Refining Healthcare Interventions: Risk Assessment and Extreme Management for Sudden Cardiac Arrest

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Abstract

The research has focused on exploring the healthcare interventions related to risk assessment and extreme management of sudden cardiac arrests. A systematic review has been performed by including thematic analysis that has increased the reliability of the study by interpreting only relevant information. CPR can be helpful in this process that involves the stages of chest compressions and rescue breaths. It helps to flow the blood in vital organs so that the heart can be restarted as it involves rescue breaths and chest compressions. The findings of the research have demonstrated that proper medical advice and diagnosis are essential for heart patients to prevent SCA. Therefore, the purpose of the research is fulfilled by expressing the major components associated to SCA.

***Keywords**: Sudden cardiac arrest, Extreme management, Risk assessment of SCA, Sudden cardiac death, Lifestyle changes.*

Introduction

Sudden cardiac arrest (SCA) is considered a life-threatening situation that might occur when Malfunction in the electrical system of the heart takes place. It causes an erratic beat of the heart

or stops beating leading to death within minutes if not immediately treated (Koene et al. 2017). The current study will focus on finding appropriate interventions that can help in preventing death due to SCA. The research will focus on various factors contributing to the risk assessment of SCA such as heart disease, family history, age, gender, and lifestyle factors. Besides, extreme management such as emergency medical services (EMS) will be discussed by analyzing the interventions to provide effective information on this issue.

Background and rationale

The assessment of SCA must be done from an early stage of life to prevent it through lifestyle changes and effective precautions. SCA has become a growing global issue that leads to the death of approximately 4-5 million sudden cardiac deaths (SCD) (Jayaraman et al. 2022). Reports from WHO have shown that 55% of cardiac deaths occur within the first hour and it is mainly visible among people 60 years or above age (WHO, 2025). They tend to have prior symptoms developing from a younger age and a majority of people tend to have cardiac arrest due to myocardial infarction. The risk of SCD increases about 8-10 times with the presence of myocardial damage that needs proper risk assessment and timely management to prevent deaths.

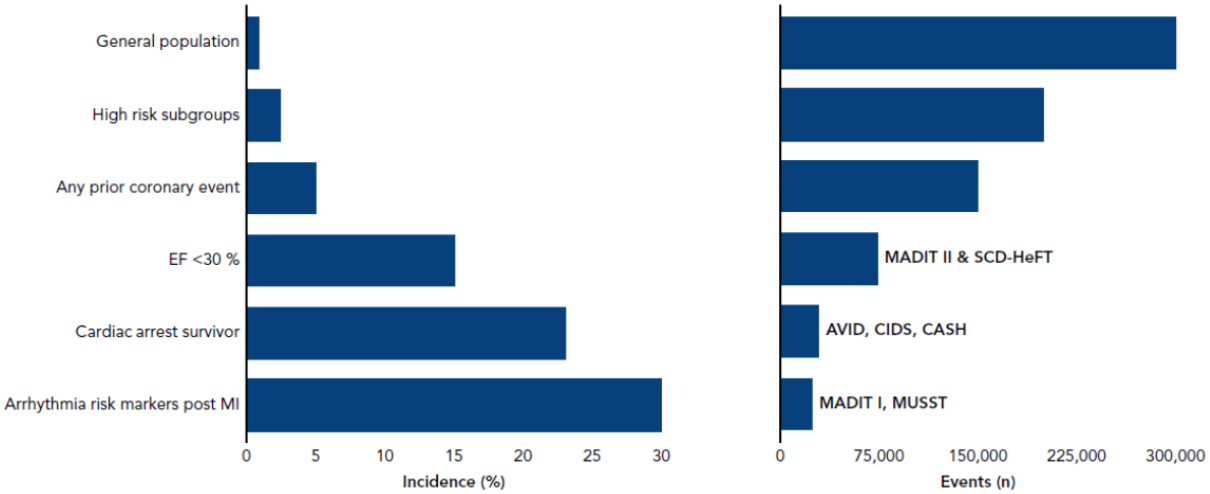

Figure 1: Incidence and occurrence of SCD in a year

(Source: Influenced by Srinivasan & Schilling, 2018)

Figure 1 shows the results of a survey conducted by Srinivasan & Schilling (2018), showing that the cases of SCA in the UK had a lower survival rate of 8.1% in 2018. The improved outcomes of SCA can only be visible with immediate recognition of the symptoms and emergency response system activation. Early CPR is believed to be effective and must be emphasized in chest

compressions. It also requires integrated post-cardiac arrest care that can improve the conditions of the patients significantly.

However, the study by Koene et al. (2017) has found that the major issue of risk assessment of SCA involves difficulties in predicting SCA and its risk factors. People having SCA might not have immediate access to risk assessment tools and prevention methods which leads to an increasing number of deaths as well (WHO, 2025). On the other hand, SCA and SCD are time-sensitive conditions that create obstacles in extreme management as well. Similarly, the risk of brain damage and other relevant complications might arise without proper post-resuscitation care even if a successful SCA is treated. It is becoming a growing global concern as the cases of SCD in the US have a range of 180,000-250,000 per year which has rapidly evolved in recent times (Chugh et al. 2008).

Research aim and objectives

Aim

The research aims to critically evaluate risk assessment and management for sudden cardiac arrest as a refined healthcare intervention.

Objectives

To identify the factors affecting risk assessment and management of sudden cardiac arrest in healthcare intervention

To evaluate the best-suited interventions in assessing risks and managing extreme cases of sudden cardiac arrest

To understand the challenges in applying refined healthcare interventions to assess and manage risks of sudden cardiac arrest in healthcare

Method

The research has followed a secondary qualitative method to include existing literary knowledge on risk assessment and extreme management of SCA. Relevant and peer-reviewed research papers have been included in the critical analysis for accurate information (Dzwigol, 2022). The collected data and information have been analyzed through a systematic review method that has allowed the incorporation of previous knowledge on this background and evolved the data interpretation. Authentic databases such as ScienceDirect, ProQuest, and PubMed have been accessed to collect

peer-reviewed journals and articles. The selection of these databases is justified as they can provide genuine information on healthcare interventions (Mishra & Alok, 2022).

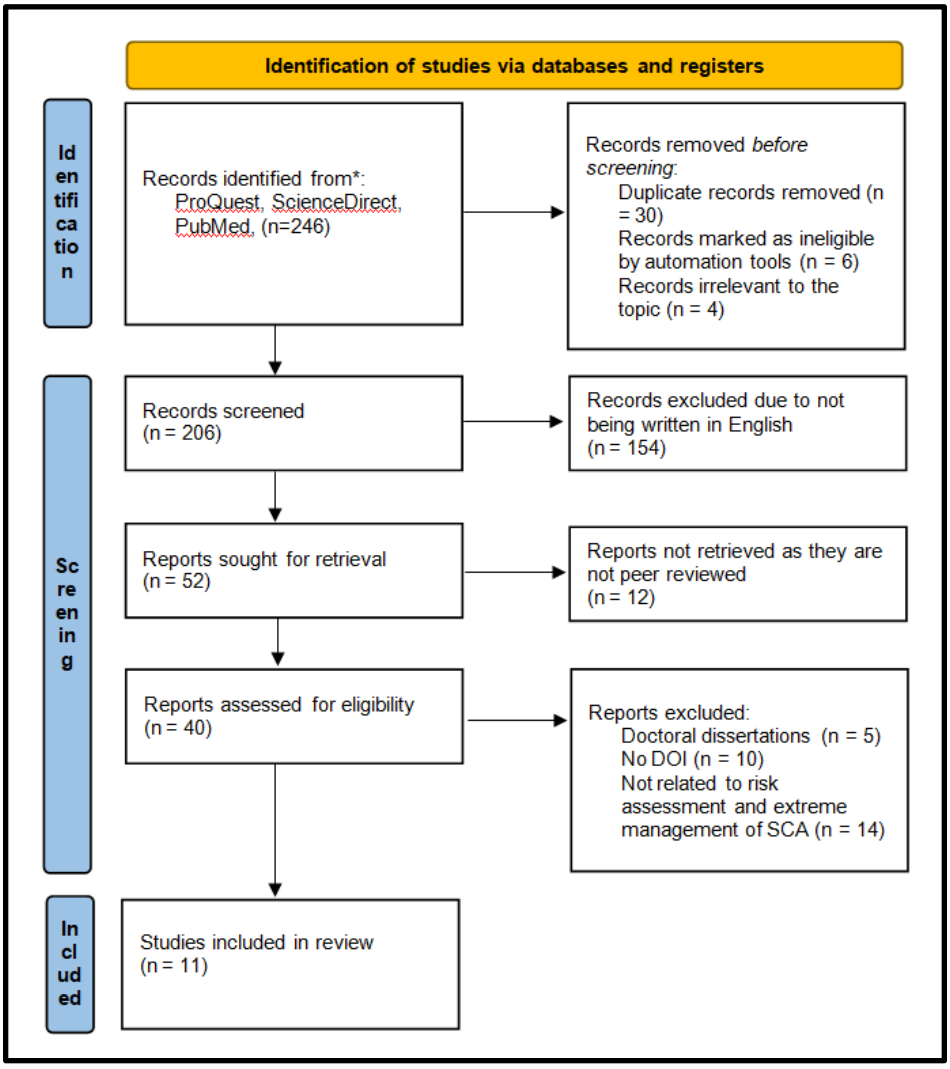

Figure 2: PRISMA

(Source: Influenced by Marra & Nielsen, 2025)

Figure 2 is the presentation of the PRISMA diagram which has revealed that a total of 11 peer-reviewed journals and articles are selected from the mentioned databases. Certain filters such as DOI and content related to effective assessment and management of SCA have been applied to narrow down the vast amount of data obtained from the databases.

Keywords	AND/OR	Keywords	AND/OR	Keywords	Search results
Sudden cardiac arrest	AND	Erratic heartbeat	OR	Healthcare interventions	ProQuest=65 ScienceDirect=56
Emergency medical services	OR	Sudden cardiac deaths	AND	Cardiac deaths	PubMed=22 ProQuest=32
Risk assessment of SCA	AND	Myocardial damage	AND	Extreme management of SCA	ScienceDirect=41 PubMed=30

Table 1: Boolean search results

(Source: Influenced by Dzwigol, 2022)

Table 1 demonstrates the Boolean search results that contain the major keywords that help in searching only relevant journals and articles for the research. The main keywords are "sudden cardiac arrest", "emergency medical services", "myocardial damage", "extreme management of SCA", and the respective. A thematic analysis has been conducted to analyze the collected set of information related to risk assessment and management of SCA in a global context. Thematic analysis is considered to be an impactful analytical method for having an in-depth discussion on the chosen research topic (Dzwigol, 2022). Consequently, the current research is expected to show a considerable outcome in assessing and managing the risks of SCA.

Result

An axial coding table can be created in this section to provide a brief idea about the sources acknowledged for the data analysis section of the study.

Authors	Codes	Themes
Ha et al. 2022 Park et al. 2022 Abbas et al. (2023) Dores et al. (2024)	Sudden cardiac death (SCD), Premature death, Existing heart issues	"Theme 1: Lifestyle and existing heart diseases are crucial factors impacting risk assessment and extreme management of SCA"
La Gerche et al. (2024) Wyckoff et al. (2022) Obermaier et al. (2022) Semeraro et al. (2021)	Life-support interventions, CPR, Reverse cardiac arrest	"Theme 2: Early CPR is the best intervention to prevent SCA involving life-support measures"

Voi et al. (2024) Ojo et al. (2024) Obeagu & Obeagu (2024)	Access to healthcare, Risk assessment tools, Survival rate	"Theme 3: Insufficient access to risk assessment tools causes the major challenge of assessing and managing the risks of SCA"

Table 2: Axial coding

The axial coding table has mentioned key themes to have an in-depth analytical discussion to highlight appropriate interventions, their benefits, and the challenges of implementation as well.

Analysis

Theme 1: Lifestyle and existing heart diseases are crucial factors impacting risk assessment and extreme management of SCA

Changes in lifestyles contributed to developing heart problems as a crucial factor requiring certain changes. According to Park et al. (2022), proper risk assessment of existing heart concerns must be done due to the diverse lifestyle in today's modern world. Smoking is one of the main risk factors causing heart trouble which also increases the chances of SCA risks among people. Moreover, obesity is another risk associated with a lifestyle that is mostly common among overweight or obese populations. It also leads to another risk factor of a lack of physical activities that also increases the chance of SCA as well (Abbas et al. 2023). Similarly, people having poor diets, intake of saturated fat, sodium, and cholesterol tend to develop heart diseases early in their lives leading to SCA. Another population having excessive alcohol consumption damages their heart health gradually going towards SCA.

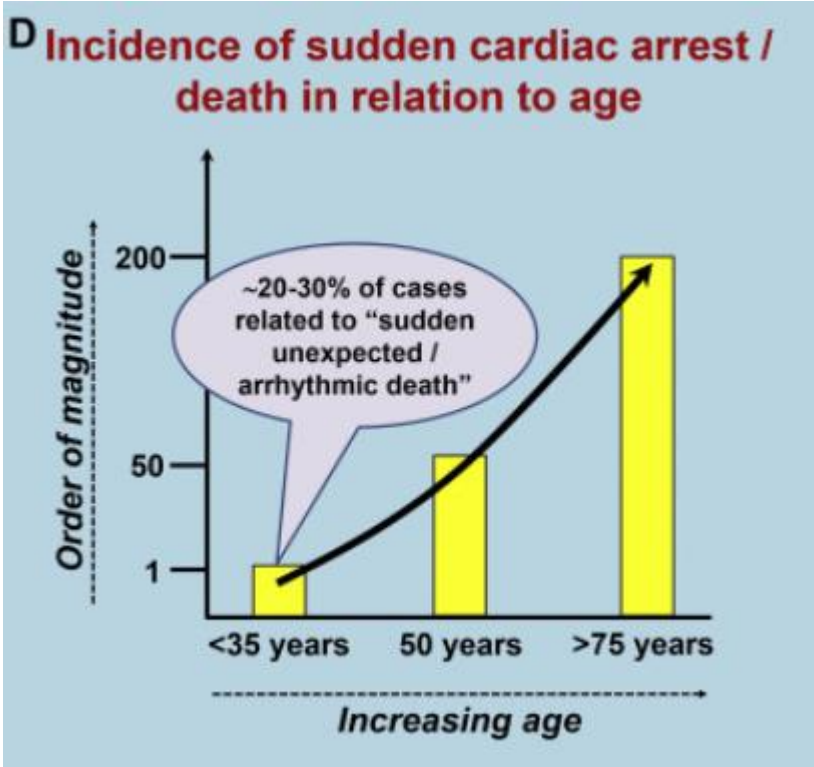

Figure 3: Incidence of SCA and deaths related to age

(Source: Influenced by Ha et al. 2022)

Figure 3 develops a notion of SCA incidents and deaths related to the age of the patients according to a study conducted by Ha et al. (2022). In this case, it can be mentioned that the population below the age of 35 is likely to experience unexpected arrhythmic death by 20%. However, the cases of SCA increase with age due to a prolonged impact of heart health on the body. Existing heart diseases such as coronary heart disease can be held responsible for a lack of blood supply creating a block or narrowing heart (Dores et al. 2024). This results in an increased risk of heart attack evolving into SCA or SCD as well. Other existing heart problems might also involve cardiomyopathy, heart valve diseases, and congenital heart defects (Park et al. 2022).

SCA can have a significant impact on lifestyle factors as well as existing heart conditions developing a higher chance of SCA. As stated by Abbas et al. (2023), people having a healthy lifestyle and no heart issues tend to have a reduced risk of SCA as they are likely to engage in healthy diet and physical activities. In addition, extreme management can also be highly impacted by lifestyle choices as people involved in an unhealthy lifestyle are prone to have reduced survival in an SCA (Dores et al. 2024). Thus, such people need to improve their choices of lifestyle to

increase their chances of survival if SCA occurs.

The early detection of SCA must be known to the population who already have heart diseases to prevent such unfortunate situations. Ha et al. (2022) have shared that the major symptoms of SCA include sudden collapse, no pulse, loss of consciousness, and no breathing. Other symptoms such as weakness, chest discomfort, and shortness of breath can also occur before SCA whereas; it can also take place without any warning. People with a family history of coronary diseases must adopt a healthy lifestyle by avoiding smoking, high blood pressure, obesity, high cholesterol, or an inactive lifestyle (Abbas et al. 2023). Thus, such chances of complicated heart conditions can be avoided leading to SCD.

Theme 2: Early CPR is the best intervention to prevent SCA involving life-support measures

Cardiopulmonary resuscitation (CPR) is regarded to be one of the most effective emergency procedures that can be adopted the keep blood flow to the brain and other organs under control (Wyckoff et al. 2022). Additionally, chest compressions tend to assist in circulating blood and rescuing breaths to provide oxygen to the lungs. Early CPR plays an important role in improving the chances of SCA survival or sudden stops of a beating heart (Obermaier et al. 2022). It leads to sudden death within minutes if not immediately treated whereas, CPR ensures that the blood flows into the brain and vital organs until the heart are restarted. In this way, the chances of SCD can also be avoided by acknowledging such an effective and life-supporting measurement.

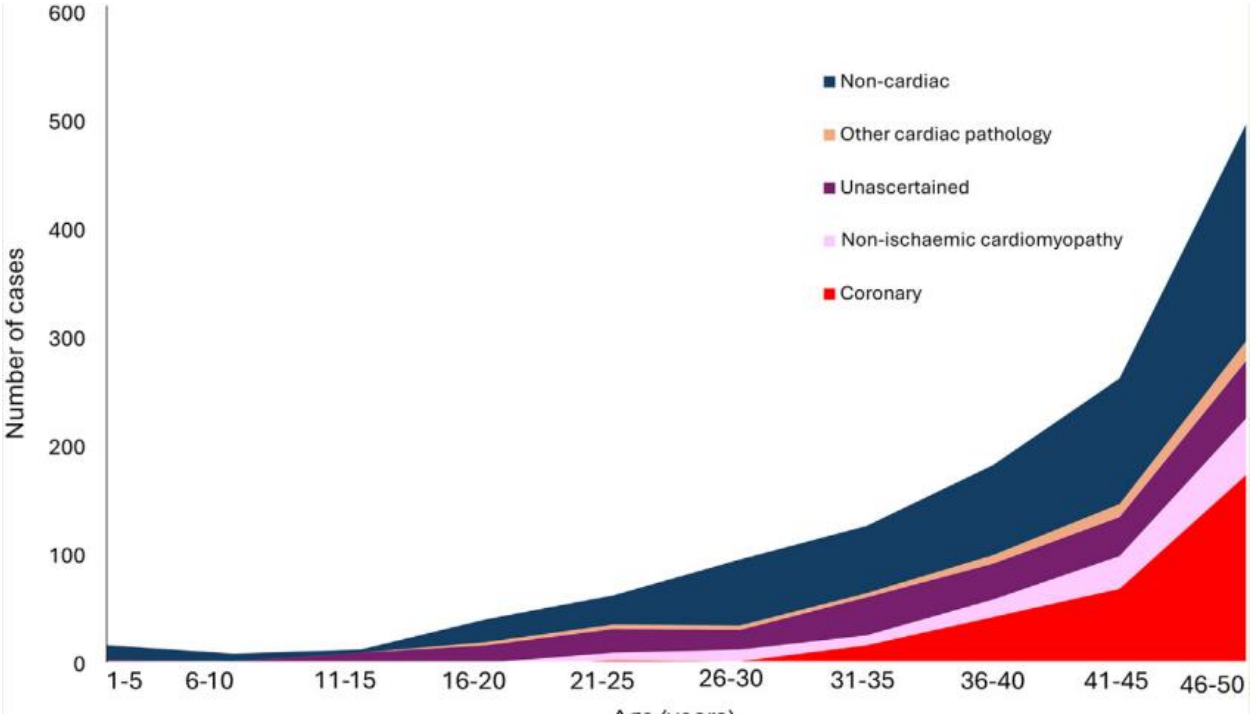

Figure 4: Causes of SCA by age group

(Source: Influenced by La Gerche et al. 2024)

Figure 4 presents the findings of La Gerche et al. (2024) regarding the reasons behind the development of SCA by age group. It has been predicted that the major reason behind SCA is coronary diseases majorly among the population 46-50 years of age. Besides, other significant reasons behind this issue are non-ischemic cardiomyopathy, cardiac pathology, and even non-cardiac diseases. The study has also suggested that unexplained cardiac death can occur which is referred to as "sudden arrhythmic death syndrome as well (La Gerche et al. 2024). In contrast, Semeraro et al. (2021) have pointed out that CPR experts must always perform in such cases as the situation is time-sensitive and the survival of the patients depends on this. Thus, the chances of a patient's survival can be increased along with preventing further complexities post-CPR process.

On another note, La Gerche et al. (2024) have suggested that hands-on CPR can be provided if a CPR expert cannot perform the procedure. This method involves only the phase of chest compressions that can also rescue the breathing of the patient (Wyckoff et al. 2022). This process can be followed by using Automated External Defibrillator (AED) immediately after the collapse. It is an effective device to deliver electric shocks to the heart to restart it as a life-supporting

measure. Contrarily, CPR remains the best intervention to prevent cases of SCA if someone is seen to have collapsed with the SCA symptoms (Obermaier et al. 2022). Therefore, the conditions of individual hearts and the immediate access to such expertise can increase the chance of survival.

Theme 3: Insufficient access to risk assessment tools causes the major challenge of assessing and managing the risks of SCA

People having sudden cardiac problems can experience it anywhere where appropriate risk assessment tools might not be available. As per the view of Voi et al. (2024), rescuing patients of SCA can be challenging without using appropriate tools and devices as emergency responses. Moreover, limited visibility of such tools and a lack of understanding about their usage can also lead to challenging situations even for healthcare professionals. Open-source components must be present to assess exact risks and examine the patients to save their lives. On the contrary, Ojo et al. (2024) have expressed that the identification of vulnerabilities of the patients can be challenging without risk assessment tools. As a result, inaccurate risk prioritization can arise which can lead to inaccurate treatment for the patients as well.

The severity and vulnerability of the patients must be assessed at the early stage of SCA to avoid potential impacts. As mentioned by Obeagu & Obeagu (2024), risk assessment tools help in recognizing critical issues so that the focus can be relied on efficient remediation efforts. Thus, a delay in the identification and address of the vulnerabilities can increase the chance of exploiting the situations that can endanger the lives of the patients. Other relevant issues in this context might involve regulatory challenges in accessing healthcare services by the patients experiencing SCA (Voi et al. 2024). Hence, such critical issues must be addressed to take preventive measures as soon as possible.

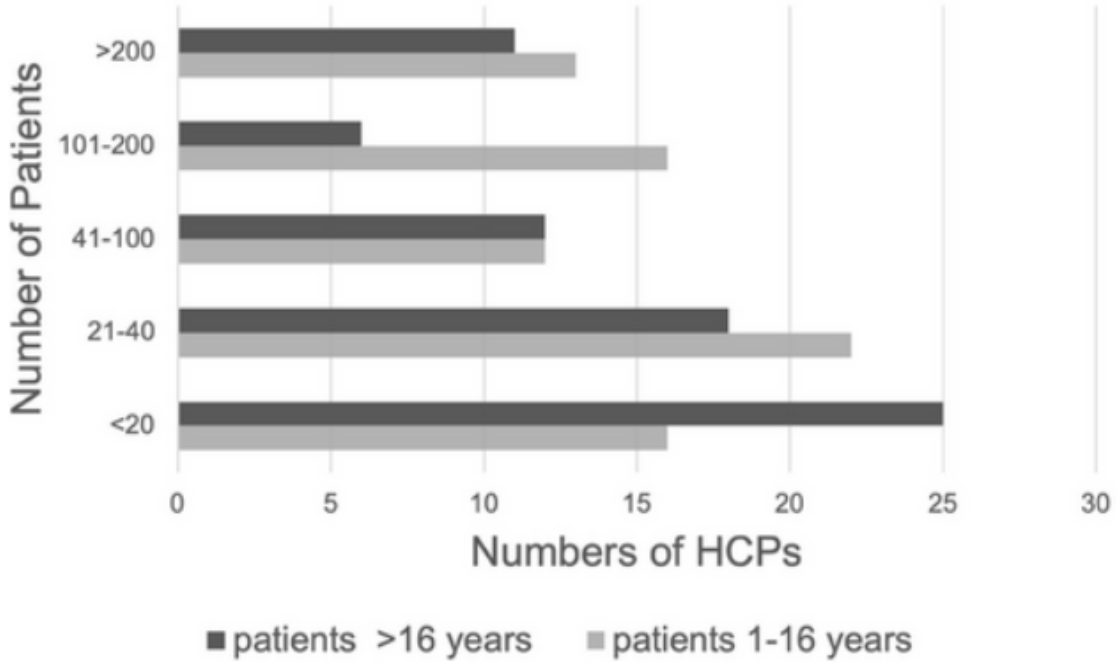

Figure 5: The ratio of the number of patients and number of healthcare professionals (HCPs)

(Source: Influenced by Voi et al. 2024)

Figure 5 presents the ratio of patient and HCP numbers that can impact the care quality of critical patients. The findings of Voi et al. (2024) have suggested that 67 out of 77 HCPs have detailed expertise in their respective fields. The number of patients is increasing in healthcare centres that lack effective professionals to take proper measurements. In this way, access to appropriate services can narrow down the chances of SCA patients for their survival. The assessment and management capabilities of the HCPs play a vital role in determining the cases of survival as well (Obeagu & Obeagu, 2024). Addressing such issues can lead to an increased number of survival patients of SCA globally promoting risk assessment tools.

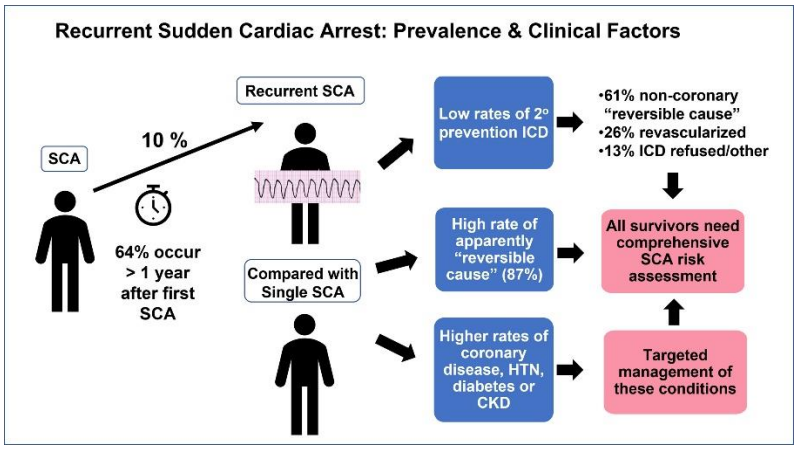

Figure 6: Reasons for sudden cardiac arrest

(Source: Held et al. 2022)

These issues can be addressed by investing in the risk assessment tools used in the cases of SCA. Ojo et al. (2024) have suggested that comprehensive vulnerability detection must be done as a significant healthcare intervention. In addition, integrated software development can also be done for an accurate detection of the symptoms. Consequently, it can lead to an equal chance of accessing such services so that the lives of people can be saved. However, as argued by Voi et al. (2024), a culture of security is essential to be fostered in healthcare services to help people in need and overcome challenges. Thus, a proactive measurement can be taken against SCA to reduce its impact on the vulnerabilities of people.

Discussion

Professionals must be consulted a regular intervals to identify the symptoms before the occurrence of SCA or SCD (Wong et al. 2022). In this context, it has also been found that SCA is threatening to life and can take place at an early age and among the young population as well. Lifestyle factors such as obesity, smoking, and a lack of physical activities result in a higher chance of SCA. Additionally, treatment must be started as soon as the EMS arrives for the patients such as CPR (Kjaergaard et al. 2022). Besides, defibrillation is another effective procedure involving electric shocks that reset the heart's rhythm. The application of these methods and proper medication can reduce the chances of SCD among heart patients.

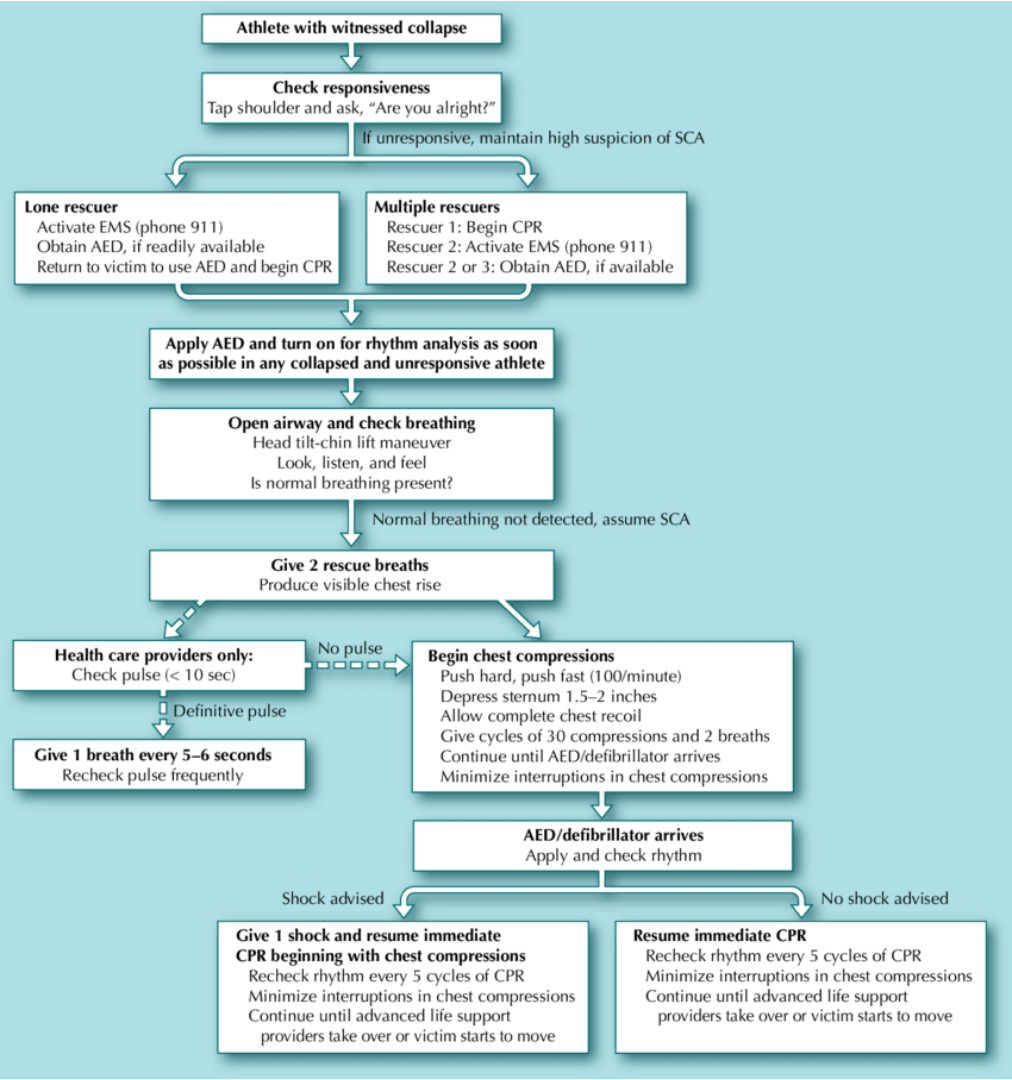

Figure 7: Management of sudden cardiac arrest

(Source: Harmon &Drezner, 2007)

The relevant journals and articles of the research have depicted that prevention of SCA is a complex process requiring early detection of symptoms. Schmidt et al. (2022) have expressed that maintaining a healthy lifestyle with a heart-healthy diet and healthy weight is necessary. Regular light to moderate exercise can also be effective in averting such dire consequences that help in managing underlying health conditions as well. However, people often lack proper information on such preventive measures or access to immediate healthcare services which worsens the situation (Lott et al. 2021). Thus, appropriate risk assessment can result in healthcare interventions to avoid risks of SCA or SCD.

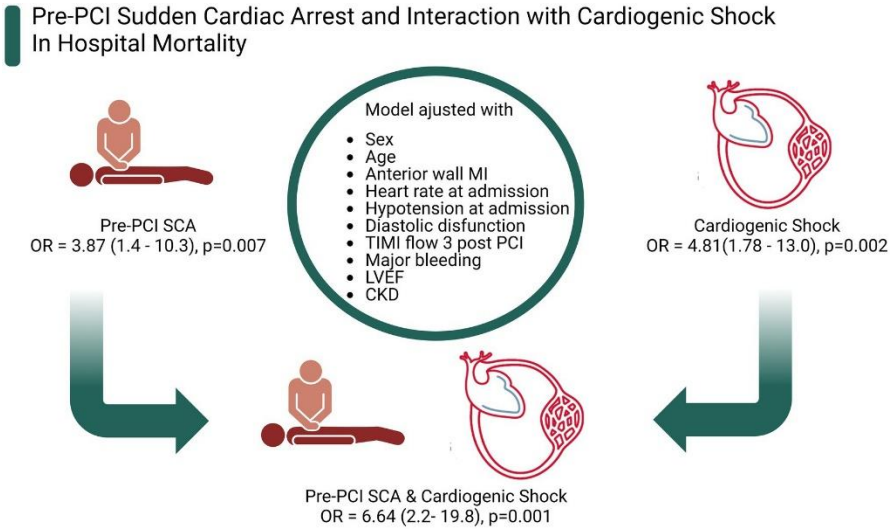

Figure 8: Pre-percutaneous coronary intervention for sudden cardiac arrest

(Source: Machado et al. 2023)

Conclusion

The critical analysis of the research has projected that the rate of SCA and SCD is drastically increasing globally. Immediate risk assessment and a lack of CPR support for cardiac patients are the major contributors to this issue. A systematic review has been conducted which has depicted that SCA is a time-sensitive condition that results in death within the first hour of its occurrence. Besides, the thematic analysis has focused on CPR which is regarded to be one of the best interventions as a life-supporting measurement as well. The analysis has also suggested that people having serious heart problems need to have regular diagnoses to be informed about their heart conditions.

Future scope and limitations

The study has a significant future scope as it has addressed a relevant health concern of the global population. A focus on risk assessment and extreme management of SCA has been proven to be effective as a significant healthcare intervention in a global context (McKenna & Behr, 2022). The systematic review has resulted in a set of genuine information related to the topic that will have further scope to be explored based on a specific region or a targeted population.

On another note, despite genuine information on SCA and SCD along with the identification of reasons behind such occurrences, the research holds a few limitations. A lack of quantitative information from the healthcare professionals dealing with such cases could have improved the

outcome of the research (Kumar et al. 2021). Besides, a lack of focus on a specific geographical location or population has made the findings somewhat general as the rate of heart disease depends on the backgrounds and lifestyle choices of people.

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