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A Hybrid Education Model to Deliver Cardiovascular Nursing Education During the COVID-19 Pandemic: A Quality Improvement Study

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Introduction

The coronavirus (COVID-19) pandemic disrupted the traditional in-person training and learning opportunities for new hire nurses. Social distancing requirements were implemented to reduce COVID-19 transmission.³ Nursing education had to suddenly shift to a virtual format using new techniques to deliver education remotely in an engaging and comprehensive manner.² Even during this disruption, orientation

for new nurse hires needed to be comprehensive, thorough, multimodal, and use evidence-based nursing practice. Nursing orientation also must validate that newly hired nurses have the knowledge, skills and attitude to be able to provide safe, independent nursing care, a Joint Commission standard.⁷

A combination of asynchronous and synchronous learning methods can be used to deliver education. Asynchronous learning is self-guided education to be completed at the learner's pace and can include reading, watching videos or completing online modules.⁸ Synchronous learning provides the learner with education and the opportunity to communicate with the instructor during a specific timeframe.⁸ When combined, the asynchronous and synchronous learning methods are called a blended or hybrid

classroom.⁸ Hybrid learning has shown to be effective and beneficial in health professions.⁵ The purpose of this project was to deliver high quality, engaging education remotely to newly hired cardiology nurses utilizing asynchronous and synchronous learning techniques while maintaining social distancing.

Background

Newly hired intensive care (ICU) and progressive care (PCU) nurses attend a series of classes called Cardiac Boot Camp facilitated by the Cardiovascular Center Clinical Nurse Specialists (CVC CNS) team. The purpose of Cardiac Boot Camp is to lay the foundation for nurses to provide competent, safe, and knowledgeable nursing care to a variety of cardiac patient populations. It is required that all new nurses attend regardless of

Table 1. Pre-Pandemic Table of Cardiac Boot Camp Class Overview

Cardiac Boot Camp Series		
Class No.	Class Title	Class Topics
1	Introduction to Hemodynamics	Hemodynamic Concepts, Pressure Line Waveforms (Arterial Blood Pressure & Central Venous Pressure), Pacemaker Concepts, Vasoactive Medications
2	Advanced Hemodynamics Note: Attended by ICU Nurses Only	Hemodynamic Alterations And Derangements, Arterial Derived Hemodynamics, Vasoactive Medication Case Studies, Pacemaker Case Studies, Pulmonary Artery Catheter Waveform Interpretation
3	Myocardial Infarction & Heart Failure	12-Lead Ekg Interpretation, Acute Coronary Syndrome, Arterial Closure Devices, Heart Failure Management, Heart Transplant, Targeted Temperature Management
4	Ventricular Assist Device & CT Surgery	Ventricular Assist Device Review, Heartware & Heartmate Vad Device Review, Cardiac Surgery, Endovascular Aortic Repair, Transcatheter Aortic Valve Replacement, Lumbar Drain
5	Pulmonary	Pulmonary Hypertension, Chronic Thromboembolic Pulmonary Hypertension (Cteph), Pulmonary Thromboendarectomy, Balloon Pulmonary Angioplasty, Prostacyclin Nursing Management, Lung Transplant, Oxygen Management



The CVC CNS Team from left to right: Rahel Bahru, Daniel Pollack, Khrizna Chong

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Daniel Pollack, MSN, APRN, ACCNS-AG, CCRN is a Clinical Nurse Specialist with Nursing Education, Development & Research. Daniel worked as a critical care nurse for 8 years before becoming a Clinical Nurse Specialist. He has experience working not only with the cardiac patient population, but also neuro, trauma, and general surgical patient populations. Daniel has worked at UC San Diego Health for the past 3 years for the cardiovascular service line.

Khrizna Chong, MSN, RN, CNS, CCRN, CMC-CSC is a Clinical Nurse Specialist with Nursing Education, Development & Research. Khrizna has worked extensively with cardiovascular patients including heart failure, heart transplants, cardiac surgery and cardiac devices for 17 years as a critical care nurse, then as a Clinical Nurse Specialist. Khrizna has worked for UC San Diego Health for the past 11 years.

their previous experience. Attendees range from new nurse graduates and novice nurses to experienced nurses. Cardiac Boot Camp education topics include cardiac surgery, post pulmonary thromboendarterectomy (PTE), pulmonary hypertension, lung transplant, heart transplant, and ventricular assist devices. Topic speakers include physicians, nurse practitioners, pharmacists, clinical nurse specialists, and clinical nurse educators with expertise in their respective fields. Cardiac Boot Camp consists of 5 classes and typically 3-4 series are held over the course of a calendar year (Table 1).

Prior to the pandemic, each Cardiac Boot Camp class was held in-person for eight hours. The agenda for each class was driven by the required education topics. Cardiac Boot Camp offered didactic and hands-on learning opportunities. Some classes afforded the nurse attendees the opportunity for hands-on skill practice with arterial pressure lines, pulmonary artery catheters, ventricular assist devices, and prostacyclin medication pumps (Table 2).

Table 2. Pre-Pandemic Table of Cardiac Boot Camp Class Overview

Introduction To Hemodynamics Example Agenda		
Topic	Method Of Education	Minutes Allotted
Welcome & Ice Breaker		15
Cardiac Anatomy & Physiology	Lecture	60
Introduction into Hemodynamics	Lecture	120
Arterial Line Waveforms	Lecture	30
Pulmonary Artery Catheter Management	Lecture	45
Pressure Tubing Review	Skills Practice	30
Pacemakers	Lecture	45
Vasoactive Drug	Lecture	90
Pressure Waveform Review	Case Studies	15

Boot Camp Redesign Objective

On March 19, 2020, the Governor of California issued a stay-at-home order which included closing the hospital to non-clinical staff and ceasing of all in-person events, including education.¹ This prompted a quick transition to provide the entire Spring 2020 Cardiac Boot Camp series virtually. The first online series started on March 24, 2020, and concluded May 18, 2020. All content for the classes in the series was delivered synchronously using Zoom. This method caused numerous challenges. In the virtual environment, the instructors had difficulty gauging participant understanding of the material being taught with the lack of quality eye contact and body language cues. It was anecdotally reported that nurse attendees struggled to maintain attention during class and were hesitant to participate. After this series of classes, a Plan-Do-Study-Act (PDSA) model was utilized to improve the delivery of education while physical distancing requirements were still in place.

Methods

In preparation for the Fall 2020 Cardiac Boot Camp series, the CVC

CNS team used the PDSA model (Figures 1 & 2) to develop a hybrid learning model utilizing asynchronous and synchronous learning techniques. The eight-hour course was divided into four hours of asynchronous education and four hours of synchronous learning with the instructor to validate knowledge and answer questions. To build a curriculum for asynchronous learning, the CVC CNS team curated articles, book chapters, and videos for each class topic. The CVC CNS team provided the assigned asynchronous reading and videos to nurse attendees through Microsoft Teams™ in a virtual classroom. The nurse attendees were allotted two weeks before class to review at their own pace.

Attendees were assigned a quiz to test their knowledge of the asynchronous content with a minimum pass rate of 80% to validate knowledge acquisition on the asynchronous education content. Time to complete the asynchronous content was constructed to ensure nurses did not exceed four hours to avoid overtime.

After completing the asynchronous content, the nurses attended a 4-hour class delivered virtually over Zoom (Table 3). The education delivered in

these sessions was adapted to emphasize or expand on the asynchronous content. During the synchronous class sessions, the students were able to demonstrate comprehension and application of the content and the instructors were able to evaluate whether learning objectives were met in real time. Since it can be difficult to maintain attention and interest over virtual platforms, the synchronous content was designed to be engaging and participatory. One way that this was achieved was by creating numerous case studies designed to be reviewed in teams and discussed collaboratively. Additional tools like PollEverywhere (polleverywhere.com) and Kahoot! Learning games (kahoot.com) were used to engage with learners and assess understanding.

Results

At the conclusion of each class, attendees evaluated the class based on the established objectives. The attendees scored each objective statement on a 4-point scale from 1 (poor) to 4 (outstanding). The class evaluations in the online hybrid learning series were compared to a pre-pandemic class series in the winter of 2019 to assess if the hybrid class series was still meeting the

Figure 1. PDSA Cycle #1

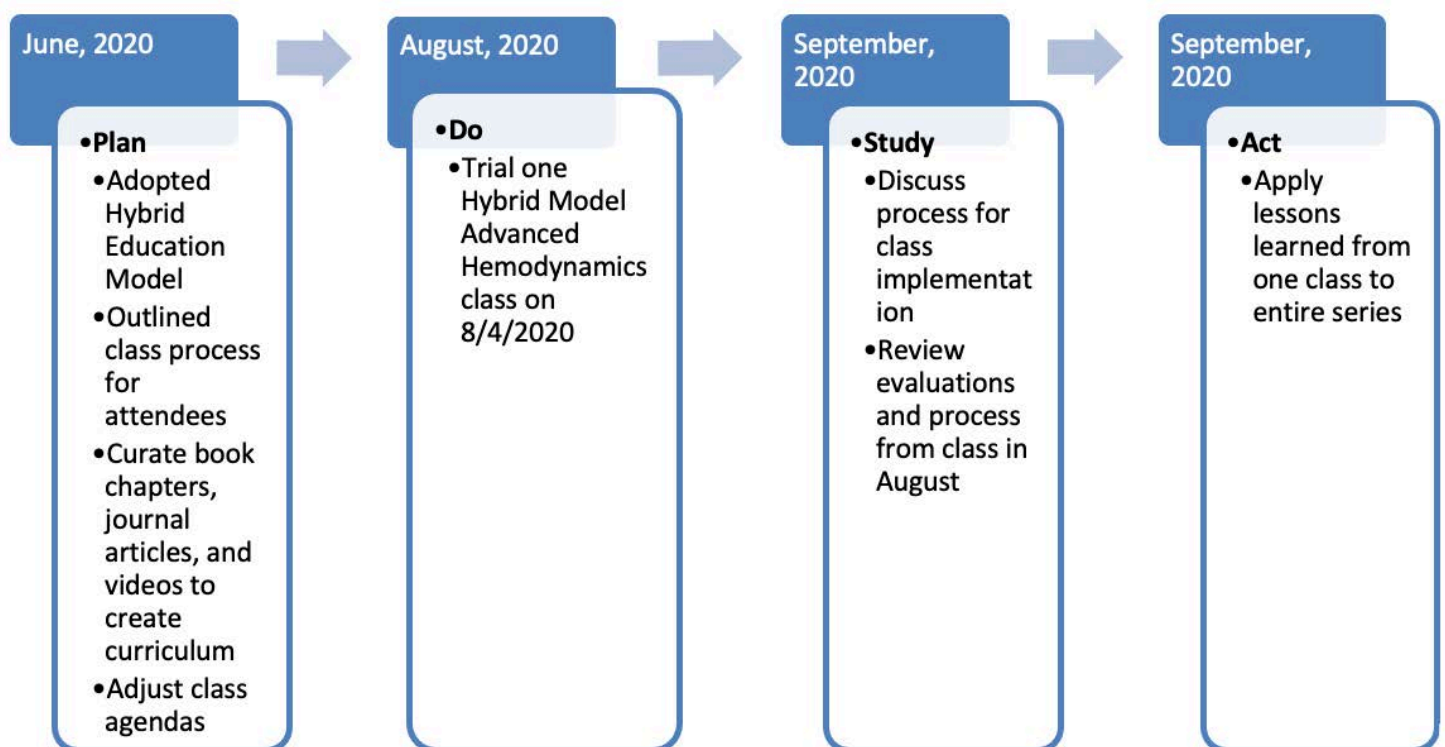


Figure 2. PDSA Cycle #2

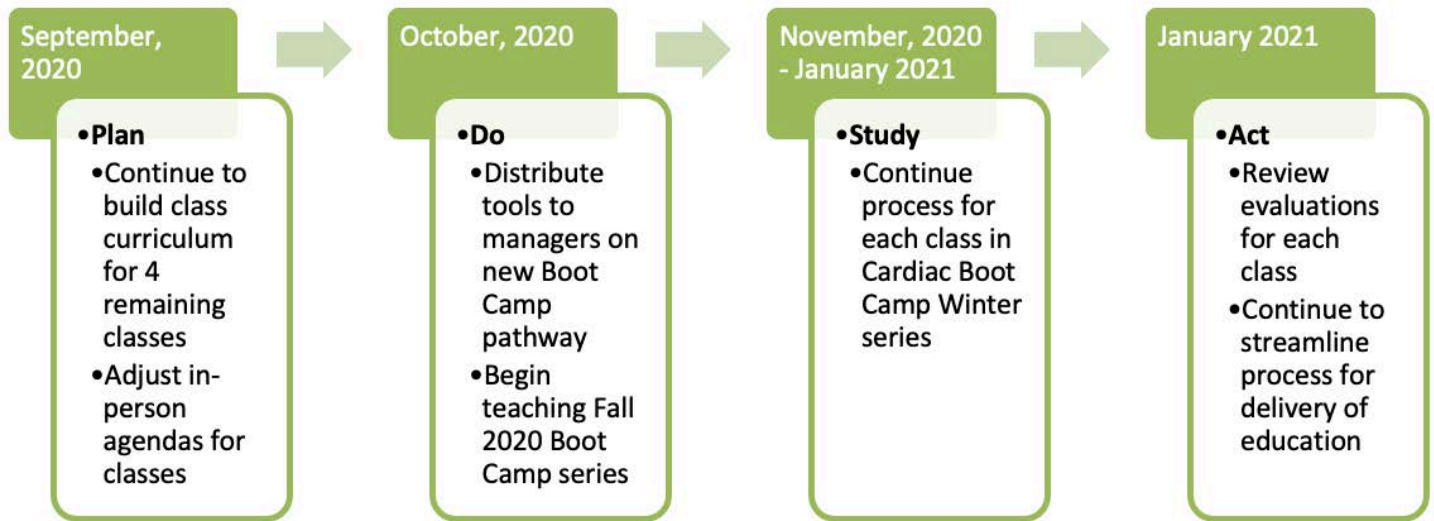


Table 3. Example Post-Pandemic Agenda

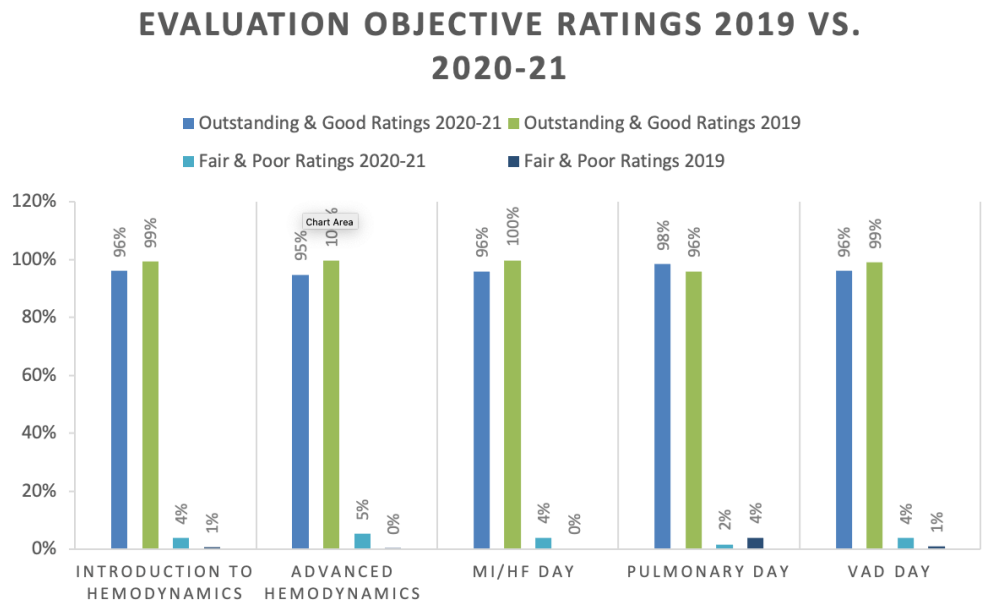
Asynchronous Learning For Introduction To Hemodynamics		
Topic	Readings	Videos
Cardiac Anatomy and Physiology	Book Chapter on Normal Hemodynamics (18 pages)	Heart Pumping Video (1 Minute)
Introduction into Hemodynamics	Book Chapter on Neurohormonal Regulation of the Heart (20 pages)	Cardiac Cycle Video (4 Minutes)
Pressure Waveform Interpretation	Article on Basic Hemodynamic Monitoring (23 pages)	Arterial Line Set-Up Video (5 minutes)
	Article on Hemodynamic Monitoring with Arterial Lines (12 pages)	Arterial Line Calibration Video (4 minutes)
Pacemakers	Article on Temporary Cardiac Pacing (7 pages)	Heart Conduction Review Video (1 minute)
		Pacemaker Online Module (6 minutes)
Vasoactive Drugs	Book Chapter on Vasopressor Agents (13 pages)	Vasopressor Review Video (24 minutes)
SYNCHRONOUS LEARNING FOR INTRODUCTION TO HEMODYNAMICS		
TOPIC	METHOD OF EDUCATION	MINUTES ALLOTTED
Cardiac Anatomy and Physiology & Introduction into Hemodynamics	Lecture Case Studies	50
Pressure Waveform Interpretation	Lecture	30
Pacemakers	Lecture	45
Vasoactive Drugs	Lecture	45
Case Studies	Case Studies	45

established objectives for the attendees. The number of evaluations completed for the 2019 Cardiac Boot Camp sessions was measured against the number of evaluations for the 2020–21 Cardiac Boot Camp sessions and were relatively similar. The evaluations showed that each pandemic class in 2020–21 series had less outstanding ratings, more good ratings, and more fair ratings compared to the classes from the 2019 series. However, when the total number of outstanding and good ratings were grouped and the total number of fair and poor ratings were grouped, the total percentages of ratings for the classes in the 2020–21 series are very similar to the 2019 series (Figure 3).

Discussion

During the pandemic, health systems and academic environments had to shift their education to online platforms. Cardiac Boot Camp successfully met its objectives and the needs of the staff during the pandemic. The hybrid learning model allowed learners to remain engaged. Adopting hybrid learning allowed the nurse attendees to gain a base of knowledge during the asynchronous portion of class. This allowed most of the live synchronous time to be devoted to higher order learning through case studies and application of learned material. During the synchronous class session, the instructors could assess if the students were able to demonstrate comprehension and application of the topics. Additionally, through increased engagement, the instructors were able to evaluate whether learning objectives were met in real time and address knowledge gaps. Even though the evaluations for the hybrid Cardiac Boot Camp class series showed a decrease in the number of outstanding scores compared to the traditional model, the asynchronous portion of the hybrid model will likely remain in place because it provides basic knowledge for learners at their own pace and allows lecturers to deliver more advanced content or focus on synthesis and application during the synchronous portion of the class. The hybrid model is also beneficial since it provides a multimodal learning platform to

Figure 3. Combined Objective Ratings for Cardiac Boot Camp Evaluations



provide new nurses with a variety of education content. The asynchronous curriculum ensures that consistent and updated education is provided to new nurses, avoiding the pitfall of variation in content delivery by numerous instructors.

There are many limitations of comparing hybrid online learning to the traditional eight-hour class. The attendees of the classes were not the same nurses. Attendees of the hybrid model had to adapt quickly to the new online format, and many have never used the online platforms Zoom or Microsoft Teams before. The hybrid model requires the attendees to complete tasks on their own time which requires time, space, technology, and self-motivation compared to passively attending an eight-hour class. The hybrid model also requires attendees to be able to process and learn the education topics from the asynchronous assignments. People have a variety of preferred learning methods, and the needs of attendees may not be met by completing all activities through a screen. Learning materials should be presented to stimulate as many senses as possible to increase the chance of

comprehension.⁴ The difference in the way the evaluations were provided could have also skewed the results. The evaluations given in the 2019 series were paper evaluations completed at the conclusion of the class and the evaluations provided in the 2020 series were online surveys emailed to each participant.

Conclusion

Based on the results of the class evaluations, in-person traditional learning was preferable to the hybrid model. However, most class participants felt that the objectives were met with a minimum of a good rating. Even though the hybrid model did not illicit the same response as the traditional didactic learning, it allows the learning objectives to be met while maintaining safety during the pandemic.

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