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RESEARCH: Aquatics Series

Lifeguard Experience, Confidence, and Learning Preferences Following Airway Management and Oxygen Administration Training

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AQUATICS SERIES: This series aims to explore the diverse aspects of water safety, including the prevention and management of water-related injuries; the education of rescuers and the lay public; and the development of safety equipment and protocols across different levels of training, scopes of practice, and contexts. Together the International Journal of First Aid Education and the International Journal of Aquatic Research invite you into the unique needs and competencies required for safety in aquatic environments.

ABSTRACT

Objective: To evaluate lifeguards' confidence, experience, and learning preferences following training in airway management and oxygen administration (AMOA). The goal was to identify gaps in confidence, experience, and preferred training methods.

Methods: An online survey was completed by 1,123 professional Canadian lifeguards certified in AMOA. The survey included questions asking respondents to rate their confidence using AMOA devices, their real-life experiences with these tools, and their preferred learning methods.

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Results: While 77.1% of lifeguards reported feeling confident in administering oxygen, only 31.4% expressed confidence in using manual suction devices in real-life situations. The majority (61.4%) recommended hands-on AMOA training every six months, and 62.2% recommended that these training sessions last between 1–2 hours. Lifeguards preferred YouTube videos as their primary learning resource (42.3%), followed by online training modules (23.2%). Limited hands-on experience with advanced AMOA devices, such as bag-valve masks and oral airways, was noted, contributing to lower confidence in these areas.

Conclusion: The findings highlight the need for regular, hands-on training, especially with advanced interventions, to enhance lifeguards' confidence. While lifeguards report confidence in oxygen administration, limited real-life application with other tools underscores gaps in practical proficiency. Considering frequent training that includes preferred digital resources, such as online videos, could strengthen skill retention and preparedness. These results support updated, adaptable training approaches to ensure lifeguards are fully equipped to respond confidently and effectively in emergencies.

Keywords: lifeguard; oxygen administration; airway management; first aid education; ventilation; drowning

RÉSUMÉ

Objectif: D'évaluer la connaissance, l'expérience et les préférences d'apprentissage des surveillants-sauveteurs après l'entrainement en gestion des voies respiratoires et à l'administration d'oxygène (« AMOA »). L'objectif était d'identifier des fausses idées en ce qui concerne la confiance et l'expérience, ainsi que les méthodes de formation préférées.

Méthodes: Un sondage en ligne a été rempli par 1 123 surveillant-sauveteurs professionnels canadiens certifiés en « AMOA ». Le sondage a inclut des questions demandant aux répondants d'évaluer leur confiance dans l'utilisation des dispositifs d'« AMOA », leurs expériences réelles avec ces dispositifs ainsi que leurs méthodes d'apprentissage préférées.

Résultats: Bien que 77,1 % des surveillant-sauveteurs aient déclaré qu'ils se sentaient à l'aise avec l'administration d'oxygène, seulement 31,4 % ont exprimé leur confiance dans l'utilisation des dispositifs d'aspiration manuelle dans des situations réelles. La majorité (61,4 %) ont recommandé une formation pratique sur l'« AMOA » tous les six mois, tandis que 62,2 % ont recommandé que ces séances de formation durent entre une et deux heures. Les surveillants-sauveteurs préféraient les vidéos YouTube comme principale ressource d'apprentissage (42,3 %), suivies des modules de formation en ligne (23,2 %). L'expérience pratique limitée des dispositifs de l' « AMOA » avancées, tels que les masques à valve ainsi que les voies respiratoires orales, a été notée, ce qui contribue à réduire la confiance dans ces domaines-ci.

Conclusion: Ces résultats soulignent la nécessité d'une formation pratique fréquente, particulièrement pour les interventions avancées, afin de renforcer la confiance des surveillants-sauveteurs. Bien que les surveillants-sauveteurs se disent à l'aise avec l'administration de l'oxygène, l'application limitée dans la vie réelle avec d'autres outils souligne les lacunes dans les compétences pratiques. Envisager une formation fréquente incluant des ressources numériques préférées, telles que des vidéos en ligne, pourrait renforcer la rétention des compétences ainsi que la préparation. Ces résultats plaident en faveur d'approches de formation actualisées et adaptables afin de garantir que les surveillants-sauveteurs sont bien équipés pour répondre avec confiance et efficacité dans des situations d'urgence.

Mots clés: Surveillant-sauveteur ; administration d'oxygène; gestion des voies respiratoires ; formation aux premiers secours ; respiration artificielle ; noyade

STRESZCZENIE

Cel: Ocena pewności siebie, doświadczenia oraz preferencji edukacyjnych ratowników wodnych po szkoleniu z zakresu udrożniania dróg oddechowych i stosowania tlenoterapii (AMOA). Celem było zidentyfikowanie luk badawczych w odniesieniu do pewności siebie, doświadczenia i preferowanych metodach szkoleniowych.

Metody: Ankietę internetową wypełniło 1,123 kanadyjskich, zawodowych ratowników wodnych, posiadających certyfikat szkolenia z zakresu AMOA. Ankieta obejmowała pytania dotyczące oceny pewności siebie w korzystaniu narzędzi do zapewniania AMOA, doświadczeń z ich użyciem w rzeczywistych sytuacjach oraz preferowanych metod szkoleniowych.

Wyniki: Choć 77.1% ratowników zgłosiło, że czują się pewnie w podawaniu tlenu, jedynie 31.4% deklarowało pewność siebie w przypadku konieczności użycia ssaków manualnych w sytuacjach rzeczywistych. Większość (61.4%) zalecała praktyczne szkolenie AMOA co sześć miesięcy, a 62.2% sugerowało, że sesje te powinny trwać od 1 do 2 godzin. Ratownicy preferowali filmy na YouTube jako główne źródło edukacyjne (42.3%), a następnie moduły szkoleniowe online (23.2%). W badaniu odnotowano ograniczone praktyczne doświadczenie z zaawansowanymi narzędziami do zapewniania AMOA, takimi jak worki samorozprężalne i rurki ustno-gardłowe, co przyczyniło się do niższego poziomu pewności siebie w tych obszarach.

Wnioski: Wyniki podkreślają potrzebę regularnych, praktycznych szkoleń, zwłaszcza w zakresie zaawansowanych interwencji, aby zwiększyć pewność siebie ratowników wodnych. Chociaż ratownicy deklarują pewność w podawaniu tlenu, ograniczona praktyka w użyciu innych narzędzi ujawnia luki w umiejętnościach praktycznych. Uwzględnienie częstych szkoleń z preferowanymi zasobami cyfrowymi, takimi jak filmy online, mogłoby wzmocnić utrwalenie umiejętności i przygotowanie. Wyniki te podkreślają potrzebę aktualizacji i dostosowywania metod szkoleniowych, które zapewnią ratownikom wodnym przygotowanie do pewnego i efektywnego działania w sytuacjach zagrożenia życia.

Słowa kluczowe: ratownik wodny; tlenoterapia; odróżnianie dróg oddechowych; edukacja pierwszej pomocy; wentylacja; tonięcie

Lifeguards serve as first responders in aquatic environments, where they are often called upon to provide life-saving interventions in the critical moments before advanced medical help arrives (Branche & Stewart, 2001). A significant component of their role involves resuscitation efforts, including airway management and oxygen administration, particularly in cases of drowning or respiratory distress (Szpilman et al., 2018). The integration of these interventions into lifeguard practice has been increasingly recognized as beneficial to improved outcomes in aquatic emergencies (Huntley et al., 2024). Training in airway management and oxygen administration (AMOA) equips lifeguards with the necessary skills to ensure adequate oxygenation and ventilation, two critical factors in minimizing hypoxia and other complications (e.g., brain damage) following cardiac or respiratory arrest. While lifeguarding training requirements in Canada are provincially and territorially legislated, there is no national mandate requiring lifeguards to be trained in oxygen administration or airway management using adjuncts. Consequently, the availability and content of AMOA training programs vary widely across the country. The COVID-19 pandemic prompted increased utilization of AMOA tools in various regions of Canada, highlighting their critical role in emergency care. However, beyond British Columbia and the Yukon—where AMOA training is standardized as part of lifeguard certification—the extent to which these skills have been integrated into training and practice remains unclear. While the importance of this training is well-acknowledged, there is limited evidence on the optimal training duration and methods to achieve competency in these interventions.

The airway management and oxygen administration training that lifeguards undergo often involves practical

and theoretical components designed to teach the recognition of respiratory compromise and the effective use of airway adjuncts and oxygen delivery devices. Airway management techniques may include the use of basic tools such as oropharyngeal airways, bag-valve-mask ventilation, and positioning techniques to maintain airway patency. Oxygen administration, on the other hand, involves the correct use of oxygen tanks and masks, often requiring lifeguards to make real-time decisions about when and how to administer oxygen based on a victim's condition. The goal of this training is to ensure lifeguards can act swiftly and effectively in emergencies, bridging the gap until more advanced care arrives.

Despite the availability of training programs related to these skills, a notable gap exists in the literature concerning lifeguard confidence and retention of these skills over time. Training programs may vary significantly in length and content, leading to potential disparities in skill retention and comfort with using these tools in real-life scenarios. While some training programs are thorough, and include multiple practice scenarios with real-time feedback, others may condense these critical skills into shorter sessions due to logistical or financial constraints. The challenge, therefore, is determining how much training is sufficient to produce lifeguards who are not only proficient in these skills but also confident in applying them under pressure.

Existing research on resuscitation and emergency interventions, such as cardiopulmonary resuscitation (CPR), has emphasized the need for ongoing skill practice and re-certification to maintain proficiency (Starosta et al., 2022). Studies have demonstrated that first responders' abilities to perform high-quality CPR degrade over time, often within just a few months of training, without frequent practice (White, 2024). Minimal research has been conducted on how these trends might apply to airway management and oxygen administration, two more complex skills that require both technical knowledge and confidence to execute effectively (Abelairas-Gómez et al., 2022; Berg et al., 2023; Bieliński & Jaśkiewicz, 2021; Huntley et al., 2024; Szpilman et al., 2014). The question remains: how much initial training time is required for lifeguards to feel competent in using these tools, and how often should they refresh their skills to maintain that competency?

In addition, lifeguards' performance in formal knowledge assessments can be measured, but understanding their subjective confidence and preferences for learning these critical interventions is equally important. Confidence plays a pivotal role in the likelihood of using a skill in an emergency; a lack of confidence may lead to hesitation or errors in judgment (Moran & Webber, 2012; Webber et al., 2018). Experience with real-life applications of these skills further shapes a lifeguard's comfort level in responding to respiratory emergencies. Moreover, understanding how lifeguards prefer to learn—whether through hands-on practice, visual aids, or repeated drills—can inform training programs to ensure that they not only impart knowledge but also instill confidence and preparedness.

This study aims to address gaps in the literature by focusing on three key areas: lifeguards' confidence in their ability to perform airway management and oxygen administration, their experiences using these skills in real-life settings, and their preferences for learning and refreshing these skills. Through the analysis of an online questionnaire survey completed by 1,123 lifeguards self-reporting professional volunteer or paid experience, this research will provide insights into how lifeguards perceive their training in these critical interventions and offer guidance on how training programs can be optimized to enhance both competence and confidence. The knowledge assessment portion of this survey was analyzed in a separate study. This manuscript focuses specifically on the subjective measures of confidence, experience, and learning preferences, which are crucial for understanding the real-world application of these life-saving skills.

METHODS

The descriptive, cross-sectional study was conducted using an online survey developed by the authors. Data were collected from 15 February 2024 to 5 May 2024 from professional lifeguards in Canada. This study received ethical approval from the Behavioural Research Ethics Board at the University of British Columbia (H24-00014).

Setting

This study utilized an original online survey to assess lifeguard confidence, experience, and learning preferences following airway management and oxygen administration (AMOA) training. The survey was part of a broader knowledge assessment on AMOA and included 15 questions designed to evaluate technical knowledge and competency. In addition, five optional questions were included to assess professional lifeguards' self-reported confidence in applying AMOA skills, their experiences with real-life application, and their learning preferences for these interventions. This manuscript focuses solely on the analysis of the five questions related to confidence, experience, and learning preferences, as the knowledge assessment portion was analyzed and published in a separate study.

Participants

The survey was distributed to lifeguards across British Columbia and the Yukon through various lifeguard associations, training organizations, and employer networks that have completed a 4-hour AMOA certification course. A total of 1,123 complete responses were collected from lifeguards reporting professional experience in a paid or volunteer lifeguard capacity. As the exact population size of professional lifeguards is unknown, a response rate of 12.23% was estimated using the total population of 9,180 certified pool lifeguards, per the Lifesaving Society's British Columbia and Yukon Branch, at the time of the study. Participation in the survey was entirely voluntary, and respondents were required to provide informed consent before beginning the survey. As an incentive to participate, respondents were offered an opportunity to win one of five lifeguard tool kits, valued at $69, through random draw. Respondents were assured of the confidentiality of their responses, and the survey was designed to be anonymous, with no identifying information collected.

Survey Design and Data Collection

The survey was administered using Qualtrics software (Qualtrics, Provo, UT) and comprised both mandatory and optional sections. The mandatory portion included 15 questions aimed at assessing lifeguards' technical knowledge of AMOA, while the optional section included five questions focused on lifeguards' self-reported confidence, experience, and learning preferences.

Statistical Analysis

Statistical analysis was performed using RStudio version 4.3.3 (R Foundation for Statistical Computing, Vienna, Austria) and Qualtrics Stats iQ statistical software version October 2024. Quantitative variables are presented using basic descriptive statistics: the arithmetic mean (x), standard deviation (SD), median (Me), minimum (Min), maximum (Max), interquartile range [IQR], and percentages (%). When comparing the effect of confidence in AMOA devices (filtered for "Yes" and "No" on experience as a lifeguard), the nonparametric Wilcoxon rank sum test was used due to the non-normality of the distribution, verified by the Shapiro-Wilk normality test. When assessing the impact of self-reported confidence and real-life experience on total score, one and two-way ANOVA testing was performed. Residual normality was tested by examining normalized Q-Q plots and fitted residual histograms; in these cases, the reported data followed normality, allowing for parametric testing. The significance level for all tests was predetermined to be $p < 0.05$.

As the aim of this study is to analyze lifeguards with professional experience, only those who self-reported having paid or volunteer experience as a lifeguard were included in this study; this was determined by the response to Q2.9 ("How many years of lifeguarding experience do you have?"). Therefore, of the 1,322 respondents who completed the original survey, the 188 participants who selected "No paid or volunteer lifeguarding experience" for Q2.9, and the 11 participants who left Q2.9 blank, were excluded from the analysis. An additional six questionnaires were excluded for having over one-third of the missing responses to the knowledge assessment. Fourteen questionnaires missing fewer than one-third of the questions were scored with zeros for the unanswered items on the knowledge assessment. Missing responses to other questions (< 2%) were categorized as "Prefer not

to answer" and omitted from formal analysis of each respective question.

RESULTS

A total of 1,123 professional lifeguards were included in the study.

Demographics

The mean age of lifeguards was 24.0 ± 10.4 (M = 20 ± 8), with the majority under 21 years of age (54.2%, n = 600). Most lifeguards were employed in a role requiring current lifeguard certification (79.3%) and more than half of lifeguards (52.2%) had 2 years or less of volunteer or professional experience. The majority of lifeguards (59.0%) identified as female (Table 1). The mean score of the 15-question knowledge assessment for professional lifeguards was 10.5 ± 2.2 (70% ± 14.7%). File S1 includes the questionnaire with the original knowledge assessment questions. A detailed analysis of the knowledge assessment can be found in Huntley et al. (2024).

Characteristics (*N* = 1123)	*n*	%
Gender		
Female	663	59.0
Male	421	37.5
Non-binary	17	1.5
Prefer not to answer	22	2.0
Age		
15–17 years	280	25.7
18–20 years	320	28.5
21–25 years	244	21.7
26–35 years	129	11.5
≥ 36 years	142	12.6
Prefer not to answer	8	0.7
Employment status		
Lifeguard or role requiring lifeguard certification	891	79.3
Unrelated employment	149	13.3
Unemployed	71	6.3
Prefer not to answer	12	1.1
Lifeguard experience		
< 1 year	313	27.9
1–2 years	273	24.3
3–5 years	187	16.7
> 5 years	350	31.2
Time since initial certification		
< 3 months ago	14	1.3
3–5 months ago	44	3.9
6–12 months ago	172	15.3
1–2 years ago	251	22.4
> 2 years ago	642	57.2
Time since lifeguard recertification	***N* = 640**	
< 3 months ago	74	11.6
3–5 months ago	70	10.9
6–12 months ago	189	29.5
1–2 years ago	218	34.1
> 2 years ago	89	13.9
Time since last employer in-service/ orientation	***N* = 890**	
< 3 months ago	506	56.9
3–5 months ago	213	23.9
6–12 months ago	132	14.8
1–2 years ago	28	3.15
> 2 years ago	11	1.2

Table 1 Sociodemographic characteristics of participants. Questions left blank were included in "Prefer not to answer."

Experience & Confidence

Most lifeguards had limited hands-on experience with airway management and oxygen administration devices in real-life emergencies (Table 2). When asked about their use of these devices, 41.7% (n = 468) reported using oxygen administration, while 10.5% (n = 118) had experience with bag-valve-mask devices, and 10.5% (n =

Characteristics (*N* = 1123)	Emergency experience	Confidence
	n (%)	*n (%)*
Supplemental oxygen		
Yes	468 (41.7)	866 (77.1)
Somewhat	81 (7.2)	212 (18.9)
No	574 (51.1)	45 (4.0)
Bag valve mask devices		
Yes	118 (10.5)	806 (71.8)
Somewhat	29 (2.6)	250 (22.3)
No	975 (86.8)	67 (6.0)
Oral airways		
Yes	118 (10.5)	651 (58.0)
Somewhat	28 (2.5)	371 (33.0)
No	977 (87.0)	101 (9.0)
Manual suction		
Yes	39 (3.5)	353 (31.4)
Somewhat	20 (1.8)	408 (36.3)
No	1064 (94.7)	362 (32.2)

Table 2 Lifeguard experience in using the device in a real life-threatening emergency compared to confidence in using the device during drowning resuscitation.

118) with oral airways. Manual suction devices were the least used, with only 3.5% (n = 39) reporting experience. A substantial proportion of respondents had no real-life experience with these devices, including 51.1% (n = 574) for oxygen administration, 86.8% (n = 975) for bag-valve-mask devices, 87.0% (n = 977) for oral airways, and 94.7% (n = 1,064) for manual suction.

Lifeguards reported varying levels of confidence in their ability to use these devices during resuscitation (Table 2 and Figure 1). The highest confidence was reported for oxygen administration, with 77.1% (n = 866) stating they felt confident, followed by 71.8% (n = 806) for bag-valve-mask devices. Confidence was lower for oral airways (58.0%, n = 651) and manual suction (31.4%, n = 353). Notably, a significant number of respondents felt only somewhat confident or not confident in using these tools, particularly for manual suction, where 36.3% (n = 408) reported only some confidence, and 32.2% (n = 362) reported no confidence.

Confidence in AMOA device usage is correlated to experience as a lifeguard. Participants reporting confidence in oxygen administration ($p < 0.001$), bag valve mask devices ($p = 0.045$), oral airways ($p < 0.001$), and manual suction ($p < 0.001$) had a statistically significant greater amount of experience as a lifeguard than those without

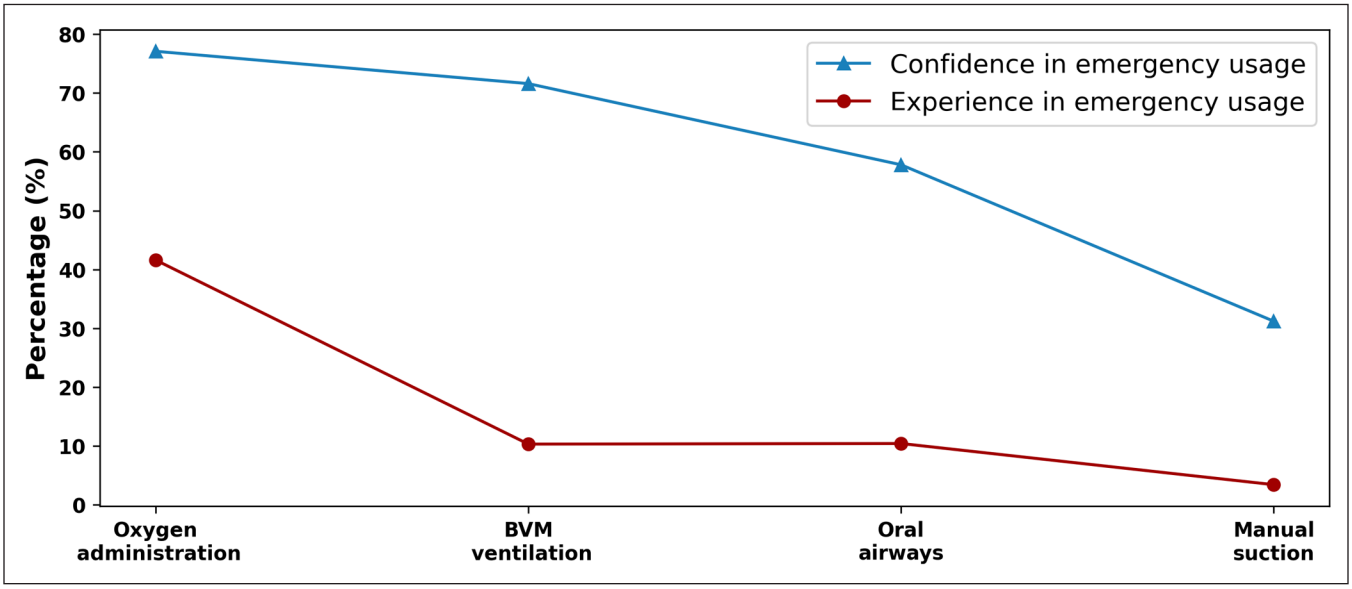

Figure 1 Percentage of self-reported lifeguard confidence and experience in real-life emergency usage of AMOA devices.

confidence. Moreover, when controlling for experience as a lifeguard, participants who reported using oxygen administration ($p < 0.001$) and oral airways ($p = 0.004$) in a "real life-threatening emergency" performed better on the knowledge assessment than those who did not. Experience as a lifeguard was controlled for, since the interaction between experience as a lifeguard and real-life experience was significant for all categories except for manual suction, showcasing the correlation between experience of a lifeguard and the chance of using AMOA equipment. By contrast, the interaction between experience as a lifeguard and confidence using AMOA equipment is only significant for oxygen administration. Two-way ANOVA testing without the interaction (with the exception of oxygen administration) found that those who reported confidence in oxygen administration ($p < 0.001$), bag valve mask ventilation ($p < 0.001$), oral airways ($p < 0.001$), or manual suction ($p < 0.001$) had a statistically significant higher score on the knowledge assessment than those who did not. In all cases, when correcting for either experience or confidence with AMOA equipment, experience as a lifeguard remains the most significant predictor of total score.

Training & Learning Preferences

The overwhelming majority (92.7%, n = 1,042) of lifeguards supported hands-on training to be conducted annually or every six months to maintain their skills. When asked how often they believed lifeguards should receive hands-on training for AMOA devices, 61.4% (n = 690) recommended training every six months, while 31.3% (n = 352) suggested annual training (Table 3). Very few participants felt that training every two years (6.5%, n = 73) or every three years (0.62%, n = 7) was sufficient. Respondents were also asked how long they believed hands-on training sessions should last. The majority (62.2%, n = 699) recommended training sessions of 1–2 hours, while 17.5% (n = 196) preferred sessions lasting 3–4 hours. A smaller percentage (18.0%, n = 202) felt that less than one hour was sufficient, and 2.3% (n = 26) recommended more than four hours of training (Table 4).

Preferred frequency (*N* = 1123)	***n* (%)**	***x* (*SD*)**	***M* (*IQR*)**
Every 6 months	690 (61.4)	10.6 (2.2)	11 (3)
Every year	352 (31.3)	10.6 (2.2)	11 (3)
Every two years	73 (6.5)	10.4 (2.4)	10 (3)
Every three years	7 (0.62)	9.0 (2.8)	9 (4.5)

Table 3 Comparison of correct answers (total score) based on lifeguard preference for frequency of hands-on training of AMOA devices.

x – mean.

SD – standard deviation.

M – median.

IQR – interquartile range.

Preferred duration (*N* = 1123)	***n* (%)**	***x* (*SD*)**	***M* (*IQR*)**
< 1 hour	202 (18.0)	10.5 (2.32)	11 (3)
1–2 hours	699 (62.2)	10.7 (2.19)	11 (3)
3–4 hours	196 (17.5)	10.2 (2.34)	10 (3)
> 4 hours	26 (2.3)	9.92 (1.94)	9.5 (2)

Table 4 Comparison of correct answers (total score) based on lifeguard preference for duration of hands-on training based on previously indicated frequency.

x – mean.

SD – standard deviation.

M – median.

IQR – interquartile range.

Lifeguards expressed clear preferences for different learning resources to refresh or maintain their AMOA knowledge (Figure 2). YouTube videos were the most preferred resource, ranked first by 42.3% (n = 471) of respondents. Online training modules were the second-most preferred, with 23.2% (n = 258) ranking them first. Paper or printed manuals and electronic manuals were ranked lower, with fewer lifeguards choosing these as their top preferences (13.0%, n = 145 and 6.4%, n = 71, respectively). Candidate workbooks were also less favored, with only 15.2% (n = 169) ranking them as their preferred resource.

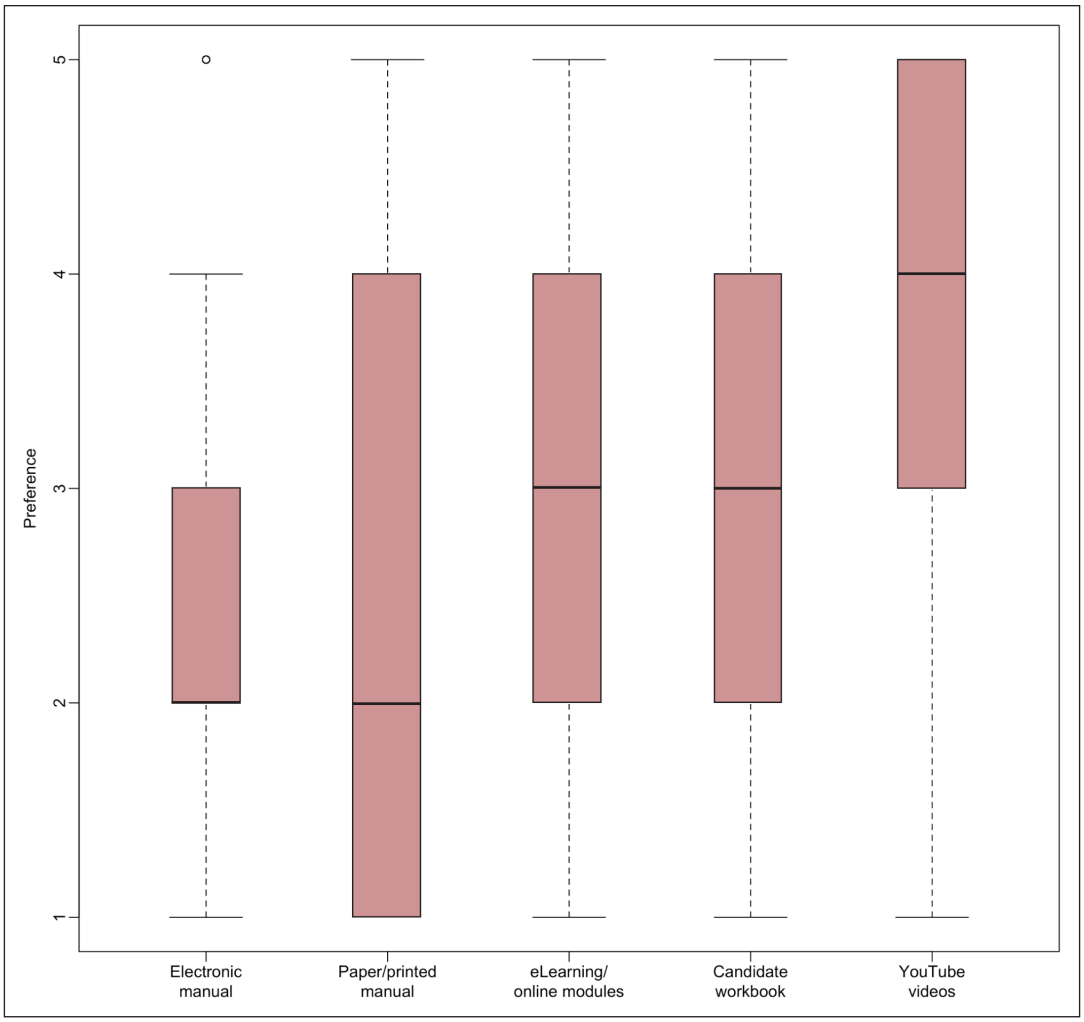

Figure 2 Boxplot of preferred learning resources for lifeguards, where a score of "5" is the most preferred and a score of "1" is the least preferred. Respondents ranked each learning resource on a scale of 1-5 with no tied rankings permitted.

DISCUSSION

This study aimed to evaluate the confidence, experience, and learning preferences of professional lifeguards regarding airway management and oxygen administration (AMOA) training. These aspects were analyzed independently to allow for a more in-depth exploration of the subjective factors influencing training efficacy and preparedness. The knowledge assessment, which objectively evaluates technical knowledge and retention, was conducted and published separately to provide a detailed analysis specific to lifeguards' technical knowledge (Huntley et al., 2024). This approach ensures that both the subjective and objective components of lifeguard training are rigorously evaluated and discussed within appropriate contexts. This approach ensures that both the subjective and objective components of lifeguard training are rigorously evaluated and discussed within appropriate contexts. While confidence and learning preferences are inherently linked to knowledge, separating these analyses allows for a clearer focus on the practical implications of training design and delivery, particularly in addressing the identified gaps in skill application and confidence in real-world scenarios.

The results showed that a significant portion of lifeguards lacked real-life experience with AMOA devices, particularly advanced tools such as bag-valve-mask devices, oral airways, and manual suction. However, lifeguards generally reported high levels of confidence in

using oxygen administration devices, while confidence was lower for more complex interventions like manual suction. Most respondents (92.7%) recommended frequent hands-on training sessions at least on an annual basis, with majority of respondents preferring sessions every six months that are 1–2 hours in duration. Furthermore, online videos were the most preferred learning resource for maintaining and refreshing AMOA knowledge.

The findings suggest that while lifeguards have been trained in AMOA, real-world application remains limited for certain devices, particularly those requiring more technical expertise. This gap in experience may contribute to the lower confidence reported for using tools like manual suction. The high confidence in oxygen administration reflects its more frequent use and the simplicity of the device, while the more specialized equipment, such as bag-valve-mask devices and oral airways, may necessitate more intensive training and practice to ensure proficiency.

The strong preference for frequent, hands-on training suggests that lifeguards understand the importance of regular practice to maintain their skills. Lifeguarding is a high-pressure profession, and confidence plays a key role in the timely and effective application of life-saving interventions. Respondents' preferences for online videos and eLearning modules highlight a shift toward more flexible and accessible learning methods, which could complement traditional training formats by providing continuous learning opportunities.

These results have significant implications for the design and delivery of AMOA training programs for lifeguards. First, the findings highlight the need for more frequent and practical training sessions, particularly for devices that require higher technical skills, such as manual suction and oral airways. Ensuring that lifeguards are not only knowledgeable but also confident in their ability to apply these interventions in real-life situations is critical to improving outcomes in aquatic emergencies.

Additionally, training programs should consider integrating more digital learning resources, such as online videos and modules, to support ongoing skill development. This approach could help address the challenges posed by limited opportunities for hands-on practice, ensuring that lifeguards continue to engage with training materials and maintain their competencies between formal training sessions.

While this study provides valuable insights, several limitations should be acknowledged. First, the reliance on self-reported data may introduce bias, as respondents may overestimate or underestimate their confidence and competence. Additionally, the lack of a known population size of professional lifeguards limits the generalizability of the findings. Another limitation is the focus on subjective measures, such as confidence and learning preferences, without an objective evaluation of lifeguards' actual performance in using AMOA devices. Furthermore, the study did not explore the potential impact of demographic factors, such as years of experience or frequency of training, on lifeguards' confidence and competence. The study also lacked questioning on confidence for standard lifeguarding procedures or general emergency response, against which confidence in AMOA could be compared, making it difficult to conclude if poor confidence is solely attributed to AMOA devices, or also includes standard lifeguarding and emergency response situations. These factors could influence the results and should be considered in future research.

Future studies should aim to validate these findings by incorporating objective assessments of lifeguards' skills and performance in AMOA. Longitudinal studies could explore how confidence and competence change over time and after different types of training interventions. Additionally, further research could examine how demographic factors, such as age, experience, and prior exposure to emergencies, affect lifeguards' confidence and preferences for training.

Given the increasing preference for digital learning resources, future studies could also evaluate the effectiveness of online videos and eLearning modules in enhancing skill retention and confidence. By addressing these gaps, future research could provide more comprehensive guidelines for optimizing AMOA training programs, ensuring that lifeguards are fully prepared to respond effectively in real-life emergencies.

CONCLUSION

This study provides valuable insights into lifeguards' confidence, experience, and learning preferences following training in airway management and oxygen administration. While lifeguards generally expressed confidence in their ability to perform oxygen administration, confidence in more advanced skills like manual suction was notably lower, reflecting a need for additional hands-on practice. The findings suggest that frequent, practical training is essential for maintaining proficiency in these critical interventions. Moreover, the preference for digital learning tools, such as online videos, highlights the potential for integrating modern educational resources into lifeguard training programs. By addressing gaps in experience and confidence, lifeguard training programs can be better tailored to enhance both knowledge retention and the practical application of AMOA skills. Future research should continue to explore the effectiveness of different training methods, including digital resources, to ensure that lifeguards are fully equipped to handle real-life emergencies.

DATA ACCESSIBILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors on request.

ADDITIONAL FILE

The additional file for this article can be found as follows:

- **Supplement 1.** Online Survey. DOI: https://doi.org/10.25894/ijfae.2485.s1

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COMPETING INTERESTS

RH is an assistant editor for IJFAE and was removed from all editorial discussions relating to the processing of this paper. The other authors have no competing interests to declare.

AUTHOR CONTRIBUTIONS

Conceptualization, R.H.; methodology, R.H.; formal analysis, R.H. and C.J.O.; investigation, R.H.; writing—original draft preparation, R.H. and C.J.O.; writing—review and editing, R.H., C.J.O., and L.W.; visualization, C.J.O.; supervision, L.W.; project administration, R.H. All authors have read and agreed to the published version of the manuscript.

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