PERFORMANCE IMPROVEMENT

Nursing & Health Sciences Research Journal

Journal Access: https://scholarlycommons.baptisthealth.net/nhsrj/

Implementation of the Resuscitation Quality Improvement Program in a System of Hospitals: A Map for Success

Claudia Sabogal-Rodriguez, MPHM, MSN, RN, CEN; John Mouw, BS, PBT (ASCP)

ABSTRACT

Introduction: To prevent cardiopulmonary resuscitation (CPR) skills decay, the International Consensus on Resuscitation suggested retraining every three to six months. Current retraining practices nationwide exceed one to two years, suggesting that clinical staff's CPR skills are rarely at optimum proficiency. The Resuscitation Quality Improvement (RQI) program offers skills decay prevention through quarterly sessions. This manuscript addresses the challenges and opportunities of implementing the RQI program in a hospital system to increase CPR skills quality and cost-savings.

Purpose & Methods: This manuscript describes the challenges and opportunities of implementing the RQI program as a quality improvement initiative in a system of hospitals and serves as a guide for implementation at similar institutions considering the adoption of RQI-basic life support (BLS).

Results: Multiple successes and challenges were identified during the program implementation. Challenges included learning management system integration and RQI station damage. Successes included a 47% improvement in clinical staff's psychomotor CPR skills (i.e., compressions, ventilation, and chest compression fraction) and a $1.6 million cost avoidance for the system of hospitals. The RQI program implementation significantly increased the psychomotor skills of the RQI users, satisfaction, staff productivity, and cost avoidance.

Discussion: Although implementing the RQI in a system of hospitals brought many challenges, the overall improvement in staff CPR skills and cost-avoidance superseded the cost-benefit analysis and justified its implementation. Implementing this program promotes superior CPR skills that could improve patient outcomes.

Keywords: Resuscitation Quality Improvement, RQI, Implementation, BLS

INTRODUCTION

The American Heart Association (AHA) and the International Consensus on Resuscitation (ILCOR) have reviewed research literature investigating time from initial resuscitation training to degradation of skills and optimum time for retraining (Cheng et al., 2020). They found that practice-based education allows mastery achievement and fosters retention in 90% of the learners two months after the training (Cheng et al., 2020; Cheng et al., 2018). While the past three guideline updates did not define an interval for retraining, all updates supported that degradation of cardiopulmonary resuscitation (CPR) skills begins at three months and worsens at six and 12 months later. While a direct correlation between CPR skills degradation and patient outcomes has not been studied, evidence shows high-quality CPR "is the most important

lifesaving intervention for a patient in cardiac arrest" (Panchal et al., 2020, p. 379). The latest AHA and ILCOR 2020 guidelines state, "It is reasonable that individuals who are likely to encounter a cardiac arrest victim perform more frequent manikin-based retraining (Class IIa, LOE C-LD1)" (Cheng et al., 2020, p. 554). The AHA recognizes the following five psychomotor components of High-Quality CPR (HQCPR): 1) minimize interruptions in chest compressions, resulting in a chest compression fraction (CCF) greater than 80%; 2) compression rate of 100 to 120 per minute; 3) maintain a compression depth of at least 50 mm (about 1.97 in) in adults and one-third anterior-posterior depth in infants; 4) no residual leaning between compressions; and 5) avoid excessive ventilation with only minimal chest rise and a rate of fewer than 12 breaths per minute (Meaney et al., 2013; Magid et al., 2020; Panchal et al., 2020). Research evidence suggests that CPR-related psychomotor skills decay rapidly, rendering the two-year re-certification frequency insufficient for skills maintenance. The AHA and Laerdal Medical released the Resuscitation's Quality Improvement Program (RQI) and formed RQI Partners to address skills decay (AHA, 2020b). The RQI Program offers an innovative approach to resuscitation education through low-dose, high-frequency training and immediate performance feedback. The program requires completion of quarterly assignments with two main components: cognitive assessment and skills performance. Each RQI session is comprised of two parts—a CPR skills practice session (4-10 minutes) followed by a brief cognitive session (less than four minutes) grounded in adaptive learning principles. During the skills session, participants are provided real-time audio/visual feedback, and their performance data is archived in a database to track and document individual student performance.

Financial Impact of Bi-annual Basic Life Support Training

Traditional basic life support (BLS) courses last approximately four hours. These traditional courses are held at three regionalized locations within our healthcare system of 11 hospitals and numerous ambulatory centers spanning 170 miles in South Florida, requiring the staff to travel substantial distances, thus decreasing productive time and staff satisfaction. Furthermore, the organization incurs the cost for books, course materials, and instructor fees. However, the most significant expenditure is the additional salary-related cost associated with the healthcare professionals' required attendance of the four-hour BLS class (AHA, 2020a). To prevent CPR skills degradation, increase skills proficiency, and decrease costs associated with BLS classes, our healthcare system decided to replace the traditional four-hour, bi-annual BLS classes with the low-dose, high-frequency RQI program.

Literature Review

Two retrospective studies conducted in the United States outlined the rollout of the RQI program in single hospitals. The first study focused on evaluating the implementation of the RQI program in a community hospital, emphasizing the psychomotor indicators provided by the RQI program analytics. The results of this quantitative study showed a significant improvement in healthcare providers' psychomotor CPR skills performance, a reduction in the number of attempts needed before successfully demonstrating skills competency, increased staff satisfaction, and a 47.4% reduction in BLS education-associated costs (Dudzik et al., 2019). The second study focused on the impact of the RQI program on the participants' psychomotor skills. The results of this study showed significant differences in compression and ventilation skills performance compared with traditional bi-annual training, suggesting the RQI program is an effective method to train BLS providers (Klacman et al., 2021).

https://scholarlycommons.baptisthealth.net/nhsrj/vol6/iss1/11
DOI: 10.55481/2578-3750.1175

Moreover, a descriptive study examining the implications of RQI within a radiology department highlighted information technology (IT), resistance to change, and education on equipment as the main challenges in implementing the RQI program (Laukhuf & Akrish, 2021). These results suggest that careful planning, multi-channel communication, and periodic re-education are essential for successful implementation in the radiology setting. The results also showed cost-savings of approximately $250,000 within the first year of RQI implementation. Additionally, in a cohort study conducted in the United Kingdom, Kuyt et al. (2021) compared the effects of RQI skills performance in 1,861 healthcare providers across four independent hospitals. The results showed a significant improvement in participants' overall psychomotor skills and a marked variance and decline in assignment completion compliance over time across all sites.

Although evidence on the impact of RQI is abundant, literature on the implementation process, including the challenges and opportunities of the RQI program in a system of hospitals is sparse. Therefore, the purpose of this paper is to describe the implementation process of the RQI program across a system of hospitals, including the challenges and opportunities.

METHODS

The RQI program was implemented in our healthcare system comprising 11 hospitals and multiple outpatient facilities geographically located in three counties; nine are acute care hospitals, and two are community hospitals. The number of beds in these hospitals ranges between 17 and 948. The implementation timeframe was November 1, 2016, to April 1, 2022, consisting of three phases: planning, pilot, and system integration.

Program Planning Phase: Cost-Benefit Analysis

In June 2015, several Florida hospitals and universities were invited to evaluate a new AHA concept for resuscitation quality improvement. Five resuscitation education leaders within our healthcare system were designated as RQI reviewers. They evaluated the quality, content, and costs of the program. The evaluation revealed that the RQI program met all expectations related to access, efficiency, and user satisfaction. However, the program was missing the essential two-rescuer skills competency component. The AHA adjusted its program six months later to include assessing the missing skills.

The evaluation also revealed the need for staff to have easy access to RQI stations; therefore multiple stations were strategically placed within each hospital. The number of RQI stations required was calculated based on the number of users at each entity following a 250 user-to-station ratio. The only unknown number of required stations was for the outpatient and ambulatory centers because the number of users was significantly lower at each non-hospital location. The original RQI stations were not sufficiently mobile enough to travel between centers; therefore, staff from multiple centers would have to travel to a single location. This added travel time created a cost avoidance gap that was presented at an AHA RQI Advisory Board meeting, where a more portable version of the RQI system was suggested. This adaptation resolved the outpatient and ambulatory center cost avoidance gap.

In 2018, a cost avoidance analysis was completed, which supported leadership acceptance of moving from traditional (two-year cycle) CPR classes to the RQI program. The analysis factored in reduced instructor fees, books and class materials costs, and the average salary for licensed and non-licensed clinical professionals while away from the patient's bedside to complete RQI training (Table 1). This investigation was used to conduct a risk-benefit analysis, which was presented to executive and clinical leadership. It was determined that pilot implementation was needed to validate

Table 1

2018 BLS RQI Implementation Cost Analysis

Current State – Live BLS Courses			
	Annual Participants	Annual Instructors	Total
Number of individuals	5900	983	
BLS Duration Hours	4	4	
Mock Code Duration Policy in hours	0.3	0.3	
Avg Hourly Compensation (includes wages & benefits)	$44	$40	
Books & Materials	$12,027	$0	
BLS Live Annual Expense	$1,135,690	$169,133	$1,304,823
Future State – RQI & 90% Reduction in BLS Live Courses			
	Annual Participants	Annual Instructors	Total
Number of individuals	590	98	
BLS Duration Hours	4	4	
Mock Code Duration Policy in hours	0.3	0.3	
Avg Hourly Compensation (includes wages & benefits)	$44	$40	
Books & Materials	$1,203	$0	
BLS Live Annual Expense	$113,569	$16,913	$130,482
Annual RQI Fee*	$578,200*	N/A	
Total Annual Cost	$691,769	$16,913	$708,682

the projected return on investment and to establish the program's viability in the healthcare system (Table 2).

Several challenges were identified during the planning phase. System testing revealed the need to integrate the existing learning management system (LMS), extensive network testing for compatibility, web-based course delivery files, internet browser, and security protocols. The need for multiple changes in IT processes was also identified, including deployment of the Microsoft Chrome browser and multi-factor authentication validation access.

The internal employee CPR education policy needed modification to ensure compliance with the new RQI program. The result was an updated policy that complied with certification requirements and met Human Resources recommendations for entities sharing staff and acquiring new hires. Preparing for the pilot project required verification that all direct patient care healthcare providers at the pilot site had valid BLS cards with expiration dates within six months at most. Clinical educators and other experienced clinical employees were identified as superusers and trained to facilitate the pilot site's program rollout. The superuser role was devised as a support-

https://scholarlycommons.baptisthealth.net/nhsrj/vol6/iss1/11
DOI: 10.55481/2578-3750.1175

Table 2

RQI Return on Investment Cost Analysis: Three-Year Expense Reduction Projection

	Year 1	Year 2	Year 3	3-Year Total
3-Yr Live BLS Course Expense	$1,304,823	$1,304,823	$1,304,823	$3,914,469
3-Yr RQI + Reduced Live BLS Course Expense	*$889,502	$708,682	$708,682	$2,306,867
Expense Reduction	$415,321	$596,141	$596,141	$1,607,602

Note. *Year 1 RQI and Live Course Expense Includes $180K Startup Expense (RQI Fee per User: $49, Required number of RQI Licenses: 11,800, Annual RQI Fee $578,200)

ing role to assist staff with basic questions regarding RQI program access, use, and troubleshooting.

When the RQI project was presented in a meeting of the healthcare system's chief nursing officers, they elected a single hospital as the pilot location. The selected hospital had 203 patient rooms for adult medical and surgical services and 747 users that were direct patient care providers.

Pilot Phase

The pilot phase began on July 1, 2018. The 747 users of the RQI program were required to complete quarterly assignments to maintain their BLS certification. The pilot stage was projected to last one year. However, a series of challenges extended the pilot phase until June 30, 2020. These challenges included the need for RQI Partners to redesign the program delivery, the transition into the redesigned platform (the RQI-One Stop platform), and the correction of equipment design flaws.

The new RQI-One Stop platform allowed seamless authentication of logging credentials, simplifying the access for the end user. Multiple modifications in the RQI-One Stop platform allowed the elimination of duplicate accounts, allowed users to modify their demographics, solved issues with compliance reports and completion errors, and facilitated the integration of program completion into the LMS. As a result, new processes for uploading demographics and compliance report feedback were devised, reducing the staffing required for system operation.

The RQI Partners increased customer support to include after-business hours and holidays to prevent workflow disruption. They also developed a notification process for downtime reporting and planned system upgrades. Finally, equipment design flaws were identified, resulting in a new adult manikin model, a redesigned RQI machine laptop support arm, an updated hub design, and the re-incorporation of RQI-owned laptops that fit the elbow support.

An evaluation of the outcomes in the pilot site revealed improved BLS skills competencies (from 75.5% in the first quarter to 94.5% at the end of the pilot), higher levels of staff satisfaction (86.7%), and a compliance rate of 99%. While the regained productive hours were substantial at 1,494 hours, the initial RQI startup fees and program planning costs resulted in minimal cost avoidance for this single hospital-limited pilot and were not provided here. Due to the calculated long-term cost avoidance and positive outcomes in the staff's BLS skill competencies at the pilot site, the decision was to proceed with system rollout once the new RQI machine design became available.

System Integration

The system integration of RQI was initiated on July 1, 2020, followed by a staggered rollout to each of the healthcare system's entities ending on January 1, 2022. Staggered rollout was conducted quarterly based on the entities' sizes and geographic locations. By April 30, 2022, all the RQI-adopted entities were included in the RQI program, with approximately 13,000 users. Before each entity integration, clinical educators and other experienced clinical employees were selected and trained as superusers to facilitate the program rollout. Additionally, a walkthrough for machine placement was conducted at each entity. Entity administrators were appointed for compliance reporting and program coordination.

Foreseen challenges to the system integration were mitigated, such as modifying the system resuscitation education policy to include entities as they adopted the RQI program. However, as with all significant endeavors, challenges were discovered. There were system network configuration issues concerning the building infrastructure during the individual entity rollouts. Among these was a weak Wi-Fi signal at some of the original machine placement locations identified during the entity walkthroughs with administrators. The solution was to relocate the machine where the signal was strong or upgrade to cellular-equipped laptops connected to an external carrier network. The implementation of an eCard and e-Credential retrieval process for users who left the hospital organization had to be developed, and RQI partners implemented a solution to the hospital system's internal practice of recycling email. Figure 1 illustrates the complete timeline of the RQI program rollout.

PROGRAM IMPLEMENTATION EVALUATION FINDINGS

Using the analytics module in the RQI program, we identified that implementing this program resulted in a 47% overall increase in CPR skill performance. The CPR skill performance constantly increased by 11.4% per quarter until leveling at 96.8% at some entities and 98% at others. Staff verbalized they preferred using RQI instead of going to the traditional BLS class due to the stations' convenience, the elimination of class availability and scheduling constraints, and increased skills confidence. Transitioning from the traditional four-hour CPR training every two years to eight quarterly 15-minute activities in the same two years resulted in a two-hour reduction of time spent training and away from direct patient care activities. Staff productivity increased by 12% by reclaiming two hours of productive time per employee per year. During the three years that RQI has been used in the hospital system, a cost avoidance of $1,607,602 has been noted. The general overview of the program implementation findings can be seen in Table 3.

Comparable results were found in other studies, supporting the increase in the psychomotor skills of the RQI users (Dudzik et al., 2019; Klacman et al., 2021; Kuyt et al., 2021; Laukhuf & Akrish, 2021). Furthermore, the findings related to staff satisfaction are similar to those of previously published research studies (Kuyt et al., 2021; Laukhuf & Akrish, 2021). Other studies have found a significant cost avoidance with the implementation of the RQI program, which reinforces our findings (Dudzik et al., 2019; Laukhuf & Akrish, 2021).

DISCUSSION

The data for this program analysis suggested improved skills among students who train more frequently and cost avoidance resulting from implementing the RQI program. This increase in skill performance competency is expected to translate into the clinical arena. Further research is necessary to investigate this expectation by comparing the resuscitation event performance quality before and after the implementation. Difficulties in the implementation process involved

https://scholarlycommons.baptisthealth.net/nhsrj/vol6/iss1/11
DOI: 10.55481/2578-3750.1175

Figure 1

BLS RQI Timeline: From Concept to Reality

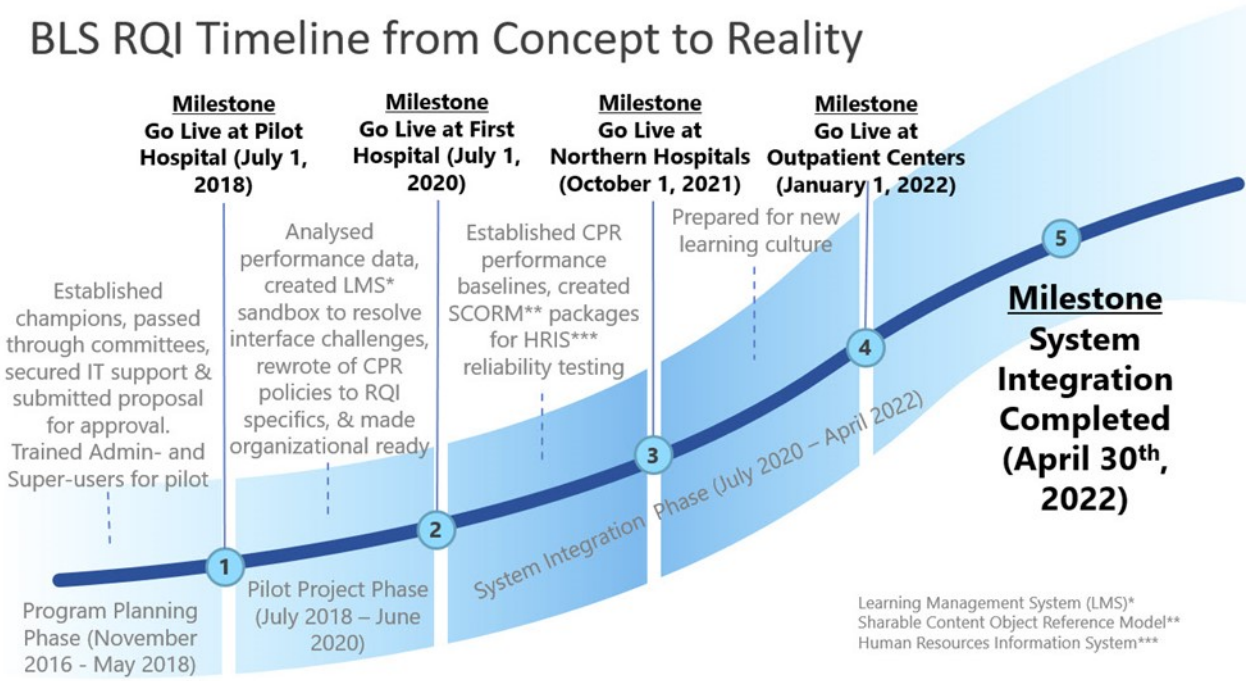

Table 3

RQI Program Implementation Outcomes

	Pre-Implementation	Post Pilot	Post-implementation
Productivity Hours Reclaimed	0	1,494	24,044
Adult/child compression median scores	62	94	97
Adult/child ventilation median scores	46	94	98
Infant compression median scores	43	94	96
Infant ventilation median scores	48	96	96
Overall median scores for skill performance	49.8	94.5	96.8
Expense Reduction	$0	N/A	$1,607,602

limited user support, IT-related concerns, equipment, policy management, human resources, RQI Partners customer support, compliance data discrepancy, and integration of the RQI system with the institution's LMS platform. Any institution that plans to adopt the RQI program must acknowledge and consider these difficulties. This recommendation aligns with Kuyt et al. (2021), which indicates the need for further assessment of the available resources and infrastructure before implementing RQI in an institution.

This paper presents a guide for other institutions that want to implement RQI-BLS, presenting a detailed description of the factors to consider during the planning and rollout stages for successful implementation. The interventions and process adjustments for implementing the RQI program are unique to our system of hospitals. Future research is needed to measure the program's effect on and relationships between staff's skill competency, resuscitation quality, and incidence of IHCA.

CONCLUSION

The RQI program implementation increased the psychomotor skills of the RQI users, staff satisfaction, productivity, and cost avoidance. Although implementing the RQI in a system of hospitals brought many challenges and opportunities, the overall quality improvement in resuscitation skills among the staff and the cost-avoidance resulting from implementing the RQI program superseded the cost-benefit analysis and justified its implementation. The Joint Commission (TJC, 2021) acknowledged the varying survivability of IHCA within hospitals and addressed the quality of hospital personnel training as a linked factor when revising standards on resuscitation care. It is unknown if increased skill performance will translate into clinical practice and improve survivability from IHCA. However, the TJC's interest suggests the need for further studies on this topic.

DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

AUTHORS

Claudia Sabogal-Rodriguez, MPHM, MSN, RN, CEN, Manager Resuscitation Education, Baptist Health Academics, Miami, FL, US. Correspondence regarding this paper can be directed to: ClaudiaRo@baptisthealth.net

John Mouw, BS, PBT (ASCP)
Director Simulation and Resuscitation Education, Baptist Health Academics, Miami, FL, US.

REFERENCES

American Heart Association. (2020a). *Basic life support: Provider manual*.

American Heart Association. (2020b). *RQI program overview*. https://cpr.heart.org/-/media/CPR-Files/Courses-and-Kits/RQI/RQI-Program-Overview.pdf

Cheng, A., Magid, D. J., Auerbach, M., Bhanji, F., Bigham, B. L., Blewer, A. L., Dainty, K. N., Diederich, E., Lin, Y., Leary, M., Mahgoub, M., Mancini, M. E., Navarro, K., & Donoghue, A. (2020). Part 6: Resuscitation education science: 2020 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation*, *142*(16 Suppl 2), S551–S579. https://doi.org/10.1161/CIR.0000000000000903

https://scholarlycommons.baptisthealth.net/nhsrj/vol6/iss1/11
DOI: 10.55481/2578-3750.1175

Cheng, A., Nadkarni, V. M., Mancini, M. B., Hunt, E. A., Sinz, E. H., Merchant, R. M., Donoghue, A., Duff, J. P., Eppich, W., Auerbach, M., Bigham, B. L., Blewer, A. L., Chan, P. S., & Bhanji, F. (2018). Resuscitation education science: Educational strategies to improve outcomes from cardiac arrest: A scientific statement from the American Heart Association. *Circulation*, *138*(6), e82–e122. https://doi.org/10.1161/CIR.0000000000000583

Dudzik, L. R., Heard, D. G., Griffin, R. E., Vercellino, M., Hunt, A., Cates, A., & Rebholz, M. (2019). Implementation of a low-dose, high-frequency cardiac resuscitation quality improvement program in a community hospital. *The Joint Commission Journal on Quality and Patient Safety*, *45*(12), 789–797. https://doi.org/10.1016/j.jcjq.2019.08.010

Klacman, A., Barnes, D., & Wang, J. (2021). The effects of a novel quarterly cardiopulmonary resuscitation training program on hospital basic life support providers' cardiopulmonary resuscitation skill performance. *Journal for Nurses in Professional Development*, *37*(3), 131–137. https://doi.org/10.1097/NND.0000000000000727

Kuyt, K., Mullen, M., Fullwood, C., Chang, T. P., Fenwick, J., Withey, V., McIntosh, R., Herz, N., & MacKinnon, R. J. (2021). The assessment of a manikin-based low-dose, high-frequency cardiac resuscitation quality improvement program in early UK adopter hospitals. *Advances in Simulation*, *6*(1), Article 14. https://doi.org/10.1186/s41077-021-00168-y

Laukhuf, G., & Akrish, K. (2021). RQI ®—The resuscitation quality initiative in radiology. *Journal of Radiology Nursing*, *40*(3), 232-238. https://doi.org/10.1016/j.jradnu.2021.04.003

Magid, D. J., Aziz, K., Cheng, A., Hazinski, M. F., Hoover, A. V., Mahgoub, M., Panchal, A. R., Sasson, C., Topjian, A. A., Rodriguez, A. J., Donoghue, A., Berg, K. M., Lee., H. C., Raymond, T. T., & Lavonas, E. J. (2020). Part 2: Evidence evaluation and guidelines development: 2020 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation*, *142* (16 Suppl 2), S358–S365. https://doi.org/10.1161/cir.0000000000000898

Meaney, P. A., Bobrow, B. J., Mancini, M. E., Christenson, J., de Caen, A. R., Bhanji, F., Abella, B. S., Kleinman, M. E., Edelson, D. P., Berg, R. A., Aufderheide, T. P., Menon, V., Leary, M., CPR Quality Summit Investigators, American Heart Association Emergency Cardiovascular Care Committee, & Council on Cardiopulmonary, Critical Care, Perioperative and Resuscitation. (2013). Cardiopulmonary resuscitation quality: Improving cardiac resuscitation outcomes both inside and outside the hospital: A consensus statement from the American Heart Association. *Circulation*, *128*(4), 417–435. https://doi.org/10.1161/cir.0b013e31829d8654

Panchal, A. R., Bartos., J. A., Cabañas, J. G., Donnino, M. W., Drennan, I. R., Hirsch, K. G., Kudenchuk, P. J., Kurz, M. C., Lavonas, E. J., Morley, P. T., O'Neil, B., Peberdy, M. A., Rittenberger, J. C., Rodriguez, A. J., Sawyer, K. N., & Berg, K. M. (2020). Part 3: Adult basic and advanced life support: 2020 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. *Circulation*, *142*(16 Suppl 2), S366–S468. https://doi.org/10.1161/cir.0000000000000916

The Joint Commission. (2021). *Resuscitation standards for hospitals* (R3 Report Issue 29). https://jointcommission.org/standards/r3-report/r3-report-issue-29-resuscitation-standards-for-hospitals