



Impact of Utilizing Lucas 3 Device in Cardiac Arrest in Prehospital Sitting Najran Region, SA

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DOI: 10.31080/ASMS.2024.08.1972

Received: November 11, 2024

Published: November 20, 2024

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Abstract

In this research we are going to investigate the impact of utilizing Lucas 3 device in prehospital sittings. A device that delivers mechanical compression to the chest during CPR replacing an EMT or Paramedic more precise and effective than a human being. We will be focusing on weak links to maximize the effectiveness of the device. Previous studies have shown no effect on cardiac arrest outcomes. Our methods rely on investigating and analyzing all related data from initiation of call to patient outcomes. We extracted and analyzed related data from our Saudi Red Crescent secure platform and conducted a survey that included 88 personals from the field. Regarding Emergency Medical Dispatch Center data indicate that about 23% where EMD failed to Identify cardiac arrest event impacting total ROSC rates which amount to 5% in the first two months of our scope study prior to the employment of Lucas 3 device. In the following Two months post the employment of Lucas 3 device we found out that EMD failed to identify 31% impacting the CPR effort resulting in only 4% of ROSC. Data also indicates that we had a law response by ALS Crews related to Code 9 cardiac arrest event where BLS Crews response amounted to 71%. These facts revile an operation malfunction in our system that need to be addressed. Regarding the employment of Lucas 3 device data indicate 3 out 18 cases where it was used amounting to 14% where the patients didn't survive. This result is concurring with previous studies. However, our survey indicates that Lucas 3 devices are highly recommended by our crew due to their flexibility and capacities.

Keywords: EMD; ROSC; ALS; Lucas 3; Code 9

Abbreviations

EMT: Emergency Medical Technician; CPR: Cardiopulmonary Resuscitation; EMD: Emergency Medical Dispatcher; ROSC: Returned of Spontaneous Circulation; ALS: Advance Life Support Unit; code 9: Cardiac Arrest

Introduction

Studying the real effects of utilizing the Lucas 3 device by comparing data with other cases (Benchmark Technique) trying

to pinpoint the variables that can lead to best outcome practice by employing Lucas 3 device in a more efficient method supported by this research findings in cardiac arrest cases.

Determining the issue

Finding relationships between certain elements or factors that might affect the efficiency of the Lucas 3 Device.

Hypothesis

Placing this technology in the hands of paramedic might increase the likelihood of return spontaneous circulation (ROSC), giving the facts the device in the hands of Basic EMTs at status.

Objectives

To determine the variables or factors that might be resolved through out this research paper and enhance the effectiveness of Lucas 3 device.

Pervious studies

In a study that was published in the Journal of Koren Society of Emergency Medicine that conclude this finding [1] "Compared to manual CPR, CPR with LUCAS required fewer healthcare workers and had no significant difference in the ROSC rate and mortality in patients with IHCA".

In another study that was published by ELSEVIER Journal of Resuscitation that also conclude this finding [2] "In this pilot study of out-of-hospital cardiac arrest patients we found no difference in early survival between CPR performed with mechanical chest compression with the LUCAS™ device and CPR with manual chest compressions. Data has been used for power calculation in a forthcoming multicenter trial".

Another study that was published by The American Journal of Emergency Medicine that conclude [3] "During this simulated cardiac arrest scenario in helicopter rescue LUCAS compared to manual chest-compressions increased CPR quality and reduced hands-off time but prolonged the time interval to the first defibrillation. Further clinical trials *are warranted to confirm potential benefits of LUCAS CPR in helicopter rescue*".

Sample study

Our sample is going to be conducted over a period of four months, in which two months prior the use of the Lucas 3 device and two month post the use of it.

Research limitation

We have limited specific time frame of a period of four months' timeline. Insufficient data.

Research methodology and tools

In this module we will analyzing saved data that has not being altered or audit as raw materials from Saudi Red Crescent Data programs where the Lucas 3 device was employed in prehospital

sitting's and comparing the data with other cases that has not employed the Lucas 3 device in order to find a patterns or relationship that might enhance the performance of prehospital likelihood of returned of spontaneous circulation.

Results

As the data shows, we achieved 5% of ROSC in total. which raises the question of how we get such a low percentage! This result consists of the fact that we only have two stations where ALS Crew is employed, leaving a large surface area that is uncovered. Therefore, there is a need for a new plan in distributing the workforce to gain access to ALS teams to cover as much surface area as possible. Data shows only 7% of Hybrid Crews were employed in Cardiac arrest events. I Believe if we can increase parentage up to 50%, we might see significant change in rate of ROSC. According to the data analysis regarding the use of the Lucas 3 device data shows only 3 cases out of 18 cases where Lucas 3 device were employed by our Crews amounted to 14% in overall cases. This indicates a low percentage in utilization of the device in which the CPR efforts were not effective. According to this data it's not clear yet the desired effect of the utilization of Lucas 3 device. This finding is consistent with previous studies, however according to our crews that data it shows great benefits of the Lucas 3 device in prehospital sittings related to minimizing the physical efforts of our crews and proven to minimize the interpretation of CPR during evacuation of cardiac arrest cases form multistore building and suitable for any weight category.

As Data analysis goes for the month December years 2023 – January – 2024 (2 month prior of utilizing Lucas 3 device).

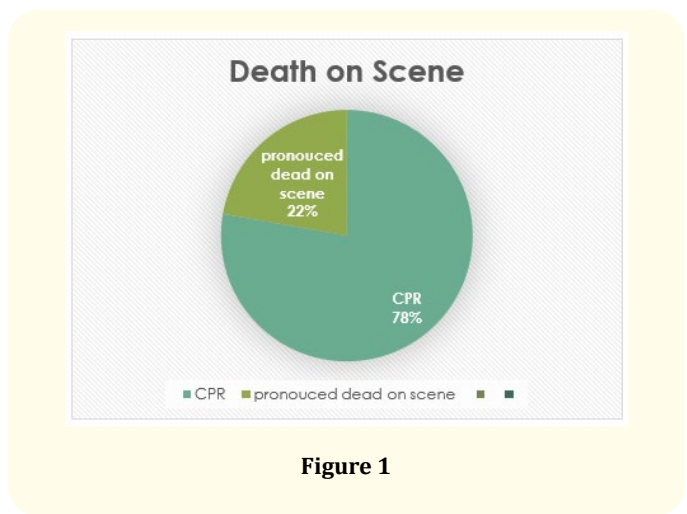


Figure 1

During the phase of data analysis, we found that 8 cases out of 31 cases were pronounced dead on scene by our teams in the field where CPR was not initiated and as per protocol declaration of death go through the online medical direction where a doctor must declare death.

instructions was giving by EMD to call to help reduce the time of brain injury as result of hypoxia during cardiac arrest event. Code 29 came as second cause for cardiac arrest which make it really difficult for EMD to determine the severity of event as its really difficult to obtain accurate information by the caller in a stressful situation regardless of the effort that are made by EMD and the same as code 30 which also trauma attributed as cause. Code 31 came third as designation by EMD where they failed to reach the correct designation where CPR efforts by our EMS compromised due to prolongation of time down. Another code comes to be noticed as it goes the same for code 26 and code 32 where initial case is attributed to a medical condition.



Figure 2

Where the ages differ from as young as 13th years old to the oldest one as 101 years old. All these cases where medical cases are attributed to a cause of Cardiac Arrest where they were code by EMD as code 9.

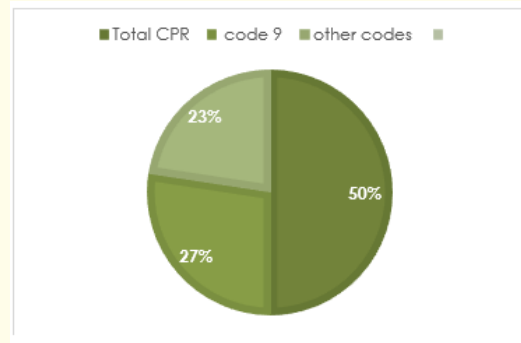


Figure 4

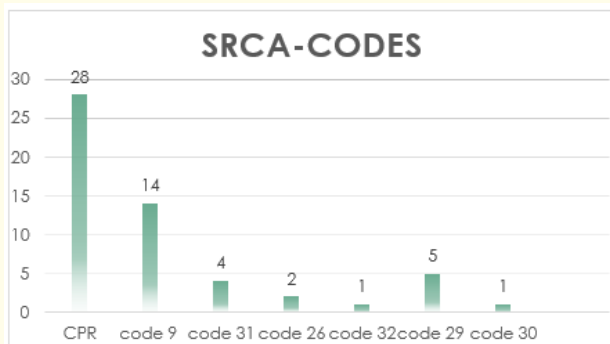


Figure 3

As the data inform us we come across 28 cases where CPR were performed in the field by our EMS Crew, 14 cases were assigned the code 9 by EMD which give a clear picture for our responding teams that it's event of cardiac arrest and as protocol goes CPR

As our data indicate that a mis designation of assigned codes by EMD comes at 23%, where EMD failed to identify a cardiac arrest event, which compromises our efforts in ROSC impacting mortality rate. While EMD was able to achieve 27% as code 9 which the right code assigned to cardiac arrest event where there are protocols set for this specific event an online instruction of initiating CPR by caller to reduce the down time prior the arrival of EMS Crew.

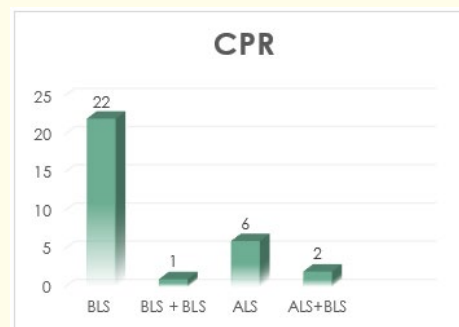


Figure 5

As far as the EMS-Crew analysis goes, data indicates that up to 71%, where the responding Crew were Basic Life Support Unit which considered to be high a percentage in comparison to other form of Crews. This indicates that we must implement specialized training targeting Basic Life Support Crews.

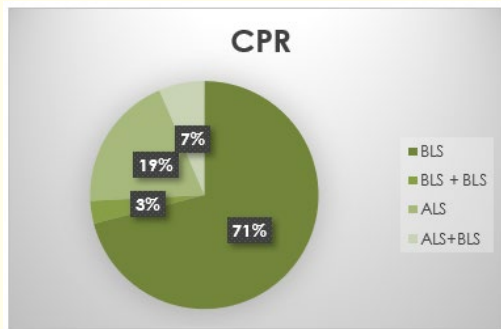


Figure 6

Advance Life Support responded to 19% of cardiac arrest events. Hybrid Crew (ALS+BLS) responded up to 7%, which signifies an operation failure in distributing work force leaving on geographical scale that reduce response time and giving access to ALS Crews.

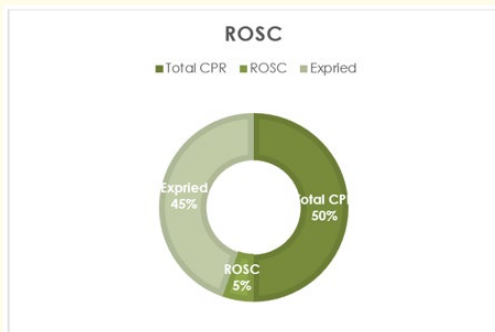


Figure 7

Data indicates that only 5% of cases where ROSC is achieved by our EMS Crews show a weak response that attributes many variables as the data indicates. Hopefully this study might alter reality and inspire decision makers to make some modifications that might enhance our outcome.

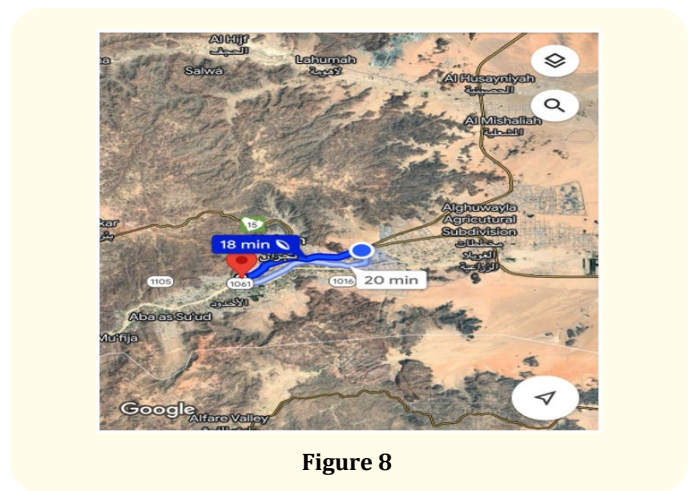


Figure 8

As Data analysis goes for the month February 2024 – Mars 2024 (2 month post of utilizing Lucas 3 device).

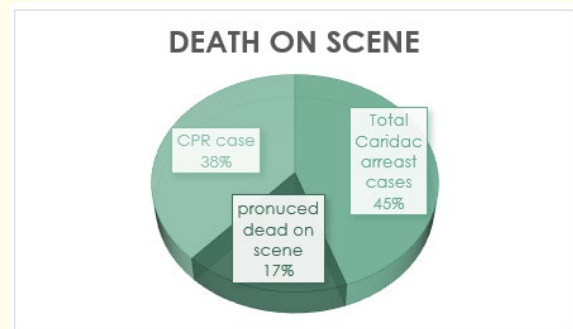


Figure 9

During the phase of data analysis, we found that 9 cases out 21 cases were pronounced dead on scene by our teams in the field where CPR was not initiated and as per protocol declaration of death go through the online medical direction where a doctor must declare death.

Where the ages differ from as young as 22 years old to the oldest one as 116 years old. All these cases where medical cases

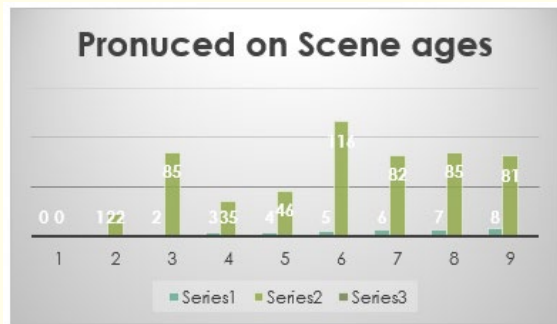


Figure 10

are attributed to a cause of Cardiac Arrest where they were code by EMD as code 9.

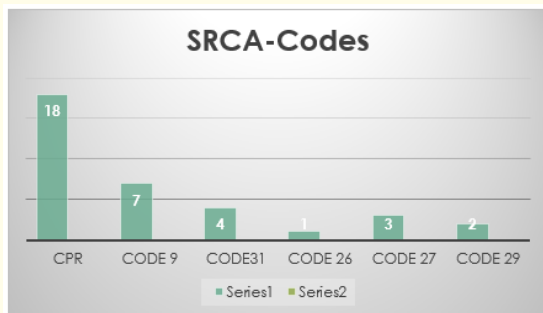


Figure 11

As the data inform us we come across 18 cases where CPR were performed in the field by our EMS Crew, 14 cases were assigned the code 7 by EMD which give a clear picture for our responding teams that it's event of cardiac arrest and as protocol goes CPR instructions was giving by EMD to caller to help reduce the time of brain injury as result of hypoxia during cardiac arrest event. Code 31 came as second cause for cardiac arrest which clearly indicates a problematic in our designed EMD system where early detection of cardiac arrest event is essential. Code 27 came third as designation by EMD where they failed to reach the correct designation where CPR efforts by our EMS compromised due to prolongation of time down. Another code comes to be noticed as it goes the same for code 26 where initial cause is attributed to a medical condition.

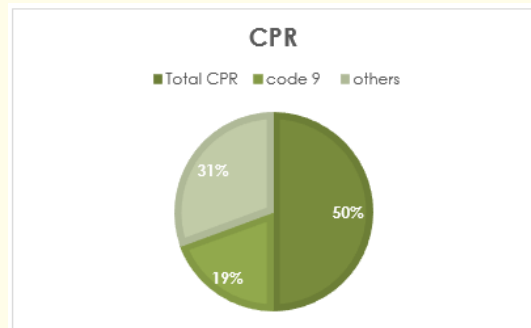


Figure 12

As our data indicate that a mis designation of assigned codes by EMD comes at 31%, where EMD failed to Identify a cardiac arrest event, which compromises our efforts in ROSC impacting mortality rate. While EMD was able to achieve 19% as code 9 which is the right code assigned to cardiac arrest event where protocols set for this specific event as online instruction were given to initiating CPR by caller to reduce the down time prior the arrival of EMS Crew.

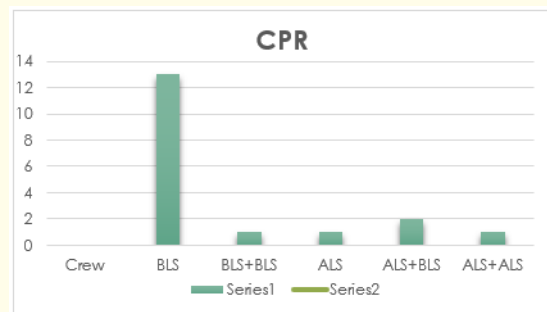


Figure 13

As far as the EMS-Crew analysis goes, data indicates that up to 72%, where the responding Crew were Basic Life Support Unit which considered to be high a percentage in comparison to other forms of Crews. This indicates that we must implement specialized training targeting Basic Life Support Crews.

Advance Life Support responded to 6% of cardiac arrest events. Hybrid Crew (ALS+BLS) responded up to 11%, which

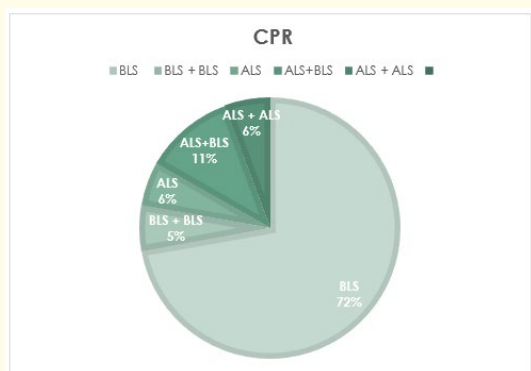


Figure 14

signifies a moderation in our method of responding due to the new regulation in progress sending two crews to any code 9 event. Failure in distributing work force is still a major issue, leaving on a geographical scale that reduces response time and providing less access to ALS Crews.

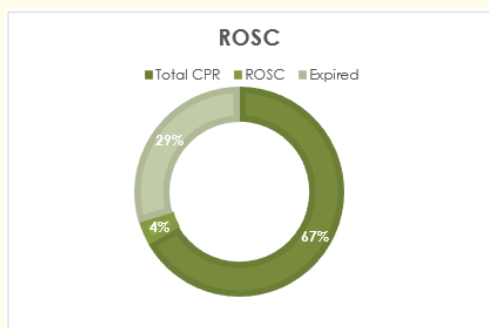


Figure 15

Data indicates that only 4% of cases where ROSC is achieved by our EMS Crews show a weak response that attributes many variables as the data indicates. Hopefully this study might alter reality and inspire decision makers to make some modifications that might enhance our outcome.

In a survey that was conducted including 88 participants of our personal who operate in the field as first responders -EMT - Paramedic -Practical nurse - Driver data revealed the following statistics.

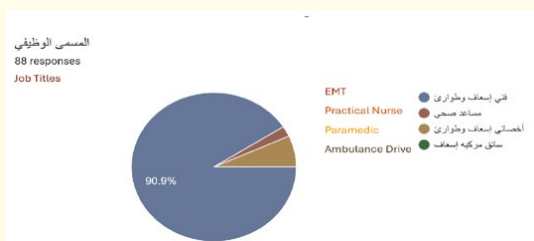


Figure 16

This is consistent with our response to cardiac arrest where most of the initial responses are by BLS team.

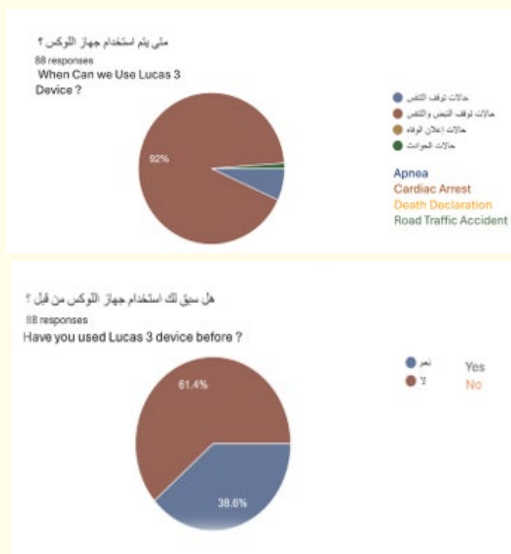


Figure 17

7.8% failed to understand when can utilize Lucas 3 device.

This result is also consistent with the fact that about 61.4% have never employed the device before. In order to enhance our understanding of how the device operates we need to create more workshops and more training sessions.

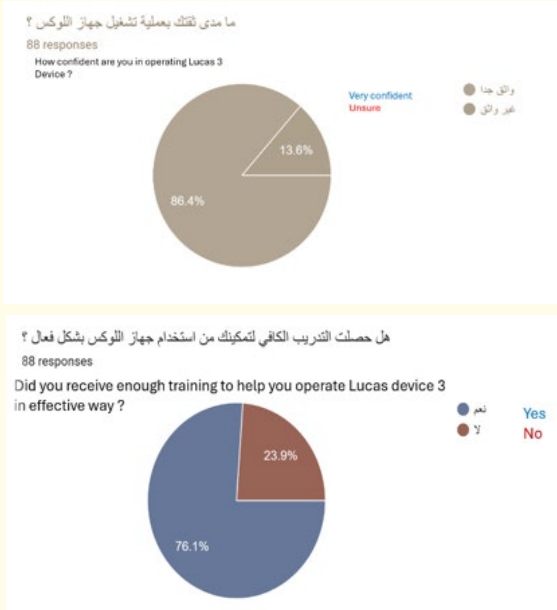


Figure 18

13.6% were not sure how to operate Lucas 3 device. A result that we anticipate also consisted with lack of equipments and lack of targeted training session. 23.9% didn't receive the proper training on this device. This findings is raising an alarm regarding our strategy in training.

Data shows that about 61.4% believed that the Lucas 3 device is very effective in cardiac arrest cases and about 87.5% stated the device help minimize the interuption of CPR effort during evacuation.

Conculsion

Data indicate that Lucas 3 device hasn't effected the outcome of the CPR concurring with perivous studies, however data indicate that utilizing this device in perhospotal sittings proven to be helpful during CPR where it reduce the physical efforts of our providers and help minimize the interuption of CPR providing enough time to perform another essential tasks such airway and ventilation and monitoring the patient.

Recommendations

- Reducing the marginal error in decoding by EMD and implementing of stress relieve system might enhance the performance.
- Employing more Paramedic in the field will enhance the outcomes of cardiac arrest cases.
- Implement mobile training units where training can be accessible by EMT's in their stations to reduce the gap in training.
- Redistribute the working force on a geographical manner that will reduce the response time and enable hybrid team concept.
- Supplying more Lucas 3 devices to prehospital Crews to enhance outcome.

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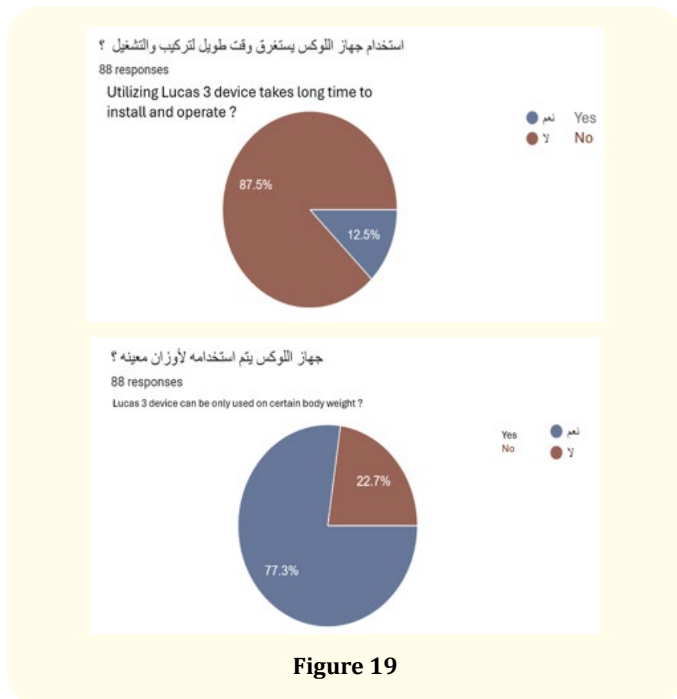


Figure 19

12.5% stated that installing and operating the Lucas 3 device takes a long time, which makes it a challenge. This statement is not accurate regarding the installation and the operation of the device. This result clearly proves that 12.5% have never used the device before.

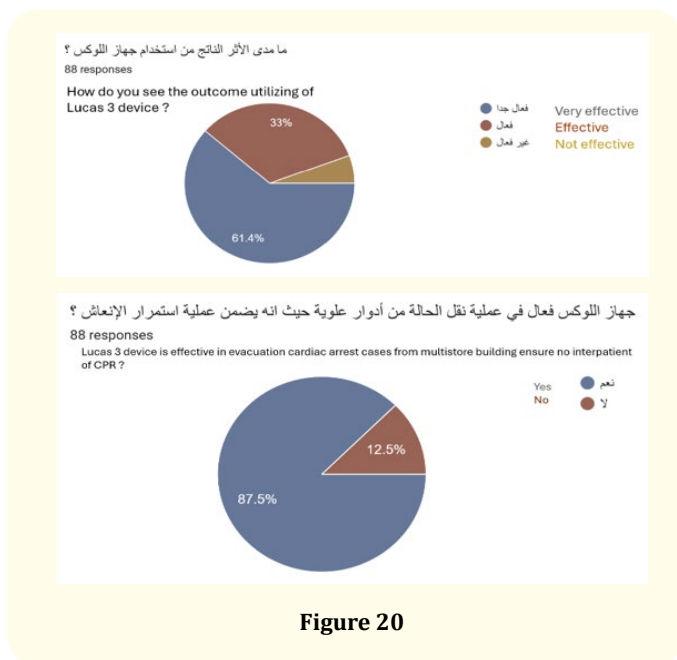


Figure 20