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Letter to the editor

The impact of ACLS training in theoretical knowledge

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To the Editor,

The Italian public health system faces significant challenges due to a shortage of medical personnel. For this reason, doctor with less than 24 months of experience, recently licensed (NLPs) hold various roles in the system, including Emergency Departments. The current Italian norm requires medical specialty for specific tasks only due to staff shortage in the Italian National Health System (1).

During the SarsCov2 pandemic, Italy's emergency healthcare system had several difficulties (2,3), and the widespread infection pushed the hospital resources near the break point. This event has further emphasized the crucial role of recently licensed medical doctors employed in various healthcare settings, including USCA (Specialized Units for Continuity of Care) and hospital departments. These young doctors have played a pivotal role in supporting the Italian National Health System during a period that has severely strained its resources (1). The skill required for young doctor wasn't clearly defined for USCA's activity. For this reason, SIMED group emphasizes the role of practical training in the curriculum of NLPs doctor. One of the most relevant practical courses is Advanced Cardiovascular Life Support (ACLS) training, developed by the American Heart Association, has been proven to have a significant impact on patient outcomes in managing cardiac emergencies. Simulation-based training offers a safe learning environment, enhances competency, and promotes self-reflection, ultimately improving skills applicable in real clinical practice (4,5).

While the introduction of the ACLS protocol and simulation courses in medical schools has been explored in other countries, it remains an overlooked area in Italy. Studies conducted abroad have shown promising results when ACLS training is implemented during the third and fourth years of medical school. Therefore, it is crucial to assess the preparedness of Italian medical doctors, both recently graduated and experienced, for the ACLS protocol (6).

A cross sectional study was conduct and approved by SIMED (Società Italiana di Medicina e Divulgazione Scientifica) board, the aim of the study was to examine the theorical knowledge of ACLS algorithm in Italian medical doctor population, and the impact of a previous ACLS's course

The questionnaire was designed by ACLS Faculty trainers of International training site (SIMED) and the study design was validate by a group of expert researcher. (Table S1).

We surveyed a sample of medical doctors by administering a 10 items questionnaire, distributed in SIMED's mailing list and by SIMED's social page and in by online official page.

A total of 6553 medical doctors was invited to complete the survey, representing a diverse group of healthcare professionals from various regions and medical specialties.

We surveyed 4,698 medical doctors, with 137 participants excluded due to invalid responses to sociodemographic questions. The final sample size consisted of 4,561 (70.2%) participants, providing a robust dataset for analysis

The sociodemographic characteristics of the sample, along with their test scores, and a multiple linear regression with 'enter' method to predict final score were summarized in Table 1.

Among the participants,1078(23.6%) reported having previous attend a ACLS course. This highlights the relatively low proportion of medical doctors who have received formal ACLS training. An overwhelming majority of physicians (89%) expressed their interest to attend a ACLS courses. This statistic underscores the significant value placed on this course and their recognition of its crucial role in improving patient outcomes.

Participants with previous ACLS training scored significantly higher (M = 5.7, SD = 1.9) on the test compared with those without experience (M = 4.6, SD = 1.9). This difference was statistically significant (t (4559) = -14.392, p <.001) and was associated with a medium effect size (d = -0.510). These findings highlight the importance of ACLS training in enhancing knowledge and skills in managing cardiovascular emergencies.

A comparison was made between recently licensed medical doctors (NLPs) and experienced physicians. The results showed that experienced physicians scored significantly higher (M = 5.3, SD = 1.9) on the test compared to recently licensed doctors (M = 4.8, SD = 1.9). This difference was statistically significant (t (4559) = 5.984, p <.001) and was associated with a small effect size (d = 0.212). These findings suggest that working experience contributes to better performance in ACLS knowledge and skills. Previous ACLS course has the greatest impact on the score. In particular, the coefficient for this independent variable extracted from the regression model is both the highest (0.964) and the most statistically significant (p<.0.001). When compared with other predictors introduced in our model, previous ACLS experience proved by far to be the strongest predictor of ACLS test scores. Other independent variables, in comparison, had a weaker predictive power. Unsurprisingly, the binary independent variable "Recent Graduation" and numerical variable "Graduation Age" were negatively associated with ACLS test scores. North geographic designation was positively associated with higher ACLS scores. Such finding may be due the major number of universities in north Italy was involving in practice training by

Table 1. Sociodemographic characteristics, working experience, score, and multiple linear regression model for prediction of ACLS score.

	Age	**Graduation Age**	**Working Experience (Months)**	**Test Score (Out of 10)**
Mean	30.09	28.35	22.26	5.32
Std. Deviation	7.34	6.36	46.02	2.35
Median	28	27	5	5
IQR	6	5	23	3
25th percentile	26	25	1	3
75th percentile	32	30	24	6
Model Summary				
Model R2 = 0.05				
	B	**SE**	**t**	**p**
Intercept	5.136	0.163	31.514	< .001
North	0.235	0.068	3.427	<.001
South	-0.030	0.075	-0.405	0.685
Previous ACLS course	0.964	0.072	13.460	<.001
Recent Graduation (NLPs)	-0.170	0.070	-2.414	0.016
Graduation Age	-0.013	0.005	-2.660	0.008

simulated project, in fact the 68,5% of ACLS trained doctor was graduate in North Italy University. The findings of this survey underscore the effectiveness of ACLS courses in equipping medical doctors with the necessary protocols to manage cardiovascular emergencies. Notably, the impact of ACLS training on preparedness appears to surpass that of clinical experience alone. Despite its proven benefits, the uptake of ACLS training among physicians remains relatively low.

The Italian population has high average age and comorbidity, which increase risk factors of Sudden Cardiac Death and other Cardiovascular emergencies. The median score in ACLS knowledge is relatively low (5/10) and only 39% of the participants achieved a score of more than 5 points, despite the importance of the topic for patients' outcomes. By incorporating the ACLS curriculum into medical education, aspiring doctors can acquire essential skills early on, ensuring their readiness to handle emergencies and significantly improving patient outcomes.

Future research should explore additional factors, such as medical specialty and departmental context, to provide a more comprehensive understanding of the relationship between ACLS training and preparedness. Further investigation is also warranted to examine the decay of ACLS skills over time and the optimal frequency of retraining.

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Ethics Committee: The study was approved by the SIMED (Società Italiana di Medicina e Divulgazione) research council

Conflict of Interest: LG and GS are BLS and ACLS instructors, GR was past-president of IRC scientific council group.

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Appendix – Supplementary file

Table S1. ACLS knowledge questions were (translated from the Italian).

Gender F M
Age
Years of working experience
University where they graduated
Have you attended an ACLS course? YES NO
In case of symptomatic severe bradyarrhythmia, how much is the first dose of Atropine to be administered? 0.5 mg 1 mg 1.5 mg 2 mg
How much is the first dose of Naloxone to be administered in case of suspected opioid intoxication? 1 mg 0.4 mg 0.6 mg 0.5 mg
How much is the maximum dose of Atropine that can be administered in severe bradyarrhythmia? 1 mg 5 mg 3 mg 2 mg
How much is the maximum FiO2 that can be delivered using only the self-expanding balloon? 25% 21% 30% 10%
After how many minutes can the second dose of Naloxone be administered, in case of suspected opioid intoxication? 2 minutes 5 minutes 1 minutes 4 minutes
Which of the following situations is a contraindication to fibrinolytic therapy in Stroke? Systolic Pressure = 150/100 INR< 1.7 On set of symptoms< 3 hours Brain injury in the past 2 months
How much should the first dose of Amiodarone be administered during the management of shockable rhythms? 100 mg 150 mg 200 mg 300 mg

Which of the following acronyms is used to indicate the typical causes of PEA and Asystole? 4T 4I 3A 3A 5T 5I 2I 2T
In the case of Asystole which of the following drugs is indicated along with the CPR? Adrenaline Atropine Amiodarone Magnesium EV
During the management of shockable CPR, after how many discharges is the administration of Amiodarone indicated? 2 3 4 5