American Red Cross

American Red Cross Advisory Council on First Aid, Aquatics, Safety and Preparedness

ACFASP Advisory

Lightning Safety for Outdoor and Indoor Pools

Overall Recommendation:

The general lightning safety recommendations associated with all swimming pools (e.g., 30 second-30 minute rule; avoiding plumbing or electrical circuits), are supported mainly by expert opinions which fall within scientific review Class IV – no convincing scientific evidence is available but is supported by rational conjecture and expert opinion).

Standards: None

Guidelines: None

Options: Because of the potentially severe consequences of being struck by lightning (e.g., death, permanent neurologic impairment, severe burns), it makes the most sense to err on the side of safety and ask patrons of both indoor and outdoor to leave the water immediately and stay in an identified safe area free from contact with water, plumbing, or electrical circuits until 30 minutes after the last lightning sighting or thunder sound.

Questions addressed in the scientific review:

Main question addressed:

What scientific evidence supports aquatic lightning safety practices?

Corollary question addressed:

What scientific evidence exists to support either closing or keeping open indoor pools and aquatic facilities during thunderstorms?

Introduction/Overview:

Estimates in the literature suggest somewhere between 300 and 1000 persons are struck by lightning annually in the U.S.A. These strikes result in 60-100 verified annual fatalities with up to 10 times that number who may suffer non-fatal lightning-related injuries. Lightning is the second most common weather-related cause of fatalities (behind flooding) in the U.S. annually (Holle, Lopez, & Zimmermann, 1999).

The two major U.S. public agencies with scientific expertise related to lightning safety are the *American Meteorological Society* (AMS) and the *National Oceanic and Atmospheric Administration* (NOAA) (to which the National Weather Service (NWS) reports related to meteorological forecasts and warnings). Another not-for profit, non-governmental organization with lightning safety expertise is called the National Lightning Safety Institute (NLSI). Of these agencies and organizations, AMS is the primary scientific society which has produced several important lightning safety statements (AMS Council, 2002, Roeder, 2002). Both NOAA and NWS primarily have relied on the expertise of AMS and NLSI in crafting lightning safety recommendations.

Print and electronic articles related to lightning safety practices are reasonably abundant although they are largely based on expert opinion and commonsense, not upon traditional empirical scientific research studies. Typical empirical research studies do not exist largely because of the inherent danger and difficulty of studying lightning. Lightning safety recommendations and guidelines (e.g., those from the National Oceanographic and Atmospheric Agency and National Weather Service) are traceable back to a few common sources including the NLSI and the AMS's Lightning Safety Group. Despite the lack of empirical scientific studies, the recommendations from these expert agencies are remarkably similar and consonant. The scientific review upon which this advisory depended relied primarily on the same expert opinion and anecdotal evidence because of the lack of evidence-based scientific studies.

With respect to the corollary question regarding the existing scientific evidence to support either the closing or keeping open indoor pools and aquatic facilities during thunderstorms, surprisingly, there were no studies upon which several agencies have based their policies aside from logic and commonsense risk management principles. Proponents of closing indoor swimming pools during electrical storms base their logic upon the existing lightning safety recommendation that persons should avoid contact with water or plumbing during lightning storms of which indoor swimming pools would be prime examples. Opponents to closing indoor pools argue that ground-fault systems in pools protect participants, citing as evidence the claim that no deaths due to lightning have ever been reported in an indoor swimming pool. The lack of research makes resolution of this specific issue difficult at this time other than to follow a conservative approach while maintaining the recommendation as an option only.

Summary:

The existing lightning safety recommendations and practices primarily depend upon logical conjecture and expert opinion as does this advisory. There is an admitted gap between the scientific evidence and lightning safety recommendations. Due to the potentially severe consequences of being struck by lightning, it is logical from safety, ethical, and legal perspectives to abide by the existing lightning safety recommendations because there is no evidence to suggest that they endanger persons and in fact may save lives and prevent injuries. At the same time, more creative scientific studies need to be conducted in order to provide a basis for the recommendations dealing with swimming pools and lighting.

Despite the absence of research and reliance upon anecdotal reports and expert opinion, a similar conclusion to the general lightning safety recommendations must be reached with respect to the question of whether to close indoor swimming pools during thunderstorms: due to potential safety, ethical, and legal reasons, it is best to follow the conservative option of removing bathers from all aquatic facilities (regardless of whether they are outdoors or indoors) during thunderstorms, following the AMS (2002) 30-30 recommendation (i.e., take cover when the time between lightning flash and thunder is 30 seconds or less and remain under cover until 30 minutes after the last lightning is seen or thunder heard; avoiding plumbing and electrical circuits), until such time as research is available that alters this optional advisory recommendation.