

WILDERNESS MEDICAL SOCIETY PRACTICE GUIDELINES

Wilderness Medical Society Practice Guidelines for the Prevention and Treatment of Drowning



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The Wilderness Medical Society convened a panel to review available evidence supporting practices for the prevention and acute management of drowning in out-of-hospital and emergency medical care settings. Literature about definition and terminology, epidemiology, rescue, resuscitation, acute clinical management, disposition, and drowning prevention was reviewed. The panel graded evidence supporting practices according to the American College of Chest Physicians criteria, then made recommendations based on that evidence. Recommendations were based on the panel's collective clinical experience and judgment when published evidence was lacking.

Key words: drowning, submersion, immersion, cold water submersion, hypothermia

Introduction

With an estimated annual worldwide human mortality of approximately 372,000, the burden of drowning as a global disease is self-evident.¹ Drowning often affects the young and can have dire personal, emotional, and financial consequences for patients, their families, and society. The goal of these practice guidelines is to reduce the burden of drowning through improvements in prevention, rescue, and treatment. We present preferred drowning terminology and a review and evaluation of the literature regarding acute care for the drowning patient in out-of-hospital and emergency medical care settings, with particular focus on the wilderness context. The experience and knowledge of a panel of wilderness and emergency medicine practitioners was used to make recommendations when little or unreliable evidence was available.²

Methods

A panel of reviewers was convened twice in 2013. Members were selected based on clinical and research experience.

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The panel included 5 emergency physicians and 1 pediatric physician, all of whom have practical wilderness medical experience, and several of whom have extensive experience in drowning prevention, education, and training.

Relevant articles were identified through PubMed, MEDLINE, and Google Scholar using a keyword search appropriate to each topic. Randomized controlled trials, observational studies, case series, and review articles were reviewed, and evidence was assessed. Abstracts for which the full article could not be obtained were excluded. If no relevant studies were identified, recommendations are based on the panel's clinical experience and judgment about potential risks of the recommended intervention vs its potential benefits. Recommendations are graded using the American College of Chest Physicians classification scheme, in accordance with prior versions of the Wilderness Medical Society Practice Guidelines (Table 1).³

EPIDEMIOLOGY

The highest risk age group for drowning is children 1 to 4 years old in residential pools; the next highest risk group is adolescents and young adults in natural bodies of water. There were 46,419 recorded drowning deaths in the United States from 1999 to 2010, including

Table 1. American College of Chest Physicians classification scheme for grading evidence in clinical guidelines

<i>Grade</i>	<i>Description</i>	<i>Benefits vs risks and burdens</i>	<i>Methodological quality of supporting evidence</i>
1A	Strong recommendation, high-quality evidence	Benefits clearly outweigh risks and burdens or vice versa	RCTs without important limitations or overwhelming evidence from observational studies
1B	Strong recommendation, moderate-quality evidence	Benefits clearly outweigh risks and burdens or vice versa	RCTs with important limitations or exceptionally strong evidence from observational studies
1C	Strong recommendation, low-quality or very low-quality evidence	Benefits clearly outweigh risks and burdens or vice versa	Observational studies or case series
2A	Weak recommendation, high-quality evidence	Benefits closely balanced with risks and burdens	RCTs without important limitations or overwhelming evidence from observational studies
2B	Weak recommendation, moderate-quality evidence	Benefits closely balanced with risks and burdens	RCTs with important limitations or exceptionally strong evidence from observational studies
2C	Weak recommendation, low-quality or very low-quality evidence	Uncertainty in the estimates of benefits, risks and burden; benefits, risk and burden may be closely balanced	Observational studies or case series

RCT, randomized, controlled trial.

boating accidents; an average of 3868 deaths per year, or about 10 per day.⁴ Based on World Health Organization and Centers for Disease Control and Prevention (CDC) systems for classifying drowning statistics, these numbers exclude deaths occurring during floods and other natural disasters. In 2010, there were 12,900 emergency department (ED) visits for drowning, with 20% of patients admitted to the hospital. Drowning deaths were 48% more likely on weekends. Fifty-three percent of all male and 26% of all female drowning deaths occurred in natural bodies of water.^{4,5}

TERMINOLOGY

The standard definition for drowning, as defined by the World Congress on Drowning in 2002, is “the process of experiencing respiratory impairment due to submersion or immersion in liquid.” Inspired by the Utstein Style for reporting cardiac arrest data, the standard definition allows for only 3 outcomes after drowning: 1) morbidity, 2) no morbidity, and 3) mortality. The following modifier terms should *not* be used to categorize “drowning” patients and events: near, wet, dry, active, passive, salt-water, freshwater, or secondary. Although previously thought to be of physiologic relevance (salt vs fresh, wet vs dry), years of data related to human drowning pathophysiology show that these are not valid distinctions because the final common pathway is hypoxemia and eventual cardiopulmonary arrest.^{2,6,7} By understanding and using the standard definition for drowning and

abstaining from using outdated terminology, communication between medical practitioners, data collection agencies, researchers, and policy makers may become more consistent, thereby more accurately reflecting the true incidence, prevalence, and sequelae of drowning.

Rescue of the Drowning Patient

RESCUER SAFETY

Rescuer safety is paramount during all rescue operations; in the aquatic environment, a specific set of skills, training, and physical capabilities is required. Technical rescue in the aquatic environment can range from swift-water to ocean, lake, scuba, and ice rescue, each requiring different sets of equipment and training. Few studies objectively measure effectiveness of in-water rescue techniques, and much of the literature on this topic is based on the experiences and policies of the writer or organization authoring the text. There is evidence for a high prevalence of fatal and nonfatal drowning of untrained persons attempting to perform in-water rescues.^{8–10} Hazardous water conditions that led to the initial person drowning often still exist and place a well-intentioned rescuer at risk for becoming an additional drowning patient.¹¹ Rescue by untrained persons should be attempted without entering hazardous conditions by reaching to the drowning patient with a paddle or branch, throwing a rope, buoy, cooler, or any floating object, or safely rowing a boat, canoe, or paddleboard to the patient. Trained rescue personnel should

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