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Simulation and education

Advanced life support provider course in Italy: A 5-year nationwide study to identify the determinants of course success☆

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ABSTRACT

Introduction: The advanced life support (ALS) provider course is the gold standard for teaching and assessing competence in advanced resuscitation. Outcomes over a 5-year period of European Resuscitation (ERC)/IRC ALS provider courses in Italy were investigated, and the factors associated with course success are described.

Methods: In 2008, the Italian Resuscitation Council (IRC) created a database in which every ERC/IRC ALS course was recorded. Data from courses organized from 2008 to 2012 were analysed. The data included: candidate's age and degree (medical doctor (MD) or nurse), medical specialty of MD candidates, course outcomes, duration and reference guidelines, number of instructors and course director. Relationships between the course outcomes and the courses and candidates' characteristics were analysed using logistic regression.

Results: A total of 13,624 candidates were evaluated from 871 courses. Among the candidates, 55% were MDs and 45% were nurses. Ninety-seven percent of candidates passed the final evaluation, while 3% failed. Candidates who passed were younger (37 [31–44] vs. 43 [37–50] years, $p < 0.0001$) and had a greater pre-course resuscitation knowledge (multiple choice quiz (MCQ) score: 88 [83–93] vs. 80 [73–87], $p < 0.0001$) compared to those who failed. The course pass rate was higher for MDs compared to nurses (98% vs. 95%, $p < 0.0001$) and participants in emergency disciplines were most significantly associated with course success (χ^2 71, $p < 0.0001$). In the multivariate analysis, an older age (OR 0.926, 95%CI [0.915–0.937]) was independently associated with course failure, while being a MD (OR 3.021, 95%CI [2.212–4.132]), having a higher pre-course MCQ score (OR 1.033, 95%CI [1.026–1.040]) together with a higher candidate/instructor ratio (OR 1.314, 95%CI [1.067–1.618]), and having a longer course duration (OR 1.717, 95%CI [1.090–2.703]), were independently associated with success.

Conclusions: Younger age, professional background, and pre-course resuscitation knowledge are the most important predictors of ALS provider course success, together with higher candidate/instructor ratios and longer course durations.

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Introduction

The quality of cardiopulmonary resuscitation (CPR) is a major determinant of successful resuscitation.[1] However, CPR quality is often poor in clinical settings, and a lack of resuscitation skills in basic and advanced life support (BLS and ALS) can contribute to poor outcomes.[2,3] Improvements in CPR knowledge and skills through specific training courses are therefore essential.

The ALS provider course is recognized as the gold standard in teaching and assessing competencies in advanced resuscitation for healthcare professionals.[4,5] It provides a standardized approach to the management of cardiac arrest, including: manual defibrillation; advanced airway; drug therapy; peri-arrest circumstances; and post-resuscitation care.[4,6] Indeed, ALS courses are held in a uniform format throughout Europe by the national resuscitation councils under the auspices of the European Resuscitation Council (ERC). More than 1.5 million healthcare professionals around the world attend ALS provider courses each year.[7]

A main advantage of the course is the simulation of different cardiac arrest scenarios (CAS), in which candidates practice and interact as members of a potential resuscitation team.[5,6] However, the same training format must fit the varying professional backgrounds of the attending professionals who can experience the course as too basic or can become overwhelmed with information and skill requirements.[5,8–11] The identification of factors associated with course outcomes might help instructors identify and target candidates' specific needs.

In Italy, the Italian Resuscitation Council (IRC) organizes ERC/IRC ALS courses nationwide in compliance with the ERC guidelines.[6,10,11] To oversee the courses and instructors' activities, in 2008, the IRC created a national database in which course data are recorded, including information on the course itself and on the candidates.

The aim of this study was to investigate the outcomes of ALS provider courses in Italy over a 5-year period and to describe the determinants associated with course pass/fail rates. This is a large-scale and multi-centre analysis, including 871 ALS courses nationwide and more than 13,000 candidates.

Methods

The study was a retrospective analysis of data recorded in the national IRC ALS course database for administrative and statistical reasons. Candidates were informed of the data collection and provided written consent for their use.

The IRC ALS provider course

The ERC ALS provider course was devised in 1992.[5] It was partly modelled on the Advanced Cardiac Life Support (ACLS) course introduced by the American Heart Association in 1975.[12] The ERC/IRC course then significantly evolved into a standardized format with a European-derived manual.[6,10,11] Details are in the Supplemental methods.

The IRC database

The IRC ALS course database was created in 2007 and became operative on January 1st, 2008 (www.ircouncil.it/corsi). All ERC/IRC ALS courses organized in Italy are recorded in the database, including information on the course outcomes, structure, director, and candidates' characteristics. Course registration in the database is mandatory to obtain ERC/IRC recognition and certifications.

For this study, data from 2008 to 2012 were extracted from the database. The data analysed included: the candidates' age; professional background (medical doctors (MD) or nurses) and specialty of MDs; course outcomes; pre- and post-course multiple choice quiz (MCQ) scores; outcomes of the first CAS testing (CASTest 1) and second (re-test) CASTest (CASTest 2); course duration and reference guidelines (2005 or 2010); candidate/instructor ratio; and course director.

Only candidates who attended the ALS provider course for the first time were included in this study. For the analysis, MDs working in the following areas were considered to belong to "emergency" disciplines: anaesthesia and intensive care; cardiology; emergency medical systems; emergency departments; and neonatology.

Statistical analysis

Categorical variables are presented as proportions, and continuous variables are presented as medians with a range (from min to max) or the interquartile range (IQR). Univariate analysis was employed to investigate the predictors of the ALS course outcomes. For categorical outcomes (ALS, CASTest 1 and 2, and pre/post-course MCQ scores), Fisher's exact test or the Chi-square test were used to evaluate their relationship with categorical variables (i.e., specialty), while logistic regression was used for continuous variables (i.e., age). For continuous outcomes (the MCQ score), the Wilcoxon rank sum test and Kruskal–Wallis test were employed to evaluate their relationship with categorical variables, while quantile regressions were used for continuous variables.[13] For multivariate analysis, all of the independent variables were entered in the logistic regression model. Goodness of fit was evaluated by comparing the actual and fit values. Because approximately one-third of records lacked a pre-course MCQ score, a multiple imputation method was employed to include the whole dataset in the multivariate analysis.[14] The results of the linear regressions are reported in terms of the beta coefficients ± SD, while the results of the multivariate logistic regressions are reported as the odds ratio (OR) with the corresponding 95% confidence interval (CI). Statistical significance was set at $p < 0.05$.[15] Statistical analyses were performed in R (www.r-project.org). Zelig and Amelia packages were employed for multivariate analyses, while the Quantreg package was used for quantile regressions.

Results

Overall, 13,744 candidates participated in 871 ALS provider courses during the 5-year period. One hundred-thirty-two candidates were excluded due to previous course attendance, while 145 candidates dropped out of the course. Finally, data from 13,264 participants (median age 37) were included in the analyses. Fifty-five percent of the candidates were MDs, and 45% were nurses (Table 1). Described using medians, there were 179 [min–max, 144–197] courses per year involving 2705 [2348–2891] candidates, 61 [46–67] course directors, and 116 [104–159] new potential instructors.

Table 1
Descriptive of candidates in relationship to ALS provider course outcome.

	All	Pass	Fail
Age (median[IQR])	37 [31–44]	37 [31–44]	43 [37-50]*
Candidates, *n*	13,264	12,803	461
MD, *n*	7352	7180	172
Nurses, *n*	5912	5623	289
Pre-course MCQ, (median[IQR])	88 [83–93]	88 [83–93]	80 [73-87]*
Post-course MCQ, (median[IQR])	89 [84–93]	89 [85–93]	72 [60-80]*

MD, medical doctor; IQR, interquartile range; MCQ, multiple choice quiz.
* $p < 0.0001$ vs. Pass.