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Compression-Only Education as a Means to Increase Bystander CPR

Cardiac arrests occurring outside of a healthcare setting are the leading cause of death in our country.[1,2] More than 240,000 people in the United States experience out of hospital cardiac arrests (OHCA) each year.[3,4] According to the U.S. Health and Human Services (USHHS), of those experiencing OHCA, only 38.2% have cardiopulmonary resuscitation (CPR) performed by bystanders before emergency personnel arrive.[3] In order to increase the rate of bystander CPR and consequently reduce OHCA mortality, the USHHS developed the Healthy People 2020 (and now 2030) objectives to find "strategies to increase bystanders' willingness to do CPR".[1,5] One possible strategy would be to focus on the reasons why people are not performing CPR and tailor a population-specific curriculum.[6] Another strategy would be to promote education of a curriculum that is brief and widely available. The author proposes that compression-only CPR can achieve both of these goals. In this paper, we will look at the origins of CPR and its role in cardiac arrest. We will look at the data to expose the problems associated with low bystander CPR. We will look at compression-only CPR as a possible solution to this problem and compare it to traditional CPR. We will conclude our discussion by looking at current efforts promoting compression-only CPR and how we can use the current tools we have to achieve the goals set out by the HP 2030 objective.

CPR is the most important part of caring for someone in cardiac arrest. OHCA occurs in all ages and races but approximately 80% of people experiencing OHCAs are aged over 50.[3] Despite major technologic advances in medicine, CPR remains an integral part of OHCA outcomes.[7,8] According to Sasson et al. in a 30 year period systematic review and meta-analysis in 2010, survival from OHCA has not improved in almost three decades and concludes an estimated survival rate between 6.7% and 8.4% globally.[7] One of the reasons for such a low

survival rate is the lack of effective bystander CPR. Reviews of the data have shown more favorable survival rates in patients who receive CPR as well as better long term outcomes in those persons experiencing OHCA.[9–11] In order to address this problem I aim to bring information and educational resources about compression-only CPR as an equally effective alternative to traditional CPR with the benefit of low cost, simplicity and availability of educational materials. In selecting a target audience, I believe that all demographics may benefit from this presentation since everyone will have a family member, friend or know someone over the age of 50. To narrow down a group that may benefit the most from this presentation, I would also need to find a population that shows an interest in emergency preparedness and education so as to increase the effectiveness of education.[12] Therefore, to provide the most benefit I searched for an audience comprised of individuals who are non-medical civilians without advanced CPR training, have no limitations in performing CPR, reside in my community and show an interest in CPR education. I found that my city of Tualatin in Washington County, Oregon has a city funded Community Involvement Organization (CIO) that has a branch involved in emergency preparedness.[13] The CIO members are aged 16+ and include residents, businesses and property owners in the City of Tualatin.

CPR finds its roots in history with the inception of the American Heart Association (AHA) in 1924, initially comprised of 6 cardiologists from Chicago.[14] Two key components of CPR, namely rescue breathing and external chest compressions, were already being experimented with in cases of drowning and resuscitation.[15] It was not until the year 1963 that the AHA formally endorsed these life-saving actions for use in humans, in what we know today as CPR.[14] Through the decades since its inception, CPR has changed quite a bit through AHA guideline updates. These updates are meant to reflect the most current evidence on best practices

as they pertain to CPR. Guideline updates such factors as depth and rate of compression, or ratio of ventilation to compressions in CPR. Traditional CPR has always included some form of external chest compression combined with ventilation.[14,16] I was able to identify AHA guideline updates from 2010, introducing the novel idea of compression-only (Hands-Only™) CPR. The update states that untrained and trained rescuers should, at a minimum, provide chest compressions with the emphasis on "push hard and fast".[16] It seems that the AHA is aware that compression-only CPR was effective and that compression-only CPR performed in instances where bystanders would not have otherwise performed standard CPR provides some benefit. Although this was introduced in 2010, traditional CPR with rescue breathing is still the default curriculum and the preferred education for medically trained rescuers.

Compression-only CPR has evidence to its efficacy in resuscitation of OHCA victims and may be a way to increase the willingness of laypersons to perform CPR.[17,18] The basis of compression-only CPR comes from the idea that residual oxygen in the blood may provide adequate oxygenation so that rescuers can focus on quality compressions instead of manipulating airways (which may be challenging on some physiques). Evidentiary reinforcement was borne out in the literature looking at OHCA survival rates comparing CPR with and without ventilation. In a 2008 AHA Science Advisory, Sayre et al. reviews five human trials that show outcome equivalence of compression-only CPR to that of standard CPR.[11] The advisory continues to assert that compression-only CPR has the advantage of simplicity, early initiation and reduces barriers that would otherwise dissuade a bystander from giving mouth-to-mouth resuscitation.[11] More contemporary studies looking at methods to improve compression only CPR also assert it has been shown to be at least as effective as standard CPR in clinical trials.[18,19] I would argue that it is very difficult to unequivocally trial compression-only CPR against

traditional CPR due to many limitations, including logistical and ethical considerations. But the studies that have been done give merit to compression-only CPR in regards to OHCA outcomes. Next, we will explore the social and psychological barriers surrounding CPR.

It has been posited that the reasons for bystander hesitancy (infection, hygiene, physique, etc.) can be attributed to bias in how that data was collected.[6,20,21] Populations were surveyed by posing hypothetical questions regarding their willingness to perform CPR and what barriers they might have. Although potentially helpful, it removes the emergent and so-called System-1 thinking at play when faced with an OHCA. Swor et al. recognized this pitfall and performed a study that polled actual bystanders who witnessed OHCA.[20] They found that it was not physical characteristics, infection risk or hygiene that people claimed stopped them from giving CPR. Rather, the study found that the most frequent reason CPR was not performed was actually panic and lack of confidence. It may be that the lack of exposure and difficulty of current traditional CPR training is adding to the panic that persons feel when witnessing an OHCA. Although in the era post-COVID and rise in HIV cases, risk of infection may crop up as a contemporary reason not to give mouth-to-mouth, this study shed light on important social and psychological factors that we may be able to influence.

In order to overcome the panic and insecurity people feel when faced with an OHCA, more resources are needed to educate the public on the topic of resuscitation and to simplify the education. In order to inspire more confidence in potential layperson rescuers, it could be argued that we should discuss CPR more frequently and promote early education. Studies have shown that if exposed to CPR from a younger age, children developed a higher level of confidence in their skills and ability to perform CPR.[8,22] Another benefit of teaching CPR to children is the tangential exposure that will occur when the child brings that knowledge back home. Stroobants

et al. performed a study to find out if training schoolchildren would have an effect of people's attitudes toward CPR. The study found that those exposed to CPR education by schoolchildren had "a more positive attitude towards CPR".[23]

Another aspect that may lead potential rescuers to panic is lack of confidence in their ability to perform adequate CPR. Retention of CPR skills and therefore confidence during an OHCA may be improved by simplifying protocols and providing easy access to education. In a paper by Fanshan et al., volunteers who received repeated CPR training were compared to medical professionals (working in an ER) who have not received training within the last year.[24] The study resulted in improved quality and performance of CPR in the volunteers as compared to the medical professionals. In fact, studies have tried to quantify the deterioration time of CPR skills. In a study by Chamberlin et al., community volunteers showed a significant deterioration of skills within 6-9 months. Ventilation was the first skill to deteriorate and the study summed up the findings with: "chest compression can be taught acceptably well in a brief training session but are subject to some skill deterioration. Successful ventilation, however, is too difficult to teach to average volunteer".[25] Finally, a study by Roppolo et al. compared the long term retention of short (30 minute) training compared to traditional CPR training.[26] They found that shorter training was as effective as traditional training. To implement these findings I would argue that CPR training to the layperson should focus on repeat exposure, brevity and simplicity in order to inspire confidence and aid retention of CPR skills. In my opinion the best way to achieve this is to promote digital education of compression-only CPR.

There is a plethora of free and accessible digital education on compression-only CPR already available. These videos are short in duration and emphasize a couple key points, making them simple and available for repeated viewing. While some may argue that an in-person class

promotes better understanding though teaching on manikins, there are studies that show video instruction can be as effective as traditional in–person training.[19] In spite of equivalence, digital media also makes CPR available to those that would otherwise not take a traditional CPR class. A study by Tanigawa et al. showed that exposure to CPR training increased a bystanders likelihood to perform CPR and the quality of dispatcher-assisted CPR.[27,28] Another argument against digital media is teaching arrest identification via pulse check, a maneuver that is challenging in an emergent setting. Studies performed have shown that when bystanders over perform CPR, the effects are negligible compared to delay in CPR.[29]

Further benefit from this digital education is making training more accessible to the socioeconomically disadvantaged. In-person classes are subject to increased cost, needed time away from work or family and transportation challenges. Digital media is easier to access and may be able to reach demographics that are consistently under educated in CPR. Thus, digital media removes socioeconomic barriers that may determine who gets CPR training within a targeted population. A study by Uber et al. showed that the standard blanket approach to CPR training resulted in no appreciable impact on rates of bystander CPR.[30] Groups with lower bystander CPR showed no improvement and may need focused education efforts towards areas with higher rates of OHCA in order to increase the rate of bystander CPR.

It is evident to me that we have the tools necessary to achieve our goal of increasing bystander CPR. In this era of limitless information from the World Wide Web, we must be the bridge to that information for our communities. We must adapt the resources available and tailor the training to our audiences.[12] In fact, the City of Medford in the state of Oregon has taken the first steps towards this type of adaptive education by its CPR anytime program.[31] This program is designed to target larger audiences by providing the tools to teach compression-only CPR to

middle school students via a one-hour class and assigning them “homework” to then teach friends and family members. The CPR Anytime kits were designed to provide hands-on training with a manikin, are prepared in both English and Spanish, and be complemented by online content like videos FAQ sheets.[32–35] I believe this program to be the paradigm of CPR education going forward. It not only familiarizes young citizens with the idea of CPR, but provides multi-modality education on compression-only CPR that allows community members to take onus of their education through whatever means they find most helpful.

In conclusion, a compression-only CPR is not a novel idea. It has been studied extensively and has endorsements from the American Heart Association (AHA) and the American Red Cross (ARC). The evidence supports this practice as an equitable means for bystander CPR following OHCA.[11,19] We have a need for CPR education as the problem of OHCA affects all persons in all demographics.[1–4] Early CPR by bystanders has been identified as a “key link” in OHCA and showing as much as a four-fold increase in survival.[8,36] Early CPR is also responsible for improved long-term outcomes following OHCA.[10,36] We now have more widely available means to provide compression-only CPR education for little to no cost.[32–35,37] Training can be done remotely and does not come at significant expense of time or money to the trainee. In order to succeed in the Healthy People 2030 initiative to increase bystander CPR we must promote compression-only CPR education and awareness in a population focused way.[12]

My hope is that by speaking on this topic to my community members that already show an interest in emergency preparedness and community improvement, the message can start spreading to others. [13] The simplicity of compression-only CPR and availability of educational material can be the key to increase bystander intervention.

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