International Journal of Community Medicine and Public Health
Adithya V et al. Int J Community Med Public Health. 2024 Jun;11(6):2508-2514
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20241519

Review Article

Lazarus syndrome-a miraculous revival

Adithya V.[1], Don Jose K.[2]*

[1]Amala College of Nursing, Thrissur, Kerala, India
[2]Department of Adult Health Nursing, Amala College of Nursing, Thrissur, Kerala, India

Received: 13 March 2024
Accepted: 15 May 2024

***Correspondence:**
Don Jose K.,
E-mail: don.jose.k@amalaims.org

ABSTRACT

The Lazarus syndrome, named after the biblical account of Lazarus, being raised from the dead, refers to the uncommon occurrence of spontaneous recovery of circulation following failed resuscitation attempts. This review article delves into the historical foundations, underlying mechanisms, prominent instances, disputes, ethical concerns, medical interventions, and psychological consequences of Lazarus syndrome. Despite being recorded in medical literature, the mechanisms underlying this condition are not well known. Possible explanations include medication-related delays, hyperkalemia, reperfusion damage, myocardial shock, and brainstem reflexes. While Lazarus syndrome calls into question our notion of life and death, it also raises ethical concerns about death verification, informed consent, quality of life, resource allocation, and cultural values therapies include diagnosing underlying reasons, enhanced cardiac life support, extracorporeal membrane oxygenation, therapeutic hypothermia, and ongoing monitoring. The psychological burden on healthcare staff and families is significant, necessitating assistance and coping measures. Understanding and managing the intricacies of Lazarus syndrome is critical to the well-being of everyone concerned.

Keywords: Autoresuscitation, Lazarus syndrome, Historical roots, ROSC, CPR

INTRODUCTION

Lazarus syndrome, a term often used colloquially to describe the phenomenon which is a strange and astonishing occurrence entails the unexpected return of spontaneous circulation (ROSC) in a patient, typically after a seemingly futile attempt at resuscitation following cardiac arrest. It stands as a medical enigma that has intrigued both the medical community and the general public alike.

By definition, Lazarus phenomenon is described as a ROSC after cessation of cardiopulmonary resuscitation (CPR).[1]

The term "Lazarus syndrome" draws its name from the biblical tale of Lazarus, whom Jesus miraculously raised from the dead. This captivating medical phenomenon echoes resurrection of Lazarus, challenging boundaries between life and death within modern medicine.[2]

In this review article, delves into historical roots of Lazarus syndrome, and potential underlying mechanisms, dissecting and examining the compelling case studies, controversies and ethical considerations, medical interventions, and potential treatment and psychological implications for healthcare providers and families.

By exploring the mysteries and complexities surrounding this phenomenon, these reviews shed light on the remarkable resilience of the human body and the ethical dilemmas it poses within realm of critical care medicine.

HISTORICAL ROOTS OF LAZARUS SYNDROME

The term "Lazarus syndrome" finds its roots in the bible, the story of Lazarus is found in the New Testament,

specifically in the Gospel of John, chapter 11. Lazarus was a man from Bethany, and he was the brother of Mary and Martha. He fell ill and died. When Jesus arrived at his tomb, he wept and then miraculously raised Lazarus from the dead, demonstrating his power over death.

It was first reported in medical literature in 1982. A 66-year-old woman in a hospital in the United States experienced cardiac arrest during surgery. Despite the medical team's strenuous efforts, she was declared dead after 30 minutes of unsuccessful CPR. To the astonishment of the attending nurses, her pulse suddenly returned nearly ten minutes later, and she regained consciousness.[2]

The term Lazarus was used by Bray in 1993. Although the Lazarus syndrome was only formally documented in the medical literature in recent decades, there have been instances throughout history of individuals seemingly coming back to life after being declared dead. These instances often carried mystical or supernatural connotations and were deeply ingrained in cultural and religious beliefs.[1]

The historical perspective of Lazarus syndrome reveals a progression from supernatural explanations to a more scientifically grounded understanding. Today, the phenomenon is recognized as a unique but documented medical phenomenon.[3] There is no doubt that the Lazarus phenomenon is a reality but so far, the scientific explanations have been inadequate. And it serves as a reminder of the complexities of life and death.

UNDERLYING MECHANISMS

The exact pathophysiology of autoresuscitation is not clear, but several theories have been proposed to explain this phenomenon:

Delayed effects of medications

One theory suggests that medications administered during resuscitation efforts may have delayed effects on the cardiovascular and respiratory systems. For example, certain drugs like epinephrine and other vasoactive medications may remain in the bloodstream and exert their effects even after CPR has been terminated. These medications can potentially stimulate the heart and restore spontaneous circulation after a delay.[4,5]

Hyperkalemia

There are few reports of delayed ROSC in the presence of hyperkalemia. It is a well-known fact that intracellular hyperkalemia could persist longer, rendering the myocardium retractile for long periods. There is a report on a 68-year-old lady with cardiac arrest due to hyperkalemia who did not respond to CPR and conventional treatment for up to 100 minutes, but later responded to dialysis and made a complete recovery. So even though prolonged cardiac arrest refractory to conventional treatment could respond to dialysis, it is unlikely that hyperkalemia on its own could explain delayed ROSC after cessation of CPR.[5]

Reperfusion injury

During CPR, especially when chest compressions are performed, there can be significant ischemia to vital organs, including the heart and brain. When CPR is stopped, and blood flow is restored, this sudden reperfusion can lead to an inflammatory response and injury to the tissues. The reperfusion injury may trigger a response that leads to autoresuscitation.[6]

Myocardial stunning

Myocardial stunning refers to a reversible dysfunction of the heart muscle following an episode of ischemia. During CPR, the heart may experience periods of ischemia and reperfusion, which can result in myocardial stunning. In some cases, the heart may recover from this stunning state after resuscitation efforts have ceased, leading to autoresuscitation.[7]

Brainstem reflexes

Some researchers have suggested that autoresuscitation may be related to brainstem reflexes that spontaneously initiate breathing and circulation. The brainstem is responsible for controlling many automatic functions of the body, including breathing and heart rate. Certain conditions or triggers may cause the brainstem to initiate these reflexes even after CPR has been discontinued.[8]

It's important to note that autoresuscitation is an extremely limited occurrence, and the exact mechanisms behind it remain poorly understood.

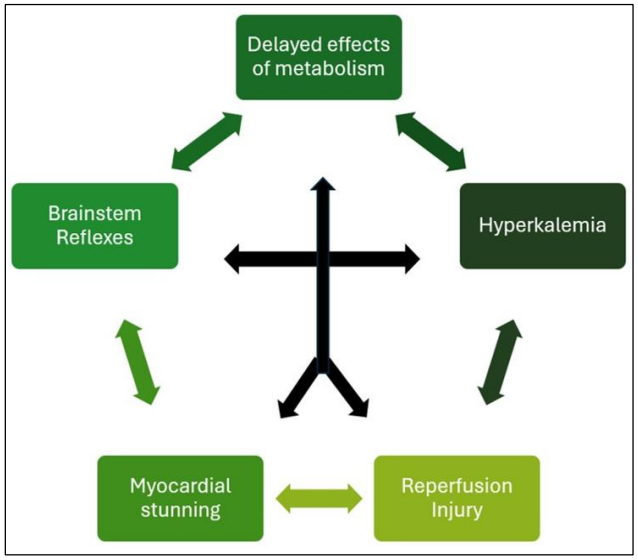

Figure 1: Interrelation of pathophysiological events in Lazarus syndrome.

NOTABLE CASES

Lazarus syndrome remains exceptionally uncommon, a few notable cases have been documented, from the period of 2015 to 2022 showcasing the mysterious and often bewildering nature of this syndrome.

Seventeen cases of the Lazarus phenomenon have been documented in table which highlights the youngest person with 11 months and the oldest patient with the 97 years old.[9]

Spontaneous return of circulation in children is extremely rare and youngest case was 9 months old infant. Resuscitation activities were initiated by her father. During transport to hospital, resuscitation was continued. After 10 min, focused assessment with sonography for trauma ultrasound was performed to assess potential myocardial contractions that were not observed. Activities stopped, but after 30s, presence of a pulse was noticed.[10] So far 17 reported cases of Lazarus phenomenon in last 10 years are summarized in Table. Cases described include both in-hospital and out-of-hospital arrests.

Table 1: Notable cases of Lazarus syndrome from the period of 2015 to 2022.

Case No:	Year	Age (in years)	Gender	Duration of CPR	Time of ROSC (Minutes)	Survival time	Reference
1	2015	67	M	47	5	1 day	11
2	2015	11 months	F	35	15	5 months	12
3	2016	57	F	NI*	3	3 minutes	4
4	2016	44	M	80	5	3 days	13
5	2017	69	M	40	180	10 days	14
6	2017	97	F	16	3	2 minutes	14
7	2017	91	F	16	3	15 minutes	15
8	2018	97	M	NI	Unknown	20 hours	16
9	2018	18 months	M	Unknown	6	Unknown	17
10	2019	86	F	DNR*	4	Unknown	18
11	2020	33	M	30	20	7 days	19
12	2021	79	F	10	20	14 days	20
13	2021	66	F	32	5	Unknown	21
14	2021	2	M	NI	14	3 h, 30 minutes	21
15	2021	18 months	Unknown	20	6	Unknown	21
16	2022	25	F	73	15	Unknown	22
17	2022	44	F	Unknown	6	Unknown	23

*DNR-Do not resuscitate, *NI-Not initiated.

CONTROVERSIES AND ETHICAL CONSIDERATIONS

Lazarus syndrome can give rise to several controversies and ethical considerations:

Verification of death

One of the primary ethical concerns is ensuring that the patient is indeed dead before resuscitation attempts are terminated. There may be disputes about when and how death is determined, especially when patients exhibit unusual signs or when there's pressure to declare death quickly.[12]

Informed consent

Resuscitation procedures often come with risks and potential harm. The ethical dilemma arises when patients or their families have not given explicit consent for the resuscitation or have requested a do-not-resuscitate (DNR) order. Decisions regarding resuscitation in the absence of clear directives can be contentious.[24]

Quality of life

When if a patient is successfully resuscitated, questions about their subsequent quality of life may arise. Ethical considerations include weighing the potential benefits of a revival against the likelihood of neurological deficits or severe disabilities.[24]

Resource allocation

The cost of extended life support and post-resuscitation care can be substantial. Allocating resources to potentially futile cases of Lazarus syndrome may be debated in healthcare systems with limited resources.[25]

Emotional and psychological impact

The emotional toll on healthcare providers and the psychological impact on witnesses, especially when they believe a person has died, can be significant. It raises

questions about the emotional well-being of those involved in resuscitation efforts.[26]

Autonomy and end-of-life decisions

Lazarus syndrome cases depreciate the importance of respecting patients' autonomy in end-of-life decisions and advance care planning. Discussions about DNR orders and end-of-life wishes are crucial in ethical medical practice.[27]

Cultural and religious belief

Cultural and religious beliefs can influence how death is perceived and what interventions are deemed acceptable. Respecting cultural and religious diversity is an ethical consideration.[28]

Legal implications

In some cases, legal issues may arise, such as allegations of medical malpractice or disputes over the decisions made during resuscitation efforts.[29]

Public awareness and education

Ethical considerations include public awareness and education about Lazarus syndrome, so people are better prepared for the potential outcomes of resuscitation efforts.[12]

Healthcare professionals need to follow established ethical guidelines, engage in open communication with patients and their families, and respect the principles of beneficence, autonomy, non-maleficence, and justice when dealing with Lazarus syndrome cases.

MEDICAL INTERVENTIONS AND POTENTIAL MANAGEMENT

Lazarus syndrome is an infrequent and perplexing medical phenomenon. This phenomenon challenges our understanding of death and underscores the complexities of medical interventions in critical situations. However, there are no specific treatments designed exclusively for Lazarus syndrome because it is not a medical condition in itself.[30]

Instead, the focus is on addressing the underlying causes and providing comprehensive care for the patient. When Lazarus syndrome is suspected, immediate medical attention is crucial.

Identification of underlying causes

A thorough evaluation of the patient's medical history and current condition is crucial. Identifying and addressing any underlying medical conditions, such as electrolyte imbalances, drug toxicity, or reversible causes of cardiac arrest, is a priority.[31]

Advanced cardiac life support (ACLS)

ACLS guidelines are followed to manage cardiac arrest situations. This includes interventions such as administering medications, advanced airway management, and defibrillation as needed.[32]

Extracorporeal membrane oxygenation (ECMO)

In severe cases, ECMO can be considered. ECMO is a life support system that temporarily takes over the function of the heart and lungs, providing the patient with oxygenated blood. It allows time for the underlying issue to be addressed.[5,31]

Therapeutic hypothermia

In some cases, inducing mild hypothermia may be considered to reduce the risk of brain damage following cardiac arrest. This therapy aims to protect the brain from ischemic injury.[31]

Monitoring and support

Monitor vital signs, administer intravenous medications, and provide supportive care to maintain hemodynamic stability.[5,31]

Continuous monitoring

Continue monitoring the patient's cardiac rhythm, blood pressure, and other vital signs to ensure the ROSC is sustained.[5]

Neurological evaluation

Assess neurological status and provide appropriate interventions to prevent or manage potential brain injuries.[33]

Psychological support

Patients who experience Lazarus syndrome often undergo significant physical and psychological trauma. Providing emotional support and psychological counseling is essential for their overall well-being.[33]

PSYCHOLOGICAL IMPLICATIONS FOR HEALTH CARE WORKERS AND FAMILIES

Lazarus syndrome, while odd presents profound psychological implications for both healthcare workers and families. The rollercoaster of emotions, from despair to elation, can take a toll on mental well-being.

The experience of witnessing a patient with Lazarus syndrome can be a whirlwind of emotions for healthcare workers. Initially, they may feel a sense of failure and guilt, questioning whether they did enough during CPR. The abrupt reversal of a seemingly futile situation can

lead to shock and disbelief. This unexpected turn of events challenges their medical knowledge and coping mechanisms, potentially leading to feelings of inadequacy or imposter syndrome.[34]

Furthermore, healthcare workers may grapple with ethical dilemmas related to decisions about further treatment and the implications for the patient's quality of life. This can cause moral distress and anxiety, as they must balance their duty to preserve life with the patient's potential suffering. The psychological impact of such decisions can be overwhelming, affecting their overall well-being and job satisfaction.[35]

Support and coping strategies to mitigate the psychological impact of Lazarus syndrome on healthcare workers, hospitals should provide robust support systems, including debriefing sessions, counseling services, and peer support networks.[35]

For families, the Lazarus syndrome experience is equally complex. Initially, they endure the grief and shock of losing a loved one, only to be thrust into a state of confusion and disbelief when the patient miraculously revives. These emotions can be traumatic, leaving families with a profound sense of uncertainty and anxiety about their loved one's future.

The psychological implications for families extend to questions about the patient's quality of life post-resuscitation. They may grapple with feelings of hope, relief, and joy but also fear and uncertainty about potential neurological deficits or long-term health complications. This emotional turmoil can strain family relationships and lead to post-traumatic stress disorder (PTSD) or other mental health challenges.[36]

For families, open and honest communication with healthcare providers is crucial to address their emotional needs and provide realistic expectations about the patient's prognosis.

Lazarus syndrome is a medical anomaly and to address these challenges, healthcare institutions must prioritize the emotional support of their staff, and healthcare providers should maintain transparent and empathetic communication with families. Understanding and managing the psychological impact of Lazarus syndrome is essential to ensure the well-being of all involved in this extraordinary medical occurrence. Healthcare providers must be prepared to manage the emotional turbulence that accompanies these cases, and families require support as well as guidance to navigate the complex emotions that arise.[36]

DISCUSSION

The Lazarus Syndrome is a bewildering medical phenomenon, defying conventional concepts of death and resuscitation. Despite various suggestions, the precise mechanisms underlying this occurrence remain unknown. The reported cases of Lazarus syndrome demonstrate the unpredictable and strange nature of this phenomenon, which affects people of all ages and medical conditions. The ethical considerations underlying Lazarus syndrome touch on core values of medical practice, such as patient autonomy, end-of-life decisions, and cultural sensitivity. Medical treatments emphasize comprehensive care and support, with a multidisciplinary approach aimed at improving patient outcomes.

However, the psychological consequences for healthcare personnel and families cannot be exaggerated, underlining the importance of strong support systems and open communication.

CONCLUSION

The Lazarus syndrome remains a tantalizing medical riddle that continues to fascinate and perplex both the medical community and the general public. Despite advances in medical technology, this event calls into question our understanding of the distinction between life and death. Ethical quandaries and psychological ramifications highlight the importance of holistic methods of care that prioritize empathy, communication, and support. Moving forward, more research is needed to understand the complexity of Lazarus syndrome and improve our capacity to handle this exceptional situation with compassion and skill.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Adhiyaman V, Adhiyaman S, Sundaram R. The Lazarus phenomenon. J R Soc Med. 2007;100(12):552-57.
2. Linko K, Honkavaara P, Salmenpera M. Recovery after discontinued cardiopulmonary resuscitation. Lancet. 1982;319(8263):106-7.
3. Ding WY, Meah M, Mann P. Unassisted return of spontaneous circulation after ventricular fibrillation. J Cardiovasc Electrophysiol. 2018;29(1):199-200.
4. Hannig KE, Hauritz RW, Grove EL. Autoresuscitation: A Case and Discussion of the Lazarus Phenomenon. Case Rep Med. 2015;2015:724174.
5. Hornby K, Hornby L, Shemie SD. A systematic review of autoresuscitation after cardiac arrest. Crit Care Med. 2010;38(5):1246-53.
6. Gordon L, Pasquier M, Brugger H, Paal P. Autoresuscitation (Lazarus phenomenon) after termination of cardiopulmonary resuscitation-a scoping review. Scand J Trauma Resusc Emerg Med. 2020;28(1):14.
7. Pappano AJ, Gil Wier W. Coronary Circulation. In: Cardiovascular Physiology. Elsevier. 2013;223-6.

8. Benghanem S, Mazeraud A, Azabou E, Chhor V, Shinotsuka CR, Claassen J, et al. Brainstem dysfunction in critically ill patients. Crit Care. 2020;24(1):5.
9. Sprenkeler DJ, van Hout GPJ, Chamuleau SAJ. Lazarus in asystole: a case report of autoresuscitation after prolonged cardiac arrest. de Potter T, Iliodromitis K, Duplyakov D, Aziz A, Green P, eds. Eur Hear J Case Rep. 2019;3(3):ytz123.
10. Sharma M, Chandna M, Nguyen T, Vakil A, Franco Jr R, Ratnani I, et al. When a Dead Patient Is Not Really Dead: Lazarus Phenomenon. Case Reports Crit Care. 2020;2020:1-4.
11. Tretter JT, Radunsky GS, Rogers DJ, Daugherty LE. A Pediatric Case of Autoresuscitation. Pediatr Emerg Care. 2015;31(2):138-9.
12. Rzeźniczek P, Gaczkowska AD, Kluzik A, Cybulski M, Bartkowska-Śniatkowska A, Grześkowiak M. Lazarus Phenomenon or the Return from the Afterlife-What We Know about Auto Resuscitation. J Clin Med. 2023;12(14):4707.
13. Sukhyanti K, ShriKrishan C, Anu K, Ashish D. Lazarus phenomenon revisited: a case of delayed return of spontaneous circulation after carbon dioxide embolism under laparoscopic cholecystectomy. Anaesthesia Pain Intensive Care. 2019;20(3):338-40.
14. Güven AT, Petridis G, Özkal ŞŞ, Kalfoglu EA. Adli Tıbbi Açıdan Lazarus Fenomeni: Bir Olgu Sunumu. Bull Leg Med. 2017;22(3):224-7.
15. Ding WY, Meah M, Mann P. Unassisted return of spontaneous circulation after ventricular fibrillation. J Cardiovasc Electrophysiol. 2018;29(1):199-200.
16. Mullen S, Roberts Z, Tuthill D, Owens L, Te Water Naude J, Maguire S. Lazarus Syndrome - Challenges Created by Pediatric Autoresuscitation. Pediatr Emerg Care. 2021;37(4):e210-11.
17. Sprenkeler DJ, van Hout GPJ, Chamuleau SAJ. Lazarus in asystole: a case report of autoresuscitation after prolonged cardiac arrest. Eur Hear J Case Rep. 2019;3(3):ytz134.
18. Sharma M, Chandna M, Nguyen T, Vakil A, Franco Jr R, Ratnani I, et al. When a Dead Patient Is Not Really Dead: Lazarus Phenomenon. Case reports Crit care. 2020;2020:8841983.
19. Martinez-Ávila MC, Almanza Hurtado A, Trespalacios Sierra A, Rodriguez Yanez T, Dueñas-Castell C. Lazarus Phenomenon: Return of Spontaneous Circulation After Cessation of Prolonged Cardiopulmonary Resuscitation in a Patient With COVID-19. Cureus. 2021;13(8):e17089.
20. Meeker JW, Kelkar AH, Loc BL, Lynch TJ. A Case Report of Delayed Return of Spontaneous Circulation: Lazarus Phenomenon. Am J Med. 2016;129(12):e343-4.
21. Zorko DJ, Shemie J, Hornby L, Singh G, Matheson S, Sandarage R, et al. Autoresuscitation after circulatory arrest: an updated systematic review. Can J Anaesth. 2023;70(4):699-712.
22. Gaba WH, El Hag SA, Bashir SM. Risen Alive: The Lazarus Phenomenon. Case reports Crit care. 2022;2022:3322056.
23. Steinhorn D, Calligan AL. Lazarus Syndrome in Pediatric Hospice Care: Does It Occur and What Home Hospice Providers Should Know? In: Section on Hospice and Palliative Medicine Program. Am Academy Pediatr. 2021;538-9.
24. Tiesmeier J, Brandt O, Emmerich M. Unexpected return of vital signs after cessation of prehospital resuscitation--Lazarus phenomenon. MMW Fortschr Med. 2010;152(23):33-6.
25. Martinez-Ávila MC, Almanza Hurtado A, Trespalacios Sierra A, Rodriguez Yanez T, Dueñas-Castell C. Lazarus Phenomenon: Return of Spontaneous Circulation After Cessation of Prolonged Cardiopulmonary Resuscitation in a Patient With COVID-19. Cureus. 2021;13(8):e17089.
26. Kostka AM, Borodzicz A, Krzemińska SA. Feelings and Emotions of Nurses Related to Dying and Death of Patients-A Pilot Study. Psychol Res Behav Manag. 2021;705-17.
27. Houska A, Loučka M. Patients' Autonomy at the End of Life: A Critical Review. J Pain Symptom Manage. 2019;57(4):835-45.
28. Duff JP, Joffe AR, Sevcik W, DeCaen A. Autoresuscitation after pediatric cardiac arrest: is hyperventilation a cause? Pediatr Emerg Care. 2011;27(3):208-9.
29. Gordon L, Pasquier M, Brugger H, Paal P. Autoresuscitation (Lazarus phenomenon) after termination of cardiopulmonary resuscitation-a scoping review. Scand J Trauma Resusc Emerg Med. 2020;28(1):14.
30. Mahon T, Kalakoti P, Conrad SA, Samra NS, Edens MA. Lazarus phenomenon in trauma. Trauma Case Rep. 2020;25:100280.
31. Zorko DJ, Shemie J, Hornby L, Singh G, Matheson S, Sandarage R, et al. Autoresuscitation after circulatory arrest: an updated systematic review. Can J Anesth Can d'anesthésie. 2023;70(4):699-712.
32. Kuisma M, Salo A, Puolakka J, Nurmi J, Kirves H, Väyrynen T, et al. Delayed return of spontaneous circulation (the Lazarus phenomenon) after cessation of out-of-hospital cardiopulmonary resuscitation. Resuscitation. 2017;118:107-11.
33. Rajajee V, Muehlschlegel S, Wartenberg KE, Alexander SA, Busl KM, Chou SHY, et al. Guidelines for Neuroprognostication in Comatose Adult Survivors of Cardiac Arrest. Neurocrit Care. 2023;38(3):533-63.
34. Mavrovounis G, Kontou M, Tsiotsikas O, Mermiri M, Tsolaki V, Beltsios E, et al. From flatline to lifeline: A scoping review of the Lazarus phenomenon. Am J Emerg Med. 2023;72:44-57.
35. Nolan JP, Soar J, Kane AD, Moppett IK, Armstrong RK, Kursumovic E, et al. Peri-operative decisions about cardiopulmonary resuscitation among adults as reported to the 7th National Audit Project of the Royal College of Anaesthetists. Anaesthesia.

2024;79(2):186-92.
36. Silverplats J, Södersved Källestedt M-L, Äng B, Strömsöe A. Compliance with cardiopulmonary resuscitation guidelines in witnessed in-hospital cardiac arrest events and patient outcome on monitored versus non-monitored wards. Resuscitation. 2024;196:110125.

Cite this article as: Adithya V, Don Jose K. Lazarus syndrome-a miraculous revival. Int J Community Med Public Health 2024;11:2508-14.