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***Lazarus phenomenon.
Awareness of autoresuscitation among medical
students and laypeople***

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¹ Poznań University of Medical Sciences, Medical Faculty² Poznań University of Medical Sciences, Department of Teaching Anaesthesiology and Intensive Therapy**Abstract**

Background. The Lazarus phenomenon, also referred to as autoresuscitation, describes the spontaneous return of circulation both in people previously declared dead after failed cardiopulmonary resuscitation or in deceased people where resuscitation attempts were not undertaken. This phenomenon remains insufficiently recognized by the general public and is rarely documented in the scientific literature. The aim of the study was to examine knowledge in the field of autoresuscitation among a group of medical students and laypeople. **Methods.** To investigate the awareness of autoresuscitation, its potential causes, and consequences, as well as the perceived necessity of penalizing the physician who declared death in cases where the patient subsequently returned to life, an original questionnaire was conducted and finally 810 respondents were recruited. The surveyed group included laypeople and medical students from the universities in Poland. **Results.** The majority of respondents from both groups were unfamiliar with the concept of autoresuscitation and the origin of the term “Lazarus phenomenon”. There were no differences between laypeople and medical students regarding awareness of Lazarus phenomenon. Among medical students, the primary sources of information on the phenomenon were the Internet, movies, and television programs. Only a few students have encountered the term and knew the mechanisms of autoresuscitation from their medical textbooks. **Conclusions.** The phenomenon remains poorly popularized. Most laypeople believed that the return of vital signs to a person declared dead was possible, but they attributed this to an incorrect declaration of death, ready for the doctor who declared death to face legal consequences. *Anestezjologia i Ratownictwo 2025; 19: 151-159. doi:10.53139/AIR.20251919*

Keywords: *Lazarus phenomenon, autoresuscitation, cardiopulmonary resuscitation, delayed return of spontaneous circulation*

Introduction

Lazarus phenomenon (LP), otherwise named autoresuscitation is a phenomenon of the heart which can restart its spontaneous activity and generate blood flow after death [1]. It was first described by K. Linko

et al. in 1982 as a recovery after discontinued cardiopulmonary resuscitation (CPR) [2]. Over a decade later, J.G. Bray named recovery from death a “Lazarus phenomenon” with referencing the biblical story about Lazarus, who was resurrected by Christ four days after his death [3]. This phenomenon is not widely known,

as evidenced by its limited representation in scientific literature. Media reports of returning life functions are generally perceived as sensational and controversial, probably due to a lack of understanding of the problem in society. However, available studies do not include data on public awareness of autoresuscitation. Regarding healthcare professionals, there are few reports examining the level of knowledge and experience with LP. However, it remains unclear what the scope of education on this phenomenon is at medical universities, and whether it is conducted at all.

The aim of the study was to examine knowledge in the field of autoresuscitation among a group of medical students and laypeople and to check the opinions of the respondents on this topic and learn about their experiences

Materials and Methods

For the research, an original questionnaire was constructed containing questions about general knowledge of the subject, and participants' own experiences and beliefs. Additionally, specific questions were addressed to individual groups. Participants were recruited on voluntary application and in response to an invitation to participate in the study.

Two groups were recruited: 383 laypeople and 427 medical students out of 810 interviewees.

The layperson group qualified all people aged 10 and over, regardless of gender, education, place of residence, or occupation, who agreed to participate in the survey. The only exclusion criterion was any medical education. The questionnaire was distributed through Google Forms and published on social media (Facebook), especially among groups of people filling out questionnaires, distributed through instant messaging (Messenger) and in email form to relatives. Moreover, single copies were distributed in paper form among acquaintances.

The medical students' group was recruited mostly from Poznan University of Medical Sciences and from other universities in Poland. For medical students, the questionnaire was completed by willing Polish and English Division students attending stationary classes at the Department. Additionally, the form was distributed via Google Forms.

Statistical analysis - calculations were performed using Statistica 13 from TIBCO and PQStat from PQStat Software. The significance level was $p=0.05$. To

examine the relationship between categorical variables, the chi-square test of independence, Fisher's exact test, or Fisher-Freeman-Halton test with Bonferroni's multiple comparisons test was calculated. Additionally, in order to check whether the results of univariate analyses are confirmed when taking into account confounding factors such as year of study, log-linear analysis was used, which consists in building models illustrating the relationships and interactions between qualitative variables. This is a regression model in which all variables are qualitative.

Results

Both groups did not differ significantly in sociodemographic characteristics, with females predominating in both groups (68.67% and 65.11%, respectively). Detailed data are presented in table I.

Statistical analysis comparing the two groups revealed that the majority in both groups were unfamiliar with the concept of autoresuscitation (56.92% and 55.50%, respectively, $p=0.69$). Surprisingly, laypeople reported encountering cases of autoresuscitation more frequently than medical students (4.70% vs. 0.94%, $p=0.001$).

Most participants in both groups did not know the origin of the term "LP" (66.84% and 62.53%, respectively, $p=0.20$). However, a statistically significant difference was noted in the perception of the frequency of autoresuscitation between laypeople and medical students ($p=0.006$). Laypeople were more likely to believe the phenomenon occurs frequently (3.66% vs. 0.70%) and less likely to believe it occurs very rarely (71.02% vs. 79.39%).

A majority of laypeople considered the return of vital signs in a person declared dead as possible (78.59%), however attributed this to an incorrect death declaration (51.43%). Importantly, 54.57% of medical students also associated this phenomenon with misdiagnosed death. Laypeople generally believed that factors such as the duration of resuscitation (68.15%), age (70.23%), and cause of cardiac arrest (78.85%) affect the likelihood of returning to life following unsuccessful cardiopulmonary resuscitation (CPR). Medical students assigned similar significance to these factors: duration of resuscitation (77.52%), age (90.63%), and cause of cardiac arrest (91.10%). Interestingly, 26.11% of laypersons felt that the individual declaring death, if the patient subsequently experiences the LP, should

Table I. Demographic data of the participants

		Medical Students		Laypeople	
Sex	Male	149 (34.99%)		120 (31.33%)	
	Female	278 (65.11%)		263 (68.67%)	
Age		<20 n(%)	140 (32.79)	10-19 n(%)	36 (9.40)
				20-29 n(%)	180 (47.00)
		20-25 n(%)	273 (63.93)	30-39 n(%)	74 (19.32)
				40-49 n(%)	49 (12.79)
		>25 n(%)	14 (3.28)	50-59 n(%)	27 (7.05)
				60-69 n(%)	11 (2.87)
70-79 n(%)	6 (1.57)				
Years of study		1. year n(%)	168 (39.34)		
		2. year n(%)	220 (51.52)		
		>3. year n(%)	39 (9.13)		
Place of residence			Village n(%)		108 (28.20)
			Town (<50.000 inh.) n(%)		89 (23.24)
			City (>50.000 inh.) n(%)		186 (48.56)
University		PUMS n(%)	417 (97.66)		
		JU n(%)	1 (0.23)		
		OU n(%)	2 (0.47)		
		UZG n(%)	6 (1.41)		
		SUM n(%)	1 (0.23)		
Study language	Polish n(%)	350 (81.97)			
	English n(%)	77 (18.03)			
Education			Primary n(%)		19 (4.96)
			Secondary n(%)		158 (41.25)
			Higher n(%)		206 (53.79)
Presence of family member with medical education	Yes n(%)	198 (46.37)		175 (45.69)	
	No n(%)	229 (53.63)		208 (54.31)	

PUMS - Poznan University of Medical Sciences, JU - Jagiellonian University, OU - Opole University, UZG - University of Zielona Góra, SUM - Medical University of Silesia

face legal consequences. In contrast, only 18.27% of medical students shared this opinion. The responses to the questions posed to both groups are presented in table II.

Additionally, within the laypeople group, the vast majority (95.30%) were aware of what CPR was. A total of 80.93% of laypeople have participated in first aid courses, with a predominance of females (84.03% vs. 74.17%, $p=0.02$) and those residing in large cities compared to those from rural areas (84.41% vs. 72.22%, $p=0.036$). However, most of these courses were not certified first aid courses (27.42%). The majority of laypeople reported never having provided first aid or witnessed such actions (72.06%). Furthermore, laypeople indicated that a return to life after a declared death did not correlate with a change in personality for those who experienced autoresuscitation (75.46%), while most believed that this phenomenon led to neurological

changes (79.11%). It is worth noting that no statistically significant differences were found between the responses of laypeople who had a family member with medical training and those who did not. Responses to the questions posed exclusively to laypersons are found in table III.

Among medical students, those who had heard of the phenomenon of autoresuscitation primarily sourced their knowledge from the Internet (10.54%), academic classes (8.67%), and films or TV series (7.26%). The majority of medical students did not find information about autoresuscitation in textbooks (96.49%), nor did they hear about it in classes (87.35%). Most medical students were also unaware of the mechanisms of the LP (97.42%). However, they associated it with hyperventilation and alkalosis (51.05%), medication effects

Table II. Answers of laypeople and medical students with statistical analysis

Question	Laypeople		Medical students		p-value	
	Yes [n (%)]	No [n (%)]	Yes [n (%)]	No [n (%)]		
Have you heard about autoresuscitation, the spontaneous return of vital functions after death?	165 (43.08)	218 (56.92)	190 (44.50)	237 (55.50)	-	
Are you familiar with the origin of the term „Lazarus phenomenon“?	127 (33.16)	256 (66.84)	160 (37.47)	267 (62.53)	-	
Have you encountered a case of autoresuscitation?	18 (4.70)	365 (95.30)	4 (0.94)	423 (99.06)	p=0.001	
Do you believe that the duration of resuscitation efforts affects the chances of returning to life after ineffective cardiopulmonary resuscitation (CPR)?	261 (68.15)	122 (31.85)	331 (77.52)	96 (22.48)	-	
Do you believe that if a deceased patient comes back to life after earlier confirmation of death, the person confirming death should face legal consequences?	100 (26.11)	283 (73.89)	78 (18.27)	349 (81.73)	-	
Do you believe that the phenomenon of returning to life after unsuccessful cardiopulmonary resuscitation is the result of incorrectly confirmed death?	197 (51.44)	186 (48.56)	233 (54.47)	194 (45.43)	-	
Do you believe that the gender of the person affected by this phenomenon influences the chances of returning to life after confirmed death?	49 (12.79)	334 (87.21)	163 (38.17)	264 (61.83)	-	
Do you believe that the cause leading to cardiac arrest influences the chances of returning to life after confirmed death?	302 (78.85)	81 (21.15)	389 (91.10)	38 (8.90)	-	
Have you heard of reversible causes of cardiac arrest (4H, 4T)?	52 (13.57)	331 (86.42)	280 (65.57)	147 (34.43)	-	
Do you believe that the age of the patient influences the chances of returning to life after confirmed death?	269 (70.23)	114 (29.77)	387 (90.63)	40 (9.37)	-	
In your opinion, what is the frequency of Lazarus' phenomenon?	Laypeople		Medical students			
	v. low <1% n(%)	average 1-5% n(%)	high >5% n(%)	v.low <1% n(%)	average 1-5% n(%)	high >5% n(%)
	272 (71.02)	97 (25.33)	14 (3.65)	339 (79.39)	85 (19.91)	3 (0.70)

Table III. Collected answers for questions posed exclusively to the laypeople group

Question	Answer	
	Yes [n (%)]	No [n (%)]
Do you know what cardiopulmonary resuscitation (CPR) is?	365 (95.30)	18 (4.70)
Have you attended to first-aid training at your study/work place?	310 (80.94)	73 (19.06)
Have you attended to advance first-aid course?	105 (27.42)	278 (72.58)
Have you ever been in a situation when someone needed first-aid?	107 (27.94)	276 (72.06)
Do you believe that the return of spontaneous circulation in people claimed dead is possible?	301 (78.59)	82 (21.41)
Have you ever heard of a person "coming alive" after unsuccessful CPR?	132 (34.46)	251 (65.53)
Do you believe that the return of spontaneous circulation is possible after unsuccessful CPR?	279 (72.85)	104 (27.15)
Do you believe that returning to life bring changes in that person's personality?	94 (24.54)	289 (75.46)
Do you believe that returning to life bring neurological consequences?	303 (79.11)	80 (20.89)

(78.22%), metabolic disorders (67.91%), and hyperkalemia (43.09%). Most medical students also considered unnoticed minimal vital signs as a possible cause for the return of vital functions after death was declared (82.44%). Moreover, medical students did not know how to prevent this phenomenon (98.13%). Regarding the use of ultrasound to confirm or exclude reversible causes of cardiac arrest, the majority of medical students answered “sometimes” (74.24%), while for the use of ECG monitoring, the most common response indicated a time of 10 minutes (25.06%), with each option having a similar number of responses.

No correlation was found between the year of study and whether a student had heard of the LP. However, a statistically significant difference was observed between the year of study and knowledge regarding the frequency of this phenomenon (very low frequency: 1st year 72.62% vs. 2nd year 92.31%, $p=0.04$) and familiarity with the origin of the term “LP” (1st year 38.69% vs. 3rd year and above 69.23%, $p=0.0016$). In each year of study, at least 95% of medical students reported not knowing the mechanisms of autoresuscitation.

When comparing responses from Polish (PD) and English Division (ED) students, it was also found that significantly more students from PD than from ED were aware of the origin of the term “LP” (42.00% vs. 16.88%, $p=0.00004$) and considered delayed medication effects (83.43% vs. 54.55%, $p=0.0001$), metabolic disorders (70.86% vs. 54.55%, $p=0.0055$), or unnoticed minimal vital signs (84.57% vs. 72.73%, $p=0.0134$) as potential causes of autoresuscitation. Both groups significantly believed that gender could have had an influence the chances of returning to life after a declared death (36.57% and 45.45%). Furthermore, both PD and ED students mostly considered the phenomenon of returning to life after unsuccessful cardiopulmonary resuscitation to be the result of incorrectly determining death (55.14% and 51.95%, respectively). It should be noted, however, that among the medical students surveyed, PD students came from grades 1–6, while ED students only from grades 1–3, which could have influenced the quality of the responses. Answers to questions among PD and ED medical students are presented in table IV.

Discussion

By searching databases, there are few reports examining the level of knowledge and personal expe-

riences related to LP. Attempts were made to estimate the knowledge about the LP among healthcare workers by Dhanani et al. [4]. The study investigated Canadian physicians' awareness of declaring death (65% believed the LP, and 37% witnessed the LP). The next report was the letter of Gerard et al. [5], who described a group of 103 emergency physicians. Sixty nine percent were familiar with autoresuscitation, but they did not associate it with the term “LP”. Importantly, 54% of them knew about this phenomenon because they had contact with it. To our knowledge, no studies have been conducted on awareness of this phenomenon among non-medical groups. Since cases of autoresuscitation are considered mysterious and surprising, they have been reported in newspapers, literature and on websites [6], but with questionable authenticity and objectivity. Therefore, our results are incomparable to any other studies.

The knowledge about LP in our tested groups is low. The similar amount of lay-people and medical students who are unfamiliar with the term “autoresuscitation” highlights the exclusion of this syndrome during medical education. The fact that most medical students did not acquire knowledge from textbooks and classes during their medical education confirms that the main source of information is not a Medical University but rather the Internet, TV series or films. Furthermore, the pathogenesis of LP is not precisely defined and hard to be scientifically proved, which makes it hard to remember for medical students [7].

Most of the medical students had no clue about the risk factors or preventing methods of LP. However, the vast majority of medical and non-medical groups correctly associated the correlation of both mechanism and duration of cardiac arrest and increased incidence of this phenomenon. The risk of occurrence of LP increases when non-shockable rhythms are present during CPR and CPR lasts over 30 minutes [7]. Both tested groups additionally chose age as an important factor of the phenomenon incidence. However, this phenomenon can occur in all ages: the youngest patient who experienced LP was 6 months old [8] and the oldest patient was 97 years old [9]. Age of >60 years is believed to be a predisposing factor [10].

Interestingly, in our research, more laypeople claimed to encounter cases of autoresuscitation than medical students. This contradiction highlights the lack of understanding of the phenomenon by laypeople as they probably confuse it with return of spontaneous

Table IV. Summary of students responses to questions on autoresuscitation depending on study language

Question	Polish Division		English Division		p-value	
	Yes [n (%)]	No [n (%)]	Yes [n (%)]	No [n (%)]		
Have you heard about autoresuscitation, the spontaneous return of vital functions after death?	160 (45.71)	190 (54.29)	30 (38.96)	47 (61.04)		
Has the topic of autoresuscitation been covered in your classes during your studies?	48 (13.71)	302 (86.29)	6 (7.79)	71 (92.21)	-	
Did you find information on autoresuscitation in textbooks?	12 (3.43)	338 (96.57)	3 (3.90)	74 (96.10)	-	
Are you familiar with the origin of the term "Lazarus phenomenon"?	147 (42.00)	203 (58.00)	13 (16.88)	64 (83.12)	p=0.00004	
Have you encountered a case of auto-resuscitation?	3 (0.86)	347 (99.14)	1 (1.30)	76 (98.70)	-	
Do you know the mechanism of auto-resuscitation?	9 (2.57)	341 (97.43)	2 (2.60)	75 (97.40)	-	
Can hyperventilation and alkalosis be causes of autoresuscitation?	175 (50.00)	175 (50.00)	34 (44.16)	43 (55.84)	-	
Can delayed drug action be a cause of autoresuscitation?	292 (83.43)	58 (16.57)	42 (54.55)	35 (45.45)	p=0.00001	
Can hyperkalemia be a cause of autoresuscitation?	155 (44.29)	195 (55.71)	29 (37.66)	48 (62.34)	-	
Can minimal vital signs be a cause of autoresuscitation?	296 (84.57)	54 (15.43)	56 (72.73)	21 (27.27)	p=0.013	
Can metabolic disorders be a cause of autoresuscitation?	248 (70.86)	102 (29.14)	42 (54.55)	35 (45.45)	p=0.006	
Do you know methods to prevent this phenomenon?	6 (1.71)	344 (98.29)	2 (2.60)	75 (97.40)	-	
Do you believe that the duration of resuscitation efforts affects the chances of returning to life after ineffective cardiopulmonary resuscitation?	275 (78.57)	75 (21.43)	56 (72.73)	21 (27.27)	-	
Do you believe that the age of the patient influences the chances of returning to life after confirmed death?	316 (90.29)	34 (9.71)	71 (92.21)	6 (7.79)	-	
Do you believe that the phenomenon of returning to life after unsuccessful cardiopulmonary resuscitation is the result of incorrectly confirmed death?	193 (55.14)	157 (44.86)	40 (51.95)	37 (48.05)	-	
Do you believe that the gender of the person affected by this phenomenon influences the chances of returning to life after confirmed death?	128 (36.57)	222 (63.43)	35 (45.45)	42 (54.55)	-	
Do you believe that the cause leading to cardiac arrest influences the chances of returning to life after confirmed death?	327 (93.43)	23 (6.57)	62 (80.52)	15 (19.48)	p=0.0003	
Do you believe that if a deceased patient comes back to life after earlier confirmation of death, the person confirming death should face legal consequences?	62 (17.71)	288 (82.29)	16 (20.78)	61 (79.22)	-	
In your opinion, what is the frequency of Lazarus phenomenon?	Polish Division		English Division			
	v. low <1% n(%)	average 1-5% n(%)	high >5% n(%)	v.low <1% n(%)	average 1-5% n(%)	high >5% n(%)
	282 (80.57)	65 (18.57)	3 (0.86)	57 (74.03)	20 (25.97)	0 (0)

circulation (ROSC) after successful resuscitation. Moreover, laypeople do not seem to understand the essence of the problem, as most of them believe that a return to life after a declared death does not correlate with a personality change, yet that it leads to neurolo-

gical changes. A majority of laypeople considered the return of vital signs in a person declared dead as possible, however, did not associate it with the occurrence of the LP but rather with a misdiagnosis.

According to the European Resuscitation Council

(ERC) Guidelines laypeople providing CPR at a basic level cannot interrupt the activity but must continue resuscitation until advanced life support (ALS) rescuers arrive. Therefore, laypeople do not know on what basis the rescuers pronounce a person dead and on what criteria they can stop resuscitation [11]. Thus, the case of autoresuscitation occurring after properly performed CPR and justified CPR discontinuation in their opinion might not be interpreted as a rare medical case but rather as a result of premature cessation of ALS or incorrect recognition of cardiac arrest. This may explain why, in cases of autoresuscitation, many laypeople want physicians to face legal consequences, whereas medical students are much less likely to share this view. Laypeople's views on the need to hold physicians legally accountable in the context of the LP seem to stem from the currently observed increase in social pressure on all types of medical personnel. It is common knowledge that the work of a doctor is a job requiring a lot of stress, but it is also associated with many medico-legal aspects [12,13]. A survey conducted among general practitioners in Germany showed that 27% of the study group had strong or very strong fears of the legal consequences of their work affecting their results [14]. Currently, all information concerning the LP is based on reported cases. Because of fear of legal repercussions and professional discredit, only a small percentage of cases are reported [9,15] and there is a lack of official guidelines concerning this phenomenon.

According to the literature, to prevent LP, several conclusions should be drawn – avoiding hyperventilation to prevent the increase in intrathoracic pressure and ECG monitoring for at least 10 minutes after the cessation of CPR due to detecting the occurrence of LP [5–7,9,10]. Noteworthy, there are differences between guidelines regarding recommended duration of observation and monitoring of a deceased patient, taking into account local laws and medical standards. For example in the UK, according to the update of Code of Practice for the diagnosis and confirmation of death published in 2025 by the Academy of Royal Medical Colleges (AoMRC) is stated “After 5 minutes the possibility of spontaneous resumption of circulatory function will have passed” [16]. Unfortunately, time of 5 minutes stands in contrast to the possibility of occurrence of the LP, which can occur considerably later.

Another thing is the Lazarus Sign - one of the rarer and most complex spinal reflexes concerning upper extremities in brain-dead patients [17]. According

to Saposnik et al. its incidence is estimated at 2% of patients [18]. Currently, there is well-established knowledge about the occurrence of spinal reflexes in brain-dead patients and the Lazarus Sign has been widely described in the literature [17,19–23]. However, the rarity of this specific symptom might raise the question of awareness among healthcare workers. The evaluation of the knowledge in this group would certainly be beneficial.

Conclusions

The Lazarus phenomenon is extremely underreported. Regarding awareness about this phenomenon, in our study no differences were found in knowledge and experience regarding LP comparing lay people and medical students. Unfortunately, the medical students acquired knowledge about LP mainly from the Internet, films, and TV series, but not during their studies at the universities. They have to possess knowledge about LP during their medical education.

According to our results, the majority of laypeople considered the return of vital signs in a person declared dead as possible, however, they attributed this to an incorrect death declaration and thus, were more willing for a doctor who declared death to face legal consequences.

Reporting new cases of LP is extremely important as it helps draw attention to the true incidence of the phenomenon, which can contribute to further research and the development of appropriate guidelines and preventive methods.

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Conflict of interest

The authors declare no conflicts of interest and disclose all financial and personal relationships.

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