

Joost J. L. M. Bierens (Ed.)

Handbook on Drowning



Since 1767, the Maatschappij tot Redding van Drenkelingen in Amsterdam, rewards succesful rescuers with this medal in bronze, silver or gold. The medal represents Charity leaning over a drowning victim and warding off Death as he wields his scythe.

Joost J. L. M. Bierens (Ed.)

Handbook on Drowning

Prevention, Rescue, Treatment

With 87 Figures, 9 in Colour and 52 Tables



Springer

Joost J. L. M. Bierens MD PhD MCDM

Professor in Emergency Medicine

Department of Anesthesiology

VU University Medical Center

PO Box 7057

1007 MB Amsterdam

The Netherlands

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Foreword

by JAN-CAREL VAN DORP

The board of Governors of the *Maatschappij tot Redding van Drenkelingen* is happy to introduce this congress book, the fruit of much effort in recent years of many devoted researchers in the fields of prevention, rescue and treatment of drowned people. It is a compilation of the results of their successful studies, as laid down during the World Congress on Drowning held in Amsterdam on 26–28 June 2002.

Background

Through the ages death by drowning, like so many other causes, was accepted as a part of life. Water brings life, water takes life; burial follows. It was not until the 17th or even as late as the 18th century that it became apparent that people could be effectively rescued by bystanders, that many seemingly dead drowning victims only died after burial and that some of them could have been saved from this fate had they received medical attention.

In Europe it was the so-called Age of Enlightenment, with changing attitudes towards fellow man and social initiatives underway, including the founding of charitable societies. At that time three noblemen in Amsterdam realised that too many victims who had fallen in the waters of Amsterdam were left to their fate and died. Hence, in 1767, they founded a society for the rescue of drowning victims, *de Maatschappij tot Redding van Drenkelingen*. Their initiative was widely applauded.

In the years that followed other cities in Holland started their own initiatives. Great interest was shown by France, Russia, Austria, England, Switzerland and Denmark, as well as the cities of Venice, Hamburg and New York and similar foundations were created in some of these places.

Since its foundation the *Maatschappij tot Redding van Drenkelingen* has devoted itself to promoting everything that would lead to or improve the prevention, rescue and treatment of drowning victims. The means by which it has done this are discussed in the following sections.

Proclamations

Both the public and the authorities needed to be made aware of the duty to rescue drowning victims and resuscitate them. Therefore, a publicity campaign was started proclaiming that a drownee should be removed from the water, taken indoors, rubbed and warmed. To this end, posters were hung around the city in churches, coffee shops, beer shops and pubs.



Fig. 1 Medal offered to rescuers of a drowning victim

Promotion of the Development of Resuscitation Methods

The methods of the time were crude, ranging from rolling the body over a barrel to inserting smoke in the intestines via the anus. Some people, however, realised at that time that more victims may have survived if these treatments had not been applied. Even worse was the fact that not much was known about the state of 'apparent death'. This ignorance persisted right up until the beginning of the 20th century, and it would last until the middle of that century before the effectiveness of mouth-to-mouth resuscitation was recognized.

So for more than one and a half centuries victims were subjected to the old methods of being hung from their feet, tickled with a feather under the nose and in the throat or inflated with smoke before slowly more effective methods became known.

Rewarding Successful Rescuers

In order to encourage bystanders to intervene and help drowning victims, rewards were offered to successful rescuers in the form of either a sum of money or a medal. The sum of money was much coveted as a possible reward and many cases of gallant rescues were reported, although on closer scrutiny some appeared to be forged cases.

The medal was designed in 1767, the year of the foundation of the *Maatschappij tot Redding van Drenkelingen* (■ Fig. 1). It shows a woman representing Charity leaning over a drowning victim and warding off Death as he wields his scythe. The reverse side of the medal has room for a personalised inscription.

Present Activities

The *Maatschappij tot Redding van Drenkelingen* continued these activities till far into the 20th century, first confined to the city of Amsterdam and later on expanding to the rest of the Netherlands.

It concentrates on the same three fields: publicity, research and awarding medals. Publicity comprises a variety of activities such as television adverts that are shown on prime time television, instruction stickers with pictures of the mouth-to-mouth resuscitation method that are widely distributed and

the yearly report containing a survey of the activities of the *Maatschappij tot Redding van Drenkelingen*. It is distributed to specific groups in the Netherlands such as watersports organisations, schools, municipalities, and swimming pool organisations.

The *Maatschappij tot Redding van Drenkelingen* supports students and researchers in their research activities on all matters within its scope. An example of a research project – in this case of significant size – supported by the *Maatschappij tot Redding van Drenkelingen* is the World Congress on Drowning.

Awarding medals is another important activity. Rescuers greatly appreciate being rewarded for their deeds. At the request of the *Maatschappij tot Redding van Drenkelingen* mayors confer the medals on recipients. The local press is usually present, which is a good way to spread the message. In its 235 years of existence the *Maatschappij tot Redding van Drenkelingen* has awarded medals in some 6770 cases of successful rescue.

In 1995, the anaesthesiologist Joost Bierens drew the attention of the *Maatschappij tot Redding van Drenkelingen* to the world-wide dimension of drowning, the need to further develop rescue methods, co-ordinate research and to aim for consensus in these fields. The need for this was indeed confirmed in a quick survey that year, undertaken by the *Maatschappij tot Redding van Drenkelingen* with experts in different disciplines in many countries. They almost unanimously applauded the idea of a World Congress on Drowning.

Thus in 1997, 230 years after its founding, the *Maatschappij tot Redding van Drenkelingen* undertook to organise the World Congress on Drowning 2002, the first of its kind. The reasons were clear: the immense number of drowning victims world-wide, the lack of research co-ordination in the different parts of the world and the need for a consensus on treatment.

The content of the congress was new with a multitude of disciplines, and therefore unlike the many existing congresses. It required an individual and innovative approach and constant designing, rethinking and adjusting.

Professionals in roughly ten different fields related to prevention, rescue and treatment were asked to organise task forces and to lead their task force members in assessing the situation in their fields. The members of the task forces were spread all over the world. For them e-mail proved the ideal mode of communication. In Holland a steering group was set up, each member being an expert and counterpart for a task force leader.

In 1999, 2000 and 2001 the task force leaders convened with the steering group in Amsterdam. Goals were set, mutual adjustments made, progress monitored and the modes and forms of presentation at the congress were discussed.

A website was opened: www.drowning.nl on which all results of the research were amassed and which has remained operational since the congress.

The PR advisors Hill and Knowlton set up a PR campaign in a score of international magazines, as well as in the Dutch newspapers and on TV, which promoted the congress very successfully.

Finally, on 26–28 June 2002 the World Congress took place in The RAI convention centre in Amsterdam, followed the day after by "Dutch Day". Some 500 people from around the world learned about the latest developments in their field, as well as in adjoining fields.

There were posters, plenary sessions and parallel sessions, an exhibition and a specialised bookshop. Many contacts were made and the congress book (which you now hold in your hand) was announced.

The Royal Netherlands Sea Rescue Institution (KNRM) organised workshops and a splendid demonstration on the North Sea coast. There were social events such as the reception held by the Mayor and Elders of the City of Amsterdam, a lively dinner event put on for congress visitors in the old West-Indisch House in the heart of the city.

Constant assessment of the results of the congress meetings resulted in provisional recommendations that were presented in the closing session on Friday afternoon 28 June 2002.

The results of the international congress were conveyed to the some 350 visitors of "Dutch Day" on Saturday 29 June 2002; and there too satisfaction was expressed.

After reviewing the results of the congress the Board of Governors of the *Maatschappij tot Redding van Drenkelingen*, together with the steering group and the task force leaders, has come to the conclusion that a significant deepening of knowledge has been achieved in the fields of prevention, rescue and treatment. Many institutions, as well as individuals, have each in their way contributed to the success of the congress and deserve a word of gratitude.

How to Proceed?

Although there is great satisfaction at what has already been achieved, it is now clear that we have only just started on the long path towards the necessary research and development.

We hope to receive suggestions on how to proceed and invite comments and ideas to be sent to the address of the *Maatschappij tot Redding der Drenkelingen*.

It is with gratitude to all those who contributed to it that we recommend this Handbook on Drowning.

The Board of Governors

Jan-Carel van Dorp

Chairman *Maatschappij tot Redding van Drenkelingen*

Foreword

by PROF. DR. JOHANNES KNAPE MD PhD

Death by drowning is unexpected and unwanted in most cases and is as old as the world. Nevertheless death by drowning was considered by many to be inevitable, the consequences of drowning to be irreversible and drowning itself in some cultures to be an act of a Higher Power. This attitude has discouraged people and even put them off taking initiatives to explore potential alternative approaches to drowning, as has been the case with sudden cardiac death for a long time.

But times have changed. The first society in the world active in the field of trying to improve the outcome of drowning victims, *de Maatschappij tot Redding van Drenkelingen* (The Society to Rescue People from Drowning), was established in Amsterdam in 1767. Other societies, such as the Royal Humane Society in London, England, soon followed this example. The growing realisation that human initiatives and activities of various kinds could result in a reduction in the number of drowning victims caused rescue societies to be set up and scientific attention on the problem of drowning from various sources to increase.

The (re-)invention of effective resuscitation techniques by the late Peter Safar (1924–2003) in 1960 meant a revolution in the prospects of victims of sudden cardiac arrest. The scientific activities which Safar and his group developed has also caused an upturn in interest in drowning victims. It seems that the same may hold true for drowning as for cardiac arrest victims and that better prospects are on the horizon. To quote Safar: "it is great when we can arrange death to come back later".

Thus many disciplines felt that a lot of progress had been made for drowning victims in the last decades of the 20th century. On the other hand it was surprising that research papers on the subject of drowning were scarce and that research meetings in this field were few. It was not surprising then that, in 1995, the oldest society in the field of drowning in the world, the *Maatschappij tot Redding van Drenkelingen*, took the initiative to organise a meeting where experts on all aspects of drowning (epidemiology, prevention and innovation in technology, rescue, resuscitation, medical aspects, hypothermia, water-related disasters and diving) could meet and discuss these issues.

The World Congress on Drowning, which was held in Amsterdam in 2002 for the first time, gathered hundreds of world experts from various fields of expertise to speak, listen, discuss and learn from one another.

This Handbook on Drowning is the first ever compilation of knowledge on drowning. It has been written by a great number of the experts at the World Congress, by the various task forces, as well as other individuals.

It is unique in that it also contains the documents which were the result of the various consensus meetings during the World Congress and the final

recommendations of the World Congress on Drowning. It has become a unique state of the art document on drowning today.

The authors, section editors and the editor, Professor Joost Bierens, sincerely hope that the contents of this book will inspire the reader to be increasingly creative in preventing drowning and in improving the chances for drowning victims in the future. If this handbook manages to prevent one case of death due to drowning, then its making was worthwhile. It is the conviction of the authors of this book that far greater progress in the improvement of the fate of drowning victims is possible due to the efforts of many.

Prof. Dr. Johannes Knapé MD PhD

Chairman of the Foundation Drowning 2002 and of the scientific steering group
World Congress on Drowning

Foreword

by MARGIE PEDEN PhD

It is estimated that nearly 400,000 people drowned worldwide in 2002, making it the second leading cause of unintentional death globally after road traffic crashes. The overwhelming majority of these drowning deaths occurred in low- and middle-income countries. In fact, China and India alone accounted for just over 40% of all the drowning deaths. Data on non-fatal drowning morbidity is hard to estimate since these data are not available in many low- and middle-income countries.

Among the various age groups, children under 5 years of age have the highest drowning mortality rates worldwide. Some other major risk factors include alcohol consumption while swimming, boating, fishing, floods, uncovered water wells, transportation in unsafe or overcrowded vessels and epilepsy. Access to water is obviously the most important risk factor for drowning.

Drowning, however, can be prevented. There are many interventions which have been evaluated in high income countries but few have been tested in the developing world. Nevertheless, the four main principles for drowning prevention remain the same: remove the hazard, create barriers, protect those at risk and counter the damage. Further research on interventions in developing countries is urgently required and public health professionals have a major role to play in most of these prevention activities. The WHO constitutional mandate, as the leading co-ordinating agency for international public health, places it in a unique position to guide a science-based programme of activities in drowning prevention.

WHO has been concerned with the health aspects of water and water supply for many years through its department of Sustainable Development and Healthy Environments. Of particular concern has been the management of recreational waters which is one aspect of drowning prevention. To this end the WHO issued Guidelines for Safe Recreational Waters in 2003 which includes a chapter on drowning prevention. Furthermore, the Department of Injuries and Violence Prevention at WHO has recently begun to look at the issue of drowning prevention, particularly in low- and middle-income countries, and raising general awareness about the problem. WHO Injury Surveillance and Survey Guidelines will guide less-resourced countries to assess the magnitude of their injury problem, including that of drowning.

Human resources in the area of drowning prevention are few and far between, particularly in developing countries. The time to act is now. We all need to work together to prevent drowning worldwide. WHO therefore compliments the organisers of the First World Congress on Drowning, held in the Netherlands in June 2002, for bringing together experts in the field, developing a standardised

definition for drowning and for subsequently developing this Handbook on Drowning which gathers together all that we know about the epidemiology, prevention and advocacy of this neglected epidemic.

Margie Peden PhD

Coordinator Unintentional Injuries Prevention

Department of Injuries and Violence Prevention World Health Organization

Foreword

by B. CHRIS BREWSTER

The International Life Saving Federation (ILS) is driven by a mission to enhance the safety and preservation of human life in the aquatic environment. We were extremely pleased to collaborate with the *Maatschappij tot Redding van Drenkelingen* in the tremendously successful effort to convene the historic World Congress on Drowning 2002. This was a seminal event that established critical benchmarks in drowning prevention procedures, as well as setting a course for future improvements to further our trademark goal: *World Water Safety*. This confluence of purpose of so many scholarly people, like the joining of streams into a mighty river, will unquestionably benefit all the people of the world.

ILS endeavours to lead the worldwide effort to reduce injury and death in, on, and around the water. Through ILS and our member federations, lifesaving research, development, education, and rescue information is generated and disseminated globally. We continually work to advocate with national governments and non-governmental organisations to establish drowning as a public safety issue. We advance lifesaving and drowning prevention by co-ordinating and facilitating the work of national lifesaving organisation, facilitating information exchange through research and dissemination of best practice, working with member organisations to establish and support lifesaving organisations in geographic areas where they do not exist, developing lifesaving by acting as the international federation for lifesaving sport, and by co-operating with other international bodies with shared goals.

The greatest value of the World Congress on Drowning 2002 is leadership toward identifying obstacles to water safety and proposing steps to remove them. The International Life Saving Federation will continue our ongoing leadership in this area, including taking action to implement recommendations made at the congress. We have now established a Lifesaving Commission composed of a rescue committee, education committee, medical committee, development committee, and drowning report committee. This commission is well prepared to address major recommendations of the World Congress on Drowning.

Since the congress, ILS has adopted the new definition of drowning and has fulfilled another of the congress recommendations by publishing international beach safety warning flag standards. The ILS rescue committee already serves as a forum for investigating and validating the efficacy of rescue techniques. This committee is now working on development of international beach safety sign standards. The rescue committee will also further congress recommendations on use of personal watercraft in rescue, optimal visual scanning techniques, and use of the incident command system in aquatic rescue.

Through our education committee, ILS intends to serve as the world body for teachers of water safety and swimming, emphasizing the value of these skills to

all the people of the world. The education committee will evaluate the use of ILS training guidelines to promote the wearing of lifejackets to prevent drowning.

ILS embraces the congress recommendation of teaching basic resuscitation skills to rescuers and lay persons. Through the co-ordination of our development committee, ILS is continually helping increase the number of lifesaving organisations throughout the world, while our education committee identifies best practice training standards for new and existing lifesaving organisations. As recommended at the congress, our standards call for all lifesaving organisations to include basic resuscitation skills for all participants. ILS member lifesaving federations can also help further the congress recommendations of helping encourage a balance between safety and profitability of recreational diving, as well as promoting the safety of diving fishers.

The World Congress on Drowning was the most impressive gathering of medical personnel focussed on drowning and water related injury in the history of lifesaving. Through the ILS medical committee, medical system organization which was recommended to improve drowning process outcomes will be encouraged and the results will be critically appraised for educational purposes. New medical terminology recommendations will also be encouraged through ILS medical committee leadership and within our member organizations. Several ILS medical position statements will be forthcoming to further the recommendations of the congress, including those related to spinal immobilisation techniques.

As suggested by the World Congress on Drowning, ILS intends to develop the *World Drowning Report* to facilitate uniform reporting of drowning cases through a single international source of data registration, both from developing and developed nations. The ILS *World Drowning Report* will also encourage adoption of standardised definitions, as suggested at the Congress.

In summary, the International Life Saving Federation embraces the opportunity to utilise the progress made at the World Congress on Drowning 2002 to advance the cause of drowning prevention throughout the world. We commend the organisers and commit ourselves to fulfilling the ultimate goal of the congress: worldwide drowning prevention.

B. Chris Brewster

Chairman of the ILS Lifesaving Commission

Foreword

by PETER B. BENNETT PhD DSc

A few years ago I was invited to speak at a meeting in Florida on scuba diving safety and accidents. It was concentrated around a pressure chamber for recompression of divers stricken with decompression sickness, or the “bends”. Conjointly there was a display with brochures and coloring books for small children organized by local volunteers on drowning. It concentrated on trying to make the general public, and especially those with swimming pools, aware of the dangers of drowning and, as far as possible, how to avoid this risk and what to do in a drowning emergency.

With some 9000 drownings in the US per year, it became very clear to me that there was simply insufficient awareness of this problem among the public. This was compounded for me by the fact that the 100 deaths in the US per year from scuba diving are usually primarily listed as ‘drowning’ by coroners in conjunction with other diving hazards.

The Divers Alert Network (DAN), a non-profit diving safety association, provides a great deal of education on what to do in scuba diving emergencies and first aid. This includes giving 100% oxygen and possibly the use of automated external defibrillators (AED). DAN has extensive international training schemes in this area.

Very often, in swimming pool drownings, among others, it may take over 30 minutes for an emergency team to arrive. During that time, if the individual is not breathing, it will be too late. After a period of some 4 minutes it becomes progressively more difficult to achieve a recovery unless the victim has been in very cold water.

Clearly, to my thinking, it would be a good idea for individuals with swimming pools, or owners of boats to have a course on emergency oxygen and AED use so that they can provide vital emergency first aid before the professional teams arrives.

It was these thoughts that drove me to stimulate the interest of the International Divers Alert Network to support this Congress on Drowning.

Although I have since retired, I hope that others will take up the concept and concentrate on a broad program of education to help prevent drowning and, if it does happen, how to provide emergency care.

Peter B. Bennett PhD DSc

Founder, Former President DAN America
Emeritus Chairman International DAN
Professor of Anesthesiology
Duke University Medical Center

Introduction

This is a unique book for those involved in aquatic incidents and, more specifically, for those involved in one way or another with drowning incidents. Although some books on drowning have been published, this book serves a well-defined cause: to reduce the number of drownings and to improve outcome in drowning victims.

The book is the culmination of a process that started in Amsterdam in 1996 on the initiative of the *Maatschappij tot Redding van Drenkelingen* (Society to Rescue People from Drowning, established in 1767) and has involved several hundred experts who came together at the World Congress on Drowning held in May 2002. During that congress these experts, from a wide variety of different backgrounds and specialties, held interactive sessions. It is this active participation and multidisciplinary co-operation that makes this book unique.

For example, some authors have practical lifelong experience with aquatic emergencies, but have never written about their expertise before. Others are experts in a particular field of research related to the issue of drowning, but have hardly ever enjoyed (or have even feared) one of the many activities associated with water. Thus, practical down-to-earth information is combined with latest scientific data.

Because of this level of collaboration there may be some overlap or contradiction of information in some of the chapters, and not all sections will be of practical use for all readers. However, all readers will undoubtedly find a lot of information that is relevant for them within the 12 sections. Even though some sections may be less applicable to their field of involvement, this information may serve to emphasise that their involvement in the prevention, rescue or treatment of drowning is only one part of a worldwide process and that collaboration with other partners on a local, national and international level is worthwhile and often even essential.

Although the authors come from all over the world it is unfortunate that the low-income areas, where most drownings occur, are underrepresented. This fact confronts us with the greatest challenge at the moment: how can we involve the low-income countries in the struggle against drowning, not instead of grappling with other major political, social and economic problems, but in addition to these struggles? International organisations such as the World Health Organisation (WHO), the International Maritime Organisation (IMO), the International Life Saving Federation (ILS), the International Life Boat Federation (ILF), the International Red Cross and Red Crescent Societies (IRCRCF) and the Divers Alert Network (DAN) will hopefully find ways to work together to combat drownings in low-income countries.

The 2004 tsunami in Asia with tens of thousands of deaths, most of them by drowning, has resulted in an increased global awareness of the unpredictable and devastating power of water. All those who are familiar with the aquatic environment already knew this and may even have experienced this themselves. Although the tragedy in Asia was on an unprecedented scale and caused immeasurable sadness, the total number of drowning victims each year worldwide is about three times that of the 2004 tsunami disaster. This immense number refers to individual drowning, without public media coverage, but resulting in the same intensity of grief and pain for those who remain behind. If the information in this book stimulates actions that would reduce even 1% of all drownings each year, and help to prepare for future aquatic catastrophes, this means that our joint efforts would already save thousands of lives each year.

Summarised below are the main items to be found in this book.

Section 1 covers some historical elements: the history of the initiating body (the *Maatschappij tot Redding van Drenkelingen*), the development of faster and safer lifeboats, the role that drownings have played in the very first developments of resuscitation, and an overview of the projects related to the World Congress on Drowning. The final chapter in Section 1 will bring back good memories to those involved, and gives others a realistic impression of the work being done.

Section 2 presents extensive epidemiological data from around the world. At the time these data were collected for the World Congress on Drowning, this was the first attempt to gain a global overview of the problem and since then, also stimulated by the World Congress on Drowning, several other new initiatives have taken place to improve data collection. The new, more practical, definition of drowning will be of great importance in the endeavour to generate more complete and reliable worldwide data.

In Section 3 several options for drowning prevention strategies are summarized. It became clear to all participants that the drowning process evolves very quickly and that death can occur in just a few minutes. Therefore, prevention will be the most effective approach to reduce the number of drownings. To achieve this, a permanent multi-focus approach of combined organisations is needed.

The organisational aspects of rescue are addressed in Section 4, while the practical aspects of rescue are covered in Section 5. Both sections give an extensive overview of what is happening in the area of water rescue. Although these rescues may differ greatly depending on the location (for example swimming pool, river, ocean), the developments occurring at one place may still be of practical use in other areas. It is noteworthy that as a result of the congress the international exchange of information, experiences, projects and research increasingly takes place in the pragmatic and practical arena.

The following five sections deal with medical aspects. Initially, it was assumed that the medical aspects would be the main focus of this project. However, soon after the project started, it became clear that prevention and rescue are more important in reducing the number of drownings than the medical care given after the victim is taken out of the water. Nevertheless, having medical aspects as the initial focus for the project meant that many medical experts were prepared to contribute their expertise and a wide variety of medical issues could be de-

scribed from different viewpoints. The medical aspects therefore still represent the majority of themes in the book. Section 6 addresses several resuscitation topics, and highlights the fact that drowning can only be survived when the immediate bystander starts with resuscitation. This section also includes a chapter on the Utstein-style guidelines for the registration of drowning which, when used in future studies, will help to better understand the resuscitation of drowning.

Section 7 deals with several aspects of the treatment of drowning victims in the hospital setting. Experts in emergency and intensive care treatment, as well as specialists in circulatory and respiratory problems, indicate which therapies are preferred.

The extrapolation of current knowledge on hypoxic brain damage to the specific situation of the drowning victim is the focus of Section 8. The information provided offers a unique scholarly background in the understanding and treatment of the often severe neurological complications after drowning.

Section 9 offers a combination of scientific and practical information on immersion hypothermia. Drowning by immersion occurs by means of a mechanism other than submersion. This section reviews the pathophysiological and practical consequences.

Section 10 addresses water-related disasters. The impact of such disasters is now painfully evident, but at the time this project started, few were so acutely aware of the extent of the potential disaster of water and the related risks of drowning. In view of the very latest knowledge concerning the 2004 tsunami, and the 2005 floods in Louisiana caused by hurricane Katrina, some chapters may have been written with a different perspective. Nevertheless, this section still provides an important theoretical basis for the actions that need to be taken to reduce the risk of drowning as a result of water-related disasters.

In Section 11 the results of a joint effort by the world's leading medical divers are summarized. The section covers prevention, rescue and treatment of the drowned diver and includes some important recommendations for future initiatives.

Several aspects of the drowning victim who has not survived are dealt with in Section 12. Although this particular area was not originally considered when preparing the project, it became clear that a lot of expertise is available on the search procedures, forensic aspects and jurisdiction related to persons who died by drowning.

For me, as project co-ordinator of the project World Congress on Drowning and co-ordinating editor of this *Handbook on Drowning Rescue, Prevention and Treatment*, it was a challenge to keep track of the continuous developments related to the dynamics of the project, and a great privilege to work with such an outstanding and dedicated group over several years. I consider their commitment, support and comradeship to be the most important reasons why the initiative, taken by a small national organisation, has become a worldwide success. The members of the steering group in the Netherlands, the international group of task force leaders, as well as each individual task force member were particularly important in the steps toward the World Congress on Drowning held in Amsterdam in 2002, and in the publication of this book in 2005.

This book marks the end of a period spanning three decades between my first day as a lifeguard on one of the most remote beaches in the Netherlands, and the worldwide upgrading of all available knowledge in the field of drowning prevention, rescue and treatment as a professor in Emergency Medicine. As such, this book is for me an acknowledgement of my emotional links with the sea and the resulting intellectual challenges to find a way to tackle the problem of drowning. Most of the work towards achieving this has been done by the hundreds of volunteers who, one way or another, have contributed to the process. I will be grateful to each of them for the rest of my life. This book is a tribute to them, their families, their loved ones, and to those they sadly lost by drowning. My special thanks go to the three board members of the Foundation Drowning 2002, Hans Knappe, chairman of the scientific steering committee, Rutger Count Schimmelpenninck, chairman of the *Maatschappij tot Redding van Drenkelingen* during the course of the project, and vice-admiral retired of the Royal Netherlands Navy, former Commander-in-Chief, Herpert van Foreest esq. Their continuing support and input kept the process going.

The book is published as a tool that will further reduce the number of drownings and improve the outcome. This means that the readers are challenged not only to read this book and put the information into practice, but also to co-ordinate local, regional, national or international initiatives in their own fields of expertise, competencies and jurisdiction. In this way the snowball will continue to roll and become even larger.

The future activities observed throughout the world may well be a reason for the *Maatschappij tot Redding van Drenkelingen* to start a second initiative under their patronage.

Joost J. L. M. Bierens MD PhD MCDM

Contents

Foreword **V**

Introduction **XVII**

Section 1

History **1**

Section editor: JOOST BIERENS

- 1.1 Brief history of *Maatschappij tot Redding van Drenkelingen*
(The Society to Rescue People from Drowning) **3**
BALT HELDRING
- 1.2 Two Centuries of Searching for Safe Lifeboats **5**
HANS VANDERSMISSEN and TON HAASNOOT
- 1.3 The History of Resuscitation **14**
BART JAN MEURSING
- 1.4 The World Congress on Drowning: A Move Towards the Future **21**
JOOST BIERENS and HANS KNAPE

Section 2

The Epidemiology of Drowning **39**

Section editors: CHRISTINE BRANCHE and ED VAN BEECK

- 2.1 Overview **41**
CHRISTINE BRANCHE and ED VAN BEECK
- 2.2 Recommendations **43**
The Task Force on the Epidemiology of Drowning:
CHRISTINE BRANCHE, ED VAN BEECK, OLIVE KOBUSINGYE,
JOHN LANGLEY, IAN MACKIE (†), ELENI PETRIDOU, LINDA QUAN,
GORDON SMITH and DAVID SZPILMAN
- 2.3 Definition of Drowning **45**
ED VAN BEECK, CHRISTINE BRANCHE, DAVID SZPILMAN,
JEROME MODELL and JOOST BIERENS
- 2.4 Methods for Estimating the Burden of Drowning **49**
LINDA QUAN

- 2.5 Availability and Quality of Data to Assess the Global Burden of Drowning **54**
IAN MACKIE (†)
- 2.6 The Global Burden of Drowning **56**
 - 2.6.1 The Global Burden of Drowning **56**
GORDON SMITH
 - 2.6.2 The Global Burden of Drowning: An African Perspective **61**
OLIVE KOBUSINGYE
- 2.7 Risk Factors for Drowning **63**
ELENI PETRIDOU and ALEXANDRA KLIMENTOPOULOU
- 2.8 Review of Literature on Available Strategies for Drowning Prevention **70**
JOHN LANGLEY
- 2.9 Occupational Drownings **73**
JENNIFER LINCOLN

Section 3

The Prevention of Drowning **77**

Section editors: JOHN WILSON, HANS KNAPE and JOOST BIERENS

- 3.1 Overview **82**
JOHN WILSON and WIM ROGMANS
- 3.2 Recommendations **84**
WIM ROGMANS and JOHN WILSON
- 3.3 Purposes and Scope of Prevention of Drowning **87**
JOHN WILSON and WIM ROGMANS
- 3.4 Risk Assessment and Perception **93**
ANDREJ MICHALSEN
- 3.5 Prevention of Drowning in the Home and Garden **99**
JOHN PEARN and DAVID CALABRIA
- 3.6 Prevention of Drowning in Home Pools **105**
IAN SCOTT
- 3.7 The Vigilance of Beach Patrols **110**
ANDREW HARRELL
- 3.8 Swimming Abilities, Water Safety Education and Drowning Prevention **112**
RUTH BRENNER, KEVIN MORAN, ROBERT STALLMAN,
JULIE GILCHRIST and JOHN MCVAN

- 3.9 National and Community Campaigns **117**
 ELIZABETH BENNETT (coordinating author), PETER BARSS,
 PETER CORNALL, KATRINA HADDRILL, REBECCA MITCHELL,
 LAURIE LAWRENCE, JOHN LEECH, MARILYN LYFORD, KEVIN MORAN,
 LUIS-MIGUEL PASCUAL-GOMÉZ, PALOMA SANZ, BLANCA BARRIO,
 SANTIAGO PINTO, FRANK PIA, LINDA QUAN, MONIQUE RIDDER,
 MARCIA ROM, GREG TATE and ANDREW WHITTAKER
- 3.9.1 National Surveillance-Based Prevention
 of Water-Related Injuries in Canada **117**
 PETER BARSS
- 3.9.2 Child Drowning Deaths in Garden Water Features –
 A Concerted Campaign to Reduce the Toll **119**
 PETER CORNALL
- 3.9.3 *SafeWaters* Water Safety Campaign in New South Wales,
 Australia **120**
 KATRINA HADDRILL and REBECCA MITCHELL
- 3.9.4 Community Campaign in Australia
 Targeted Towards Parents and Children **121**
 LAURIE LAWRENCE
- 3.9.5 The Approach to Promoting Water Safety in Ireland **122**
 JOHN LEECH
- 3.9.6 Community Campaign in Remote Aboriginal Communities
 in Western Australia **123**
 MARILYN LYFORD
- 3.9.7 Community Campaigns in New Zealand **124**
 KEVIN MORAN
- 3.9.8 Community Campaigns *Blue Ribbon Pool*
 and *Enjoy Your Swim, Sure!* in Segovia, Spain **125**
 LUIS-MIGUEL PASCUAL-GÓMEZ, PALOMA SANZ,
 BLANCA BARRIO and SANTIAGO PINTO
- 3.9.9 The Reasons People Drown **126**
 FRANK PIA
- 3.9.10 Washington State Drowning Prevention Project
 and the *Stay on Top of It* Campaign **127**
 LINDA QUAN and ELIZABETH BENNETT
- 3.9.11 Community Campaign in the Netherlands
 by the Consumer Safety Institute **128**
 MONIQUE RIDDER
- 3.9.12 Preventing Drowning in Alaska: *Float Coats*
 and *Kids Don't Float* **129**
 MARCIA ROM
- 3.9.13 Evaluation of the *Keep Watch* Media Campaign **130**
 GREG TATE
- 3.9.14 Community Campaign in Victoria, Australia **131**
 ANDREW WHITTAKER

Section 4**Rescue - Organisational Aspects:****Planning, Training and Preparation 133**

Section editors: ROB BRONS and CHRIS BREWSTER

- 4.1 Overview **135**
CHRIS BREWSTER and ROB BRONS
- 4.2 Recommendations **138**
CHRIS BREWSTER and ROB BRONS
- 4.3 Rescue Organisations: Paid or Volunteers? **142**
MIKE ESPINO and CHRIS BREWSTER
- 4.4 Lifeguard Effectiveness **145**
RALPH GOTO
- 4.5 Quality Assessment and Risk Monitoring of Lifesaving **147**
ROB BRONS
- 4.6 Beach Hazards and Risk Assessment of Beaches **151**
ANDREW SHORT
- 4.7 Training Standards for In-Water Rescue Techniques **156**
RICK WRIGHT
- 4.8 Training and Equipping Rescue Personnel for Flood Rescue **159**
SLIM RAY
- 4.9 Learning from Computer Simulations **162**
WIEBE DE VRIES
- 4.10 Data Registration for Lifesaving Organisations **168**
ANN WILLIAMSON and JULIE GILCHRIST
- 4.11 Risk Management in Training of Rescue Techniques **172**
RICHARD MING KIRK TAN
- 4.12 Life Saving as an Academic Career: International Perspectives **176**
VERONIQUE COLMAN, STATHIS AVRAMIDIS,
LUIS-MIGUEL PASCUAL-GÓMEZ,
HARALD VERVAECKE and ULRİK PERSYN
- 4.13 Fund-Raising for Lifesaving **183**
KLAUS WILKENS
- 4.14 Lifesaving in Developing Countries **185**
MARGIE PEDEN and JOHN LONG

Section 5

Rescue – Rescue Techniques 189

Section editors: CHRIS BREWSTER and ROB BRONS

- 5.1 An Overview 194
CHRIS BREWSTER and ROB BRONS
- 5.2 Recommendations 197
CHRIS BREWSTER and ROB BRONS
- 5.3 Patterns of Wave and Surf 202
EDWARD ZWITSER
- 5.4 Water Safety Signs and Beach Safety Flags 204
BRIAN SIMS
- 5.5 Lifeguard Surveillance and Scanning: Past, Present, Future 214
PETER FENNER, TOM GRIFFITHS,
MICHAEL OOSTMAN and FRANK PIA
- 5.6 Trends in Sea Rescue and Open Water Search Techniques 220
MICHAEL WOODROFFE and GABRIEL KINNEY
- 5.7 Lifejackets and Other Lifesaving Appliances 226
 - 5.7.1 Lifejackets 226
CHRIS BROOKS, GÜNTHER CORNELISSEN and ROLF POPP
 - 5.7.2 Personal Lifesaving Appliances Other than Lifejackets 229
IVAR GRØNENG
- 5.8 Self-Rescue 232
 - 5.8.1 Self-Rescue During Accidental Cold Water Immersion 232
MICHEL DUCHARME
 - 5.8.2 Survival and Self-Rescue 235
ANTHONY HANDLEY
- 5.9 Submerged Vehicle Rescue 238
JAAP MOLENAAR and JOHN STOOP
- 5.10 Horizontal and Other Rescue Techniques: Practical Aspects 241
WOLFGANG BAUMEIER and MICHAEL SCHWINDT
- 5.11 Ice Rescue 249
CARLA ST-GERMAIN and ANDREA ZAFERES
- 5.12 Rescues Under Difficult Circumstances 254
 - 5.12.1 Plane Crashes 254
MARTIN NEMIROFF
 - 5.12.2 Offshore Powerboat Rescues 256
JOOST VAN NUETEN
 - 5.12.3 The NASA Ocean Rescue Plan for the Space Shuttle 261
AHAMED IDRIS

- 5.13 Rigid Inflatable Boats **264**
HANS VANDERSMISSEN and TON HAASNOOT
- 5.14 Inshore Inflatable Rescue Boat Injuries
with Implications for New Designs **271**
PETER FENNER
- 5.15 Development and Use of Personal Watercraft
in Aquatic Rescue Operations **275**
JIM HOWE
- 5.16 Alternatives for Rescue Boats **279**
 - 5.16.1 Hovercraft **279**
MICHAEL VLASTO
 - 5.16.2 Jet Boat **284**
PETER DAWES
 - 5.16.3 Paraglider **286**
RUY MARRA
- 5.17 Spinal Injury: Prevention, Immobilisation
and Extrication from the Aquatic Environment **288**
 - 5.17.1 Prevention of Spinal Injuries **288**
JENNY BLITVICH
 - 5.17.2 Immobilisation and Extraction of Spinal Injuries **291**
PETER WERNICKI, PETER FENNER and DAVID SZPILMAN
- 5.18 Injuries to Lifesavers **296**
PETER WERNICKI and PETER FENNER
- 5.19 Management of Physical and Psychological Responses
During Administration of CPR to a Drowned Person **301**
FRANK PIA
- 5.20 Psychological Care After CPR and Rescue **304**
TON HAASNOOT

Section 6

Resuscitation 309

Section editors: PAUL PEPE and JOOST BIERENS

- 6.1 Overview **312**
PAUL PEPE and JOOST BIERENS
- 6.2 Consensus and Recommendations **314**
PAUL PEPE and JOOST BIERENS
- 6.3 The Critical Role of Lay Persons
and Their Actions in Drowning Incidents **323**
JANE WIGGINTON, PAUL PEPE, DENISE MANN,
DAVID PERSSE and PAUL SIRBAUGH

-
- 6.4 Basic Life Support for Drowning Victims **327**
AHAMED IDRIS
 - 6.5 Automated External Defibrillators in the Aquatic Environment **331**
STEVE BEERMAN and BO LØFGREN
 - 6.6 Positioning the Drowning Victim **336**
DAVID SZPILMAN and ANTHONY HANDLEY
 - 6.7 First Aid Courses for the Aquatic Environment **342**
DAVID SZPILMAN, LUIS MORIZOT-LEITE, WIEBE DE VRIES,
JUSTIN SCARR, STEVE BEERMAN, FERNANDO MARTINHO,
LUIZ SMORIS and BO LØFGREN
 - 6.8 Advance Life Support **348**
VOLKER WENZEL and PAUL PEPE
 - 6.9 Long QT Syndrome and Drowning **352**
ALFRED BOVE and RIENKE RIENKS
 - 6.10 Paediatric Considerations in Drowning **356**
ROBYN MEYER, ANDREAS THEODOROU and ROBERT BERG
 - 6.11 Termination of Resuscitation Efforts in Drowning **363**
MARTIN NEMIROFF and PAUL PEPE
 - 6.12 Unusual Circumstances of Drowning **368**
PETER MORLEY
 - 6.13 A Case Report of an Extreme Situation **372**
MARTIN STOTZ and WOLFGANG UMMENHOFER
 - 6.14 A Case Report of a Successful Resuscitation
from Accidental Hypothermia of 22°C
and Submersion with Circulatory Arrest **374**
GERT-JAN SCHEFFER
 - 6.15 A Case Report of 22-Minute Submersion in Warm Water
Without Sequelae **375**
DAVID SZPILMAN
 - 6.16 Recommended Guidelines for Uniform Reporting of Data
from Drowning: The Utstein-Style **377**
AHAMED IDRIS, ROBERT BERG, JOOST BIERENS, LEO BOSSAERT,
CHRISTINE BRANCHE, ANDREA GABRIELLI, SHIRLEY GRAVES,
ANTHONY HANDLEY, ROBYN HOELLE, PETER MORLEY,
LINDA PAPA, PAUL PEPE, LINDA QUAN, DAVID SZPILMAN,
JANE WIGGINTON and JEROME MODELL

Section 7**Hospital Treatment 387**

Section editors: HARRY GELISSEN, JEAN-LOUIS VINCENT and LAMBERT THIJS

- 7.1 Overview **389**
HARRY GELISSEN, JEAN-LOUIS VINCENT and LAMBERT THIJS
- 7.2 Recommendations **391**
HARRY GELISSEN, JEAN-LOUIS VINCENT and LAMBERT THIJS
- 7.3 Treatment Protocols: Emergency Room **392**
ANTONY SIMCOCK
- 7.4 Treatment Protocols: Intensive Care Department **397**
WALTER HASIBEDER, VOLKER WENZEL and ANTONY SIMCOCK
- 7.5 Paediatric Considerations **402**
HANS VAN VUGHT, NIGEL TURNER,
NICOLAAS JANSEN and SJEF VAN GESTEL
- 7.6 Aspiration **407**
JEROME MODELL
- 7.7 Management of ARDS **410**
DAVIDE CHIUMELLO, E. CARLESSO and LUCIANO GATTINONI
- 7.8 Risk Factors and Treatment of Pneumonia **416**
GIEL VAN BERKEL
- 7.9 Surfactant Therapy **419**
JACK HAITSMA and BURT LACHMANN
- 7.10 Cardiovascular Changes **423**
JEROME MODELL, TOMASSO PELLIS and MAX HARRY WEIL
- 7.11 Classification Systems **427**
DAVID SZPILMAN, ANTONY SIMCOCK and SHIRLEY GRAVES

Section 8**Brain Resuscitation in the Drowning Victim 433**

Section editors: DAVID WARNER and JOHANNES KNAPE

- 8.1 Overview **435**
DAVID WARNER and JOHANNES KNAPE
- 8.2 Consensus and Recommendations **436**
DAVID WARNER and JOHANNES KNAPE
- 8.3 Prehospital and Emergency Department Management
of the Drowning Victim **439**
LAURENCE KATZ

-
- 8.4 Intensive Care Management of the Drowning Victim **443**
UDO ILLIEVICH
 - 8.5 Paediatric Considerations **447**
PATRICK KOCHANÉK
 - 8.6 Neuromonitoring in the Intensive Care Unit
for the Drowning Victim **449**
COR KALKMAN
 - 8.7 Neurochemical Markers of Brain Injury **453**
BENGT NELLGÅRD
 - 8.8 Post-hypoxic Treatment with Pharmacologic Agents **455**
TAKEFUMI SAKABE
 - 8.9 Animal Experimentation on Cardiopulmonary
Cerebral Resuscitation Relevant for Drowning **460**
PETER SAFAR (†)
 - 8.10 Future Research Questions **465**
DAVID WARNER

Section 9

Immersion Hypothermia **479**

Section editors: BEAT WALPOTH and HEIN DAANEN

- 9.1 Overview **481**
BEAT WALPOTH and HEIN DAANEN
- 9.2 Consensus and Recommendations **484**
BEAT WALPOTH and HEIN DAANEN
- 9.3 The Physiology of Cooling in Cold Water **485**
MIKE TIPTON and FRANK GOLDEN
- 9.4 Body Cooling, Modelling and Risk Assessment **490**
PETER TIKUISIS and HEIN DAANEN
- 9.5 Rescue Collapse Following Cold Water Immersion **493**
MICHAEL TIPTON and MICHAEL DUCHARME
- 9.6 Prehospital Management of Immersion Hypothermia **497**
MICHAEL DUCHARME, ALAN STEINMAN
and GORDON GIESBRECHT
- 9.7 Hospital Rewarming of Hypothermic Victims **502**
DURK ZANDSTRA
- 9.8 Hospital Treatment of Victims in Cardiorespiratory Arrest **511**
BEAT WALPOTH and ADAM FISCHER

- 9.9 Fluid Management During Treatment of Immersion Hypothermia **514**
MARIT FARSTAD and PAUL HUSBY
- 9.10 Acid–Base Management During Accidental Hypothermia **519**
DURK ZANDSTRA
- 9.11 An International Data-Registration
for Accidental and Immersion Hypothermia **520**
 - 9.11.1 Implication of Treatment and Outcome of Survivors
of Accidental Deep Hypothermia:
The Need for a Hypothermia Registry **520**
BEAT WALPOTH
 - 9.11.2 The UK National Immersion Incident Survey (UKNIIS) **521**
MIKE TIPTON
 - 9.11.3 Hypothermia Research Project in The Netherlands **523**
JOOST BIERENS
 - 9.11.4 The SARRRAH Project **524**
WOLFGANG BAUMEIER

Section 10

Water-Related Disasters 533

Editors: ROB BRONS and JOOST BIERENS

- 10.1 Overview **535**
ROB BRONS and JOOST BIERENS
- 10.2 Consensus and Recommendations **539**
ROB BRONS and JOOST BIERENS
- 10.3 Disasters at Sea **540**
HELGE BRANDSTROM
- 10.4 ‘Herald of Free Enterprise’ **546**
KAREL VANDEVELDE
- 10.5 Decision Support System for Optimising a SAR Fleet Plan
to Rescue Large Numbers of Passengers **548**
SIP WIEBENGA
- 10.6 Linking Sea and Land: Essential Elements in Crises Decisions
for Water-Related Disasters **553**
MARTIN MADERN and ROB BRONS
- 10.7 Drowning in Floods: An Overview of Mortality Statistics
for Worldwide Floods **559**
BAS JONKMAN
- 10.8 Measures to Prevent The Netherlands from Flooding **565**
JOOP WEIJERS, ROBERT SLOMP and SJAAK POORTVLIET

- 10.9 Controlling the Risk of Flood-Related Drowning **568**
SJAAK POORTVLIET
- 10.10 The Safety Chain During Floods **570**
MARTIN MADERN, ROB BRONS and AMANDA KOST
- 10.11 Planning of the Mass Emergency Response to Floods
in the Netherlands **575**
PIETER VAN DER TORN and BAS JONKMAN
- 10.12 Current Trends in Swift Water, Moving Water
and Flood Rescue Response **580**
JIM SEGERSTROM

Section 11

Breath-Hold, SCUBA and Hose Diving **587**

Section editors: DAVID ELLIOTT and ROB VAN HULST

Authors: ALFRED BOVE, JIM CARUSO, GLEN EGSTROM,
DAVID ELLIOTT, DES GORMAN, ROB VAN HULST,
MAIDA TAYLOR and JÜRG WENDLING

- 11.1 Overview and Recommendations **589**
- 11.2 The Underlying Physics and Applied Physiology **591**
- 11.3 Diving Techniques **595**
- 11.4 Epidemiology of Drowning While Diving **596**
- 11.5 Physical, Mental and Medical Fitness **597**
- 11.6 Causation of Drowning Accidents in Relation to Training **598**
- 11.7 Introducing Children to Diving **599**
- 11.8 Underwater Self-Rescue and Assisted Rescue:
Training to Cope With Emergencies **600**
- 11.9 Immediate Treatment of the Diver Who Almost Drowned **601**
- 11.10 Accident Investigation and Autopsy **603**
- 11.11 Diving Accident Investigations **603**
- 11.12 The Investigation of SCUBA Diving Fatalities **605**

Section 12

Investigation of Drowning Accidents **617**

Section editor: JEROME MODELL

- 12.1 Introduction and Overview **619**
JEROME MODELL

12.2	Behaviour of Dead Bodies in Water	620
	JAAP MOLENAAR	
12.3	Search and Recovery in Near-Shore Waters	622
	JAMES HOWE	
12.4	Search Techniques	625
12.4.1	Search Techniques for Dead Bodies: Searching with Dogs	625
	ADEE SCHOON	
12.4.2	Search Techniques for Drowning Victims: Recovery Using Side Scan Sonars	627
	ROBERT WILLIAMSON	
12.4.3	Infrared Detection Systems for Maritime Search and Rescue Units	630
	GERM MARTINI	
12.5	Homicidal Drowning	633
	ANDREA ZAFERES and WALT HENDRICK	
12.6	The Approach of the Pathologist to the Diagnosis of Drowning	636
	IAN CALDER	
12.7	Accident Investigations in Drowning	640
	PETER CORNALL, ROGER BIBBINGS and PETER MACGREGOR	
12.8	Legal Aspects and Litigation in Aquatic Lifesaving	645
	JEROME MODELL	
12.9	Legal Claims in Drowning Cases	647
	RUTGER SCHIMMELPENINCK	
12.10	The M/S Estonia Disaster and the Treatment of Human Remains	650
	EKE BOESTEN	
12.11	Maritime Accident Investigations	653
	JOHN STOOP	
	Important Websites	659
	Final Recommendations of the World Congress on Drowning	661
	Acknowledgements	671
	Contact Data and Affiliations	673
	Subject Index	697

List of Contributors

Stathis Avramidis, MSc

European Lifeguard Academy Greece,
El. Venizelou 12A,
18533 Kastella-Pireas, Greece

Wolfgang Baumeier, Dipl. Ing, MD

Department of Anaesthesiology,
University Hospital Schleswig-
Holstein, Campus Lübeck,
Ratzeburger Allee 160, 23538 Lübeck,
Germany

**Peter Barss, MD, ScD, MPH, DTMH,
FACEPM, FRCPC**

United Arab Emirates University
Faculty of Medicine and Health
Sciences,
PO Box 17666, Al Ain,
United Arab Emirates

**Steve Beerman, MD, BSc, BSR,
CCFP, FCFP**

Lifesaving Society Canada,
287 McArthur Avenue,
Ottawa Ontario, K1L 6P3, Canada

Elizabeth Bennett, MPH, CHES

Children's Hospital and Regional
Medical Center, Health Education,
PO Box 50020/S-217, Seattle,
WA 98145-5020, USA

Robert A. Berg, Professor, MD

The University of Arizona
College of Medicine,
1501 N Campbell Avenue, Tucson,
AZ 85724-5073, USA

**Roger E. Bibbings, MBE, BA, FIOSH,
RSP**

Royal Society for the Prevention of
Accidents, RoSPA House,
Edgbaston Park, 353, Bristol Road,
Birmingham B5 7ST, UK

**Joost J. L.M. Bierens, Professor,
MD, PhD, MCDM**

Department of Anesthesiology,
VU University Medical Center,
De Boelelaan 1117,
1081 HV Amsterdam,
The Netherlands

Jenny Blitvich, PhD

School of Human Movement
and Sport Sciences,
University of Ballarat, Victoria 3353,
Australia

Eke Boesten, LLM, PhD

Celebesstraat 86,
2585 TP The Hague,
The Netherlands

Leo L. Bossaert, Professor, MD, PhD

University Hospital Antwerp,
Department of Intensive Care,
Wilrijkstraat 10, 2610 Antwerp,
Belgium

Alfred A. Bove, Professor, MD

Cardiology Section,
Temple University Medical School,
3401 N. Broad Street, Philadelphia,
PA 19140, USA

Christine M. Branche, PhD

National Center for Injury Prevention and Control,
Centers for Disease Control and Prevention,
4770 Buford Highway NE,
Mailstop K-63,
Atlanta GA 30431-3724, USA

Helge Brandstrom, MD

Department of University Hospital,
Anaesthesiology and Intensive Care,
Umea, Sweden

Ruth A. Brenner, MD, MPH

National Institute of Child Health and Human Development,
National Institutes of Health,
Department of Health and Human Services, Room 7B03-7510,
6100 Executive Blvd, Bethesda,
MD 20892-7510, USA

B. Chris Brewster

United States Lifesaving Association,
3850 Sequoia Street,
San Diego, CA 92109, USA

Rob K. Brons, LLM

Chief Fire Officer,
Fire and Rescue The Hague Region,
PO Box 52158, 2505 CD The Hague,
The Netherlands

Christopher J. Brooks, OMM, CD, MBChB, DAvMed, FFOM

Research & Development,
Survival Systems Limited,
Dartmouth, Nova Scotia, Canada

David Calabria

D&D Technologies (USA), Inc.,
7731 Woodward Drive,
Huntington Beach, CA 92647, USA

Ian M. Calder, MD

University of Cambridge, Thorpe,
Huntingdon Road,
Cambridge CB3 0LG, UK

Jim Caruso, MD

1413 Research Blvd,
Rockville, MD 20850, USA

Davide Chiumello, MD

Istituto di Anestesia e Rianimazione,
Universita' degli Studi di Milano,
Ospedale Maggiore Policlinico-IRCCS, Via Francesco Sforza 35,
20122 Milano, Italy

Veronique G.J.M. Colman, Professor, PhD

Faculty of Movement and Rehabilitation Sciences,
Catholic University Leuven,
Tervuursevest 101, 3001 Leuven,
Belgium

Peter N. Cornall

Water and Leisure Safety,
Royal Society for the Prevention of Accidents, RoSPA house,
Edgbaston Park, 353 Bristol Road,
Birmingham B5 7ST, UK

Günter Cornelissen, Dipl.Pol, Dipl.Ing

DIN Deutsches Institut für Normung eV, Verbraucherrat,
Postfach 301107, 10772 Berlin,
Germany

Hein A. M. Daanen, Professor, PhD

Department of Performance & Comfort,
TNO Human Factors, PO Box 23,
3769 ZG Soesterberg,
The Netherlands

Peter Dawes

Surf Life Saving Queensland,
PO Box 3747,
South Brisbane QLD 4101, Australia

Michel B. Ducharme, PhD

Human Protection
and Performance Group,
Operational Medicine Section,
Defence Research and Development,
1133 Sheppard Avenue West, Toronto,
Ontario, M3M 3B9, Canada

Glen Egstrom, PhD

University of California Los Angeles,
Department of Physiological Sciences,
3440 Centinela Avenue, Box 951606,
Los Angeles, CA 90095-1606, USA

**David H. Elliott OBE, Professor, MD,
DPhil, FRCP, FFOM**

40, Petworth Road, Rockdale,
Haslemere, Surrey GU27 2HX, UK

Mike Espino

American Red Cross National
Headquarters,
8111 Gatehouse Road, 6th floor,
Falls Church, Virginia 22042, USA

Marit Farstad, MD

Department of Anesthesia
and Intensive Care,
Institute for Surgical Sciences,
Haukeland University Hospital,
5021 Bergen, Norway

**Peter J Fenner AM, MD, DRCOG,
FACTM, FRCGP**

School of Medicine, James Cook
University, Townsville, Queensland,
PO Box 3080, North Mackay,
Qld 4740, Australia

Adam P. Fischer, MD

Department of Cardiovascular
Surgery, Centre Hospitalier
Universitaire Vaudois,
Rue du Bugnon 46, 1011 Lausanne,
Switzerland

Andrea Gabrielli, MD

Division of Critical Care Medicine
University of Florida, 1600 Sw Archer
Road, Gainesville, FL 32610-0254,
USA

**Luciano Gattinoni, Professor, MD,
PhD**

Maggiore Hospital, Department of
Anesthesia and Intensive Care,
Via F. Sforza 35, 20122 Milan, Italia

Harry P.M.M. Gelissen, MD

Radboud University Medical Centre,
Department of Intensive Care,
PO Box 9101,
6500 HB Nijmegen, The Netherlands

**Gordon G. Giesbrecht, Professor,
MD, PhD**

211 Max Bell Centre,
University of Manitoba,
Winnipeg, MB, R3T 2N2, Canada

Julie Gilchrist, MD

National Center for Injury
Prevention and Control, Centers for
Disease Control and Prevention,
Division of Unintentional Injury
Prevention, 4770 Buford Highway NE,
Mailstop K-63, Atlanta, GA 30341,
USA

**Frank St. C. Golden, MB, MD, BCh,
PhD**

15 Beech Grove, Gosport,
Hants PO12 2EJ, UK

Des Gorman, Professor, MD

Occupational Medicine Unit,
University of Auckland,
Private Bag 92019, Auckland,
New Zealand

Ralph S. Goto

Ocean Safety and Lifeguard Services
Division, City and County of
Honolulu, 3823 Leahi Avenue,
Honolulu, HI 96815, Hawaii

Shirley A. Graves, MD

University of Florida,
College of Medicine, PO Box 100254,
Gainesville, FL 32610, USA

Tom Griffiths, EdD

Aquatics and Safety Office,
Penn State University, Department
of Intercollegiate Athletics,
University Park, PA 16802, USA

Ivar Grøneng

Norwegian Maritime Directorate,
PO Box 8123, 0032 Oslo,
Norway

Ton Haasnoot

KNRM (Royal Netherlands Sea
Rescue Institution),
PO Box 434, 1970 AK IJmuiden,
The Netherlands

Katrina Haddrill

New South Wales Department of
Tourism, Sport and Recreation,
PO Box 1422, Silverwater NWS 2128,
Australia

Jack J. Haitzma, MD, PhD

Department of Anesthesiology,
Erasmus University Medical Centre,
PO Box 1738, 3000 DR Rotterdam,
The Netherlands

Anthony J. Handley, MD, FRCP

40 Queens Road, Colchester,
Essex CO3 3PB, UK

W. Andrew Harrell, Professor, PhD

Centre for Experimental Sociology,
University of Alberta, 5-21 Tory,
Edmonton, Alberta T6G 2H4, Canada

Walter Hasibeder, MD

Department of Anesthesiology
and Intensive Care Medicine,
Krankenhaus der Barmherzigen
Schwestern, Schlossberg 1,
4910 Ried im Innkreis, Österreich

Balt Heldring, LLM

PC Hoofstraat 204,
1071 CH Amsterdam,
The Netherlands

Walter Hendrick

PO Box 548, Hurley, NY 12443,
USA

Robyn M. Hoelle, MD

Emergency Medicine,
University of Florida,
PO Box 14347,
Gainesville, FL 32604, USA

James D. Howe Jr

Honolulu Emergency Services
Department, Ocean Safety and
Lifeguard Services Division,
3823 Leahi Avenue,
Honolulu Hawaii 96815

Paul Husby, Professor, MD, PhD

Department of Anesthesia
and Intensive Care, Institute for
Surgical Sciences,
Haukeland University Hospital,
5021 Bergen, Norway

Ahamed H. Idris, Professor, MD

Surgery and Emergency Medicine,
University of Texas Southwestern
Medical Center,
5323 Harry Hines Blvd, Dallas,
TX 75390-8579, USA

Udo M. Illievich, Professor, MD

Neuroanesthesiology and Critical
Care, Clinic of Anesthesia and
General Intensive Care,
Medical University of Vienna,
1090 Vienna, Austria

Nicolaas J.G. Jansen, MD, PhD

Pediatric Intensive Care Unit,
Wilhelmina Children's Hospital,
University Medical Center Utrecht,
PO Box 85090, 3508 AB Utrecht,
The Netherlands

Bas N. Jonkman, MSc

Delft University of Technology,
Faculty of Civil Engineering,
PO Box 5044, 2628 CS Delft,
The Netherlands

Cor J. Kalkman, Professor, MD, PhD

Division of Perioperative Care,
Anesthesia, Emergency Medicine
and Pain Management,
University Medical Center Utrecht,
PO Box 85500, 3508 GA Utrecht,
The Netherlands

Laurence M. Katz, MD

University of North Carolina
at Chapel Hill,
Department of Emergency Medicine,
Neurosciences,
101 Manning Dr,
Chapel Hill, NC 27599, USA

Gabriel Kinney

Business Development,
Martime Systems and Sensors,
Lockheed Martin, Syracuse,
New York NY 13221 4840, USA

Alexandra Klimentopoulou, MD

1st Department of Pediatrics,
Athens University Medical School,
Aghia Sophia Children's Hospital,
Thivon & Levadias str,
11527 Athens, Greece

Johannes T.A. Knappe, Professor, MD, PhD

Division of Perioperative Care,
Anesthesiology, Emergency Medicine
and Pain Management,
University Medical Center Utrecht,
PO Box 85500, 3508 GA Utrecht,
The Netherlands

Olive C. Kobusingye, MD, MBChB, M.Med (Surg), MPH

WHO Regional Office for Africa,
PO Box 6, Brazzaville,
Republic of Congo

Patrick M. Kochanek, MD

Safar Center for Resuscitation
Research, Department of Critical
Care Medicine,
University of Pittsburgh School of
Medicine,
3434 Fifth Ave,
Pittsburgh, PA 15260, USA

Amanda Kost, LLD

Fire Department of The Hague,
PO Box 52155,
2505 CD The Hague,
The Netherlands

Gerard D. Laanen, MSc

Ministry of Transport,
Public Work and Water Management,
PO Box 20906, 2500 EX The Hague,
The Netherlands

Burhard Lachmann, MD, PhD

Department of Anaesthesiology,
Erasmus Medical Center,
PO Box 1738, 3000 DR Rotterdam,
The Netherlands

John Langley, PhD

Injury Prevention Research Unit,
Department of Preventive and Social
Medicine, Dunedin School of
Medicine, University of Otago,
PO Box 913, Dunedin,
New Zealand

**Laurie J. Lawrence, Dip Phys Ed,
Dip Ed, BA**

D&D Technologies Inc, PO Box 379,
Sydney, Brookvale, NSW 2100,
Australia

John Leech, Lt Cdr, MNI, MIIMS

Irish Water Safety Association,
The Long Walk, Galway, Ireland

Jennifer M. Lincoln, MS

4230 University Drive, Suite 310,
Anchorage Alaska 99508, USA

Bo Løfgren, MD

Department of Cardiology,
Research Unit, Aarhus University
Hospital, Skejby Sygehus,
Brendstrupgaardsvej 100,
8200 Aarhus N, Denmark

John B. Long

Royal Life Saving Society,
Commonwealth Headquarters,
River House, High Street, Broom,
Warks, England B50 4HN, UK

Marilyn Lyford, BHsc

The Royal Life Saving Society
Australia (NSW Branch), PO Box 753,
Gladesville NSW 1675, Australia

**Peter MacGregor, RSP MIFire DMS,
FIM MIOSH**

Royal Society for the Prevention of
Accidents, RoSPA House,
Edgbaston Park, 353 Bristol Road,
Birmingham B5 7ST, UK

Ian Mackie, AM, FRACP †

Martin H.E. Madern

Fire Department of The Hague,
PO Box 52155,
2505 CD The Hague,
The Netherlands

Denise M. Mann, BS, EMT-P

12006 Glenway, Houston,
TX 77070, USA

Ruy Marra

Superfly, Estrada das Canoas,
1476 casa 2 Sao Conrado,
22610-210 Rio de Janeiro,
Brasilia

**Fernando Neves Rodrigues
Martinho, PhD**

Casa Patrão de Salva Vidas Ezequiel
Seabra, Praia de Anjeiras 4455 –
204 – Lavra, Matosinhos,
Portugal

Germ Martini

KNRM (Royal Netherlands Sea
Rescue Institution),
PO Box 434, 1970 AK IJmuiden,
The Netherlands

John T. McVan, MEd

United States Military Academy,
Aquatic Instruction,
735 Brewerton Road,
West Point, NY 10966, USA

Bart-Jan T.J. Meursing, MD

Canisius-Wilhelmina Hospital,
Weg door Jonkerbos 100,
6532 SZ Nijmegen,
The Netherlands

Robyn J. Meyer, MD, MS

Department of Pediatrics,
The University of Arizona College
of Medicine,
1501 N Campbell Avenue, Tucson,
AZ 85724-5073, USA

Andrej Michalsen, MD, MPH

University Medical Center Utrecht,
Division of Perioperative Care,
Anesthesia, Emergency Medicine
and Pain Management,
PO Box 85500, 3508 GA Utrecht,
The Netherlands

Rebecca Mitchell, MA, MOHS

Injury Prevention and Policy Branch,
New South Wales Health,
North Sydney, Australia

Jerome H. Modell, MD, DSc (Hon)

Department of Anesthesiology,
University of Florida,
College of Medicine,
PO Box 100254,
Gainesville, FL 32610, USA

Jaap Molenaar

NIBRA (Netherland Institute for Fire
Service and Disaster Management),
PO Box 7010, 6801 HA Arnhem,
The Netherlands

Kevin Moran, MEd

Centre for Health and Physical
Education,
Symonds Street, 74 Epsom Av.,
Private Bag 92601, Epsom, Auckland,
New Zealand

Luiz Morizot-Leite, MS

Beach and Marine Safety,
Miami Dade County Fire Rescue,
10800 Collings Avenue,
North Miami Beach, FL 33154, USA

Peter Morley, MD

Intensive Care Unit,
Royal Melbourne Hospital,
Parkville, Grattan Street,
Melbourne Victoria 3050,
Australia

Bengt Nellgård MD, PhD

Neuro Intensive Care Unit,
Sahlgrenska University Hospital,
413 45 Gothenburg, Sweden

Martin J. Nemiroff, MD

US Public Health Service/
US Coast Guard,
20829 Via Colombard,
Sonoma California CA 95476 – 8059,
USA

Michael A. Oostman

1912 Dimmitt Court,
Bloomington, IL 61704, USA

**Linda Papa, MD, CM, MSc, CCFP,
FRCP(C), FACEP**

Department of Emergency Medicine,
University of Florida College of
Medicine, PO Box 100186,
Gainesville FL 32610-0186, USA

Luis-Miguel Pascual-Gómez

Buena Vista 4, Esc-3, 2-b,
40006 Segovia, Spain

John Pearn, Professor, MD, AM, RFD

Department of Paediatrics and Child Health, University of Queensland, Royal Children's Hospital, Herston, Brisbane, Queensland 4029, Australia

Margie M. Peden, PhD

Department of Injuries and Violence Prevention, World Health Organization, Appia Avenue 20, 1211 Geneva 27, Switzerland

Tommaso Pellis, MD

Cardiac Mechano-Electric Feedback Lab, The University Laboratory of Physiology, Oxford, OX1 3PT, UK

Paul E. Pepe, MD, MPH, FACP, FCCM, FACEP, FCCP

Emergency Medicine Administration, 5323 Harry Hines Blvd, MC 8579, Dallas, TX 75390-8579, USA

David E. Persse, MD

The City of Houston Emergency Medical Services, USA

Ulrik Persyn, Professor, PhD

Faculty of Movement and Rehabilitation Sciences, Catholic University Leuven, Tervuursevest 101, 3001 Leuven, België

Eleni Petridou, MD, MPH

Department of Hygiene and Epidemiology, Athens University Medical School, 75 Mikras Asias Street, Goudi, 115 27 Athens, Greece

Francesco A. Pia, PhD

Pia Consulting Services, 3 Boulder Brae Lane, Larchmont, NY 10538-1105, USA

Sjaak Poortvliet

Association of Water Boards, PO Box 80200, 2508 GE The Hague, The Netherlands

Rolf Popp, Dipl.-Ing

Binnenschiffahrts-Berufsgenossenschaft, Präventionsbezirk West D IV-1, Frankenweg 2, 56337 Eitelborn, Germany

Linda Quan, Professor, MD, MPH

Department of Pediatrics, Children's Hospital and Regional Medical Center, 4800 Sand Point Way NE cm-09, Seattle, WA 98105, USA

Slim Ray, PhD

CFS Press, 68 Finalee Avenue, Asheville NC 28803, USA

Monique Ridder, MSc, PhD

Christelijke Hogeschool Windesheim, PO Box 10090, 8000 GB Zwolle, The Netherlands

Rienk Rienks, MD, PhD

Heart Lung Center, Central Military Hospital, Heidelberglaan 100, 3584 CX Utrecht, The Netherlands

Wim H.J. Rogmans, PhD

Consumer Safety Institute, PO Box 75169, 1070 AD Amsterdam, The Netherlands

Marcia L. Rom, JD

Alaska Injury Prevention Center,
3701 East Tudor, Suite 105,
Anchorage, AK 99508, USA

**Peter Safar, Professor, MD,
DSc (hon) †****Takefumi Sakabe, professor, MD**

Department of Anesthesiology and
Resuscitology, Yamaguchi University
School of Medicine,
1-1-1 Minami-Kogushi, Ube,
Yamaguchi, 755-8505, Japan

Paloma Sanz

Morillo n° 11,, 1° D, 40002 Segovia,
Spain

Justin P. Scarr, BEd, MBA (MGSM)

The Royal Life Saving Society
Australia, Suite 201,
3 Smail Street, Broadway, NSW 2007,
Australia

**Gert-Jan Scheffer, Professor, MD
PhD**

Radboud University Medical Centre,
Department of Anesthesiology,
UMC St. Radboud Nijmegen,
PO Box 9101, 6500 HB Nijmegen,
The Netherlands

Rutger J. Schimmelpenninck, LLM

Keizersgracht 814,
1017 EE Amsterdam,
The Netherlands

Adee Schoon, PhD

Leiden University,
Institute of Biology,
Animal Behaviour Group,
PO Box 9516, 2300 RA Leiden,
The Netherlands

**Michael Schwindt, Professor, Dipl.-
Pädagoge**

Rolandstraße 35, 31137 Hildesheim,
Germany

Ian Scott, PhD

PO Box 302, Abbotsford,
Victoria 3067, Australia

Jim Segerstrom, MICP

Special Rescue Services Group,
World Rescue Service, PO Box 4686,
Sonora CA 95370, USA

Andrew D. Short, Professor, PhD

Coastal Studies Unit,
School of Geosciences,
University of Sydney, Sydney,
NSW 2006, Australia

Antony Simcock, MD, MB BS, FRCA

Royal Cornwall Hospital, Truro,
Cornwall TR1 3LJ, UK

Brian V. Sims

Royal Life Saving Society – United
Kingdom, River House, High Street,
Broom, Warwickshire B50 4HN, UK

Paul E. Sirbaugh, DO, FAAP, FACEP

Texas Children's Hospital,
6621 Fannin Ste A210,
MC 1-1481, Houston, TX 77030, USA

Robert M. Slomp, Msc

Works and Water Management
Department Water Systems,
Safety Against Flooding,
Ministry of Transport, Public,
Postbus 17, 8200 AA Lelystad,
The Netherlands

Gordon S. Smith, MD, MPH

Liberty Mutual Research Institute
for Safety, 71 Frankland Road,
Hopkinton, Massachusetts 01748,
USA

Luiz Smoris

Robert K. Stallman, PhD

Sandvollvn. 80, 1400 Ski,
Norway

Alan M. Steinman, MD, MPH

1135 Harrington Place,
DuPont, WA 98327, USA

Carla St-Germain, BA, BEd

Education, Lifesaving Society,
287 McArthur Avenue,
Ottawa, Ontario K1L 6P3, Canada

John A. Stoop, PhD

Faculteit TBM,
Technical University,
PO Box 5015, 2600 GA Delft,
The Netherlands

Martin Stotz, MD

Bloomsbury Institute of Intensive
Care, The Middlesex Hospital,
Mortimer Street, London, W1T 3AA,
UK

David Szpilman, MD

Socieda Brasileira de Salvamento
Aquatico, Av. das Américas 3555,
bloco 2, sala 302, Barra da Tijuca,
Rio de Janeiro, Brasil 22631-004

Richard Ming Kirk Tan

73 Farrer Drive,
#02-01 Sommerville Park,
Singapore 259280, Singapore

Greg Tate

Royal Life Saving Society Australia,
Floreat Forum, Perth WA 6014,
Australia

Maida Taylor, MD

785 Foerster Street,
San Francisco, CA 94127, USA

Andreas Theodorou, MD

Pediatric Critical Care Medicine,
Department of Pediatrics,
The University of Arizona Health
Sciences Center, PO Box 245073,
Tucson, AZ 85724-5073, USA

Lambert Thijs, Professor, MD, PhD

Department of Intensive Care,
VU University Medical Centre,
PO Box 7057, 1007 MB Amsterdam,
The Netherlands

Peter Tikuisis, PhD

Human Modelling Group,
Simulation, Modelling,
Acquisition, Rehearsal,
and Training Section, Defence
Research and Development Canada,
1133 Sheppard Avenue West, Toronto,
Ontario, M3M 3B9, Canada

Michael Tipton, Professor, MD

Institute of Biomedical &
Biomolecular Sciences,
Department of Sport & Exercise
Science, University of Portsmouth,
Portsmouth PO1 2DT, UK

**Nigel M. Turner, MB, ChB, FRCA,
EDICM**

Pediatric Intensive Care Unit ,
Wilhelmina Children's Hospital,
University Medical Center Utrecht,
PO Box 85090, 3508 AB Utrecht,
The Netherlands

Wolfgang Ummenhofer, MD, PhD

Department of Anesthesia,
University Hospital, Basel,
Switzerland

Ed van Beeck, MD, PhD

Institute Public Health Care,
Erasmus University Rotterdam,
PO Box 1738, 3000 DR Rotterdam,
The Netherlands

Giel van Berkel, MD

Beatrixziekenhuis, PO Box 90,
4200 AB Gorinchem,
The Netherlands

Pieter van der Torn, MD, DEnv

Foundation for Cooperation of
Technique & Care,
Blankenburgerpark 154,
3042 HA Rotterdam,
The Netherlands

Josephus P.J. van Gestel, MD, PhD

Pediatric Intensive Care Unit,
Wilhelmina Children's Hospital,
University Medical Center Utrecht,
PO Box 85090, 3508 AB Utrecht,
The Netherlands

Robert A. van Hulst, MD, PhD

Diving Medical Center,
Royal Netherlands Navy,
PO Box 10.000, 1780 CA Den Helder,
The Netherlands

Joost van Nueten

Belgium Medical Crash Team
– Sea Eagles vzw,
Vloeiende 26, 2950 Kapellen,
Belgium

Adrianus J. van Vught, Professor, MD, PhD

Pediatric Intensive Care Unit,
Wilhelmina Children's Hospital,
University Medical Center Utrecht,
PO Box 85090, 3508 AB Utrecht,
The Netherlands

Hans Vandersmissen

KNRM (Royal Netherlands Sea
Rescue Institution),
PO Box 434, 1970 AK IJmuiden,
The Netherlands

Karel R.R. Vandevelde, MD

Emergency Department,
AZ Sint-Jan,
Ruudershove 10, 8000 Brugge,
Belgium

Harald Vervaecke, PhD

International Life Saving Federation,
Gemeenteplein 26, 3010 Leuven,
Belgium

Jean-Louis Vincent, Professor, MD, PhD

Department of Intensive Care,
Erasmus University Hospital,
Route de Lennik 808, 1070 Brussels,
Belgium

Michael Vlasto, FRIN, FNI

The Royal National Lifeboat
Institution (RNLI), West Quay Road,
Poole, Dorset BH15 1HZ, UK

Wiebe de Vries, MSc

Royal Foundation of National
Organisation Providing Accident
Rescue Services and First Aid
“The Orange Cross”,
Scheveningseweg 44,
2517 KV Den Haag,
The Netherlands

Beat H. Walpoth, MD, FAHA

Cardiovascular Research,
Service for Cardiovascular Surgery,
Department of Surgery, HUG,
University Hospital, 1211 Geneva 14,
Switzerland

David S. Warner, Professor, MD

Department of Anesthesiology,
Box 3094, Duke University Medical
Center, Durham, NC 27710, USA

Joop B.A. Weijers

Institute for Civil Engineering,
PO Box 17, 2628 CS Delft,
The Netherlands

**Max Harry Weil, MD, PhD, ScD
(Hon), Distinguished University
Professor**

35100 Bob Hope Drive,
Rancho Mirage, CA 92270, USA

Jürg Wendling, MD

Fbg du Lac 67, 2505 Biel-Bienne,
Switzerland

Volker Wenzel, Professor, MD, PhD

Department of Anesthesiology and
Critical Care Medicine, Innsbruck
Medical University, Anichstrasse 35,
6020 Innsbruck, Austria

Peter G. Wernicki, MD

Pro sports, 1355 37th Street,
Vero Beach, FL 32960, USA

Andrew G. Whittaker, BHMS

Victorian Aquatic Industry
Council, 44–46 Birdwood Street,
Box Hill South, Victoria 3128,
Australia

Sip E. Wiebenga

KNRM (Royal Netherlands Sea
Rescue Organisation), PO Box 434,
1970 AK IJmuiden,
The Netherlands

Jane Wigginton, Professor, MD

University of Texas Southwestern
Medical Center,
5323 Harry Hines Blvd.,
Dallas, TX 75390-8579, USA

Klaus Wilkens, PhD

Holunderweg 5, 21365 Adendorf,
Germany

Ann M. Williamson

NSW Injury Risk Management
Research Centre,
University of New South Wales,
Sydney NSW 2052, Australia

Robert L. Williamson, BS, MS

Marine Sonic Technology, Ltd.,
5508 George Washington Memorial
Highway, PO Box 730,
White Marsh, VA 23183-0730, USA

John R. Wilson, Professor, MSc, PhD

Institute for Occupational
Ergonomics,
University of Nottingham,
Nottingham NG7 2RD, UK

Michael Woodroffe

International Lifeboat Federation c/o
The Royal National Lifeboat
Institution, West Quay Road,
Poole, Dorset, BH15 1HZ, UK

Rick Wright

Rescue and Education Commission,
International Life Saving Federation,
PO Box 451, Swansea NSW 2281,
Australia

Andrea Zaferes

Lifeguard Systems/RIPTIDE,
PO Box 548, Hurley, NY 12443, USA

Durk F. Zandstra, MD, PhD

Intensive Care,
Onze Lieve Vrouwe Gasthuis,
PO Box 95500, 1090 HM Amsterdam,
The Netherlands

Edward Zwitser

KNRM (Royal Netherlands Sea
Rescue Institution), PO Box 434,
1970 AK IJmuiden, The Netherlands

Other Contributors:

Blanca Barrio, Spain
Santiago Pinto, Spain