CPR, including one computer simulation study of four different conditions (CCC, and compression-to-ventilation ratios of 5:1, 15:2, and 50:5). In the CCC group, cardiac output was greatest, PO_2 was lowest and PCO_2 was highest. Oxygen delivery was highest in CCC at 2 minutes but lowest in CCC at 6 minutes. Oxygen delivery was roughly equal for the 15:2 and 50:5 ratios, which was maintained throughout the 6 minutes. The other simulation studies involved volunteers performing CPR on mannequins. These included a study of elderly subjects randomised to CCC or a compression-to-ventilation ratio of 15:2. All could perform CPR for 10 minutes at 5-7 months after instruction. Those performing CCC had fewer pauses and increased number of compressions. A similar study evaluated CCC versus compression-to-ventilation ratios of 15:2 and 30:2 for 5 minutes of CPR. The depth of compressions significantly decreased over time in the CCC group (mean <30 mm at 5 minutes). The number of compressions given was significantly greater in the CCC group. *Half of the ventilation attempts were unsuccessful. Half of the time in the 15:2 ratio group and 38% of the time in the 30:2 ratio group were used for ventilations*. A study from Japan evaluated CPR skills 1 month after training with standard CPR versus CCC. Subjects in the CCC group performed a greater number of total chest compressions, appropriate compressions and less time without compressions. Two studies of medical students found that CCC provided more adequate compressions for the first 2 minutes in 9 minutes of CPR and that when students were given courses on either CCC or standard CPR, the CCC group performed more adequate compressions after 18 months. In a cross-over study of paramedics, performing CCC resulted in a greater number of compressions per minute. A randomised trial of dispatcher-assisted CPR to volunteers performing CCC or standard CPR on mannequins found that those performing CCC completed four cycles of CPR earlier and had fewer pauses. *Only 9% of the ventilations were of correct tidal volume* (between 800-1200 cc) in the CCC group and only 21% (500-1200 cc) in the standard CPR group; depth of compressions was poor in both groups. Another randomised study of telephone instructions for standard CPR versus CCC found that the CCC group performed more compressions in 10 minutes with a similar percentage of compressions at adequate depth. In the standard CPR group, few ventilations were of adequate tidal volume.

In summary, there is one prospective randomised trial of 9-1-1 dispatchers giving instructions for either compression-only CPR or compressions with ventilations, and survival to hospital discharge was similar in both groups. There are eight observational trials in which CPR was performed by a bystander and that had compression-only CPR as one of the groups. One study demonstrated that CPR with compressions and ventilations had better outcomes than CPR without compressions or ventilations; however, compression-only CPR was not evaluated. In the other observational studies, compression-only CPR was not worse than standard CPR with ventilations. One of these studies found no difference in outcome on univariate analysis; however, the multivariate analysis found that survival was improved with compression-only CPR versus standard CPR. There are three before-and-after studies of a protocol implementation by EMS systems that contained CCC as part of the initial resuscitation for cardiac arrests. Two of these studies only reported outcomes of arrests with an initial shockable rhythm. The other study included all cardiac arrests, but compliance with the protocol was limited. Survival was improved in the group after the protocol was implemented. Several, but not all, of the animal studies, most of which are of ventricular fibrillation, found equivalent or improved outcomes with CCC. Importantly, the limited studies on pediatric asphyxial models have revealed concern of CCC. A consistent finding is that any CPR is superior to no CPR. In simulation studies, CCC is easy to remember and subjects perform more compression, but fatigue is greater. Ventilations are performed poorly and take a significant amount of time during which compressions are not being performed.

Recently, two community-based studies and an associated editorial were published that specifically addressed compression-only CPR in a controlled fashion. In one study, which was prospective, there was no significant difference with respect to survival at 30 days between instructions given by an emergency medical dispatcher before the arrival of EMS personnel for compression-only CPR and instructions for standard CPR in patients with suspected witnessed out-of-hospital cardiac arrest. The other study also showed similar outcomes with dispatcher-led compression-only CPR versus standard CPR with a trend to improved outcome in some subgroups, although this was not statistically significant. The key findings of the articles are that dispatcher-led compression-only CPR had an outcome equal to that of standard CPR, and that there may be a trend to better outcome in certain types of arrest victims (cardiac disease for example). Both articles then state with equal outcome and the belief (although not studied) that compression-only CPR is easier to teach and is more likely to be done, it should be advocated in certain situations. The editorial discusses that no definitive study exists that has shown the benefit of compression-only CPR performed by EMS personnel and whether the success of compression-only CPR is limited to ventricular tachycardia and fibrillatory arrest in adults.

Compression-only CPR is acceptable for adult out-of-hospital cardiac arrests. The available evidence does not strongly support that compression-only CPR provides a survival advantage over standard CPR performed by lay responders. Given that the lay public may be more likely to perform compression-only CPR without ventilations, that ventilations are generally of poor quality and cause significant delays, and that 9-1-1 dispatcher CPR instructions on compression-only CPR take less time, compression-only CPR is the preferred technique for lay responders. For trained responders, compression-only CPR should be performed if the responder is unable or unwilling to perform standard CPR. In addition, there is an obvious need for rescue breaths after a prolonged period of CPR.

References: 551-595

Guidelines

- For untrained or minimally trained first aid providers treating an adult victim, compression-only CPR should be used (recommendation**).
- For formally trained first aid providers (and professionals) treating an adult victim, compressions with breaths should be provided (recommendation**).
- Every effort should be made to shorten the time until compressions and to minimize any interruptions in compressions (recommendation**).
- For formally trained first aid providers (and professionals) treating an adult victim who is unwilling or unable, or in another special circumstance, compression-only CPR may be substituted for compressions with breaths (option*).
- For infants and children with cardiac arrest, the preferred method of CPR is compressions with breaths (recommendation**).
- For infants and children with cardiac arrest, and first aid providers unwilling, unable or untrained, compression-only CPR may be performed (recommendation**).
- For infants, children and drowning victims who are unresponsive and not breathing, breaths should be given before compressions (recommendation**). Either two or five breaths may be given (option*).
- Professional rescuers may be taught to do a pulse check, but this should not increase assessment time and is preferred to be done with the breathing check (option*).
- Professional rescuers should check for pulse and if unsure as to whether the pulse is present, they should act as if the pulse is absent (recommendation**).
- For adults, the compression rate may be at least 100 per minute and not exceed 120 compressions per minute (option*)
- For adults, the depth of compression may be at least 2 inches (5-6 cm) (option*).

Implementation considerations

- For the CPR guidelines, the following age definitions are used:
- Infant is defined as birth until 1 year of age.
- Child is defined as over 1 year of age until the onset of puberty (generally accepted as 12 years of age, presence of axillary hair or presence of breast development in females).
- Adult is defined as older than the onset of puberty.
- For automatic external defibrillators (AEDs; *see below*), one should defer to manufacturers' recommendations, which are currently based on a child being 8 years of age or younger.

Each National Society will need to determine the forms of CPR that are best suited for their student populations. Factors that need to be considered include the individual Society's resources, training, educational programmes offered, legislation and regulation, liability and scientific expert input, especially the EMS with the national chain of survival.

When calling for EMS, providing an adequate description of the victim is of critical importance.

For the unconscious victim

1. Make sure you (and any other first aid providers), the victim and any bystanders are safe.
2. Check the victim for a response by gently shaking his or her shoulders and asking loudly: "Are you all right?"

If the victim responds:
1. Leave the victim in the position in which you found him or her, provided there is no further danger.
2. Try to determine what is wrong with the victim.
3. Call for help if needed.
4. Reassess the victim regularly.

If the victim does not respond:
1. Shout for help, turn the victim onto his or her back and then open the airway using head tilt and chin lift (as described in the next steps).
2. Place your hand on the victim's forehead and gently tilt his or her head back, and consider keeping your thumb and index finger free to close the victim's nose if rescue breathing is required (this later step may vary by National Society).
3. With your fingertips under the point of the victim's chin, lift the chin to open the airway.
4. Keeping the airway open, look, listen and feel for normal breathing.
5. Look for chest and/or abdominal movement.
6. Listen at the victim's mouth for breath sounds.
7. Feel for air on your cheek.
8. For professional rescuers, a simultaneous pulse check can be done.

Note: In the first few minutes after cardiac arrest, a victim may be barely breathing or taking infrequent, noisy gasps. Do not confuse this with normal breathing. Look, listen and feel for no more than 10 seconds to determine whether the victim is breathing normally. If you have any doubt whether breathing is present, assume it is not. Similarly, for professional rescuers if uncertain as to the presence of a pulse, assume one is not present.

If the victim is breathing:
1. Turn the victim into the recovery position, or HAINES if suspected cervical spine injury.
2. Send or go for help/call EMS.
3. Continue to check if the victim is breathing normally.

If the victim is not breathing (for lay rescuers and with no pulse for professional rescuers):
1. Send someone for help and to bring an automated external defibrillator (*see below*) or, if you are on your own, leave the victim and alert EMS; return and start chest compression (as described in the next steps [may vary by National Society]):
2. Kneel by the victim's side.
3. Place the heel of one hand in the centre of the victim's chest.
4. Place the heel of your other hand on top of the first hand and ensure that pressure is not applied over the victim's ribs. Do not apply any pressure over the upper abdomen or the bottom end of the bony sternum (breastbone).
5. Position yourself vertically above the victim's chest and, with your arms straight, press down on the sternum at least 2 inches (5-6 cm) at a rate of at least 100 per minute (nearly 2 compressions each second) but no more than 120 per minute. After each compression, release all the pressure on the chest without losing contact between your hands and the sternum; compression and release should take equal amounts of time.

Combine chest compression with rescue breaths:

1. After 30 compressions, open the airway again using head tilt and chin lift.
2. Consider pinching the soft part of the victim's nose closed, using the index finger and thumb of your hand that is on the victim's forehead (this step may vary by National Society).
3. Allow the mouth to open, but maintain chin lift.
4. Take a normal breath and, making sure you have a good seal, blow steadily into the victim's mouth (or squeeze the BVM if using a BVM) while watching for the chest to rise, taking about 1 second as in normal breathing; this is an effective rescue breath.
5. Maintaining head tilt and chin lift, take your mouth away from the victim (or allow exhalation if using a BVM) and watch for the chest to fall as air passes out.
6. Take another normal breath and blow into the victim's mouth once more, for a total of two effective rescue breaths. Do not attempt more than two breaths each time before returning to chest compressions.
7. Without delay, return your hands to the correct position on the victim's chest and give 30 more chest compressions. Count out loud.
8. Continue with chest compressions and rescue breaths in a ratio of 30:2.
9. Stop to recheck the victim only if he or she starts to move around and clearly wakes up; otherwise, do not interrupt resuscitation.

Note: If your initial rescue breath does not make the victim's chest rise as in normal breathing, then before your next attempt, check the victim's mouth and remove any obstruction and recheck that there is adequate head tilt and chin lift (as described in the care of a foreign body airway obstruction).

If more than one rescuer is present, rescuers should change over performing CPR every 1–2 minutes to prevent fatigue. Ensure that chest compressions are not interrupted during the changeover of rescuers.

For compression-only CPR:

1. If you are unable or unwilling to give rescue breaths, give chest compressions only.
2. If chest compressions only are given, these should be continuous, at a rate of at least 100 per minute.
3. Stop to recheck the victim only if he or she starts to move around and clearly wakes up; otherwise, do not interrupt resuscitation.
4. Continue resuscitation without interruption until qualified medical help arrives and takes over, or if the victim starts to breathe normally.

If the victim is not breathing and has a pulse (for professional rescuers):

1. Send someone for help and to bring an automated external defibrillator (*see below*).
2. Kneel by the victim's side.
3. Consider pinching the soft part of the victim's nose closed, using the index finger and thumb of your hand that is on the victim's forehead (this step may vary by National Society).
4. Allow the mouth to open, but maintain chin lift.
5. Take a normal breath and, making sure you have a good seal, blow steadily into the victim's mouth (or squeeze the BVM if using a BVM) while watching for the chest to rise, taking about 1 second as in normal breathing; this is an effective rescue breath.
6. Maintaining head tilt and chin lift, take your mouth away from the victim (or allow exhalation if using a BVM) and watch for the chest to fall as air passes out.

7. Continue delivering breaths at a rate of 1 breath per 5 seconds.
8. Periodically recheck for pulse and if the victim begins to breathe and/or move around, perform a complete reassessment.

Note: If your initial rescue breath does not make the victim's chest rise as in normal breathing, then before your next attempt, provide care of a foreign body airway obstruction.

Resuscitation of children (and victims of drowning)

After recognizing a cardiac arrest (a victim that is unresponsive and not breathing), first aid providers should perform the following:

1. Give two to five initial rescue breaths before starting chest compressions. Take a normal breath and, making sure you have a good seal, blow steadily into the victim's mouth (or squeeze the BVM if using a BVM) while watching for the chest to rise, taking about 1 second as in normal breathing; this is an effective rescue breath.
2. Maintaining head tilt and chin lift, take your mouth away from the victim (or allow exhalation if using a BVM) and watch for the chest to fall as air passes out.
3. If alone (sole rescuer), perform CPR for approximately 1 minute before going for help.
4. Compress the chest by approximately one-third of its depth. For a child <1 year old, use two fingers; for a child >1 year old, use one or two hands as needed to achieve a compression of adequate depth.
5. Continue giving 30 compressions followed by 2 breaths.
6. Stop to recheck the victim only if he or she starts to move around and clearly wakes up; otherwise, do not interrupt resuscitation.

If more than one rescuer is present, rescuers should change over, performing CPR every 1-2 minutes to prevent fatigue and use a ratio of 15 compressions and 2 breaths. Ensure that chest compressions are not interrupted during the changeover of rescuers.

The same steps of five initial breaths and 1 minute of CPR by a sole rescuer before getting help may improve outcomes for victims of drowning. This modified form of CPR should be taught only to those who have a specific duty of care for potential drowning victims or to professional rescuers (e.g., lifeguards).

If the victim is not breathing and has a pulse (for professional rescuers):

1. Send someone for help and to bring an automated external defibrillator (*see* below).
2. Kneel by the victim's side.
3. Consider pinching the soft part of the victim's nose closed, using the index finger and thumb of your hand that is on the victim's forehead (this step may vary by National Society).
4. Allow the mouth to open, but maintain chin lift.
5. Take a normal breath and, making sure you have a good seal, blow steadily into the victim's mouth (or squeeze the BVM if using a BVM) while watching for the chest to rise, taking about 1 second as in normal breathing; this is an effective rescue breath.
6. Maintaining head tilt and chin lift, take your mouth away from the victim (or allow exhalation if using a BVM) and watch for the chest to fall as air passes out.
7. Continue delivering breaths at a rate of 1 breath per 3 seconds.

8. Periodically recheck for pulse and if the victim begins to breathe and/or move around, perform a complete reassessment.

Note: If your initial rescue breath does not make the victim's chest rise as in normal breathing, then before your next attempt, provide care of a foreign body airway obstruction.

Automated external defibrillation

Introduction

Automated external defibrillators (AEDs) have proved to be safe and effective and allow defibrillation many minutes before EMS arrives with a manual defibrillator. Rescuers who use an AED should continue CPR with minimal interruption while applying the AED, as well as during and after its use. Once a fully automatic AED has detected a shockable rhythm, it will deliver a shock without further input from the rescuer. Rescuers should focus on immediately performing the actions as soon as they are instructed by the voice prompts.

Summary of scientific foundation

Immediate defibrillation, as soon as an AED becomes available, has always been a key element in guidelines and teaching, and considered of paramount importance for survival from ventricular fibrillation. This concept has been challenged because evidence suggested that a period of chest compression before defibrillation may improve survival when the time between calling for EMS and its arrival exceeds 5 minutes. That being said, the current recommendations are to use an AED as soon as available and attached to the patient. Published reports suggest that 42% of patients treated with public access defibrillation (PAD, *see below*) survive to hospital discharge in carefully controlled settings. The PAD trial, a large, controlled interventional trial, demonstrated a statistically significant 11% reduction in risk of death before hospital discharge for patients suffering cardiac arrest of presumed cardiac cause in areas with a PAD program compared with areas trained for CPR only. This demonstrates that minimally trained witness defibrillation does improve survival to hospital discharge from witnessed out-of-hospital cardiac arrest due to ventricular fibrillation or ventricular tachycardia.

Data have also shown that this strategy may include the need for an AED that is suitable for use in pediatric patients and in its absence the use of an adult AED is acceptable, even for infants. Untreated ventricular fibrillation or pulseless ventricular tachycardia will lead to death in the absence of prompt defibrillation. AEDs improve the time to shock in many out-of-hospital settings, and AEDs have been successfully used in infants. The algorithms used by AEDs have an acceptable safety and efficacy profile in infants. AEDs will deliver a greater energy dose than the currently recommended 2-4 J/kg; however, the safe energy dose is known. The limited available data suggest that high-energy doses can be effectively used in infants. Given the dismal outcomes of untreated (or delayed treatment of) ventricular fibriallation, shocking with high-energy doses is acceptable. Biphasic energy likely results in less myocardial injury, based on very limited data and no data in infants. The data do not support the use of one AED model over another for infants

There are no data in people to determine the superiority of fully or semi automatic AEDs in clinical use.

References: 596-625

Guidelines

- Standard AEDs must be used in adults and children >8 years old (standard***).
- For children between 1 and 8 years old, pediatric pads/adapter or a pediatric mode must be used if available (standard***); if these are not available, the AED should be used on children between 1 and 8 years old as it is (recommendation**).
- AEDs may be used for children <1 year old (option*).

Implementation considerations

It is important to include in training the importance of following both manufacturers' recommendations and device prompts.

Sequence for use of an AED:

1. Make sure you (and any other first aid providers), the victim and any bystanders are safe.
2. If the victim is unresponsive and not breathing normally, send someone for the AED and call for EMS.
3. Start CPR according to the cardiac arrest guidelines.
4. As soon as the defibrillator arrives, switch it on and attach the electrode pads. If more than one rescuer is present, CPR should be continued while this is being done. Follow the voice/visual prompts.
5. Ensure that nobody touches the victim while the AED is analysing the rhythm.

If a shock is indicated:

1. Ensure that nobody touches the victim.
2. Push the shock button as directed (fully automatic AEDs will deliver the shock automatically).
3. Continue as directed by the voice/visual prompts.

If no shock is indicated:

1. Immediately resume CPR, using a ratio of 30 compressions to 2 rescue breaths.
2. Continue as directed by the voice/visual prompts.
3. Continue to follow the AED prompts until qualified help arrives and takes over, or if the victim starts to breathe normally.

Public access defibrillation programmes

The full potential of AEDs has not yet been achieved because they are mostly used in public environments, while 60%-80% of cardiac arrests occur in private homes. Public access defibrillation (PAD) and first-responder AED programmes may increase the number of victims who receive bystander CPR and early defibrillation, thus improving survival for out-of-hospital cardiac arrest victims. These programmes require an organized and practiced response with both rescuers trained and equipped to recognize emergencies, and EMS to provide CPR and use an AED.

The logistical problem for first-responder programmes is that the rescuer needs to arrive not just earlier than traditional EMS, but within 5-6 minutes of the initial call, to attempt defibrillation in the electrical or circulatory phase of cardiac arrest. However, small reductions in response times achieved by first-responder programmes that impact many residential victims may be more cost-effective than larger reductions in response times achieved by PAD programmes that have an impact on fewer cardiac arrest victims.

Recommended elements for PAD programmes include a planned and practised response (pre-evaluation of locations/best places to put an AED), a community and/or target people trained in CPR and use of an AED, a strong link with the local EMS system and a programme of continuous quality improvement. PAD programmes are most likely to improve survival from cardiac arrest if AEDs are placed in locations where witnessed cardiac arrests are likely to occur. Suitable sites might include those where the probability of cardiac arrest occurring is at least once every 2 years (e.g., airports, casinos, sports facilities). Because approximately 60%-80% of out-of-hospital cardiac arrests occur in private or residential settings, the overall impact of PAD programmes on survival rates is inevitably limited. Programmes that make AEDs publicly available in residential areas have not yet been evaluated. The acquisition of an AED for home use for individuals considered at high risk of sudden cardiac arrest has proved to be not effective and is not recommended.

Methods of providing ventilations

Introduction

While providing ventilations has been minimized in certain resuscitation procedures such as compression-only CPR, it remains an important skill and part of the sequence of care for professional and lay providers who are resuscitating infants, children and certain adult victims.

Summary of scientific foundation

The first study of the mouth-to-mask method found that the technique allowed effective ventilations to be delivered to nine adult postoperative patients. The operators could easily maintain acceptable blood levels of oxygen and carbon dioxide in the patients without experiencing fatigue, shortness of breath or dizziness. The authors suggested that the technique had several advantages and could be useful in emergency situations.

A review of the available literature comparing mouth-to-mask and BVM ventilation reveals that there are many unanswered questions regarding these potentially lifesaving techniques. For example, the actual risk of infection while using either of these methods is unknown. More research is needed, but still, some conclusions can be drawn.

The mouth-to-mask method may be effective at delivering adequate tidal volumes, although with higher peak airway pressures and increased risk of excessive ventilation and gastric insufflation than two-rescuer BVM use. This technique can also be more tiring for the rescuer to perform.

Mouth-to-mask ventilation may be easier to learn and perform than the one-rescuer BVM technique. When a single rescuer is required to perform both ventilations and compressions during one-rescuer CPR, the mouth-to-mask technique is simpler and faster, and results in shorter interruptions of chest compressions.

Most brands of resuscitation masks are available in one standard adult size. This size is particularly ineffective when used on infants. BVM devices are available in adult and pediatric versions, with a complete range of mask sizes.

One-rescuer BVM ventilation is a complex skill that is harder to learn and perform. In order to use this technique, the rescuer first has to select the appropriate-sized mask and bag. Using one hand, the rescuer needs to open the victim's airway and form an adequate seal between the mask and face. Then, using the other hand, the rescuer has to deliver the necessary tidal volume by squeezing the bag with one hand, while observing the victim for visible chest rise. Many rescuers have difficulty performing this skill, especially on adults. Mask design and variations in technique influence the results.

The two-rescuer method of BVM ventilation may facilitate making an adequate seal and delivering the necessary tidal volume, with less peak airway pressure and lower risk of excessive ventilation and gastric insufflation than the mouth-to-mask technique. It also allows higher concentrations of supplemental oxygen and facilitates transportation of the victim. It may be an easier skill to learn and perform than the one-rescuer technique.

References: 626-652

Guidelines

- A single rescuer providing ventilations should use the mouth-to-mask technique rather than the BVM technique (recommendation**).
- Multiple rescuers with at least two available for providing ventilations should use the two-person BVM technique if properly trained and experienced in this method (recommendation**).

Implementation considerations

National Societies need to determine based on the providers they train whether to address only barrier devices or to also include BVM usage. In addition, certain National Societies may choose to allow in their materials the provision of ventilations without a barrier device based on local beliefs and practices, but this would not be consistent with current infection control practices.

Psychosocial support/mental health

Introduction

Psychosocial support as defined by the IFRC Reference Centre for Psychosocial Support refers to the actions that address both the psychological and social needs of individuals, families and communities after critical events and that aim at enhancing the resilience of the affected individuals, group and community. This definition corresponds with the Interagency Standing Committee (IASC) Guidelines on Mental Health and Psychosocial Support in Emergency Settings and is widely accepted. The IASC guidelines state that in emergencies, people are affected in different ways and require different kinds of support. A key to organising mental health and psychosocial support is to develop a layered system of complementary supports that meets the needs of different groups; these layers include basic services and security, community and family supports, focused non-specialized supports and specialized services.

The most basic aspects of psychosocial interventions of this multi-layered approach are integrated into the provision of basic services and security. A psychosocial approach ensures that these services are provided and that they are provided in a way that is respectful and socially appropriate. These interventions may include advocating that these basic services are put in place by responsible actors, documenting their impact on mental health and psychosocial well-being and influencing humanitarian actors to deliver them in a way that promotes mental health and psychosocial well-being. At a community or family level, psychosocial interventions aim to promote social support by re-establishing family links and social support networks. Trained volunteers may also provide psychological first aid (PFA) and implement activities that support the inherent resilience of the affected groups. PFA is described in *The Psychological First Aid Field Operations Guide, 2nd Edition* (2006) is one example of this very basic aspect of psychosocial support. A smaller number of people may require support focused on specific problems or issues. These may take the form of individual, family or group interventions and should be performed by trained and supervised personnel. In cases when the more focused interventions are insufficient or severe mental health disorders are suspected, it is important to arrange for referral to mental health professionals.

Summary of scientific foundation

There is strong consensus among recognized authorities as to the definition of psychosocial support and its underlying goals. The primary goal is the enhancement of resilience and psychosocial well-being through providing structured psychosocial support, which may mitigate against the development of adverse psychological reactions. Psychosocial support interventions in emergency response situations that provide informational, practical and emotional support, such as PFA, are highly recommended by various experts and guidelines (*see* NICE guidelines, 2005, IASC guidelines, 2009). There is overwhelming evidence from 30 years of research that social support is a major protective factor after adverse life events/trauma. Aspects of psychosocial support that have repeatedly been reported as being helpful during this process are security and safety, empowerment, connectedness, calm and hope. The European Network for Traumatic Stress (www.tentsproject.eu) was tasked to develop guidelines for psychosocial care after disasters that could be disseminated across Europe and potentially beyond Europe. Given the limited evidence base, it was decided to develop guidelines through achieving a consensus of expert opinion. The recommendations propose that every area has a multi-agency psychosocial care planning group and that responses provide general support, access to social, physical and psychological support and that specific mental health interventions are provided only if indicated by a comprehensive assessment.

The Psychological First Aid Field Operations Guide, 2nd Edition (2006) issued by the National Child Traumatic Stress Network and National Center for post-traumatic stress disorder characterizes PFA as "evidence-informed". This evidence is sufficient to demonstrate that PFA is an acceptable intervention that can be provided by trained volunteers without professional mental health training for people who have experienced a traumatic event. The *Psychological First Aid: Field Operations Guide (2006)* and the Disaster Services of the American Red Cross course entitled Psychological First Aid (DSCLS206A), intended for volunteers responding to disasters offer strong support for the credibility of this intervention.

References: 653-663

Guideline

- The core principles of psychosocial support (as stated by the IFRC Reference Centre for Psychosocial support, the IASC guidelines as well as the *Psychological First Aid: Field Operations Guide)* recommend that PFA should be included in all first aid training programmes (recommendation**).

Implementation consideration

Psychosocial support as well as PFA must be conducted in collaboration with emergency services and the provision of first aid expertise. Support/supervision can be overseen by mental health practitioners and experts in psychosocial support. It is also important to determine the type of intervention as appropriate and necessary and to identify which psychosocial support provider is best suited for the task according to resources available. Lastly, it is important to include information for both victims and first aid providers.

Psychological first aid principles

Measures to enhance resilience and psychosocial well-being after a traumatic event have been explored by different health care professionals. First aid providers should use the following intervention strategies for a person who has experienced a traumatic event. Training in PFA or other similar psychosocial support interventions will provide the platform for their application.

- **Safety and security:** Ensure security and enhance immediate and ongoing safety and provide physical and emotional comfort. Allow the person a period of rest, and provide an opportunity to discuss feelings and experiences if he or she wants to. If the person talks about thoughts, feelings or emotions in relation to the event voluntarily, listen in a calm, non-judgmental way.
- **Assessment of needs:** Provide practical and emotional support to the affected person according to needs (e.g., shelter, financial assistance, social network, medical and legal assistance).
- **Stabilization:** In some cases, the person may have an initial state of "daze", in which his or her field of consciousness is constricted and attention narrowed, with a loss of the ability to comprehend stimuli (symptoms of "acute stress reaction", i.e., the immediate and brief responses to a sudden intense stressor). Calm and orient emotionally overwhelmed persons. Give the affected person opportunities to distance himself or herself from the traumatic event. Give children opportunities to play.

- **Information:** Provide useful information for the person on the event including the state and place of missing persons, the resources in the community and where the person can seek help in case emotional or mood problems develop in the future, as appropriate. Providing psychoeducation supports the healing process; explaining normal reactions to abnormal situations can help prepare the person for reactions that may come in the following days and weeks and how to best cope in a healthy manner.
- **Connect to social support and collaborating services:** Social and peer support has been found to be useful and should be facilitated as well as help-seeking behaviour. Help establish contact with primary social support persons or other sources of support such as family members or friends. Link with available services at the time or in the future.
- **Empowerment and hope:** Help the person to be active and make their own decisions wherever possible. Support in planning small steps into the near future.
- **Facilitate culturally appropriate rituals:** Rituals of mourning and farewell have an important function in promoting resilience of an individual as well as at a cultural and social level.

De-escalating techniques for violent behaviour

Introduction

First aid providers may occasionally encounter a person at risk of violent behaviour.

Summary of scientific foundation

There are no data from randomised controlled trials evaluating the effects and usefulness of de-escalating techniques as short-term measures in preventing a violent behaviour. Evidence for the effectiveness of de-escalating techniques regarding violent behaviour stems from case reports, case series, cohorts and expert opinions and consensus.

However, no evidence has yet been found against the usefulness of de-escalating techniques in preventing violence or that these techniques would cause any harm to a person at risk of violent behaviour.

References: 664-684

Guidelines

- First aid providers should have basic skills in handling a person at risk of violent behaviour until help from a health care professional is available (recommendation**).
- Thorough and comprehensive assessment for violent risk and for the possibility of an underlying mental illness for violent risk should be done by trained health care professionals (recommendation**).
- If a person is considered to be at risk of engaging in violence, de-escalating techniques can be adopted by trained first aid providers as short-term measures in preventing a violent behaviour (option*).

Implementation considerations

Violent risk is assessed based on the risk factors for violence and on the nature of the violent act if the assessment is done after the violent act. Risk factors for violence include the following:

- age (higher risk if <30 years old)
- sex (higher risk if male)
- unstable relationship
- unstable employment
- history of repeated impulsive behaviours and problems with authority
- previous history of violence
- presence of personality disorders (e.g., antisocial type, impulsive type)
- presence of other mental disorders (e.g., schizophrenia with psychotic symptoms related to violence; morbid jealousy)
- history of childhood problems (e.g., behavioural and conduct problems)
- presence of alcohol and substance abuse
- presence of brain injury
- presence of pain
- lack of social support

The nature of and circumstances after a violent act that suggest a higher risk include the following:
- lack of provocation for the violent act
- bizarre violent act
- lack of remorse and regret
- continuing major denial
- threats to repeat violence
- negative attitudes towards treatment if physical or mental illnesses are identified
- provocation or precipitant likely to recur (if provocation for or precipitant of the violent act is identified)
- the presence of alcohol or substance abuse
- social difficulties and lack of social support

If a person is considered to be at risk of engaging in violent behaviour, preventing a violent behaviour is a major concern.

"De-escalation" is defined as a gradual resolution of a potentially violent and/or aggressive situation through the use of verbal and physical expressions of empathy, alliance and non-confrontational limit setting based on respect. It involves defusing, negotiation and conflict resolution with the eventual aim of recognizing signs of impending violence so as to prevent it before it happens. First aid providers can use the following de-escalating techniques in approaching a person at risk of engaging in violent behaviour:
- Adopt a calm and sincere attitude; show genuine concern.
- Beware of your own safety and the safety of other people at the scene. Be alert to the possibility that the person may have a weapon; if needed, evacuate other people to a safe place.
- Keep at a safe distance from the person at risk of violence.
- Stand at a "friendly angle" to the person (e.g., 45°).
- Keep an "open posture" (e.g., hands by side and palms turned outwards).
- Avoid touching the person at risk of violence.
- Monitor for signs of violence (e.g., observe for facial expression and posture).
- Speak to the person at risk of violence using a calm and soothing tone and in a non-provocative, non-confrontational way (e.g., nod your head to show that you're listening, use open-ended sentences).
- Adopt empathetic statements such as, "I understand that you are having a hard time and would like to understand what makes you so angry" but try to keep a factual stance and do not get too emotional or talk too much about emotions.
- Encourage the person to talk about his or her reasons for being angry or agitated (focus on the situation and his or her problem, not on his or her intent to take action).

- Maintain contact with the person and keep him or her talking until he or she has time to calm down.
- Listen to the person in a non-judgmental way.
- Be assertive and tell the person decisively and empathetically that he or she will not be allowed to harm himself or herself or others. If appropriate, provide positive reinforcements and suggest ways other than violent behaviours to solve the difficulties or problems.
- Ask about the person's social support and resources.
- Call for help early, especially if the person appears emotional and cannot be calmed down (e.g., call the crisis team, ambulance or police).
- Send the person to the hospital for further assessment and management if required.

Panic attack

Introduction

A panic attack is a distinct episode of anxiety during which a person develops fear and apprehension and the anxiety reaches its peak within 10-15 minutes. During the panic attack, the person can have multiple somatic symptoms such as palpitation, shortness of breath with hyperventilation, chest discomfort, profuse sweating, dizziness and light-headedness and nausea, with fear of dying, fear of losing control and fear of fainting. An accident or a traumatic event can precipitate a panic attack. It is important for first aid providers to know how to handle a person with a panic attack.

Summary of scientific foundation

A formal scientific evidence review was not done for this topic, but it is important in first aid education, and the following guidelines are based on expert opinion.

Guideline

- A victim experiencing a panic attack should be assessed and treated by a mental health care provider (recommendation**).

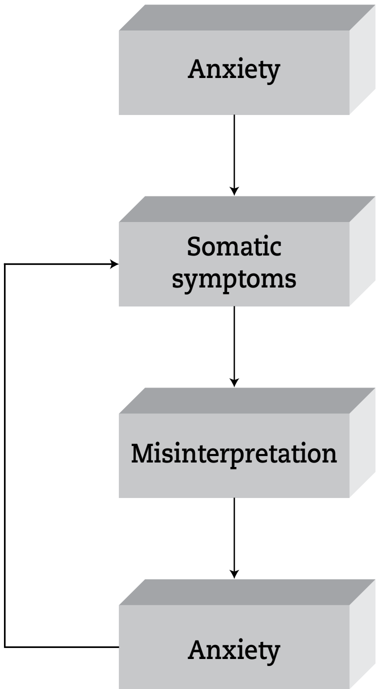
Implementation considerations

It may be difficult for first aid providers to recognize or distinguish between common symptoms of heightened anxiety and that of 'panic disorder' in emergency situations. However, trained first aid providers can use the following approaches for assisting a person suspected to be having a panic attack:

- Be aware that the presentation of chest discomfort and shortness of breath can be caused by physical problems such as a heart attack or asthma; if in doubt, send the person to a hospital for management.
- Speak to the person in a calm and unhurried manner. Speak slowly with clear, short sentences.
- Ask the person if he or she knows whether their symptoms are being caused by a panic attack.
- Encourage the person to breathe in through the nose and out through the mouth slowly.
- Reassure the person that his or her anxiety and somatic discomfort will decrease gradually and that the condition is not life threatening.

Explain to the person that the somatic symptoms are caused by anxiety and that they will disappear after he or she calms down. However, if he or she misinterprets that the somatic symptoms are originating from severe physical problems, his or her anxiety will increase, which will further increase the intensity of the somatic symptoms resulting in a vicious cycle (*see Figure 1 below*):

Figure 1: The vicious cycle in panic attack



Extreme stress and post-traumatic stress disorder

Introduction

Major events outside the range of everyday experience involving a real or perceived/imagined serious threat, accompanied by feelings of powerlessness, horror or terror may result in extreme or traumatic stress.

Common reactions to extreme stress can include anxiety and fear; constant vigilance and accompanying startle responses; poor concentration and memory; intrusive imagery and sensory intrusions; sleep disturbances including nightmares; feelings of guilt, sadness and anger; emotional numbness and diminished interest as well as both mental and behavioral avoidance. These reactions may be accompanied by physical symptoms such as muscular tensions and trembling or shaking; aches and pains; nausea, vomiting or diarrhea, disturbance of the menstrual cycle or loss of interest in sex.

It is important to be aware that these reactions and symptoms are a normal response to an abnormal event. This message should be conveyed to affected people as the reactions may be interpreted as signs of ill health or mental disturbance. Usually people are resilient and these reactions gradually fade and eventually disappear. Resilience can be promoted by providing different forms of psychosocial support, including PFA. However, for some people these reactions may be particularly powerful or persist over a longer period of time or worsen. In these cases it is important to intervene, because this may lead to serious mental health problems that require professional help.

Post-traumatic stress disorder (PTSD) is a protracted pathological response to a traumatic event; in some cases, this may be delayed. In general, PTSD is not a very common disorder (prevalence rates are rather low). Today the focus of psychotraumatology is more on resilience and less on disorders.

The core symptoms of PTSD are similar to the acute reactions to extreme stress but are protracted. They include the following:
- hyperarousal, e.g., persistent anxiety, irritability, insomnia, poor concentration
- intrusions, e.g., intense intrusive imagery, smells or sounds (sensory intrusions), recurring distressing dreams
- avoidance, e.g., difficulty in recalling stressful events at will, avoidance of reminders of the events, detachment, inability to feel emotion (numbness), diminished interest in activities

By witnessing traumatic events, first aid providers are also at risk of developing stress reactions and PTSD. It is important for first aid providers to be aware of this and seek help if needed.

Summary of scientific foundation

Social support is one of the main protective factors after trauma (*see above*). Psychosocial support, including PFA and informational, practical and emotional support, are highly recommended after trauma.

References: 685-698

Guidelines

- For persons or groups that have experienced a traumatic event, psychosocial support provided by trained mental health providers is highly recommended within the first month after exposure to a traumatic event (recommendation**).
- First aid providers are not expected to make a diagnosis of PTSD. However, in case of particularly powerful or persistent stress reactions or symptoms, first aid providers should seek help from health care professionals, including a clinical psychologist or psychiatrist (recommendation**).

Implementation considerations

Although PTSD is not very common, some people may have a higher risk of developing PTSD after a traumatic event. Risk factors for PTSD include the following:
- history of exposure to previous trauma(s)
- subjective life threat (the person believes they were going to die)
- lack of positive social support
- history of psychiatric disorder
- a strong sense of a loss of control
- proximity to the event
- high degree of dissociation during trauma
- high degree of psychophysiological arousal immediately after the trauma
- loss of resources

Suicidal ideation

Introduction

It is not uncommon for first aid providers to encounter a person who expresses suicidal ideation. Certainly, a thorough and comprehensive suicide risk assessment should be done by trained health care professionals. Regardless, it is important for first aid providers to have basic skills in handling a person at risk of suicide until help from a health care professional is available.

Summary of scientific foundation

The belief that asking about suicidal thoughts directly can "induce" a suicide attempt has been described as a myth by commentators. There are no studies supporting that asking about suicide thought or inclination will increase the suicide risk. On the contrary, a randomised controlled trial showed that asking about suicidal ideation does not increase the risk of suicide. Expert opinions support the belief that asking about suicidal thoughts generally neither increases the person's distress, nor precipitates a suicide attempt. When asked appropriately, the person feels more understood and cared for.

References: 699-707

Guideline

- If a person is considered to have suicidal ideation, he or she should be directly asked about suicidal thoughts by trained first aid providers. Inquiry about suicidal thoughts will not precipitate a suicide attempt. Instead, the person will feel being cared for if the inquiry is performed appropriately (recommendation**).

Implementation considerations

The depth and level of assessment and intervention need to be based on the level of training and support of the first aid provider. This will vary among different countries and first aid educational programmes.

Suicide risk is assessed based on the risk factors for suicide and the circumstances of the suicide attempt if the person survives after a suicide attempt. Risk factors for suicide include the following:
- presence of depression
- presence of psychosis
- sex (the risk ratio of male:female is 2:1)
- age (the older the age, the higher the risk)
- being single, separated, divorced or widowed
- presence of alcohol or substance abuse
- previous history of suicide attempts
- presence of a suicide plan
- lack of social support
- presence of chronic illness (e.g., chronic pain)

Circumstances of an unsuccessful suicide attempt that indicate a higher risk:
- planning in advance
- precautions to avoid discovery
- no attempts to obtain help afterwards
- final acts (e.g., writing a suicide note or making a will, transferring savings to a close relative's account, asking someone to help take care of small children)

- dangerous method (e.g., a lethal dosage of drugs, a violent method); the person's own perception of the lethality of the method used should also be considered

First aid providers can use the following approaches for a person with suicidal ideation:
- Talk in a calm and unhurried way.
- Express empathy.
- Be aware of your own safety and the safety of other people in the area (a person with suicidal ideation may have items such as sharp objects intended to harm himself or herself).
- Encourage the person to talk about his or her suicide thoughts and plans, and the problems that lead to suicide as a way of coping, including ambivalence between the will to live and the will to die, if still present.
- Listen in a non-judgmental way.
- Ask about the person's social support and resources.
- Encourage the person to seek professional help.
- Ensure that the suicidal person is not left alone; ask the person's relatives or friends to accompany him or her to the hospital or other medical facility.
- If the person appears emotional and cannot be calmed down, summon for help (e.g., call the crisis team, ambulance or police).

Thorough and comprehensive assessment for suicide risk and for the possibility of an underlying mental illness for the suicide risk should be done by trained health care professionals.

Education

Introduction

Red Cross Red Crescent National Societies are the primary force worldwide in training the lay public in first aid. But quantity is not enough; we must focus also on quality. Our existing training practices can be improved. Continuing first aid education is essential to maintain first aid providers' knowledge and skills, particularly when the skills are not used frequently. This is the reason for first aid refresher classes. All skills must be practiced and upgraded.

One way that training can be improved is by increasing the level of realism. It is one thing to be in a training session but quite another to apply that classroom learning in a real situation. Simulation is important to learn to deal with factors that can prevent efficient first aid from being provided, such as coping with the terrifying presence of blood or a person in cardiac arrest. First aid providers must be prepared to face such stresses.

Evaluation is another important step of education. The purpose of competence-based assessment is to collect sufficient evidence to demonstrate that individuals can perform or behave to the specified standards in a specified role. We should note some key differences in the competence-based assessment approach: focus on "outcomes", individualised assessment, no percentage rating, no comparison with other individual results, all standards (requirements) must be met, on-going process (leads to further development and assessment) and only "competent" or "not yet competent" judgements made.

Unfortunately, education in first aid and resuscitation continues to be insufficiently documented, and many questions are without evidence-based answers. What is the best way to teach first aid skills? Evidence shows a deterioration of skills almost from the moment that a course is completed. How does one ensure that the skills, once learned, are retained so they can be performed when needed? The progress in technology proposes growing number of attractive simulation techniques. An evaluation of the literature raises more questions and does not provide any definitive answers.

Effectiveness of non resuscitative first aid training in laypersons

Introduction

In case of an accident, injury or sudden illness, first aid delivered by bystanders can save lives and limit damage until professional help arrives. Published reports of effectiveness of first aid training are scattered across a large array of biomedical journals published in different languages and in journals associated with different practice specialities, making it difficult to derive a valid assessment of current knowledge in this area. Given the increased premium on layperson first aid skills under conditions of disaster and the consequent likelihood of substantial increase in resources devoted to training efforts, the evaluation of effectiveness of such training assumes paramount importance. Such evaluations need to assess whether course participants acquire appropriate attitudes, competencies and behavior for first aid provision. This implies that course participants demonstrate a positive attitude and helping reaction toward emergencies, and furthermore that they can assess the situation, ensure safety, assess the condition of the victim, get help if required and administer first aid and provide emotional support to victims.

Summary of scientific foundation

One scientific review shows that after a first aid course, laypersons are better informed about the right way to handle emergency situations. As such, they are more likely to know the right phone number for the poison control centre, how to stop a bleeding wound, etc. Another finding of this review is that first aid training must overcome obstacles to action: even trained laypersons hesitate to intervene in ambiguous situations and in the presence of bystanders. Training that addresses this problem increases the likelihood of intervention by laypersons.

Guidelines

- First aid educational programmes must include approaches to overcome barriers to action, including addressing self-efficacy and inhibitors of emergency helping behavior.

Implementation considerations

None.

Simulation

There are no studies on the evaluation of simulations in first aid education. In other medical educational settings and for resuscitation, simulations have been used successfully in both education and testing. Studies have shown the benefit of using simulations as both an educational and evaluative tool.

In first aid and resuscitation training, the use of simulation appears to improve participant learning if it is accompanied by other effective teaching methods. Those other teaching methods could be traditional lecture-based, clinical-based learning adapted to the level of education of the participants.

To explore the efficiency of simulation, we need well-designed studies to compare training using simulation with didactic lectures and other pedagogic methods, especially for the training of lay people. We need also well-designed studies on the efficiency of first aid providers trained using simulation with other pedagogical methods.

Retraining/updating

There are no data on how frequently first aid retraining should be recommended. Some studies demonstrated a loss of skills between 3 and 6 months after basic life support (BLS) training. One study suggested that video retraining in first aid at 1 week, 1 month and 13 months after initial training demonstrates better retention of skills compared with no re-training over this period.

There are insufficient data to formally recommend a specific frequency of retraining in first aid in order to retain skills and knowledge. However, extrapolation from resuscitation training leads to a recommendation for regular retraining, especially for the lay public who do not often use first aid measures. A realistic interval between retraining could be 6-12 months. To propose the methods and interval between retraining, we need well-designed studies to help define the optimal retraining/update strategy (timing, duration, etc.) and to evaluate self-instruction versus participation in a traditional first aid refresher course.

Evaluation, monitoring and feedback

There are no data on how best to evaluate and monitor progress in first aid education. Studies with well-defined populations explored evaluation during resuscitation training, but no conclusions could be drawn because a variety of methods were used.

There are no data for or against any method of evaluating or monitoring a first aid/resuscitation provider trainee's educational progress. We need well-designed studies to evaluate the optimal evaluation strategy (method, timing, duration) of first aid and resuscitation courses.

In a competency-based assessment system, the purpose of the assessment is to collect sufficient evidence that individuals can perform or behave to the specified standards in a specific role. If this assessment is also linked to an award system, a further purpose is formal recognition of successful performance.

So the "assessment process" is a series of actions or events, or a sequence of operations. We could say that all forms of assessment involve the following sequence of operations: defining requirements or objectives of assessment, collecting evidence, matching evidence to requirements or objectives, making judgments based on this matching activity.

Methodology

Self-efficacy has been defined as a person's belief in his or her capability to perform at a certain level. Self-reported provider comfort has been used repeatedly throughout the medical literature to assess the confidence of a health care provider's ability to recall or perform skills during a real or simulated patient encounter. This method has also been used to evaluate the confidence of pre-hospital medical professionals in the performance of their job duties and clinical skills. Self-reported comfort in health care providers has been associated in previous studies with several variables that influenced the ability to provide care. Some of these variables previously associated with comfort include hours of continuing medical education, method of training, provider level, level of training and years of experience.

Competency based

The competency-based approach is a level of achievement, not a method of training. Students can obtain the knowledge and skills that they require to show competence in a variety of different ways. For example, options could include home study, public events, quizzes, continuation training, set assignments, interactive CD-ROM, etc. If a taught course is used, it is important that the students are actively involved. A training and assessment programme needs to be flexible enough to encompass the needs of the students in the group.

Messaging

A key concept in the form of training design is flexibility. New trends in competence-based standards, assessment and training have increased the focus on learner-centred learning. As the use of new competence-based systems expands, training professionals will need to respond quickly and effectively to the increased involvement of learners in their own learning process. Trainers will find themselves working in a training and development context in which there will be a modular structure of training, greater access to and demand for learning and assessment, greater links between education and training, a more focused approach to training design, and wider and broader demands on the trainer.

References: 708-711

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03.
References

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Note: *Because the references for this document number in the hundreds, they have been grouped within relevant sections. The reference citations have been numbered in these groups and are listed below under headings that correspond to the same heading (or sub-heading) found in the main body of the document.*

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04. Annexes

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Survey data on first aid and first aid education

In 2010, a global survey of first aid was conducted. The key findings of this survey are as follows:

- In Europe, more than 50% of the responding National Societies have data on the percentage of the population being trained in first aid in their countries. In Asia-Pacific, less than 13% of the National Societies have such data, and in MENA 33% have such data.
- In 2009, more than 7 million people were trained by 52 National Societies worldwide in first aid certified courses, representing a 20% increase since 2006.
- National Societies not only make certified first aid courses available but also use other means to make first aid more accessible. In 2009, fewer than 6 hours of first aid courses were organised for 17 million people worldwide, with 46 million reached by Red Cross first aid and preventive messages in different events by different means.
- In 2009, more than 36,000 active first aid trainers and 770,000 active volunteers served their communities in first aid education and services.
- Only 7 of the 52 (13.5%) National Societies are in countries that have laws that make first aid compulsory in schools, and in only 12 of the 52 (23%) are teachers required to take first aid courses. However, laws in the workplace that make first aid compulsory are almost 58% and 42% for drivers in the 52 countries.
- Only 8 of the 52 National Societies are in countries that have laws to protect people who provide first aid, which typically carries a liability of 15%. Our research shows that fear of liability is one of the key barriers stopping people from giving first aid.
- The average time for emergency services to arrive is 45 minutes, showing there is a great need for citizens of a community to be prepared to provide first aid in disasters and daily emergencies.
- First aid is delivered to the more rural and vulnerable population via the CB-HFA curriculum, providing training in disease/injury prevention and first aid skills.
- National Societies are adapting first aid courses/education according to the needs of their local areas and more vulnerable populations. For example, the Philippines Red Cross provides 19 different types of first aid education courses.
- Research to look at methodology to improve first aid education and skills retention has been done in 13 National Societies mainly in MENA, Asia-Pacific and Europe. Research has also been done to identify the barriers stopping people from providing first aid.

The Fundamental Principles of the International Red Cross and Red Crescent Movement

Humanity The International Red Cross and Red Crescent Movement, born of a desire to bring assistance without discrimination to the wounded on the battlefield, endeavours, in its international and national capacity, to prevent and alleviate human suffering wherever it may be found. Its purpose is to protect life and health and to ensure respect for the human being. It promotes mutual understanding, friendship, cooperation and lasting peace amongst all peoples.

Impartiality It makes no discrimination as to nationality, race, religious beliefs, class or political opinions. It endeavours to relieve the suffering of individuals, being guided solely by their needs, and to give priority to the most urgent cases of distress.

Neutrality In order to enjoy the confidence of all, the Movement may not take sides in hostilities or engage at any time in controversies of a political, racial, religious or ideological nature.

Independence The Movement is independent. The National Societies, while auxiliaries in the humanitarian services of their governments and subject to the laws of their respective countries, must always maintain their autonomy so that they may be able at all times to act in accordance with the principles of the Movement.

Voluntary service It is a voluntary relief movement not prompted in any manner by desire for gain.

Unity There can be only one Red Cross or Red Crescent Society in any one country. It must be open to all. It must carry on its humanitarian work throughout its territory.

Universality The International Red Cross and Red Crescent Movement, in which all societies have equal status and share equal responsibilities and duties in helping each other, is worldwide.

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MIDDLE EAST AND NORTH AFRICA (MENA)

- Between 2008 and 2009, the number of certified courses provided by National Societies increased by around 10%. The total number of people trained in certified first aid courses was 586,423.
- The total number of active first aid volunteers increased by 62% between 2006 and 2009, to reach 51,000.
- Only 2 of the 12 countries have laws that make first aid compulsory for students and teachers. However, 7 of the 12 (58%) have laws that make first aid compulsory for employees of airlines and other workplaces, e.g., hotels, other public transportation.
- The average time before the arrival of an ambulance service varies greatly between capital cities and rural areas. In capital cities, the average can be 14.5 minutes, but in rural areas and in times of crisis and high demand, the time for arrival of emergency services is very difficult to estimate.

EUROPE

- Among the 21 responding National Societies, the percentage of the population trained in first aid averaged 27%. However, the percentage varied widely among countries, being as high as 80% in Austria and as low as 0.15% in Turkey. In some countries, a large percentage of certified first aid courses are provided by the National Societies, e.g., the Danish Red Cross provides 46% of such courses to the population.
- Between 2006 and 2009, the number of first aid courses provided increased by more than 90%. The total number of people trained in 2009 was more than 2.3 million. In France alone, the French Red Cross trained more than 1 million people in 2009.
- Since 2006, among these 21 National Societies, the number of active first aid volunteers doubled, reaching 366,000 in 2009.
- Only 3 of 21 countries have laws that make first aid compulsory in schools. Only 6 of 21 have laws to ensure that teachers have first aid training. However, in Europe, 62% of these 21 countries have laws that ensure first aid training for employees in airlines, hotels and other workplaces, as well as laws that make first aid training compulsory for drivers and applicants waiting to take their driving license test.
- Almost 50% of these countries have laws that require first aid kits to be installed in cars.
- The average time for emergency services to arrive is 15 minutes.

ASIA-PACIFIC

- Between 2006 and 2009, the number of first aid certified courses provided by the 15 responding National Societies increased by 75%. In 2009, Red Cross of China alone doubled the number of people trained since 2006. In 2009, all 15 responding National Societies trained more than 4.15 million people.
- Indian and Chinese Red Cross together provided first aid certified training courses to about 4 million people in 2009.
- In 2009, the number of active first aid volunteers was 350,945, an increase of more than 50% since 2006. However, only 8% of the total number of people trained (4.15 million) became Red Cross volunteers.
- Only 2 of the 15 responding National Societies are in countries that have laws to make first aid compulsory in schools, and only 4 of the 15 have laws that require teachers to take first aid courses. However, 8 of the 15 (53%) have such laws for employees working for airlines, hotels, transportation companies, etc.

- The time for emergency services to arrive varies greatly, from 10 minutes for Singapore to 3 hours for Nepal. National Societies have adapted their first aid courses to make first aid more accessible to the rural communities by adjusting the contents and approach to the environment (i.e., the CBHFA).
- In Asia-Pacific, there are also less than 6 hours of first aid education and training courses available for different targeted groups of the population; in 2009, almost 16 million people were trained in these courses.