Evaluating the Benefits and Risks of Cardiopulmonary Resuscitation

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Cardiopulmonary resuscitation, or CPR, is an emergency procedure used when someone enters cardiac arrest and their heart stops beating. It is accomplished through a combination of performing chest compressions and mouth-to-mouth breathing at a 30:2 ratio. While CPR appears to be a common procedure, the survival rate for patients who received CPR in 2021 was only 9.1%. Additionally, CPR can harm the patient by damaging internal organs and fracturing ribs. Survival rates for patients after receiving CPR varies among hospitals, and can be impacted by off-hours, defibrillation, and unwitnessed arrests (Rubulotta & Rubulotta, 2013). There has been much discussion about whether CPR should be performed on any patient who enters cardiac arrest or should be withdrawn for certain patients, such as those with conditions that typically result in a lower survival rate. While performing CPR is the immediate action when someone enters a cardiac arrest, this should be reconsidered due to variation in survival rates among elderly patients and those with chronic illnesses.

CPR Survival Rate

When examining the survival rate of people receiving CPR, it was found that the return of spontaneous circulation significantly decreased with age (Bacon et al., 1998).

Additionally, a study completed between 2001 and 2010 compared the survival rate of younger patients with patients over age 75. Among 810 patients observed during the study, 68% achieved a return in spontaneous circulation, with 23% of those patients being elderly. 57% of the total amount of younger patients receiving CPR survived to hospital discharge, while only 33% of the elderly patients survived. The younger patients also had better neurological outcomes with 86% receiving a CPC score of one, indicating good cerebral performance, while 73% of elderly

patients received a CPC score of one. The variations in neurological outcome were also observed with only 2.5% of younger patients receiving a CPC score over two, indicating poor neurological outcome, while 7.3% of elderly patients had a CPC score over 2. Additionally, in patients over age 75, the 1-year survival rate was 76% and the 5-year survival rate was 59%, which is much lower when compared to the overall 1-year survival rate of 94% and 5-year survival rate of 85% (Hiemstra et al., 2018).

Based on these statistics, it is evident that younger patients have a much better outcome after receiving CPR when compared to patients above age 75. Based on the lower survival rate and poorer neurological outcomes, CPR may not be a perfect solution for all age groups. Since some patients experienced a worsening in neurological status after receiving CPR, the benefits of resuscitation after a cardiac arrest should be compared with the possibility of worsening in brain function when deciding if a healthcare worker should perform CPR on a patient.

CPR-Related Injuries

Research has also shown that injuries can result in patients who received cardiopulmonary resuscitation with variations based on age. The most common type of injuries are traumatic chest wall injuries, but upper airway, pulmonary, and intra-abdominal injuries can also occur. The prevalence of chest wall injuries ranged from 27 to 90%, and multiple rib fractures occurred in 30% of patients. Patients who received CPR outside of a hospital even had a higher frequency in the incidence of rib fracture injuries (Ram et al., 2017).

This study also found that rib fractures occurred at significantly higher rates in older patients, those who received CPR for a longer duration of time than average, and those who had a non-traumatic out-of-hospital cardiac arrest. The rib fracture injuries were also associated with

a lower rate of return in spontaneous circulation for these patients. Additionally, sternal fractures resulted in an even lower rate in return of spontaneous circulation when compared to rib fractures occurring after CPR (Ram et al., 2017).

The incidence rate of cardiovascular and thoracic injuries occurring after CPR also varied based on the type of CPR performed. The prevalence ranged between 32 and 45% in patients receiving standard CPR, between 58 and 75% in patients receiving active compression-decompression CPR, and 100% in patients with both standard CPR and ACD-CPR (Ram et al., 2017).

This information shows that “life-saving” cardiopulmonary resuscitation still has risks that should be considered before initiating this procedure in patients undergoing cardiac arrest. While broken ribs typically heal without treatment, it can lead to complications of excess pain, vessel injury, and collapsed lungs (yale). The low return of spontaneous circulation occurring after rib fractures, in addition to the previously mentioned potential complications, shows that CPR is not always beneficial and should possibly be avoided in elderly patients at a higher risk for these injuries.

It is also significant that the incidence rate of cardiovascular and thoracic injuries in patients who received CPR and ACD-CPR was 100%. Based on this information, the potential of return in spontaneous circulation does not outweigh the definite occurrence of injury after initiation of this specific type of resuscitation. Since standard CPR had a lower incidence rate, this should always be used first, although still used with caution since an injury can occur.

Chronic Illness

Research has also shown that survival rates in patients receiving CPR varies based on their chronic illnesses, and these patients were less likely to survive until discharge. While 7.2% of CPR recipients without chronic illness were discharged and survived for at least 6 months, only 1.9% of patients with severe COPD and 2.% of patients with severe congestive heart failure were discharged from the hospital after receiving CPR and survived for at least 6 months. Additionally, less than 2% of overall patients who had a chronic disease and had received CPR survived for at least 6 months without rehospitalization (Stapleton et al., 2014).

Specifically, survival rate after receiving CPR is much lower in patients with malignancy, COPD, congestive heart failure, diabetes, and liver cirrhosis. The most notable statistics include 10.1% of patients with severe cirrhosis surviving until discharge, and 11.3% of patients with severe malignancy surviving until discharge after receiving CPR. These values are very low when compared to an overall survival rate of 17.1% and 17.3% survival rate for those without chronic illnesses (Stapleton et al., 2014).

This data shows that not all chronic illness patients receive the same benefits from cardiopulmonary resuscitation after a cardiac arrest. Although you cannot require a patient with chronic illness to sign a Do Not Resuscitate order with a physician, this option should be discussed and recommended with these patients to ensure that they understand their lower survival rate after receiving CPR.

Oncology Patients

Additional studies have been completed on the effects of CPR in oncology patients. These patients have lower rates of return of spontaneous circulation and survival to hospital discharge when compared to non-cancer patients receiving CPR. They even have a diminished

quality of life at discharge if they survive CPR, and many survive for a short length of time after hospital discharge (Giza et al., 2020).

Survival rates in patients after receiving CPR also vary based on different types of cancers. For example, the hospital discharge rate was 7.1% for those with solid tumors, but only 2% for patients with hematological malignancies. Additionally, the overall rate of discharge to home for patients who received out-of-hospital CPR was 4.9%, but 18% for patients with solid tumors and 12.5% for those with hematological malignancies (Giza et al., 2020).

This data shows that the decision of receiving a Do Not Resuscitate order should be individualized to each patient with cancer. Since patients with solid tumors responded to CPR better compared to different patients, physicians should change their CPR recommendations for patients based on their specific medical status. In Sweden, a physician has the unique ability to choose to request a DNR order for hematology patient, and the patient chooses to consent if possible (Pettersson et al., 2020). Although this is currently not a policy in the United States, this idea can be applied here by encouraging physicians to have more conversations with patients about their health status, their likelihood of surviving CPR, and the possibility of getting a DNR order with the patient's consent.

Additionally, it is important to note that there is an overall lower survival rate for cancer patients receiving CPR when compared to non-cancer patients. These patients should receive specific consideration by physicians when evaluating their health status and physical capability to survive CPR. Since 34.4% of cancer patients who survived CPR changed their code status to DNR (Giza et al., 2020), it is important to recognize that CPR is a very rigorous procedure that is not always desired by patients. This statistic should be discussed with patients while evaluating

the benefit of resuscitation with their physician because they should be educated that their body may feel worse if they have a spontaneous return of circulation after CPR.

Variation in Cultural Beliefs

Many observant Jews oppose DNR orders because they do not want to sacrifice a life too soon. During the time period known as *Gosses*, it is believed that the dying process should not be impeded as the person approaches death. However, some people believe that CPR could be beneficial during this stage and the patient could be effectively resuscitated (Edin, 2007).

This specific cultural concern can be applied to people of different cultures as they consider making a decision about receiving a DNR order. Some people may implement the belief of *Gosses* by deciding to avoid CPR when a person is close to death. This can be supported by other previously discussed arguments against CPR because certain illnesses cause a lower CPR survival rate in patients and can result in more damage, ruining their quality of life as they reach death.

Conclusion

Although CPR is still a commonly used procedure, it only has a low survival rate at 9.1%. It also has the common unwanted side effects of cardiovascular and chest wall injuries. The survival rate for patients receiving CPR is much lower among those with certain chronic illnesses, and elderly patients have a lower 5-year survival rate. While it would be very difficult to implement a policy to constantly avoid performing CPR on patients with specific risk factors for damage, it is important to consider these factors when evaluatin the request of a DNR order. Since not all patients receive the same healthcare treatments for specific conditions due to

variations in comorbidities, they should also receive the same consideration before receiving CPR.

References

Edin, M. G. (2007). *Cardiopulmonary resuscitation in the frail elderly: Clinical, ethical and halakhic issues*. The Israel Medical Association journal : IMAJ. https://pubmed.ncbi.nlm.nih.gov/17402332/

Giza, D. E., Graham, J., Donisan, T., Balanescu, D. V., Crommet, J., Botz, G., Gutierrez, C., Vidal, M., Mejia, R., & Iliescu, C. (2020, June 16). *Impact of cardiopulmonary resuscitation on survival in cancer patients: Do not resuscitate before or after CPR?* JACC. CardioOncology. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8352333/

Hiemstra, B., Bergman, R., Absalom, A. R., van der Naalt, J., van der Harst, P., de Vos, R., Nieuwland, W., Nijsten, M. W., & van der Horst, I. C. C. (2018, December). *Long-term outcome of elderly out-of-hospital cardiac arrest survivors as compared with their younger counterparts and the general population*. Therapeutic advances in cardiovascular disease. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6266245/

Pettersson, M., Hedström, M., & Höglund, A. T. (2020, July 31). *The ethics of DNR-decisions in oncology and Hematology Care: A Qualitative Study - BMC Medical Ethics*. BioMed Central. https://bmcmedethics.biomedcentral.com/articles/10.1186/s12910-020-00508-z

Ram, P., Menezes, R., Sirinvaravong, N., Luis, S. A., Hussain, S. A., Madadin, M., Lasrado, S., & Eiger, G. (2017, December 28). *Breaking your heart-a review on CPR-related injuries*. The American Journal of Emergency Medicine. https://www.sciencedirect.com/science/article/pii/S0735675717310653?casa_token=2NB2AxQCprYAAAAA%3AL0dn9wqpx7lx-xUHcz8B0fDKlQclYeCGTpv4MOk50R9Hnn8gv32TwUIcxxI_4fmuMl7wW0bNzkY

Rubulotta, F., & Rubulotta, G. (2013). *Cardiopulmonary resuscitation and ethics*. Revista Brasileira de terapia intensiva. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4031875/

Stapleton, R. D., Ehlenbach, W. J., Deyo, R. A., & Curtis, J. R. (2014, November). *Long-term outcomes after in-hospital CPR in older adults with chronic illness*. Chest. Retrieved March 26, 2023, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4219338/

Yale Medicine. (2022, October 29). *Rib fracture (Broken Rib)*. Yale Medicine. https://www.yalemedicine.org/conditions/rib-fracture