Title
The Impact of the COVID-19 Pandemic on Nursing Simulation Use and the Influence of Simulation Use on Future Admissions

Author
Tabbakhian Khaziran, Melia

Publication Date
2021

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA

Los Angeles

The Impact of the COVID-19 Pandemic on Nursing Simulation Use and the Influence of Simulation Use on Future Admissions

A dissertation submitted in partial satisfaction of the

requirements for the degree Doctor of Education

by

Melia Tabbakhian Khaziran

2021

ABSTRACT OF THE DISSERTATION

The Impact of the COVID-19 Pandemic on Nursing Simulation Use and the Influence of Simulation Use on Future Admissions

by

Melia Tabbakhian Khaziran

Doctor of Education

University of California, Los Angeles, 2021

Professor Diane Durkin, Co-Chair

Professor Megan Loef Franke, Co-Chair

Nursing simulations have been used for over 100 years to better prepare nursing students and equip them with the medical and social skills necessary to provide high quality patient care. The use of simulation in nursing programs has helped students better their clinical skills, increase their confidence with patients, and practice with rare and difficult medical and social scenarios. With states approving up to 50% replacement of clinical hours with simulation hours, many schools have taken this opportunity to provide their students with the technology. With the onset of the COVID pandemic, clinical placements were suspended, and nursing programs turned to virtual simulations. The California Board of Nursing (BON) increased their approval to 75% replacement of clinical hours (AB2288) and, based on the results of this study, the vast majority

of California nursing programs increased their percent of simulation use by 100% on average. Simulation was used to replace a higher percent of clinical hours than ever before.

This explanatory sequential mixed methods study included a survey, followed by an interview to understand how simulation use changed as a result of the COVID pandemic and explore ways in which simulation technology can impact nursing school admissions for the future. For the quantitative portion, surveys were sent to simulation leaders at 128 of the 149 nursing programs in California, and 43 completed the survey (a 34% response rate). The survey revealed that 90% of programs increased their simulation use overall during the pandemic, 92% of respondents stated that the increase was necessary to address a scarcity of clinical placements, and the percent of clinical hours replaced by simulation during the pandemic rose from an average of 16% to 40%. After the pandemic, 68% of respondents predicted that they would use more simulation than they did before the pandemic, which suggests that schools have increased their buy-in to the benefits of the technology. Lastly, 31% of respondents stated that they were able to increase admission offers in 2020 because of increased simulation use.

From the survey data collected, I interviewed simulation leaders of 5 nursing programs at which simulation impacted enrollment in the past, currently or had a predicted impact on future enrollment. Interviews were conducted virtually and further confirmed that increasing simulation use for the replacement of clinical hours could allow the enrollment of more students. If each student requires fewer clinical placement hours because a higher percent of these hours can be replaced by simulation, then the available clinical placement hours can be spread across more students. However, all interview respondents stated the next biggest barrier of increasing enrollment, insufficient number of faculty, would stifle any hopes of enrolling more students.

Program leaders reported highly positive perceptions of the effectiveness of simulation on student NCLEX scores as well as their clinical competence. Respondents noted that the top three motivators for increasing simulation use before the pandemic was to practice clinical skills, expose students to rare scenarios and assess students' clinical skills. During the pandemic, the top three motivators shifted; an overwhelmingly high percent of respondents (92%) stated that the top reason for increasing simulation was to address the scarcity of clinical placements.

Although most nursing programs have increased their simulation substantially, there are still programs that are nowhere near the maximum allowable usage. The Diffusion of Innovation theory categorizes schools that have not fully integrated the innovation as being in the implementation stage. Applying the theory and understanding the history and current state of simulation use may help more California programs diffuse the technology, meet the maximum allowable replacement of clinical hours, and use the clinical placements that have opened to increase student admissions.

The dissertation of Melia Tabbakhian Khaziran is approved.

Louis M. Gomez

Mark P. Hansen

William A. Sandoval

Diane Durkin, Committee Co-Chair

Megan Loef Franke, Committee Co-Chair

University of California, Los Angeles

2021

DEDICATION

This dissertation is dedicated to my daughter Evelina Belle, who was born during my graduate education and this study. I hope you grow up to have a passion like the one I have for learning and life. I hope you see the immense beauty and unlimited magic in this world and always make the conscious choice to be happy and push for greatness! The choices you make will create the life you dream of my sweet girl. Mama loves you.

This paper is also dedicated to:

- To my husband, Edwin Khaziran. You continually stand by my side as I accomplish all my goals and passions; never once questioning my sanity with the insane workload that I often take on. You are truly the best dad and Evie and I are both so lucky to have you...your effort never goes unnoticed. Thank you for always putting in 100/100 (rather than 50/50). You are the definition of a wonderful man. Thank you for grounding me when I feel like I am losing my anchor. You are my rock, and I am forever blessed that it was *you* who walked in through the door at Black Market.
- To my incredible parents, George and Hasmik Tabbakhian. I watched you guys bend over backwards to make sure I had every single opportunity in life. Thank you for trusting me with the decisions I made and never having a single doubt in your minds that I could accomplish any goal. I was never afraid to reach for my dreams or push for more because I knew that you guys had my back every step of the way. To you it might just seem natural, but for a child/young adult who is incredibly cautious with decision making, having that unwavering support is everything. Bab, the pride you have in me has always made me reach higher in

life. Mom, thank you for watching Evie, cooking, cleaning, and cheering me on me so that I could accomplish this goal. I love you both so much!

- To my aunt Narine Galstian, aka Mokur. Thank you for always believing in me, supporting me, and inspiring me to keep pushing through tough times and living life to the fullest. Your passion for life, traveling, and happiness is infectious; a huge part of who I am today is because of you. Here is to cherry earrings on Orange Grove, traveling the world together (best-worst trip to Machu Picchu), slumber parties, and concerts. Evie and I are the luckiest girls to have you in our lives. You have paved the road to greatness, and so many of my students will walk that road because of the mentor you have been to me the last 32 years.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGEMENTS

To my amazing committee: Mark, you have been such a supportive mentor through this long and arduous process. Through the pandemic, having a baby, doing countless iterations of this paper, your understanding, kindness, and help every step of the way was exactly what I needed. Thank you for your unwavering guidance and support through this process and for always suggesting a more efficient way to get things done. Diane, I don't even know how to thank you for being so honest and straightforward with your teaching and editing of all my writing. I can honestly say that I have become a better writer because of you. Bill, Louis, and Megan, I am so very grateful for the interest you all have had had for my project and am so lucky to have been able to meet and work with the three of you.

I must also acknowledge my co-worker and friend Christina Lee at Moorpark College. Without you, this project would not have come into fruition. Thank you for your endless guidance and direction on this topic and for taking the time to talk, email and send over documents. You have no idea how much you have helped me understand the vastness of nursing education and simulation. The nursing education field is incredibly lucky to have you!

VITA OF MELIA TABBAKHIAN KHAZIRAN

November 2021

EDUCATION

University of California, Los Angeles **2021**
Doctoral Candidate, Education Leadership

University of Southern California **2013**
Masters of Physiology and Biophysics

University of California, Irvine **2009**
Bachelor of Science: Biology

PROFESSIONAL EMPLOYMENT

Moorpark College **2016 - Present**
Tenured Professor

College of the Canyons **2014 - 2021**
Adjunct Faculty

Antelope Valley College **2014 - 2016**
Adjunct Faculty

Santa Monica College **2015 - 2016**
Adjunct Faculty

Pierce College **2015 - 2016**
Adjunct Faculty

COURSES TAUGHT

Human Anatomy
Human Physiology
Human Anatomy & Physiology
Microbiology
Human Biology
Cell & Organismal Biology

PUBLICATION

Tabbakhian, M. (2013). *KcsA: Mutational analysis of channel selectivity filter with molecular dynamics* [Unpublished master's thesis]. University of Southern California.

CHAPTER ONE: INTRODUCTION AND BACKGROUND OF PROBLEM

This multi-site study investigated the changing landscape of clinical simulation use within nursing programs and its reported impact on enrollment. I examined the ways in which simulation use changed before and during the COVID-19 pandemic, perceptions of effectiveness of use, and impact on enrollment. Through this inquiry, the study provided insight into the outcomes of high simulation use, how those outcomes paved the way for future simulation usage, its impact on the number of nursing school acceptances, and ultimately, the future of the healthcare field. The study was motivated by a nursing shortage that is expected to worsen. For example, by 2030, California alone is expected to face a shortage of 45,500 nurses if no action is taken to increase the number of licensed nurses. With the help of technology, nursing education is finding ways to increase the efficiency and effectiveness of the nursing curriculum and potentially increase the number of graduates.

Simulation technology has diffused through different fields of study and careers, providing training that makes students more confident and enhances their critical thinking skills (Padilha, Machado, Ribeiro, Ramos, & Costa, 2019). Some programs that utilize simulation technology include nursing schools, teacher preparation programs, firefighter training, pilot education, and military training. In the medical field, clinical simulation technology develops proficiency in skills and procedures that practitioners must master before graduating. These simulations are also completed in hospitals, alongside experienced nurses, with real life patients. Nursing simulations provide "An activity or event replicating clinical practice using scenarios, high fidelity manikins, medium fidelity manikins, standardized patients, role playing skills stations, and computer-based critical thinking simulations" (Hayden, Jeffries, Kardong-Edgren, & Spector, 2009, p.44). Simulations in nursing schools help students excel in their programs by

increasing their confidence, skills, and hands-on hours necessary to be successful in their chosen careers (Shinnick, Woo, & Mentes, 2011). Simulation is a long-time used technology that allows faculty to control medical scenarios to teach students clinical skills necessary to succeed.

The Nursing Shortage

The nursing shortage has been caused by a consistent shortage of clinical placements and nursing faculty, especially in rural areas. The two states that will experience the most severe nursing shortages in 2030 are California and Texas. These expected shortages are due to an increased demand of healthcare and factors that are challenging the supply of providing healthcare. An aging population with increasing chronic disease and higher healthcare utilization due to the Affordable Care Act have both created an increase in healthcare demand. The supply to providing sufficient healthcare has been affected by baby boomer generation nurses are retiring from the workforce, too few new nurses being trained, and nurse burn out (Purdue University Global, 2018; Clavreul, 2013). According to data collected by the Kaiser Family Foundation, there are currently approximately 340,000 nurses in California, 55% of whom are at least 50 years old. The average retirement age for nurses is about 60 years old, which means that by the year 2030 California may need to replace at least 50% of their nursing workforce (Ring, 2019). The American Nurses Association reported that the nursing field will have more positions available nationally through 2022 than any other profession worldwide (Nightingale College, 2020).

A demand increase combined with low acceptance rates of qualified applicants is exacerbating the problem. There is high interest to join the nursing field and the number of qualified applicants into nursing programs is predicted to increase. However, the demand for nurses will outpace supply by 11.5% in California by the year 2030 if programs themselves do

not increase the number of nurses they graduate (Ring, 2019). Not admitting more students into nursing programs will leave approximately 44,500 open nursing positions unfilled specifically in California by 2030 (Nightingale College, 2020). Despite this shortage, aspiring nursing students who successfully complete the series of core science pre-requisites, volunteer at clinical sites, and maintain stellar grades, still have difficulty getting accepted to California nursing programs. As such, California has one of the lowest nurse-to-population ratios in the nation, with one nurse per 169 patients within the population (Bigbee, 2008). States like Massachusetts and District of Columbia have a 1:67 nurse to population ratio which is a much safer and effective ratio in terms of patient care. The ratio in California is only expected to worsen by 2030 in California as a result of the above listed factors.

The California healthcare industry needs to find a way to lower the nurse to population ratio by admitting more nursing students within the next 4 years in order to ensure there are enough skilled nurses by 2030. However, in 2016, 33% of qualified applicants were turned away by Bachelor of Science in Nursing (BSN) programs nationwide (Biennial Survey of Schools of Nursing, 2016). The American Association of Colleges of Nurses reported that in 2018, U.S. nursing schools turned away more than 75,000 qualified applicants from baccalaureate and graduate nursing programs. The top reasons reported included insufficient number of faculty, clinical sites, classroom space, and clinical preceptors, as well as budget constraints. The shortage of nurses is national and needs to be addressed in order to prevent a national crisis in healthcare.

Requirements for Clinical Placements

The struggle to find clinical placement sites has become increasingly difficult for public nursing programs. This, in turn, makes it difficult for nursing programs to increase their

enrollment or graduate more licensed nurses to fill the nursing shortage. To provide background: Nursing programs must have clinical placements reserved at hospital sites for their admitted students, including ones in specialty fields like pediatrics, psychiatry, and obstetrics—which are the most difficult to find placements. Without completion of the required clinical hours, nursing students cannot fulfill their graduation requirements. Thus, clinical rotations are key to generating licensed nurses for the future. As one nursing education blog notes, "The greatest challenge to enrollment capacity … is a widespread lack of clinical sites for nursing students" (Wolsters Kluwer, 2017). During the two-year registered nursing programs in California, students need to complete three clinical hours per one hour spent in the classroom learning theory, which adds up to approximately 560 clinical hours per student (Anatomy of a Nursing BSN Degree, 2021).

Because of the shortage of clinical sites and preceptors, several programs have capped the number of students admitted. Nursing programs are unable to accept fully qualified applicants because they do not have enough instructors or clinical placements to accommodate more students (Kavilanz, 2018). Given the lack of instructors and clinical placements, California's registered nurse (RN) workforce will only grow about 10% from 2018 to 2030 which is only predicted, based on past trends, to increase the 1:169 nurse to patient ratio, rather than closing the growing gap (Fank, Kennedy, & Trautman, 201). This ratio is unacceptably high and undermines a nurse's ability to provide quality patient care.

Barriers to Addressing the Shortage

To provide the best care possible and improve the nurse-to-patient ratio, programs will need to address the issues behind the inability to admit more pre-nursing students. According to the American Association of Colleges for Nurses (AACN), a few main factors (insufficient

number of faculty, lack of clinical site, not enough classroom space, not enough preceptors) account for the low matriculation of students into nursing programs and subsequently are primary contributors to the nursing shortage (Rosseter, 2019; Blitchok, 2018). Although there are several reasons behind the low acceptance rate of qualified applicants, almost two-thirds of the nursing schools that responded to the AACN survey pointed towards a shortage of faculty and/or clinical preceptors as the top two reason for not accepting more qualified applicants into their programs (Gaines, 2019). Without the ability to increase nurses in the field by more than just 10%, nurse to patient ratios will be even lower; patient care will suffer, and the rates of hospital infections and death will increase (Martiniano, Chorost, & Moore, 2016). Luckily, technology experts and the healthcare field have been working together for the past several years to create an alternative method for train nursing students without the need for as many clinical placements or preceptors: clinical simulations.

Benefits of Simulation Use

The reported benefits of simulation include, but are not limited to, better performance with real patients, higher confidence levels, more accuracy with medication distribution, more practice with rare medical scenarios and better communication/reporting skills. Since the integration of simulation in nursing education curriculum, reports from supervising nurses indicate that students had improved clinical skills and confidence levels. Bosek, Li, and Hicks (2007) reported that baccalaureate students (n=9) performed better and with higher confidence levels after supplementing their hospital clinical experience with in-class clinical simulations. The authors concluded that usage of simulation helped with nurse preparation, confidence levels, and improved problem-solving skills. From 2020-2021, nursing programs were forced to increase their use of simulations for clinical hours, however student pass rates on the NCLEX or

program completion have not yet been collected. However, graduate and undergraduate nursing programs have reported positive learning experiences with the increased use of simulation (Fogg, Wilson, Trinka, Campbell, Thomson, Merritt, Tietze, & Prior, 2020). The use of simulation has provided nursing programs with a way to measure competency of skills and knowledge in a controlled environment and offers opportunities to learn in critical care settings which would be otherwise minimal in the hospital (Nehring, Ellis, & Lashley, 2001; Durham & Alden, 2008). Given such data, schools need to find ways to incorporate clinical simulations into their pre-licensure curriculum at a higher percentage with not only the goal of replacing clinical hours but also enhancing student skills, even after the pandemic passes.

Detailing the Use of Simulation

With so much data in support of clinical simulations, schools might consider simulation to supplement theory in the classroom and to provide students with a way to earn clinical hours. One way to supplement theory and/or replace clinical hours would be to integrate more simulation of all kinds into the existing curriculum. There are several different types of simulation styles, including virtual, hybrid, manikins, role playing, and actors. Within each respective nursing program curriculum, simulation scenarios are created by the instructors of the courses and have students participate in medical situations in a safe environment. Manikins are lifelike bodies that have bodily abilities as a real patients' and can be controlled by instructors to speak to students about their symptoms and display symptoms. Nursing students can communicate with manikins to determine the diagnosis, best method of treatment and practice their patient interaction skills. By participating in these realistic medical scenarios, students develop their critical thinking and clinical decision-making skills while under pressure, with no risk of hurting patients (Shinnick et al., 2011).

Virtual simulations are computer based and allow students to interact with and treat patients in a life like medical setting. The scenarios are set by instructors and can be adjusted as students complete the patient's care. Virtual simulations also teach students how to work with digital patient charts and electronic health records; both of which are taking over in the medical field. The use of virtual simulations has spiked since the COVID-19 pandemic as the preferred way to assess and complete the clinical hours required to graduate (Hendrix, 2020). As a result of the current public health crisis, nursing programs are utilizing a variety of simulation styles to expose students to medical scenarios and test their clinical knowledge.

Opportunities During the COVID-19 Pandemic

Prior to the COVID-19 pandemic, many schools struggled to maintain or find new clinical placements for their students. This struggle worsened during the pandemic, as most healthcare facilities and hospitals suspended their direct clinical patient care placements. As such, students were forced to complete a high percentage of their clinical hours in virtual or laboratory simulations. Virtual simulation are simulations that are done completely online and can be done at home, but laboratory simulations require a small group of students to come into the school's clinical lab and work on the manikin led simulation. According to the NCSBN, both virtual and laboratory simulations are equally effective in teaching students' clinical skills and preparing them for the NCLEX exam.

Simulation as an Effective Replacement for Clinical Hours

Simulation use over the last 100 years has diffused slowly, but with increasing data proving its effectiveness, more programs are investing time and money into the technology. With the increasing integration of new patient simulation technology into the nursing school curriculum, students have been given an opportunity to complete a percentage of their clinical

hours in the classroom (rather than in the hospital) as well as prepare for real life patient contact situations. In 2006, 16 state BONs (Board of Nurses) officially approved the use of simulation to replace clinical hours (Nehring, 2008). The number of schools that have incorporated simulations has jumped from 66 (6.6%) in 2002 to 917 (92%) in 2010, which indicates a growing desire for integration of this technology (Jason & Hunt, 2015). Since 2010, it is continually used more and more *within* programs. As such, simulation is currently replacing clinical hours at a 1:1 ratio at some institutions (Smiley, 2019). However, the COVID-19 pandemic impacted the use of all types of nursing simulation nationally. This study aimed to examine the impact of the COVID-19 pandemic on simulation use, student completion rates, and the impact of simulation on enrollment.

Lacking Guidelines, a Need to Determine the Extent of Use

Despite such positive data, there is no national consensus (and no national regulation) concerning the percentage of clinical hours that can effectively be substituted with simulation (Bradley, Johnson, Dreifuerst, Conde, & Curry-Lourenco, 2019). As a result, nursing schools lack clear guidelines for successful expansion of simulation programs. Although the National Council of State Boards of Nursing (NCSBN) stated there was a 50% effective replacement of clinical hours after conducting the National Simulation Study (2014), each state's Board of Nursing (BON) can enact their own legislation for what percentage of simulation will be allowed to replace clinical hours (Bradley et al., 2019; Hayden, Smiley, Alexander, Kardon-Edgren, & Jeffries, 2014). In the United States, 30 BONs currently have regulations for simulation integration, while 21 still have no regulations that could be located. Thirteen BONs allow 50% replacement of clinical hours with simulation, two allow 30%, seven BON's allow 25%, four

allow less than 25%, and another four allow usage but do not specify a specific replacement (Bradley et al., 2019).

The pandemic challenged schools to expand simulation, but we lack data on how much and to what effect. Many clinical placements were cancelled or suspended, and programs had to quickly find an online-only approach to meet clinical objectives and hours for graduation. Most states have allowed students to expedite their graduation and use virtual simulations to complete the remainder of their clinical hours, so long as it does not surpass 75% direct patient care hours required for graduation (Clark, 2020). In response to the COVID-19 pandemic, California has allowed nursing programs to replace up to 50% of clinical hours with simulation, a substantial increase above the previous ceiling of 25% (Exec. Order No. 39, 2020). In responses, many nursing programs have increased their simulation use. However, no studies have yet documented these increases in simulation use or examined whether programs expect to maintain higher simulation use beyond the pandemic.

What Is Considered Normal Rate of Usage?

The extent of simulation usage varies among states and schools, even though the NCSBN has found evidence of effectiveness in nursing education with 50% clinical replacement (Hayden et al., 2014). Despite the proven effectiveness, many nursing programs have a low simulation usage or incorporate it ineffectively because of three key reasons: lack of personnel, time, and materials in clinical settings (Reed et al., 2009). Before the COVID-19 pandemic, the California Board of Nursing regulation Title 16 California Code of Regulation (16 CCR) § 1426(g)(2) limited the use of simulation to 25% of clinical hours with even though 50% has proven effective. During the pandemic, the approval rose to 50% in order to allow students to complete

their clinical hours despite not having hospital placements (Changes in Education Requirements for Nursing Programs During COVID-19*,* 2020).

Although there is integration of simulation technology in a high number of nursing programs (over 90% of schools are now using clinical simulations), there has not been a significant change in the admissions rates. In 2012, nursing programs were turning away 36% of qualified applicants while in 2018, that percentage only decreased to 29% (National League for Nursing, 2014, 2018). With national surveys regularly pointing out that clinical placements are one of the primary barriers of nursing school admissions, increasing the amount of simulation use within each school could increase admissions numbers (Hayden et al., 2009; Hayden et al., 2014; California Board of Registered Nursing, 2020). Without preliminary data, it is currently unknown why admission numbers have not increased, but possible reasons include that schools are using the technology for lessons rather than for substitution of clinical hours, there is an insufficient number of faculty prepared to incorporate simulation into curriculum, or there may be limited classroom and lab space.

How Has Simulation Technology Diffused?

Simulation technology has been used in the nursing field since 1911, more than 100 years ago, yet some faculty who are responsible for incorporating or spreading its use throughout nursing curriculum remain unconvinced of its benefits (Meurer, 2017). The Diffusion of Innovation theory (DOI; Rogers, 2003) outlines that knowledge, persuasion, decision, implementation, and confirmation are the five stages by which a new technology diffuses. Nursing programs have the knowledge of simulation technology, as it has disseminated throughout 92% of nursing programs that are currently using this innovation as of 2018 (Jason & Hunt, 2015). However, although the technology has diffused to 92% of programs, nursing

schools are not using clinical simulations to the maximum allowable percentage for a few notable reasons: difficulty of use, lack of faculty buy-in, and proof that it is advantageous to what it supersedes (hospital and in-person clinical hours) (Meurer, 2017). By using the theory of DOI, this study aims to decipher the key factors required to overcome the implementation stage and further diffuse clinical simulation technology *within* a nursing program. Ultimately, if programs can increase their simulation usage, they may also be more prepared to increase the percent of their students' clinical hours replaced by simulation hours.

Study Overview

The goal of this paper was to, for the first time, collect data on the percent of clinical hours replaced by simulation, how that was impacted by the COVID-19 pandemic and illuminate how programs can utilized this technology to impact the future of nursing school enrollment. I attempted to bridge the idea that the higher percent of replacement of clinical hours could impact future enrollment into nursing programs, and therefore impact the number of nurses in the healthcare field.

By identifying how simulation use has changed during a time when simulation was *required* for program completion, the findings from this study may serve as a guide towards increasing simulation usage after the COVID-19 pandemic. Looking into how programs quickly implemented high simulation use and their subsequent student outcomes may inform future increases in simulation usage. To carry out this purpose, this study surveyed nursing program administrators, faculty, and simulation specialists to understand the changing landscape of simulation use (simulation type and amount of use) and the impact on enrollment.

I analyzed all the data from this study to document the percent of simulation California public nursing programs are using to replace clinical hours and to see if simulation has had or

can have an impact on enrollment. The survey found that all respondents reported increasing simulation use substantially during the COVID-19 pandemic and that interviews confirmed that using more simulation could increase the number of licensed nurses in healthcare. Thereby closing the nursing gap by 2030.

Research Questions

The study focused on the following research questions:

1. How has simulation use in pre-licensure programs in California changed (or is changing) due to the COVID-19 pandemic?
2. Do users of simulation perceive any potential benefit of simulation with respect to increased enrollment?

Design and Methods

This investigation utilized an explanatory sequential mixed method design to ascertain the changes of simulation usage, perceptions of effectiveness and the impact on current and future student enrollment. An explanatory sequential mixed-methods design was appropriate for this study because it allowed me to use data from the quantitative survey for interviewee selection and development of the interview protocol.

The quantitative portion of the study used a survey, distributed to all California pre-licensure nursing programs (approximately 128 schools), to gather data on percentage of simulation usage before and during the COVID pandemic (prior to and after March 2020), the overall perceptions about simulation benefit (including impacts on student success), future simulation usage and current and future student admissions. Perceptions of effectiveness and student outcomes provided insight into the future usage of simulation and the potential to increase the percent of simulation approved by the California Board of Nurses. These

perceptions evolved as the use of simulation increased in the last ten years and this study aims to understand the new perceptions and their connection to the amount of simulation a program uses. Finally, the survey asked for willingness to participate in the qualitative portion of the study.

I conducted follow-up interviews with respondents from public nursing programs that met at least one of the remaining criteria (criteria 2-5): Schools that (1) were public nursing programs, (2) used increased enrollment as a primary motivator of adoption, (3) stated that simulation use had a positive impact on current enrollment (4) predicted that simulation use could impact future enrollment and that the (5) program was planning to increase their simulation use in the future (post-pandemic). The purpose of the interviews was to give respondents an opportunity to respond to open-ended questions about simulation use and enrollment using their own words.

The interviews were conducted with the same participant who took the survey which included a range of simulation experts like simulation faculty, simulation coordinators or department leaders at the four selected sites. The interviews included questions to further understand changes that took place when the pandemic began, how perceptions of benefit effect the percent of simulation used, how students' clinical competencies were affected by the changes, and opinions on potentially increasing simulation in education and its impact on enrollment. Through the interviews, the investigation gathered detailed information for how programs were able to fulfill student graduation requirements during the COVID-19 pandemic and comment on how the changes of simulation use in schools can impact future simulation use.

This explanatory sequential mixed-methods study documented changes in the amount of simulation used before and after the pandemic and the impact high use of this innovation has on enrollment.

Study Significance

While nurses play a critical role in healthcare around the world, hospitals in the United States face increasing nursing shortages. The national issue of the nursing shortage is primarily within public nursing schools and hospitals, especially those in rural areas. Clinical simulation is a critical intervention that, if used effectively, can help nursing programs increase the number of licensed nurses as well as the confidence of nurses who enter the healthcare industry. One promising approach to addressing the clinical placement inadequacy is the use of simulations and manikins in clinical labs. Rather than needing to secure the limited student placements in hospitals for students to complete their required clinical hours, programs can substitute a portion of these hours using simulation labs. Despite continuously reported data on the effectiveness of simulation for students, many schools are still not utilizing simulation to the maximum allowed percentage or for a greater replacement of clinical hours. However, the COVID-19 pandemic has forced many programs to increase their simulation use to the maximum allowable percentage to get students to graduate on time. This project investigated the percent of clinical hours replaced by simulation in nursing schools before and during the pandemic and the predicted use of simulation after the pandemic. It explored the impact of the pandemic on a schools utilization of simulation, the association between perception of simulation and the amount of simulation integrated and uncover the possible impact of increasing simulation use on enrollment.

This findings from this study can be used by institutions looking to understand the effects of increased simulation usage for replacement of clinical hours and if, by incorporating more simulation in lieu of clinical placements, the institution can increase the number of students that can be admitted. Since the number of clinical placements is one of two major barriers for increasing enrollment (the other being a faculty shortage), this study concerns a way to decrease

programs' reliance on limited clinical placements. With a comprehensive study that investigates increasing the percent of clinical hours replaced with simulation and elucidates how the COVID-19 pandemic has forced this change to begin taking place, this study has the opportunity to inform both the state and nursing programs of their opportunity to continue the higher use after the pandemic and ultimately to impact student admissions. With more clinical hours replaced by simulation technology, programs will be less dependent on clinical placements to fulfill their students' graduation requirements. The prediction is that the less a nursing program relies on clinical placements for admissions allowances, the more students they can admit in the future. With more students getting admitted into nursing programs, and more graduating, the number of nurses entering the healthcare industry would theoretically also increase.

CHAPTER TWO: LITERATURE REVIEW

This review of the literature first provides background on the nursing shortage. It discusses the current nursing crisis, including a brief history and future outcomes if the shortage is not addressed. It then focuses on the primary causes of the shortage and proposed solutions to increase the number of licensed nurses in the field. The review highlights two primary factors that impede nursing schools from increasing the size of incoming cohorts: the lack of nursing faculty and the shortage of clinical placements for students. To best understand causes, this chapter reviews data on the current faculty shortages, limitations on clinical placements, and ways in which nursing programs have tried to overcome these barriers. The review then focuses on studies featuring clinical simulations. It illustrates how simulations provide a non-traditional method of completing clinical hours, increasing student confidence and covering basic skills. It addresses the process of simulation integration, its current usage, difficulties of usage, and what still needs to be done enhance simulation success. Finally, the literature review explores research on the effects of the COVID-19 pandemic on clinical availability.

The National Nursing Crisis

To understand the nursing shortage crisis, one first needs to understand nursing's role in the health professions. The nursing profession is the largest subdivision of the healthcare force and arguably has a larger impact on the quality of patient care than physicians (U.S. Bureau of Labor Statistics, 2015). Nurses provide both medical advice and emotional support to patients, deliver hands-on care, administer medicine, complete paperwork, help doctors diagnose patients, and provide follow-up care. Nurses must be trained well enough to be able to notice irregularities in patients' vital signs, teach patients and families, and advocate for their patients outside of the healthcare environment (Flavin, 2018).

The need for properly trained and experienced nurses is rising quickly because of a large retiring baby boomer generation and the increased need for healthcare within that generation. According to the Health Care Employment Projections, nurse practitioners are expected to increase by 35% from 2014 to 2024 (Martiniano, Chorost, & Moore, 2016). Registered Nursing (RN) is one of the occupations predicted to experience the most growth through 2026, with a need of 1.5 million new RN's (Rosseter, 2019). The need for 1.5 million new registered nurses stems from the AACN's (American Association of Critical-Care Nurses) projection that one million nurses will retire by 2030. Baby boomers, the largest cohort of nurses thus far, began mass retirement in 2010. This retirement has caused a 15% nursing shortage in 2020 (McKeon & Gonzalez, 2004). Each retirement represents not only a reduction in the size of the workforce but also a loss in terms of professional knowledge and experience.

Although this nursing shortage is not projected to hit every state, it is expected to hit high population states, including those in the West and South. The National Council of State Board of Nursing 2017 *National Simulation Study* and the California Board of Registered Nursing *2017-2018 Annual School Report* both conclude that there are not enough incoming nurses to satisfy the national need (Smiley, 2019; Blash & Spetz, 2019). Both studies provide data regarding current simulation usage, nursing students' success, nursing faculty turnover, and reasons behind low nursing program matriculation.

Role of Nursing Schools in National Nursing Shortage

The need for more clinical simulation usage is seen mostly in pre-licensure nursing programs. Nursing programs need to generate the number of nurses required to fill the open positions in hospitals, nursing homes, and clinics. Accomplishing this will require increased enrollment into pre-licensure nursing programs. Of nursing program applications, 36% are not

qualified. Common issues being incomplete applications, not completing the required pre-requisite courses, not having competitive grades, or lacking clinical experience. Of the remaining 64% who *do* qualify, only 45% are accepted (Biennial Survey of Schools of Nursing, 2016). There is a clear gap between the number of qualified applicants and the number of students admitted. With the way current nursing education stands, by the year 2030 licensed nurses will grow by 55%, while the need to bridge the gap and subsequently have enough nurses for an effective nurse-to-patient ratio will be at 80% (Employment Projections, 2016).

This shortage is underscored by several sources of data. According to the 2016 Biennial Survey of Nursing School, there was only a 3.6% increase in 2014 enrollment into entry-level registered nursing baccalaureate programs. However, to have met the nursing demands of the 2016 American healthcare industry, new BSN programs should have increased their 2014 enrollment by 7.5% (Biennial Survey of Schools of Nursing, 2016). This illustrates that the need to increase nurses is not being satisfied with recent percentage of student enrollment. As a result, educators and researchers should consider why admissions numbers are not increasing to the necessary percentage. An analysis of these barriers will suggest the need for increased simulation usage in nursing schools.

Impact of the COVID-19 Pandemic on the Nursing Shortage

In the Spring of 2020, the world was faced with the quickly worsening COVID-19 pandemic. The pandemic impacted almost every facet of life, including the healthcare industry and education sector. The pandemic made incredibly clear the detrimental impact of the nursing shortage and within months of its onset, the healthcare field was facing another crisis: nurse burnout. The reality of the situation is that most nurses saw more trauma in a month of working during the pandemic than they had in their entire careers. Dealing with such high stress over a

long period of time caused the mental health of healthcare workers to decline, leading to burnout and high turnover (McLernon, 2020). The pandemic also brought to light what a high-risk job being a nurse was, which contributed to the high turnover. The 2020 national nurse turnover rate was at 17% while a 2021 survey of nurses showed that 22% of nurses intend to leave their job within the next year (Peng & Rewers, 2021; Vaughn, 2020). One solution that nursing programs have come up with to help with the increasing shortage is to allow nurses to graduate early and join the workforce. Although this has helped slightly, the ongoing pandemic is seeing more nurses leave the field rather than joining to field. Another consideration is the long-term impact of fast-tracking nurses to enter the workforce quickly (Chmielewski, 2021). For now, the need for an immediate increase in the number of working nurses outweighs the potential detrimental future impact of fast-tracking those nurses. Negative future impacts of fast-tracking nursing students might include having nurses that lack the experience to deal with critical cases, the confidence to make decisions in stressful situation and critical thinking skills to undertake difficult cases. The COVID pandemic has continued for about 2 years and is predicted to impact daily life until late 2021, with hopes of returning to normalcy in 2022 (Charumilind, Craven, Lamb, Sabow, & Wilson, 2021). Community colleges and nursing programs were already struggling to meet the demands for nurses—even more so now that the country is facing a pandemic. With many schools halting their admissions during the pandemic, it has become increasing clear that the healthcare field is falling severely behind (Krupnick, 2020). The education of healthcare workers needs to be a priority for nursing programs and the government alike.

Barriers to Increasing Nursing School Enrollment

According to the 2018-2019 AACN report *Enrollment and Graduations in Baccalaureate and Graduate Programs in Nursing*, 75,029 (17%) aspiring nursing students were turned away from BSN programs because of a shortage in faculty, lack of clinical sites, insufficient classroom space, and funding constraints. Approximately 66% of schools were not able to accept all qualified applicants because of a faculty shortage (Blash & Spetz, 2019). Due to barriers nursing programs face, an increase in qualified applicants would not affect how many students are accepted or the number of licensed nurses.

The two most significant barriers to increasing the nursing school admissions rates are the shortage of nursing faculty and the limited availability of clinical placements for students (Rosseter, 2019). Programs are unable to open up more slots to increase cohort numbers because there are not enough instructors to teach additional courses (Allen, 2008). In 2011, nursing schools turned away 67,563 students, with 67% of those schools citing that the primary reason for turning the students away was an insufficient number of faculty (McDermid et al., 2012). Nevertheless, if there *were* more instructors, programs would still need to find clinical placements for each of their students to complete the ~500 hands-on clinical hours (variability in the number of required hours is based on each states requirements). If barriers like faculty shortages and limited clinical placements cannot be overcome, it would be unrealistic to expect any increase in the nursing population.

Nursing Faculty Shortage

The insufficient number of nursing faculty is attributed to low numbers of incoming faculty and high numbers of retiring faculty (Rosseter, 2019). Internationally, nursing schools are seeing a continual shortage of full-time faculty due to an aging faculty population, a deficiency

in the number of doctorally prepared nurses to take their place, and poor compensation in the education sector (McDermid, Peters, Jackson & Daly, 2012; Rosseter, 2019).

Recruiting new nursing school faculty is undermined by the non-competitive salaries offered in academies relative to what clinical nurses make working in a hospital (Ingeno, 2013). In the 2016-2017 academic year, 63% of programs reported that their top issue in recruiting new faculty was the non-competitive salaries (Chau, Fleetwood, & Martin, 2017). According to data published in 2017 on the average salary of registered nurses (RN), a California RN makes an average annual salary of $102,000 (U.S. Bureau of Labor Statistics, 2021). However, in 2017, the National League for Nursing reported that the average salary for a master's-prepared Assistant Professor in schools of nursing was $75,000 (Average full-time salary for nursing faculty, 2017). The Oregon Center for Nursing reported that 46% of faculty left their teaching positions in 2014 because of low compensation and 53% left for this reason in 2017 (Allgeyer & Bitton, 2017). Within three years there was a seven-percentage increase in faculty leaving the field due to low compensation. Faculty salaries, especially at public nursing schools, change slowly as salary is controlled by the state. This slow change contributes to faculty turnover (Flaherty, 2018).

Another impediment is generating nurses with doctoral degrees, the preferred degree for nurse educators. Since licensed nurses are not required to have doctorates before entering the health field, most will attain their ASN (Associate of Science in Nursing), RN (Registered Nurse), BSN (Bachelor of Science in Nursing), or MSN (Master of Science in Nursing) and end their educational paths to work to begin paying off student loans (Monti, 2021). In an ever growing and complex healthcare environment, the need for more nurses with a doctorate to teach the incoming generation, perform research, and act as clinical leaders for the new generation will

increase (Altman, Butler, & Shern, 2016). From 2000 to 2008, doctoral degrees for nurses only grew by 1%. In 2019, less than 30,000 of the nation's three million nurses had either a DNP (Doctor of Nursing Practice) or Ph.D. (Doctor of Philosophy in Nursing) (McDermid et al., 2012; RJW Foundation, 2013). Although the number of D.N.P and Ph.D. level nurses is growing, the growth is happening much too slowly to address the number of baby boomers retiring from current teaching positions. To increase the number of incoming doctorate students, programs can offer incentives for current nurses to return to school, scholarships for joint BSN-PhD programs, and a general shift in nursing education culture to continue onto a graduate degree (Altman et al., 2016). Studies also suggests that *if* nurses do continue and earn their doctoral degrees, most prefer a research career to teaching undergraduate nursing students (McDermid et al., 2012). Without qualified nursing faculty, programs will not be able to admit even the most qualified students. This suggests the need for further research into how to maximize the effect of current nursing educators or ways to recruit and retain new faculty.

Rapid Turnover Rate of Nursing Faculty

The shortage of nursing faculty with a doctoral degree is primarily attributed to an aging workforce that is approaching retirement age. Between 2003-2012, 200-300 doctorally prepared nurse educators retired. The retirement of these nursing instructors has caused waves throughout education. These openings will not be filled as quickly as is needed to ensure steady enrollment of nursing students. According to the AACN, there is an extremely high turnover rate for nursing instructors in general for two reasons. First, the average age of nurses who eventually get their doctoral degrees and enter education is 56.8 years old. Secondly, the average age of retirement from the education sector is 64.4 years old (Kowalski, Dalley, & Weigand, 2006). This totals an eight-year timespan for instructor turnover, which might not be enough time to develop strong

relationships with the institution or community. This timespan ultimately impacts future recruitment of faculty (University of Saint Mary, 2015). As both clinical nurses and nursing instructors continue to retire and leave the field, the field will feel the loss in nursing school admissions, hospitals, and the quality of patient care.

Limited Clinical Placements

In addition to lacking full-time faculty, nursing programs lack available clinical placements to accommodate more students (Kavilanz, 2018). The clinical placement is the opportunity for students to work in hospitals and/or clinical settings to gain the required hands-on experience before receiving licensure. Students need to complete approximately 500 hours of hands-on clinical work in order to graduate. This equates to approximately three clinical hours required for every one classroom hour spent learning theory (Anatomy of a Nursing BSN Degree, 2021). Students complete these clinical hours by rotating through different hospital departments, including the medical surgical unit, obstetrics, pediatrics and psychiatry. Within each department, students work with nurse preceptors, currently practicing nurse mentors who teach nursing students within the hospitals. Since clinical rotations are a graduation requirement, programs must provide students with clinical placements in order to complete their hands-on clinical hours. However, 52% of programs were denied clinical placements for the 2014 cohort of students. As a result, 41% of nursing programs were forced to admit fewer students. This impacted a total of 2,145 applicants for the 2014-2015 academic year (Blash, Keane & Spetz, 2016).

Not only can programs not secure the placements they need, but they are losing placements they previously had in primary rotations. Clinical areas that lost placements include 73% in Medical/Surgical, 49% in Pediatrics and 34% in Obstetrics because of the growing

number of private nursing programs (Blash & Spetz, 2019). From 2017 to 2018, private nursing programs increased by 18.2% (Blash & Spetz, 2019). Due to this increase in private nursing programs, more students needed clinical placements to complete their degrees. With a growing number of nurses retiring and increase in the number of nursing students in new private nursing programs, there is an imbalance in the traditional preceptor to nursing student ratio. Due to the spike in the number of nursing students and the increased demand for clinical placements, hospitals had to limiting the number of placements available to nursing programs in order to maintain a safe medical environment (Rosseter, 2015; Matua, Seshan, Sayithri, & Fronda, 2014). Although 60% of programs are currently *searching* for new clinical sites, only 43% of programs have replaced clinical placements with clinical simulations, and 10% of schools simply reduced student admissions to make up for the lost sites (Fang, Li, Kennedy, & Trautman, 2017).

Nursing programs are requiring more clinical placements to expand because they are currently limited in the number of placements granted in specialty units like pediatrics, obstetrics, psychiatrics (Fogg et al., 2020). As such, 70% of programs that responded to the 2017-2018 national survey reported they had insufficient number of clinical sites, 43% reported that there was an insufficient number of qualified classroom faculty, and 23% reported that they had insufficient numbers of physical facilities and space for skills labs (Blash & Spetz, 2019). Since the numbers of clinical sites and preceptors are not increasing proportionally, the ratio of student to clinical placement is higher and will require an alternative for completing clinical hours.

Impact of COVID-19 Pandemic on Clinical Placements

The pandemic has changed the delivery of nursing education including a shift to virtual lectures and going from in-person clinical training to simulation-based clinical training (often

using virtual simulations). The COVID-19 pandemic quickly overwhelmed hospitals with the number of patients that were coming in. As a result, these hospitals could no longer follow the state mandated nurse to patient ratio of one nurse to two patients in the ICU. Intensive care nurses are now, on average, tending to six patients each (Associated Press, 2021). The number of patients coming into the emergency room and the ICU had tripled from October 2020 to December 2020 (Madrigal and Meyer, 2021). Not only were the number of hospitalizations up to 100,000, the highest since the onset of the pandemic, but there was difficulty treating many of the more serious cases, leaving little time to oversee and mentor nursing students (Galiatsatos, 2021). Aside from these reasons, healthcare facilities like nursing homes have restricted access to nonessential visitors to minimize the risk to their residents (Ostrov & Healthline, 2020). As such, hospitals and healthcare systems suspended clinical placements. Across the country, nursing programs lost their clinical placements and preceptors due to hospital restrictions, suspension of clinical programs, the unavailability of staff to mentor students and the scarcity of personal protective equipment (PPE) (Peoples, 2020).

Amidst the loss of clinical training sites, nursing programs turned to virtual simulations and manikins to provide students with opportunities to practice their clinical skills and earn clinical hours towards graduation. Although simulations were already being used across 98% of nursing programs in the nation (Hayden et al., 2014), the circumstances of the pandemic drove the further use of this technology. States like California relaxed their regulations on the number of hours that are allowed to be completed in simulation training (Karim, 2021). For instance, during the COVID-19 pandemic, some BONs across the nation approved students to complete up to 75% of their clinical hours in simulation versus the 25% that was approved pre-pandemic. Programs must first apply for the 75% allowance and prove their need to use simulation by

showing loss of clinical placements. In California specifically, *Executive order N-39-20* allowed programs to use up to use simulation for up to 75% replacements of clinical hours in specialty units (NCSBN, 2020). Since most clinical placements were lost in specialty areas like obstetrics and pediatrics early in the pandemic, programs were applying for replacement of those specific clinical hours This increase in simulation allowance has been the single most important factor allowing students to complete their training and enter the workforce as licensed nurses (Fogg et al., 2020).

Current Interventions to Ameliorate the Nursing Crisis

This review next explains current interventions that have attempted to address the nursing crisis including ways to incentivize becoming a nursing faculty and exploring alternatives to clinical placements. It will then turn to a discussion focused on how nursing simulation may *best* address these problems, and ultimately suggest a need to further research on nursing simulation.

As the need for nursing faculty increases, programs have taken action to actively recruit and incentivize nurse educators. Issues pertaining to the faculty shortage are already being addressed by different organizations across the nation. There are several scholarship and mentorship programs in different states designed to target talented nursing students who have the potential of becoming great faculty members in the future. In 2014, the University of Wisconsin put $3.2 million towards the Nurses for Wisconsin initiative, which provided loan forgiveness for nurses who agree to teach in the state after graduation (Rosseter, 2015). Schools in Oregon are utilizing faculty retention programs, including allowing instructors to teach the same course in consecutive years, including adjunct faculty in decision-making meetings, funding part-time faculty who are considering graduate school to become full-time faculty and implementing strong faculty mentorship programs (Chau, 2017). By providing incentives, guidance and

simplifying course prep work, Oregon nursing programs are hoping to retain their faculty and encourage new faculty to apply. Although there is no published data with results from these measures, it is a promising start towards increasing interest in nurse education and the pursuit of graduate nursing degrees.

In addition, direct baccalaureate to Ph.D. programs offer students a smooth transition from a BSN to a doctorate in a shorter time than doing the degrees separately (Ketefian & Redman, 2015). This reduces students' total amount of time before attaining a nursing doctoral degree to about seven years, because they skip the time in between their licensure and doctorate degree working at the bed side (NursingLicensure.org, 2020). Most nurses earn their RN and then work in a clinical setting for a few years. If they decide to continue their professional educations, they go back for a BSN and continue clinical employment. Attainment of an MSN is usually followed by either a few more years of clinical work or part time teaching before potentially returning for a PhD (Xu, Francis, Dine & Thomas, 2018). By this point, most doctoral level nurses are in their 50s. If they chose to go into teaching, they have only about 10 years of instructional time before retirement (Kowalski et al., 2006). However, even with a doctoral degree, nursing programs are finding that there is an inherent flaw in the pedagogical preparation of incoming faculty. In an integrative review done on the effectiveness of nursing doctoral education on teaching ability, full-time nursing faculty with doctoral degrees felt ill prepared to enter the classroom and teach as they had had no mentorship or formal training to become instructors (Bullin, 2018).

Many schools now offer an express BSN to Ph.D. program, bypassing the MSN step, in order to get aspiring doctoral candidates to reach their goals at least two years faster (Greene, Fitzpatrick, Romano, Aiken, & Richmond, 2017). Students who graduate directly from a BSN to

Ph.D. program have approximately a 40-year career ahead (Altman, Butler, & Shern, 2016). By giving students the opportunity to go straight from a BSN to a doctoral degree, the field will see much younger doctoral level nurses who can join the education sector, with more years in the profession before retirement. Spending more years teaching can also give professors an opportunity to build lasting relationships with the administration and the community. These strong relationships will then influence the future recruitment of instructors and ultimately the success of the nursing program (Froneman, DuPlessis, & Koen, 2016).

Clinical Simulation in Nursing Education

Although well-meaning, the efforts to increase and retain nurse educators do not have data that show a significant or immediate effect on increasing enrollment capacity or generating licensed nurses. One promising solution detailed in a meta-narrative review by INACSL (International Association for Clinical Simulation and Learning), is to focus on the issue of clinical placements instead of the nursing faculty shortage (Roberts, Kaaak, & Rolley, 2019). The review concluded that there was no significant difference in students' clinical skills when clinical hours were replaced with simulation thereby schools can rely less on clinical placements to determine their enrollment size. Simulation allows faculty to write any life-like medical scenarios for students to participate in using human-like manikin to allow students to practice their primary nurse skills. It is neither a new enterprise nor is it a technology that will be phased out of career training anytime soon. Several careers including pilots, architects, teachers, law enforcement and nursing utilize simulation training using mixed-reality simulations, manikins, or virtual reality simulation scenarios (Heikkila, 2018). Simulations provides a technique for practice and learning for trainees as if they were in real life or amplified scenarios of their fields. It tests the ability to react and make decisions under pressure in situations that they may not

encounter on a daily basis in the field. Pilots can simulate difficult weather conditions and practice maneuvering under stress, educators can practice dealing with difficult students they may not have a chance to encounter during training, and tactical training squads can practice their aim, teamwork and enhance their performance before entering into a real-life threatening situation (Lateef, 2010). Ultimately, simulation usage was found to be a great tool for crisis management and team-based training—two factors that are incredibly important to the nursing field (Sanko, 2017).

History of Clinical Simulation Usage

Simulation has a long history of use in the nursing field. The first nursing simulation manikin, "Mrs. Chase," was developed and used by nursing students in 1911 at the Hartford Hospital Training School in Hartford, Connecticut (Nickerson & Pollard, 2010). This simulation was used well into the 1950s. Because Mrs. Chase did not have a palpable pulse, visible respiratory movements, or measurable blood pressure, she was considered low fidelity—not a true representation of the human body. In 1914, Mrs. Chase was upgraded to "Arabella," which had the additional function of allowing students to do arm injections (Weir, 2012). Since the 1950s, simulation manikins have become much more complex, with the ability to bleed, cry, speak, breathe, and give birth. They also allow nursing students to insert urinary catheters and nasogastric tubes (Anthony, 2018). In 1990, the Laderal Company developed the first high fidelity simulator called SimMan, which is still used today (Cooper & Taquiti, 2008). High to medium fidelity manikins are used by nursing programs to supplement students' theory courses with hands-on practice of the techniques. Because of the rising demand of this modality of education, technology has advanced and there has been a reduction in the cost of manikins (Sanko, 2017).

Manikins are categorized into two categories: medium and high fidelity. Medium fidelity manikins can provide breath and heart sounds, bowel sounds and have simulated blood in the blood vessels and allow students to do IV, catheter and nasogastric tube insertions. This level of manikin is used to build competence in nursing students and is the primary manikin of use in simulation labs (Howard, 2018). High fidelity manikins have the additional ability to talk and run pre-programmed scenarios and include specialized manikins like pregnant mothers that can deliver infant manikins. High fidelity manikins are used to develop performance and action sills in nursing students but are not found as often in simulation labs because they are five times more expensive than medium fidelity manikins, starting at around $30,000 and going up to $60,000 (Lapkin and Levett-Jones, 2011). These two categories of manikins are important because their increased use addresses a dire need in student training and for the completion of clinical hours.

Description of Simulation Usage

Standardized nurse training can be conducted on either living patients or simulation manikins. The modality of training has shown small to no differences between the skills acquired by the nurses who participate in either training method (Kim, Park, & Shin, 2016). The analysis done by Kim, Park, and Shin looked at the effects of simulation fidelity (high, medium, and low) on educational effectiveness on learning outcomes. This meta-analysis of 40 published articles comparing simulation fidelity and student success showed that the effectiveness of training with high-fidelity manikins was equal to training with live standardized patient.

How Manikins and Scenarios are Developed

Simulation is invaluable to students because it not only provides hands-on training, but also allows students to experience rare medical conditions they might not see during training (Durham & Alden, 2008). With the use of manikins, students can make mistakes, not harm the

"patient," and have the opportunity to debrief with their professors to enhance their nursing and diagnostic skills. In addition to deciding the type of manikin used, simulation educators control the disease and medical complications that may develop during the simulation with each manikin and the roles that each student plays. Nursing programs predominantly purchase and use medium fidelity manikins because they are affordable yet still provide students with all the primary functions of a real patient (Lapkin & Levett-Jones, 2011). Instructors can purchase premade medical scenarios from manikin manufacturers or create them themselves.

Creation of scenarios requires knowledge of nursing content as well as an understanding of what is needed to make the scenario play out as realistically as possible. Resources for making scenarios as lifelike as possible include medication carts, a computer that displays vital signs, character roles of family members or technicians, proper hospital beds and EKG machines, patient charts, and any other factor that would duplicate the appearance and feel of the real situation (Howard, 2018). The manikin's role is that of the patient, and two or three students participate in the role of the nurse, secondary nurse and any other role that would be required to play out each particular medical scenario. Roles that may need to be added to scenarios include a respiratory therapist, family member, cardiac specialist or a laboratory technician (Harrington, 2020)

Students' Tasks Using Simulations

How simulations are used and their importance to nursing has been detailed by the University of California, Los Angeles simulation leader, Mary Ann Shinnick. Students are given specific character role-playing instructions, and the patients vitals are set by the instructor using a computer. Instructors can set and change the manikin's heart rate, oxygen levels, emotions, respiratory rate, and—for cases of labor and delivery—contraction cycles (Shinnick, Woo, &

Mentes, 2011). As students play out the scenario in a room that simulates a typical hospital room, the instructor stands behind a one-way mirror observing the students and changing the manikin's vitals if necessary. The students' primary tasks within the 10- to 12-minute simulation is to diagnose medical issues, learn how to interact with patients and family members, understand how to read and interpret vital signs, take blood, administer medications, and follow proper nursing protocol (Kim, Park, & Shin, 2016). After the simulation is complete, students go into a thorough debriefing session to review their actions and understanding of the scenario.

Debriefing After the Simulation

Debriefing is a powerful tool as well as an educational technique in medical training (Abulebda, Auerback, & Limaiem, 2021). According to Mary Ann Shinnick, UCLA's Director of Simulation, debriefing is said to be one of the most important parts of clinical simulations (Shinnick, Woo, Horwich, & Steadman, 2011). Debriefing with good judgement helps students learn and move towards key objectives, gives meaning to students' assumptions and knowledge, and allows instructors to share their primary concerns—all to avoid future medical mistakes that may undermine patient safety (Rudolph, Simon, Dufresne, & Raemer, 2006).

Benefits of Clinical Simulations

Simulations have been proven to offer additive benefits to traditional instruction, enhance student performance with real patients, and create confident nurses who are better equipped to handle stressful situations. Pre- and post- tests done on nursing students before they entered clinical simulations and after they completed the simulation showed a significant decrease in stress levels. Stress levels had a significant inverse relationship with self-confidence and caring ability (Khalaila, 2014). In the 2011 study done by Shinnick and her team, students from three different nursing schools were tested on their knowledge of heart failure. At each institution, one

group of students did the high-fidelity simulation and debriefing while the second group did not do the simulation but participated in the debriefing. The study showed statistically a significant difference in knowledge about heart failure after debriefing for both groups of students. Students who participated in the simulation portion as well had significantly higher post-test scores that those that just participated in the debriefing.

Research indicates that nursing simulations are transforming nursing education by both allowing students to have hands on "patient" experience while giving them the ability to make mistakes without potentially harming patients (Sofer, 2018). Several papers have cited the benefits of simulation usage including improving safe medication administration, promoting communication, encouraging teamwork, increasing student nurse confidence levels (Sanko & Mckay, 2017; Hughes, 2008). During the simulations, instructors can change the clinical scenarios to increase intensity, level of realism, and difficulty of the patient diagnosis (Reed, Lancaster & Musser, 2009). Previous research showed that faculty perceptions of simulation included that simulation is an "excellent teaching tool" and an "important element in nursing education" (Akhtar-Danesh, Baxter, Valaitis, Stanyon, & Sproul, 2009). Empirical studies confirm that students showed statistically significant decreases in anxiety scores and mistakes, as well as improvements in decision making, communication, teamwork and confidence after participating in clinical simulations (Gore, Hunt, Parker, & Raines, 2011).

Despite all of the benefits that have been documented within the last 100 years of using simulation manikins, many schools have not maximized on their use of simulation (Ray, 2017). Ultimately, if nursing programs can increase their faculty numbers and further invest in simulations, the assumption is that the number of students accepted into nursing programs will

increase and the nation might see positive impacts in nurse-to-patient ratios, and the quality of patient care.

Use of Simulation Before the COVID-19 Pandemic

Each state sets its own limitations for simulation usage; twenty-five percent is the maximum percentage of simulation that California's BRN (Board of Registered Nurses) currently allows for pre-licensure nursing programs in the state. For the 70% of programs in California that have not reach the approved 25% simulation usage, primary reasons include having ample availability of clinical placements (61 of 95, 64.2%) lacking available trained staff, technicians, or faculty (52.6%, n=50), or lacking available space or equipment (33.7%, n=32). From those schools that use simulations, 98.6% of schools have integrated some version of simulation standards to help faculty understand and facilitate simulation pedagogy (i.e. ISACSL, NCSBN, NLN, and the Society for Simulation in Healthcare-HHS). The NCSBN developed policies regarding simulation, and the state BRNs are given the responsibility of implementing them. Some states' BRNs were implementing the simulation standards faster than others, but as of 2018, 98.6% of schools had integrated recognized simulation standards (Blash & Spetz, 2019).

The usage of simulation has undoubtedly increased across the nation as reported by both *The NCSBN National Simulation* Study (Hayden et al., 2014*)* and the *BRN 2017-2018 Annual School Report* (Blash & Spetz, 2019*)*. Most recently, the Board of Registered Nurses (BRN) surveyed all nursing programs across the nation and published their findings in their 2017-2018 Annual School Report. The California Annual School Report includes surveys on student enrollment, instructor retention and funding for simulation usage, NCLEX preparation and clinical hours. Thirty percent of the California respondents reported using simulation for the

maximum allowable replacement of 25% clinical hours during skills labs. The majority of manikin-based simulation usage was seen in the departments that were most difficult to find clinical placements. Nursing fundamentals (87%, n=130), medical surgical (97%, n=136), obstetrics (91%, n=131) and pediatrics (87%, n=128) had the highest rates of manikin-based usage for the clinical skills lab. These clinical rotations are highly impacted and do not have enough nurse preceptors to guide nursing students. As a result, nursing programs find it most important to provide students with simulation hours for these particular areas and use medical scenarios that pertain to things like childbirth, childhood disease, post-surgery care and basic knowledge of patient care. With an increasing difficulty of finding rotations for specialty units, it is more important than ever to have these simulations available for students.

While there is consensus about the benefits of simulation usage, not every institution nor state uses the technology to the same degree (Quilici, 2015; Medley & Horne, 2005; Lateef, 2010). National Council of State Boards of Nursing (NCSBN) in 2014 conducted *The NCSBN National Simulation Study: A Longitudinal, Randomized, Controlled Study Replacing Clinical Hours with Simulation in Prelicensure Nursing Education*, which had a great impact on what is known about nursing simulations. The NCSBN showed effective replacement of up to 50% of clinical hours with clinical simulations. The study defines effectiveness as the impact of simulation on educational outcomes including knowledge, clinical competency, critical thinking and readiness for practice. These factors were assessed by placing students into three groups for the two years of their nursing education, with each group differing in the percentage of clinical hours that were replaced with simulation: 10% simulation usage, 25% simulation usage and 50% simulation usage. Measures of the factors listed were collected across all three groups, and no statistically significant ($p<0.05$) differences were observed in the mean scores across treatment

groups. This breakthrough was as important during the time of the study as it is now and in the future.

This study by the NCSBN proved that simulation was an effective comparable alternative to in person clinical training. Although the study showed no significant differences when replacing 50% of the clinical hours with simulation compared to a 10% replacement, each state's BON (Board of Nursing) must approve the maximum percentage of clinical replacements permittable for that state (Hayden et al., 2014). According to a 2019 study on the regulation of simulation, some states like California, Illinois, and Nevada have approved replacement of 25%, others have approved 30%, and a few states like Florida, Kentucky and Louisiana have approved up to 50% replacement (Bradley, Johnson, Dreifuerst, White, Conde, & Meakim, 2019). Although states have set approvals for replacement of clinical hours with simulation hours, the California Annual Survey Report proved that 70% of schools have not yet maximized their simulation usage. Integrating low amounts of simulation denies both current students the opportunity to benefit from this technology and limits the potential for schools to dramatically increase enrollment and meet the need for nurses in the coming years.

Use of Simulation During the COVID-19 Pandemic

Most nursing programs have increased the use of simulation because of the loss of clinical placements during the pandemic (Karim, 2021). States like California have a state waiver that allow for an increase in simulation use from 25% to 50% of required clinical hours—and even up to 75% in some specialty fields when schools show a need (Fogg, Wilson, Trinka, Campbell, Thomson, Merritt, Tietze, & Prior, 2020). Additionally, there has been a decrease in the total number of required clinical hours for completion of the nursing program during the pandemic per Assembly Bill 2288. In September of 2020, AB 2288 was passed which allows for

reductions in direct patient care hours during a Governor declared state of emergency. This allows for reductions in direct patient care hours to 50% in geriatrics and medical-surgical nursing and 25% in mental health, obstetrics, and pediatrics provided a series of conditions are met.

One of the conditions to decreasing the clinical requirements to 25% is that the student must be close to graduation and in their last year of their nursing program (AB-2288 Nursing Programs: state of emergency, 2019-2020). For students who are just starting their programs, the 50% clinical rotation requirement still stands and due to the suspensions in clinical placements, those students will most likely not complete on time (Smith, 2020). In order to qualify for the decrease in required clinical hours, the programs must also prove that they do not have any available clinical placements within a 25-mile radius. Program leaders are on the hunt for clinical placements for their students and often times find placements that require students to take patient temperatures all day. This mundane task may help the hospital, but it provides no meaningful clinical experience for the future success of the student (Smith, 2020). This is why many nursing program leaders believe that the California Board of Nursing should approve simulations for all students, regardless of their progress through the program. There is still lobbying for an across-the-board allowance of direct patient care to drop to 25% in all care areas, even in times of non-emergency, however AB 2288 was a step in that direction, at least (Smith, 2020).

Despite resources, training and money, simulation is underused. Although simulation has numerous proven benefits, schools are still not maximizing their simulation usage (Medley & Horne, 2005). While some institutions (like UCLA) have implemented the maximally approved 25%, many other institutions (like community colleges) have integrated simulation into their curriculum at a low or unknown percentage. Currently, there is no record of what percent of

clinical hours is replaced by simulation within nursing programs in California or data on post-pandemic usage. There is also no research done on the potential of increasing nursing school admissions as a result of increasing simulation usage. This study aims to uncover pre- and post-pandemic uses of simulation in terms of clinical hours replaced, understand the impact of simulation use on enrollment, and uncover, if any, correlations between perceptions of effectiveness and the amount of use. It will focus on pre-licensure nursing schools throughout California for the preliminary questionnaire and then, using selection criteria, select up to five schools for an interview. The conclusions of this study will shed light on changes in simulation usage due to the pandemic and how those changes may impact the long term, future simulation use and program enrollment. It will document the current uses and question whether replacing clinical hours with simulation has the potential to increase future enrollment.

Theory of Diffusion of Innovation: Application to Use of Clinical Simulation

This study draws on the Theory of Diffusion of Innovation (DOI) (Rogers, 2003) which posits that the diffusion of innovation and technology depends on communication through networks of people. My hypothesis is that if the network of nursing program leaders and each state Board of Nursing (BON) communicate evidence showing that increased simulation use increases enrollment, each states BON might consider increasing the maximum allowable use, even after the pandemic is over.

This theoretical framework depicts how simulation technology is adopted over time within nursing programs. Knowledge, persuasion, decision-making, implementation and confirmation are the five stages by which new technology diffuses throughout a program. Nursing programs have the knowledge of simulation technology. However, faculty buy-in (persuasion and decision-making) is a leading issue in getting to the implementation stage

(Starkweather & Kardong-Edgren, 2008). For a technology to diffuse successfully, the technology needs to be advantageous to what it supersedes, maintain consistency with expected needs, be understandable, and produce observable results.

Although programs have the knowledge of the technology and have integrated it into their curriculum, the results of this study show that programs can expand their use towards clinical hours. Throughout the last 100 years, almost all nursing programs have increased their simulation use (Kim, Park, & Shin, 2016). According to the NCSBN National Simulation Study in 2014, 98% of nursing programs across the nation are using clinical simulations as a teaching tool or to replace clinical hours. Since the increase in simulation use, several published sources have shown that the use of simulation has been beneficial to students and that faculty perceptions of simulation value have increased (Hayden et al., 2014). This knowledge and perception of benefit influences the *persuasion* stage of the theory of DOI. The perception of benefit has an impact on the amount of use of the technology, which this study will explore more (LaMorte, 2019).

With the onset of the pandemic, the *persuasion* stage was less about perceptions of benefit but more about necessity. As a result of having clinical placements suspended, nursing programs had no other option but to turn to simulation for completion of clinical hours. The need to use simulation replaced the *persuasion* and *decision*-making phase. What programs decide to do with their simulation use after the clinical placements open again (post-pandemic) will determine the long-term *implementation* of this technology. Depending on the sustainability of the technology and impact of simulation on student success during the COVID-19 pandemic, program leaders have predicted their programs' future simulation use. This study aims at providing evidence that if programs maintain higher simulation use long term, they could

decrease their reliance on clinical placements and allow for higher enrollment of students into the program.

Conclusion

Based on the literature, clinical simulations meet the requirements for a technology to diffuse successfully. Nonetheless, the increased use of this technology in nursing programs depends on faculty buy-in and the proven benefit to students. Research has shown that the main impediments to increasing faculty buy-in is the many layers of technical systems required for usage, the workload needed to create scenarios, and the ratio of students to each manikin (Quilici, Bicudo, Gianotto-Oliveira, Timerman, Gutierrez, & Abrão, 2015).

This dissertation will show the current uses of simulation as a percent of replacement of clinical hours, how simulation use has changed as a result of the pandemic, how perceptions of benefit impact the amount of simulation use and will find out if simulation use has had any impact on enrollment currently or possibly in the future. The quantitative portion of this study will use a survey to find out the amount of use during and after the pandemic, impact to student success and predicted impact on future enrollment. The survey will be followed up with an interview and the qualitative data will allow programs to use their voice to provide more details into their simulation use during the COVID-19 pandemic and how this use will impact future enrollment of students.

CHAPTER THREE: METHODOLOGY

This multi-site study investigated the extent of nursing simulation integration and the factors needed to support and increase simulation usage in pre-licensure nursing programs. With the help of simulation technology, the nursing education field is finding ways to increase the efficiency and effectiveness of the nursing curriculum and potentially the number of graduates. The study looked at correlations between assets deemed important for implementation, barriers schools faced, and the decision-making that led to the diffusion of simulation technology within the program. The conclusion of this study provides best practices for other nursing schools looking to speak to the national shortage of nurses by integrating simulation usage.

Research Questions

The study focused on the following research questions and subquestions:

1. How has simulation use in pre-licensure programs in California changed (or is changing) due to the COVID-19 pandemic?
    a. What are the perceptions of benefit around simulation use for schools that have increased use to 25% or higher during the pandemic?
    b. Is there a correlation between perceptions of benefit and the amount of simulation used?
2. Do users of simulation perceive any potential benefit of simulation with respect to increased enrollment?
    a. To what extent was increasing enrollment a motivation for initial adoption and increased use of simulation?
    b. To what extent has the use of simulation allowed schools to increase enrollment?

c. To what extent do simulation staff and faculty believe that use of simulation could be used to increase enrollment in the future?

Research Design and Rationale

This investigation utilized an explanatory sequential mixed method design to determine the extent of simulation usage before and during the COVID-19 pandemic and the impacts of higher simulation use on current and future enrollment. In this sequential mixed methods design, there was an initial quantitative data collection including identification of high implementers, documentation of percent of simulation use, a correlation analysis of use versus perception of benefit, and perceptions of impact on nursing enrollment. Understanding clinical simulation usage in nursing education first required an understanding of the *extent* of usage (i.e. how many hours is sim used and which courses utilize the technology), the change in simulation use during the pandemic and students' clinical success during that time. In sum, the quantitative results were used to determine who participated in the follow-up interviews and helped to plan the qualitative follow-up questions. The data showed effects of simulation on enrollment that needed to be explored further. Qualitative results allowed respondents to provide in-depth explanations of the impact that changing simulations use had on students, the program, and their predictions of how this could increase enrollment in the future; the goal of this study. The interview allowed the researcher to probe survey answers, answer Research Question 2 in more depth, and collect direct quotes from participants (Creswell & Creswell, 2018).

The quantitative portion of the study was necessary to identify the elements that made for the successful usage and the perceptions of benefit surrounding the increased use of the technology during the pandemic. However, survey questions alone could not probe deeply enough to truly understand the reasoning and underlying decision making behind usage or if the

perceptions of benefit truly dictated how much a program utilized the technology. Responses pertaining to perceptions and predictions of usage or enrollment might be difficult to answer in depth in a survey. Most respondents opted out of answering open ended questions, so if answer options respondents might have preferred were missing, the analysis of the data would not have been as thorough (Keyserling, 2021). Fully answering the research questions of this study was possible with only a quantitative portion however the potential to inquire and offer respondents a chance to answer more fully and provide details in their own words made the study more complete. Therefore, a comprehensive, qualitative interview portion was essential to fill in the missing details and explanations for perceptions of benefit of simulation (after the increase in integration) and its potential to impact the future of nursing school enrollment. Interviews gave the interviewees the ability to explain their survey selections, clarify questions and offer the opportunity to discuss the topics further in their own language (Burkholder, Cox, Crawford, Hitchcock, & Patton, 2020).

In designing this study, it was important that the collection of quantitative data was done first because it provided the statistics on the population from which a specific subset sample was selected for the qualitative portion. The quantitative results not only addressed both research questions, but they also provided, for the first time, the percent of simulation that was used to replace clinical hours before the pandemic and during the pandemic. The survey also asked about applications received and enrollment before and during the pandemic and asked respondents to make predictions about the future of enrollment given the current percent of simulation used. Both the quantitative and qualitative portions were interpreted and discussed together in Chapter 4 as they provide complementary evidence to answer the research questions.

Survey Sample

The survey for the quantitative portion of the study was distributed to 128 of the 149 public and private pre-licensure nursing programs in California. There are a total of 149 university and community college level pre-licensure nursing programs that were listed on the State of California's Department of Consumer Affairs list of approved pre-licensure nursing programs (see Tables A1 and A2 in Appendix A). Table A1 is a list of 4-year universities in California, while table A2 is a list of California community colleges. By researching the program websites and calling the program offices, I identified a point of contact for 128 of the 149 schools (86%), including 89 community colleges, 21 public universities, and 18 private universities. This point of contact was the person I was able to identify who seemed most qualified to respond to the survey questions: a program coordinator, program chair, simulation director, or a person who is familiar with the academic and administrative sides of simulation at these institutions.

To ensure consistency amongst schools' maximum reported usage of simulation, the survey was restricted to the state of California. Each state's Board of Nursing (BON) has approved a different maximum percent of clinical replacement with simulation. California's BON approved a maximum of 25% substitution of clinical hours outside of national emergency times (before the COVID-19 pandemics), so the maximum simulation usage for replacement of clinical hours before the pandemic reported by survey respondents was expected to be 25%. However, during times of national emergency (like the COVID pandemic), California's BON approved an increase in the amount of simulation used to 75% for high impact units like pediatrics and obstetrics. These regulations of maximum use created a consistent categorization of those considered "high implementers" both before and after the pandemic. However, it must

be taken into consideration that although an institution was considered a "high implementer," this does not mean that the institution was replacing clinical hours with simulation hours. Care must be taken to distinguish between schools that were using simulation as simply an educational tool versus those that were using simulation to replace a portion of students' clinical hours. This survey had distinct questions regarding the programs use of simulation hours to directly replace clinical hour requirements. For example, a program could respond with "47%," which would mean that the program is replacing 47% of the required clinical hours with simulation hours. Programs were asked to report the percent of replacement of clinical hours before the pandemic and during the pandemic.

Interview Sample

I utilized purposive sampling to select five schools for qualitative data collection. After the surveys were complete, willing participants that met selection criteria were invited to the interview portion of the study where I probed deeper into their survey responses and their professional opinions on the future of simulation in nursing. For the selection of participants, I identified participants whose schools were public and met at least one of the following criteria: (1) schools that used increased enrollment as a primary motivator of adoption, (2) schools that stated simulation use had a positive impact on current enrollment, (3) school that predicted simulation would have a positive impact on future enrollment, and (4) programs that predicted increased use of simulation post-pandemic.

The survey was sent to a variety of job titles within different programs including program coordinators and simulation faculty. Either of these individuals would be appropriate participants for the interview portion as well. The program coordinator can provide information through an administrative and political lens including faculty buy-in, costs, and available clinical rotation

placements for the program. Simulation faculty directly interact with students and understand minimum simulation requirements to substitute clinical hours. They also understand the classroom and hardware requirements as well as the difficulties in getting the simulations to run successfully. It is especially important to ensure that the participants are directly involved in the simulation program including those who are part of the decision-making regarding simulation, teaching lessons using simulation, creating simulation scenarios, and handling the simulation hardware. Program coordinators and simulation faculty will have valuable input on the changes in use from before to during the pandemic and how those changes impacted the students and ability of programs to maintain or increase enrollment during a time of emergency.

For the selection of interviewees, I initially created a list of public schools from which to apply the selection criteria. I chose only public institutions because they have similar state funding structures and decision-making protocols. Furthermore, 71% of nursing programs in California are public (Distributed by ERIC Clearinghouse, 1983; Blash & Spetz, 2019). Since private programs have fewer financial restrictions, they may not experience the same motivations or barriers for using simulation for replacement of clinical hours and as such, were omitted from the interview. I then chose schools that used enrollment as a primary motivator to understand the thought process behind the program's decision making to initially integrate the technology and how they believed it would impact their enrollment numbers. The same reasoning was used for the third and fourth selection criteria regarding the impact of enrollment on present and future enrollment. It is one of the goals of this study to find out if using simulation can help or has helped to increase enrollment and to identify ways in which schools can use simulation to increase their enrollment. Lastly, schools that plan on using more simulation after the pandemic than they did before the pandemic will be chosen. These schools will provide information on

why they are choosing to use more simulation; the possibility that it was highly beneficial to their students during the pandemic or the realization that the program could rely less on clinical placements to determine their enrollment.

Of the 34 public programs that responded to the survey, 24 of those programs indicated a willingness to participate in the interview portion of the study. Of those 24 programs, 10 met at least one of the remaining selection criteria and were invited, by email, to participate. Ultimately, interviews were completed with five individuals.

Data Collection

Survey Data Collection

I collected quantitative data using a questionnaire distributed to 128 pre-licensure nursing schools in California. The goal of this survey was to obtain a representative sample of California's pre-licensure nursing programs in order to and characterize overall usage of simulation, perception of benefit and its correlation to usage, and changes in enrollment. Participants who completed the entire survey received a $5 gift card to Amazon as a show of appreciation.

The survey (Appendix B) asked about the changes to simulation use (i.e. initial integration, use before the pandemic and use during the pandemic), perceptions of effectiveness on NCLEX scores and clinical skills, the status of clinical placements during the pandemic, and changes in applications and enrollment during the last 5 years (2014-2019). Survey questions were mostly closed-ended (with only three questions that offer a section to add additional comments if the participant wishes), with multiple choice and Likert-type response options. The survey was administered online for easy submission. The median completion time was about 12 minutes. The survey responses provided, for the first time, the percentage of clinical hours

replaced with simulation usage at each nursing institution (Research Question 1). The data from the quantitative portion of the study also allowed for an examination of relationships between perceptions of benefit of the technology and implementation percentages (part a of Research Question 1). Finally, the survey asked about the approximate number of applicants to the programs, how many students were admitted and enrolled between the years 2014 and 2019, and the potential of simulation technology to impact enrollment (Research Question 2).

Interview Data Collection

The interview was semi-structured. The interview protocol (Appendix C) includes predetermined questions but still allows room to probe participants for additional details. Interview questions were aimed at gaining a more thorough understanding of the perceptions of simulation use and if they felt it had any impact on how much their program uses the technology. The interview then asked if the programs increased simulation use during the pandemic will likely have any impact on the amount of simulation use after the pandemic. Lastly, the interview focused on the respondents' views on whether increasing the percent of clinical hours replaced by simulation could have an impact on future enrollment. Programs that have decided or decide (in the future) to increase their use of simulation for the replacement of clinical hours may be able to diffuse their contracted number of clinical hours with the hospital across a larger cohort of students. The five programs selected for the qualitative portion of this study will answer questions about their own opinions on whether building this bridge between simulation use and higher enrollment would be realistic.

The interviewees provided site specific information on the use of simulation and a detailed chronological process for their successful implementation and continued usage. According to the Diffusion of Innovation Theory, in order for a technology to spread, it must

first overcome the persuasion and decision stages. In this study, the theory would focus on a programs *interest* in adopting the technology for more clinical hour replacement and then *deciding* to integrate it for more courses and clinical rotations, ultimately leading to the implementation stage. The implementation stage of DOI for the prospective nursing programs would be to have a higher percentage of simulation usage towards replacement of clinical hours across more courses and clinical departments that do not yet utilize the tech.

The interview questions focused on the details regarding simulation programs and opinions regarding ways the program can use simulation to increase enrollment. The interview also asks about weather perceptions of effectiveness of simulation have had or have an impact on the amount of simulation the program uses. Asking participants to elaborate on survey responses will allow the participant to share more thoughts, feelings, and opinions. Interviews were conducted over ZOOM and recorded with the participant's permission. Interviews lasted approximately 45 minutes to one hour each, and the interviews were conducted over a span of two weeks. Once the interview is completed, participants received a $20 Amazon gift card as a show of appreciation.

I interviewed participants and ask them to provide details regarding the impact of simulation use on enrollment at their institution, focusing on weather simulation use has already helped to increase enrollment in the past or if the increased use of simulation during the pandemic will motivate them to continue their higher use. For those schools that predicted higher use for the future (post-pandemic), I am interested in knowing if using more simulation could lead to increasing enrollment because of lower reliance on clinical placements. It is especially important to ask these programs if their enrollment numbers have already changed as a result of using simulation technology to replace clinical hours. This is key because if programs have

already used simulation to increase enrollment, it is indicative that increasing enrollment because of higher simulation use is possible. By allowing survey respondents to respond in an interview format, the study might elucidate critical points missed by the survey questions. Future studies could dive deeper into this realm and understand the structure of a program that utilizes technology to decrease reliance on clinical placements and how the program overcomes other barriers to successfully enroll more students.

Data Analysis

After collection of survey data, I summarized the responses using descriptive statistics (e.g., means and standard deviations for quantitative variables including percent of simulation usage before and during the pandemic, type of simulation used before and during the pandemic, and impact on enrollment). I displayed the type of simulation used by programs at initial integration and during the pandemic on bar graphs, color coordinating the simulation types to identify which types increased and decreased use. Using correlation coefficients and t-tests, I examined possible associations between perceptions of benefit of the technology and the percent of simulation usage. The survey also provided a deeper understanding into the motives for increasing the usage of simulation and the impact the program believes simulation has on students. The responses from the interviews regarding the impact on enrollment, predicted future use of the technology and the impact of faculty and staff perceptions of benefit were used to provide direct quotes and reinforce the survey data. By understanding the effects on student success during higher implementation and the potential role simulation technology plays in increasing nursing school enrollment, recommendations have been made to schools and the state BON. Schools that have not yet integrated simulation to the maximum allowable percent should

consider increasing their use of the technology and the state BON should maintain the current increase in allowable percent of replacement following the pandemic.

The unit of analysis for the interviews were the factors that truly contribute to increasing the amount of simulation used and predictions on future enrollment if simulation use is maintained. The interview transcripts were analyzed to see if there were any common perceptions of benefit, statements regarding the potential to increase enrollment or reasons why enrollment still cannot increase for the future. The categories that were be coded include perceived benefits to students, increasing enrollment, predicted use, and goals of increasing simulation use. These were the same categories coded for in the survey. By using the coding trends from both the survey and the interviews, I was able to draw conclusions about how different perceptions influence the amount of a program's simulation usage, look at overall trends in percent of simulation used before and during the pandemic, and how that higher use impacted student success and faculty's perceptions of what future use might look like. With this information, the study makes recommendations to programs looking to increase their clinical simulation usage and for programs looking to increase their enrollment. Above all, this data can show the California BON that by allowing the long-term increase of replaceable clinical hours with simulation, programs have an opportunity to increase enrollment by relying less on the limited clinical placement.

Role Management and Positionality

Once I identified willing participants who met at least one of the selection criteria, I reached out to all of them via email. I included my title as both a UCLA graduate student as well as a pre-nursing college faculty member so that the potential participants know that my work will directly impact the nursing field and that the study is being done at a top tier research institution.

I think both of these titles ensured that participants found me both a credible researcher and a member of the nursing education community, just like themselves. I made sure to include in the email that 90% of the students that take my college courses are pre-health students, with the majority of them aspiring to become nurses. Many of these students are struggling to gain admissions into public nursing programs even with great grades and medical experience. My purpose in this study is to show a personal interest in all students' continued ability to reach their goals as healthcare practitioners and the progression of nursing school education.

Ethical Issues

Although my study focused on the changing use of simulation amidst the COVID-19 pandemic, there were questions regarding enrollment which can provide benefit to nursing programs struggling to find clinical placements or increase enrollment due to lack of clinical sites to train students. The feedback included the reasons behind why programs decided to increase their simulation usage and why maintaining high implementation would be difficult long term. Interview responses included critical viewpoints about the program, supervisors or colleagues, and as such, it was imperative to ensure anonymity of the program and interviewee. No school names, individual names or descriptions of characteristics that would indicate the specific California nursing program were included. Creating trust between myself and the interviewee was important because I needed complete and honest answers about barriers that may have hindered implementation or success of the technology. Without trust, I could not expect my interviews to elucidate truly valuable information to contribute to this study.

Reliability and Validity

To ensure validity of the quantitative portion of the study I made sure the survey design and questions would capture the data I was looking for to answer the research questions. Once

the survey was created in Qualtrics, I had two faculty members who are leaders in simulation go through the survey and test its effectiveness and content validity. I received feedback from both faculty members and made changes to the wording of questions, the question order, and the skip logic that I had used. The two faculty members also made sure that the survey content covered a representative sample of the domains to be measured. The survey provided opportunities for participants to type in additional information, in the case that they felt the survey did not provide responses that pertained to their institution. Although there were open spaces to type out more detailed responses, most survey respondents opted not to type out detailed, explanative responses and so the survey might have missed important details pertaining to "how" and "why" questions making interviews so imperative (Keyserling, 2021).

Another validity threat to my survey data was having insufficient evidence and being unable to make broad, statewide conclusions. Although the survey was sent to 86% of the pre-licensure nursing programs in California, only one respondent per institution was asked to reply to each survey. Because I was unable to send the survey to all programs in California (due to difficulty finding a person of contact) and some programs did not respond to the survey request, I am unable to hold the conclusions from this study true for all other cases or make statewide generalizations. One way to address this concern with external validity is to select a subset of schools (only *public* programs in California) for the interview portion in order to increase the validity of some recommendations. This addresses the stated concern because 81% of the survey respondents were public programs and so the interview responses will pertain to the majority of survey respondents. Additionally, respondents ranged from leaders of the program to staff who run the program hands on, so the perspectives of each individual may differ based on their role in simulation use.

One credibility issue may be that simulation leaders felt the need to respond in a certain way to questions regarding the percent of simulation used before the pandemic and during the pandemic. It is possible that respondents reported using a higher percent of simulation to show their programs are advanced or to conceal their difficulty adopting the technology. They could have also underreported percentages if they are using more simulation than what the state allows. Some respondents may also not have had a complete understanding of simulation use within the program or about simulation use during initial integration, causing them to not report honestly or just choosing answers they think would benefit the study. To address this issue in credibility, I assured respondents that study participants would not be identified (alternate institution names are used when reporting data or using interview quotes) and upon completion of the study, all data and recordings were deleted.

To ensure the reliability of the survey answers, I asked survey questions in overlapping ways and then make sure that the answers for overlapping question types are the same. In addition to providing overlap among some of the questions to ensure accuracy of the survey, I further confirmed responses by interviewing the respondent from the five selected programs. Interviews with nursing program coordinators and seasoned instructors of simulation provided credibility and trustworthiness to the study. By interviewing a variety of individuals from nursing programs, I provided an opportunity for participants to have an open conversation about their experience with simulation during the pandemic and what they believe their programs are truly capable of accomplishing in terms of future enrollment.

Themes between programs from both the survey and the interviews were codified and analyzed for correlations and significance. By interviewing staff and faculty at multiple sites, I

can be more confident that the findings of this cross-case analysis will generalize as much as possible beyond any individual location.

Chapter Summary

This study used explanatory sequential mixed methods design to identify the changes in percent of simulation use before and during a global pandemic and how these changes impacted student success and enrollment. Data from the surveys was used to better understand the most common types of simulation used, the exact percent each school uses simulation, the programs perception of simulation, and predicted future use of simulation. The interviews also briefly ask about the potential of simulation to increase enrollment. To increase the depth of the research, interviews were conducted with leaders in nursing simulation to get more details on the enrollment piece of the study. The interview focused primarily on the opinions of participants regarding a programs potential to increase their enrollment if students are allowed to use simulation, rather than filling the limited clinical placements. This paper should be an effective tool used by the California BON when considering whether increase the percent of simulation allowed to replace clinical hours. Additionally, nursing schools may consider maximizing on the percent of clinical hours they replace with simulation in order to diffuse the number of clinical placements across a larger cohort of students.

CHAPTER FOUR: RESULTS

This study looked at changes in simulation use as a result of the COVID-19 pandemic, perceptions about the effectiveness of simulation and the potential impact of simulation use on increasing enrollment. The survey distinguished how much simulation schools are using, how they are using the technology and the perceived effectiveness of the technology on student NCLEX scores and clinical competencies. The study looked at the association between perceptions of effectiveness and simulation use (in terms of percent of clinical hours). Lastly, the survey examined the predicted potential impact of simulation on enrollment. Although much of this study was about perceptions and predicted future usage, it brings light to a potential benefit of simulation.

Sites and Participants

Of the 128 survey links that were sent, there was a total of 43 respondents from a variety of public and private institutions. Of the 43 respondents, 29 (67%) were willing to participate in the interview portion of the study. From those 29 schools, 13 schools met at least two of the five selection criteria described in Chapter 3 and I intended on interviewing all 13 institutions. The first five interviews reinforced the survey data however, during those interviews, I was not hearing any new information. I anticipated that additional interviews would not provide much further benefit. It was at this point that I decided not to contact the remaining eight schools that also met the selection criteria.

Table 4.1 summarizes some key characteristics of the schools in the sample; Table 4.2 summarizes characteristics of the respondents. Of the schools represented in the sample, 81% were public institutions. About 30% of programs enroll more than 100 students a year, 30% enroll between 51 and 100 students, and 12% enroll between 81 and 90 students. 56% of

institutions reported having a moderate amount of difficulty placing their students into clinical placements while only 2% responded that they had no difficulty. Remarkably, 100% of responding institutions reported currently using simulation technology to supplement student education. Simulation was used by the majority of respondents (65%) for a period of between 6 and 15 years. The positions held by 43 respondents included faculty (26%), department chairs or deans (26%), simulation coordinators/directors (16%), program coordinator/directors (14%), assistant program directors (12%). Of the remaining respondents one identified as a clinical placement director, another as director of clinical labs, and a third identified as holding multiple roles (assistant program director and department chair). Respondents ranged in experience with one respondent working less than 1 year to another respondent working over 40 years. About 91% of survey respondents hold a nursing degree. Within that group, only 22% used simulation technology during their training.

Table 4.1
Characteristics of Institutions Represented in Survey Sample

	n	%
Institution Type (n=43)		
Public	35	81.4
Private	8	18.6
Number of Students Admitted (Annual Average) (n=43)		
50 or Fewer	17	39.5
51 to 100	13	30.2
More than 100	13	30.2
Currently Use Simulation (as of Fall 2020) (n=43)		
Yes	43	100.0
No	0	0

Table 4.2
Characteristics of Survey Respondents

	n	%
Respondent Position/Role (n=43)		
Department Chair or Dean	11	25.6
Faculty	11	25.6
Simulation Coordinator/Director	7	16.3
Program Coordinator/Director	6	14.0
Assistant Program Director	5	11.6
Other/Multiple	3	7.0
Holds a Nursing Degree (n=43)		
Yes	40	93.0
No	3	7.0
Years Employed by Institution (n=43)		
5 or Fewer	12	27.9
6-10	12	27.9
11-15	6	13.9
16-20	8	18.6
21 or More	5	11.6

I will refer to the five institutions that were chosen for the interview by the following pseudonyms: College of the Coast, University of Suburbs, West Beach College, California University of Nursing, and Palms College.

Research Findings

In this section, I will present the findings related to the research questions from both the quantitative and qualitative sections of the study. The findings will be presented in order of the

research questions and subquestions. Each question has survey questions that pertain to them as well as interview questions that provide more context and direct quotes from participants. The findings will provide supplemental tables that show details of the statistical analysis and figures that allow readers to visualize to the findings.

Findings Related to Research Question One

This section provides quantitative and qualitative data collected for the following research question and subquestions:

1. How has simulation use in pre-licensure programs in California changed (or how is simulation use changing) due to the COVID-19 pandemic?
    a. What are the perceptions of benefit around simulation use for schools that have increased use during the pandemic?
    b. Is there a correlation between perceptions of benefit and the changes in simulation use?

Changing Use of Simulation

The use of simulation to replace clinical hours before and during the COVID-19 pandemic is summarized in Table 4.3 (usage for each of the responding programs is provided in Appendix D). Simulation was used to replace an average of 16% of clinical hours before the pandemic (with a range of 0% to 35%) and an average of 40% after the onset of the pandemic (with a range of 1% to 75%) in March of 2020, an increase of nearly 150%. This difference was statistically significant ($t=9.5$, $p<.001$) and corresponds to an effect size of 1.6.

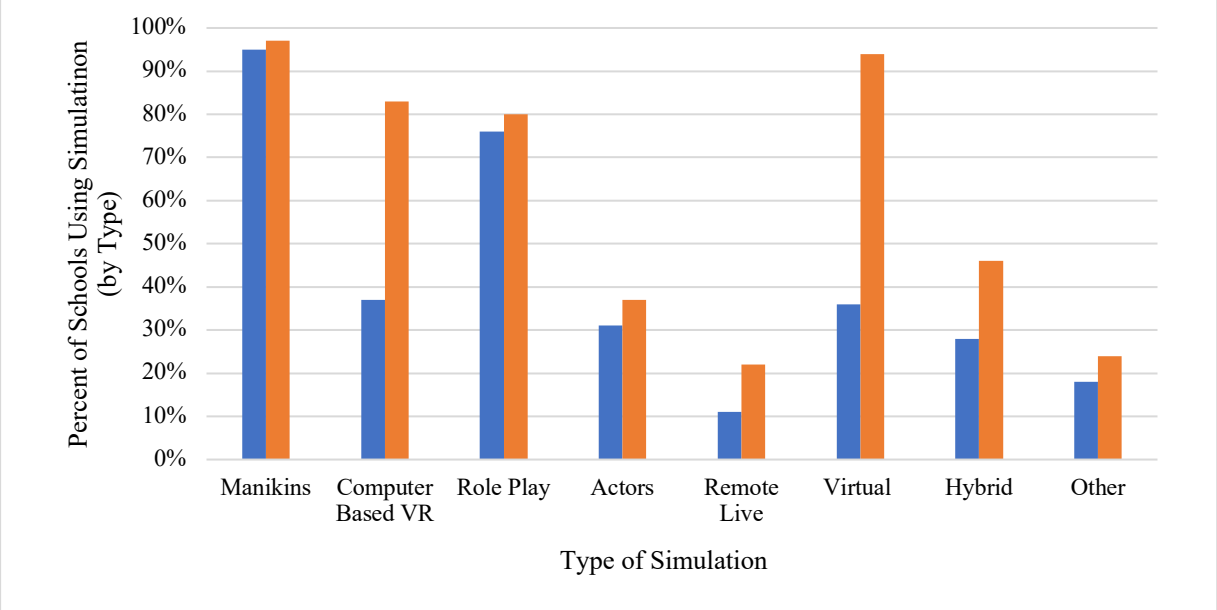
Table 4.3
Change in Simulation Usage (n=38)

time	Descriptive Statistics				ΔMean	ES	Paired Sample t-Test		
	Min	Max	Mean	SD			df	t	p
Pre-pandemic	0	35	16.1	9.0	23.4	1.6	36	9.5	<.001
During pandemic	1	75	39.5	16.1					

Notes: ES: Effect size (Cohen's d); Information about simulation use pre-pandemic and during pandemic was available for 38 of the 43 survey respondents.

In addition to changing the amount of simulation use, programs also altered the type of simulation they predominantly used before versus after the pandemic. Of the 39 schools that responded to the survey question about changing the type of simulation since initial integration, 93% of schools changed their form of simulation use. Figure 4.1 below shows the types of simulation used during initial integration and current integration used by schools.

Figure 4.1
Types of Simulation Used During Initial Integration and Currently



Note: Blue represents initial use and orange represents current use. Manikins and Role Play were the most widely used types of simulation used during initial integration, and both continue to be widely used. Computer Based VR and Virtual simulation are also used currently by large majorities of schools.

During initial integration, the primary types of simulation used included manikins and role playing with other students. Presently, schools are equally using manikins and virtual simulations. While approximately the same number of schools were utilizing manikins during first integration and in the present, the number of schools that are using virtual simulations has more than doubled. This could be explained by the fact that many nursing programs had to convert to 100% virtual learning at the start of the pandemic and the use of virtual simulations was the only way to continue providing students with clinical skills training. Overall, schools have shown an increase in the variety of simulation types being used. Every type of simulation listed on the survey showed an increase in use compared to when the school first integrated simulation.

Perceived Benefits of Simulation

Faculty and staff reported that simulation had a "large positive impact" on the program's ability to provide students with the opportunity to complete clinical hours (29 of 37, 78%) and on student program completion (15 of 35, 43%). Overall, 55% of programs believe that their increase in simulation use during the COVID-19 pandemic had a positive impact on students.

Respondents rated their perceptions of effects of simulation on student success. For the 41 schools that reported their level of perception of effects on NCLEX success, the average rating was 5.7 out of 7, with a minimum rating of 4 and a maximum rating of 7. For the 36 schools that reported their level of perception of effectiveness of simulation for developing clinical competence, the average rating was a 6.2 out of 7, with a minimum rating of 4 and a maximum rating of 7. These results suggest that programs, on average, have a high perception of benefit of simulation use on student testing and their practical skills outcomes.

Participants were asked to rate their agreement with ways in which the use of simulation helped their institution. The responses are summarized in Table 4.4. Large majorities of respondents *strongly agreed* that the use of simulation helps their institution improve clinical judgement (34 of 37, 92%), improve decision-making skills (34 of 37, 92%), and ensure patient safety (36 of 42, 86%). The lowest percent under the "strongly agree" response was to overcome preceptor shortages and lack of clinical sites (13 of 42, 30%). The interviewee from College of the Coast stated in their interview that, "NCLEX is great, but the main focus is prioritization of tasks and clinical skills." In addition to helping student pass their national nursing exams, simulation technology has multiple other benefits that respondents have identified in both the survey and the interviews.

Table 4.4
Perceived Benefits of Clinical Simulation

	Strongly Disagree		Somewhat Disagree		Somewhat Agree		Strongly Agree		Total n
	n	%	n	%	n	%	n	%	
To ensure patient safety	1	2.4	1	2.4	4	9.5	36	85.7	42
To promote better preparation of new nurses	1	2.4	0	0.0	4	9.8	36	87.8	41
To support innovative teaching strategies	2	4.8	1	2.4	9	21.4	30	71.4	42
To overcome preceptor shortages and lack of clinical sites	9	21.4	3	7.1	17	40.5	13	30.1	42
Improving clinical judgement	0	0.0	0	0.0	3	8.1	34	91.9	37
Improving decision-making skills	0	0.0	0	0.0	3	8.1	34	91.9	37
Teaching student basic skills	1	2.9	0	0.0	11	31.4	23	65.7	35

The Relationship Between Perceptions of Effectiveness and Simulation Use

I examined the correlations between percent of simulation use after the COVID-19 pandemic and perceptions of benefit with respect to NCLEX scores and clinical competency. The results are summarized in Table 4.5.

Table 4.5
Correlations Between Perceived Effects on NCLEX/Clinical Competency and Simulation Usage (n=35)

	M	SD	Correlation with Sim Usage	
			r	p
Perceived effect on clinical competency	6.26	0.78	.331	.052
Perceived effect on NCLEX score	5.69	0.96	.435	.009

Notes: Simulation Usage is the percentage of clinical hours replaced by simulation during the COVID-19 pandemic. Perceived effects of simulation on NCLEX score and clinical competency were measured on a scale from 0 ("highly detrimental") to 7 ("highly beneficial"). Results are based on respondents with complete data for these questions (n=35).

There was a moderately strong and statistically significant positive association between perceived impact on NCLEX scores and the percent of simulation use after the COVID-19 pandemic (r=.435, p= .009). There was also a moderate positive correlation between perceived impact on clinical competency and the percent of simulation use after the COVID-19 pandemic, but this association was not statistically significant (r=.331, p=.052). These findings show that there may be a connection between how beneficial a program believes simulation is and how much they integrate the technology into the curriculum. However, the low correlation values may in part be due to the fact that there was not a wide range in the perceptions, as well as other, more important, factors that are predictive of usage. If there is strong buy-in to the technology, programs may choose to replace more clinical hours (up to the maximum allowable) with simulation. The interviewee from the University of the Suburbs said that "the programs

perception of benefit isn't really what impacts how much we use. We will use simulation based on what the research shows. Research shows that sim is effective." However, other programs do internal evaluations of the simulation from the previous semester use from faculty and student perspectives. One interviewee from the College of Sunshine stated, "Our programs do evaluations after we do simulations. A lot of times, the evaluations find that our students are learning more with simulation that some days on clinical floors. It has in fact driven our program to add more simulation to replace and supplement clinical hours."

So far, there are no evident or significant changes to national NCLEX scores before the pandemic (lower simulation use) compared to after the pandemic (higher simulation use). The 2021 NCLEX scores (January through March) were recently released and reported that 84% of US educated RN candidates passed after taking the exam their first time. In 2020 that pass rate was at an 86% and in 2019 it was at an 88%. Although this is not a statistically decrease, it does show a downward trend the last three years. It will be interesting to see the pass rates for students taking their NCLEX exams for the remainder of the 2021 test dates as those students will have had a full year of virtual learning and a high use of simulation.

Predicted Future Use

During the pandemic, 90% of respondents (36 of 40) reported that they increased the amount of simulation used, three reported no change, and one reported a decrease. Of the 36 respondents who reported an increase in their simulation use during the pandemic, 34 stated they increased the use primarily to address the scarcity of clinical placements. When asked about future usage of simulation (post-pandemic), 24 of 37 (65%) respondents stated they will be using a higher percent of simulation relative to what was used before the pandemic. Eleven respondents (30%) stated they will be maintaining the same level of simulation use as before the

pandemic while two (5%) stated they will be using less simulation than their pre-pandemic usage. The interviewee from West Beach College stated, “We’re going to go back to our original amount of simulation use because we got lucky, and we are able to maintain our clinical placements for the students and go back to using sim as a backup.” Additionally, the interviewee from the College of Sunshine said that they do not have a dedicated simulation lab and therefore had to rent space off campus which was costly. Their program did mostly virtual simulations but feel that maximizing on virtual simulation would not be a good way to train nursing students as a primary source of clinical training. They added that, “only a small part of faculty feels comfortable with simulations because most don’t have formal training.” The interviewee from Palms College stated that “After COVID, we will still use higher simulation hours because the feedback from students has been very strong.”

Findings Related to Research Question Two

This section provides quantitative and qualitative data collected for the following research question and subquestions:

2. Do users of simulation perceive any potential benefit of simulation with respect to increased enrollment?
    a. To what extent was increasing enrollment a motivation for initial adoption and increased use of simulation?
    b. To what extent has the use of simulation allowed schools to increase enrollment?
    c. To what extent do simulation staff and faculty believe that use of simulation could be used to increase enrollment in the future?

Factors Motivating Simulation Adoption

This study was motivated by the fact that there is a national nursing shortage and not enough nurses graduating from nursing schools each year to fill the shortage by the year 2030. The main goal is to uncover how much simulation is being used, factors motivating the different stages of use, and its indirect impact on nursing school enrollment.

The survey asked participants to predict if their program has the potential to increase their enrollment in the future if simulation is used to replace a higher percent of clinical hours. Responses are summarized in Table 4.6.

Table 4.6
Motivations for Initial Adoption of Simulation

Statement	Not a motivator		Not sure		Somewhat a motivator		Definitely a motivator		Total n
	n	%	n	%	n	%	n	%	
To allow students to practice clinical skills in a low-stakes environment before working with real patients	0	0.0	0	0.0	6	14.3	36	85.7	42
To expose students to rare conditions that students would be unlikely to encounter in clinical placements.	6	15.0	5	12.5	10	25.0	19	47.5	40
To expose students to specialties our program does not currently have clinical placements for	19	47.5	2	5.0	9	22.5	10	25.0	40
To assess students' clinical skills	2	5.0	1	2.5	16	40.0	21	52.5	40
To address scarcity of clinical placements	10	24.4	4	9.8	12	29.3	15	36.6	41
To allow our program to enroll a larger number of students	33	80.5	3	7.3	3	7.3	2	4.9	41

For 80% of respondents (33 of 41), increasing enrollment was not a motive for adopting the technology; 7% (3 of 41) stated that it was somewhat a motivator, and only 5% (2 of 41) viewed this as definitely a motivator. Instead, the predominant motivator for the initial adoption of simulation was to allow students to practice their clinical skills in a low stakes environment before working with real patients; 86% (36 of 42) identified this as definitely a motivator, and 14% (6 of 42) identified this as somewhat of a motivator. The second most predominant reason for adopting the technology was to assess students' clinical skills (93%, 37 of 40). Addressing the scarcity of clinical placement was a motivator for 66% (27 of 41) of respondents.

Factors Motivating Changes in Simulation Use Over Time

Findings for the question on motivating factors for increasing simulation use after initial adoption (but prior to the pandemic) show that programs increased their simulation use primarily to address issues securing clinical placements. Responses are summarized in Table 4.7. Scarcity of clinical placements was a motivator for 75% (24 of 32) of schools that increased their simulation use before the pandemic. From the survey, increasing enrollment played a factor in increasing simulation use for 22.6% of school (n=31). The data shows that from initial adoption to increasing the amount of use after adoption, there seems to be an increasing motivation towards using simulation to enroll and larger number of students.

Table 4.7
Motivations to Increase Simulation Use After Initial Adoption

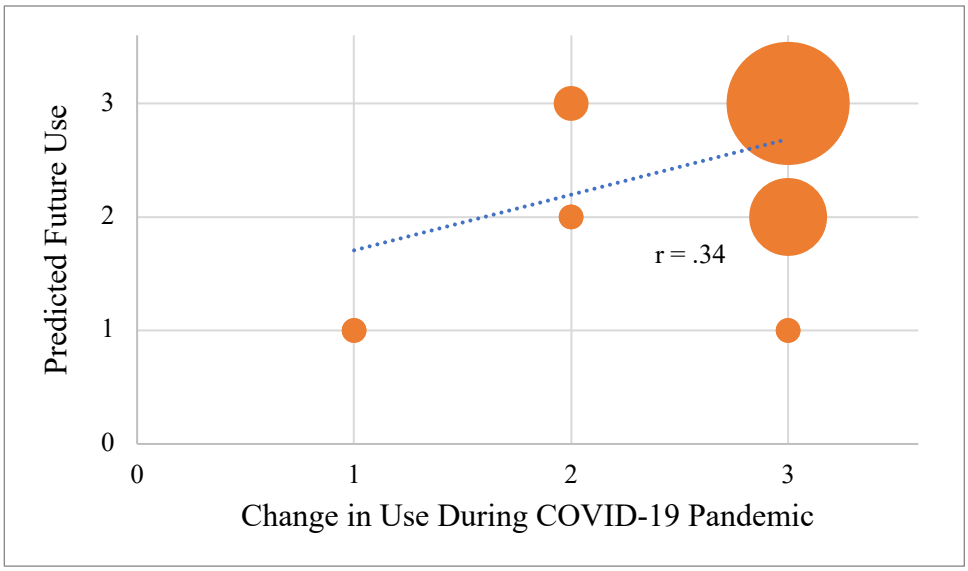
Statement	Not a motivator		Not sure		Somewhat a motivator		Definitely a motivator		Total n
	n	%	n	%	n	%	n	%	
To allow students to practice clinical skills in a low-stakes environment before working with real patients	1	3.1	0	0.0	5	15.6	26	81.3	32
To expose students to rare conditions that students would be unlikely to encounter in clinical placements.	5	16.1	3	9.7	6	19.4	17	54.8	31
To expose students to specialties our program does not currently have clinical placements for	12	38.7	3	9.7	7	22.6	9	29.0	31
To assess students' clinical skills	1	3.2	0	0.0	9	29.0	21	67.7	31
To address scarcity of clinical placements	6	18.8	2	6.3	12	37.5	12	37.5	32
To allow our program to enroll a larger number of students	2	18.2	2	18.2	3	27.3	4	36.4	11

During the COVID-19 pandemic (March 2020 to present), the percent of respondents that reported using more simulation because of difficulty securing clinical placements was 24% higher than before the pandemic. During the pandemic, addressing the scarcity of clinical placements was the primary motivator for 98% (37 of 38) of schools that increased their simulation use during the pandemic. The suspension of clinical sites more than likely played a role in the drop in percent of schools looking to use simulation to increase enrollment. The percent of respondents who agreed that increasing enrollment motivated higher simulation use during the pandemic was at 14% (5 of 36). The decrease in enrollment as a motivating factor

during the pandemic was most likely because programs were having difficulty placing the students they currently had or that students were not applying/enrolling into schools because of the recession.

The survey data suggest that the more a program utilized higher percent of simulation during the pandemic, the higher they also predicted their future usage would be. There was a small to moderate positive correlation between the change of simulation use during the pandemic and the predicted change in simulation use after the pandemic (r=.34, p=.033). Figure 4.2 shows that increases in simulation use during the pandemic (ratings of 2 or a 3) were associated with predicted future increases.

Figure 4.2
Plot of Change in Simulation Usage During COVID-19 Pandemic and Predicted Future Use (n=41)



Note: Rating of 1 indicates the program has decreased or will decrease percent of simulation use. Rating of 2 indicates program has maintained or will maintain their percent of simulation use. Rating of 3 indicates program has increased or will further increase their percent of simulation use. Size of the circles indicate the frequency at each data point.

Participants were asked to identify the resources that would be required for increasing simulation use. The responses are detailed in Table 4.8.The resources reported by the largest percentages as "Very Important" to increasing simulation use after the pandemic included instructor training (33 of 41, 80%), an increase in the BON allowances (32 of 41, 78%), having more faculty to teach using simulation (29 of 41, 71%), and financial resources (28 of 40, 70%).

Table 4.8
Resources to Increase Simulation Use After COVID-19 Pandemic

Field	Not at all important		Somewhat important		Very important		Total n
	n	%	n	%	n	%	
Financial Resources	1	2.5	11	27.5	28	70.0	40
Faculty Buy-in	2	5.0	12	30.0	26	65.0	40
Staff Buy-in	3	7.7	14	35.9	22	56.4	39
Classroom Space	6	14.6	10	24.4	25	61.0	41
Instructor Training	2	4.9	6	14.6	33	80.5	41
More faculty to teach using simulation	1	2.4	11	26.8	29	70.7	41
BON increasing maximum allowable simulation use	2	4.9	7	17.1	32	78.0	41

Changes in Admissions

Program enrollment also changed from before the pandemic to during the pandemic. Eight out of 39 respondents (21%) reported an increase in enrollment in the 2019 school year, compared to 2014. These eight schools were asked about factors that contributed to the ability to increase their admissions offers. Seven respondents reported that hiring more instructors was a positive factor, six respondents reported that gaining more clinical placements was a positive factor, and three respondents reported that increasing classroom space was a positive factor. Importantly, only three of the respondents reported that increased simulation use was a factor.

For the 2020 school year (during the pandemic), 19 of 39 respondents (49%) reported an increase in the number of applications received compared to 2019. Only three of 38 respondents (8%) reported an increase in *enrollment* compared to the previous year. Fourteen of 38 respondents (37%) reported that admissions offered actually decreased in 2020. During the interview, the respondent from West Beach College stated, "our admissions offers went down because obviously at that point we realized that we were limited in the number of clinical placements and our simulation facilities and faculty weren't equipped or ready to take on the same number of students as the previous year."

Potential Impacts of Simulation on Enrollment

With a higher use of simulation leading to less reliance on clinical placements to determine how many students can be admitted, programs could have the opportunity to increase their enrollment. The survey asked respondents if increasing simulation technology could have a potential impact on future enrollment. All interviewees reported that using simulation to replace direct patient care hours could increase enrollment since enrollment is largely based on the number of clinical placements a program can secure.

One interview respondent from Palms College said that if simulation increased, there could be an increase in enrollment. She did mention though that "class size might be a small barrier [as well as] figuring out the increased workload for faculty." The simulation instructor from the University of the Suburbs said that increasing simulation use for replacement of clinical hours could hypothetically increase enrollment for the future. However, again mentioned that the primary barrier to increasing the amount of simulation used was funding for the hiring of more simulation faculty. The potential to increase enrollment by increasing simulation use is clear, but the two main barriers that were mentioned in almost all five Interviews and the survey included

(1) the low approved percent of simulation by the state and (2) the need for more funding to hire instructors.

Summary

The changing use of simulation has been a key topic in nursing education, especially during the COVID-19 pandemic where the loss of clinical placements accelerated the increased use of the technology. My first research question addressed how schools altered their simulation amid the pandemic. The survey included a specific question on the percent of required clinical hours fulfilled via simulation. The survey also asked for simulation use before the pandemic, during the pandemic, and the predicted use after the pandemic. The findings showed that many of the survey respondents maximized their simulation use during the pandemic due to necessity but that they also planned on maintaining higher use after the pandemic. However, even with a higher simulation use, most schools are not planning on using those simulation hours to replace clinical hours but rather to supplement theory. Schools reported that the main reason that they cannot offer more simulation is because of BRN restrictions on the maximum allowable use of sim for replacement of direct patient care hours.

For schools that have increased their simulation use to 25% or higher, Research Question 1a asked about the perceptions of benefit to students' NCLEX scores and students' clinical competency. Most respondents gave high scores for the benefits of simulation on these factors, with average ratings of about 6 points using a scale ranging from 0 (highly detrimental) to 7 (highly beneficial). Research Question 1b then investigated correlations between perceptions of benefit and how much simulation a program uses. Although this data did not show causation between perception of benefit and the amount of use, it did show a small to moderate correlation

between both NCLEX scores and clinical competencies on the amount of the technology used in the program.

Respondents were then asked about the potential impact of increased simulation use on future enrollment. They reported that enrollment will most likely not increase even with a higher simulation use due to other barriers including enough instructors to teach a larger number of students and the financial ability to hire staff to run simulation as well as purchasing more hardware like manikins. What is interesting, though, is almost all schools agreed that if those barriers were eliminated and simulation was used to replace more clinical hours, it could have a positive impact on enrollment. The final chapter of this study will discuss the findings, limitations of the study, recommendations for future research as well as recommendations for nursing programs and the state in addressing the nursing shortage.

CHAPTER FIVE: DISCUSSION

Before this study, it was known that 98% of nursing programs had already integrated simulation technology into their curriculum (Hayden et al., 2014). However, the percent of clinical hours replaced by simulation at each school was not known, nor was the impact of simulation use on enrollment. This study was done during the unprecedented time of the COVID-19 pandemic. It revealed important information about the ability of schools to utilize resources to increase their simulation use.

In this final chapter, I will discuss the findings about simulation usage before and during the pandemic and the predicted use after the pandemic is over. The data will provide evidence to support recommendations to maintain high simulation use (over the previous limit of 25%) after the pandemic is over and to use simulation to replace more clinical hours. The recommendations will be aimed at increasing the number of clinical hours replaced using simulations in order to provide programs the opportunity to free up some of their clinical placement. Given the limited availability of clinical placements, increase use of simulation may allow programs to increase their enrollment.

Summary of Findings

Of the findings, the most significant discovery was that the vast majority of programs (36 of 40, 90%) increased their use of simulation during the COVID pandemic. In many cases, these increases were substantial, and average use increased by nearly 150%. Programs increased their use of simulation primarily in order to satisfy clinical hour requirements for the clinical placements that were suspended. Although schools reported that they had significantly higher simulation use during the 2020 year and are planning on using higher simulation after the pandemic is over, it does not prove that the COVID-19 pandemic directly played a role in

motivating schools to increase their post-pandemic use. There are a few points to keep in mind. During the pandemic, many clinical placements were completely suspended and if programs wanted their students to fulfill their clinical hours and graduate, they did not have a choice but to offer more simulation. Recently, though, clinical placements have opened back up to students. However, there are no published reports of how many facilities have opened back up to nursing students or if schools have reverted to using hours from in person rotations rather than simulations. Ultimately, during the height of the COVID-19 pandemic, schools in California were given the opportunity (by the California BON) to increase their simulation use to higher than 25% (up to 75%) for those schools that showed a need for clinical hours in order for students to stay on track towards graduation. These two factors may have proven to nursing programs that more simulation is in fact possible and beneficial to students and schools alike.

A second important finding was that 65% of programs (24 of 37) plan to use more simulation after the pandemic than they were using before the pandemic. This finding is significant because it shows that schools currently have the resources to integrate more of the technology. In previous research (e.g. Starkweather & Kardong-Edgren, 2008; National League for Nursing, 2014; National League for Nursing, 2018; Kim, Park, & Shin, 2016), schools said they could not increase their simulation use because of insufficient faculty, classroom space or lack of technical knowledge. However, this pandemic proved that programs can in fact increase and maintain their clinical simulations towards clinical hour requirements. This is one of the most significant findings because although nursing programs have often stated barriers to increasing use, their ability to successfully replace more than double their initial percent of use during the pandemic shows a capability that can potentially be maintained long-term (given the BON increases the percent of simulation allowed).

Some programs mentioned that a barrier to increasing the long-term percent of simulation post-pandemic would be the state-approved limit on how much simulation a school could use to replace clinical hours. At the time of this writing, there had been discussion but not legislation for a long-term increase in approved simulation hours. The BON is having their second legislative sunset hearing (during the time of this report, a date had not been set), and the nursing program deans and directors of California are continuing to recommend adoption of the increased allowances for non-direct patient care (including simulation). The COADN (California Organization of Associate Degree Nursing) and CACN (California Association of Colleges of Nurses) sent a joint letter as public comment for the Sunset Hearing. The goal of this letter was to convince the BON to permanently reduce the number of direct patient care hours (increase the number of hours that can be replaced with simulation) required for nursing students to those hours stipulated in AB 2288.

The COADN referred to the national study (California Board of Registered Nursing, 2020) which found "...no difference between students who received 25% vs. 50% of their clinical education conducted through simulation-based pedagogy." They then outlined that during the pandemic there was a loss of clinical sites which required emergency legislative action (AB 2288), lowering the required percent of direct patient hours, which require students to interact directly with real life patients rather than using manikins. Ultimately, this change was effective, as there was no statistically significant difference in the percent of students (results from before the pandemic compared to during the pandemic) who successfully completed their clinical hours or passed the NCLEX exam. The national NCLEX pass rate for all RN students in 2018 and 2019 was 73% for both years and 72% for both 2020 and 2021 (NCSBN, 2021). The pass rates have been consistent the two years before the pandemic as well as during the pandemic however

"despite evidence, the California BON has opposed permanently changing their requirement for 75% direct patient care. This unnecessarily places an ongoing burden on nursing education programs and clinical placement sites." The BON is rationalizing their delay in decision making on the NCSBN study on recommended minimum direct patient care hours. A final recommendation is to be available in spring of 2022 (California Board of Registered Nurses, 2021). From this recommendation, each state BRN can then decide what the requirement for maximum simulation use will be moving forward (C. Lee, personal communication, July 12, 2020).

A third important finding was that most programs did not connect increased use of simulation to potential increases in enrollment. Even with an expected higher simulation use after the pandemic (for which the hours will replace clinical hours), 69% of schools still predict an inability to increase enrollment. Interviewees mentioned that for enrollment to actually increase, the BON would need to increase simulation allowances and programs would need to hire more faculty to teach a larger cohort of students. This indicates that there is a willingness to utilize more simulation but there are barriers out of the control of nursing programs (hiring of new instructors is dependent upon state funding for public nursing programs).

Interviewees confirmed that with the use of more simulation towards replacement of clinical hours, programs may be able to free up their number of clinical placements for the purpose of enrolling more students. This confirms that nursing programs can increase enrollment with a little help from simulation technology and more funding to hire instructors. Moreover, this indicates that there is a way to bridge the nursing shortage by 2030.

If the BON and the state work together to maintain the simulation allowances offered during the pandemic and provide sufficient funding to nursing programs, programs could

potentially enroll more students and graduate more licensed nurses in the next eight years. Nevertheless, it does not seem that any of the programs plan on increasing simulation for the purpose of increasing enrollment, so this seems to still be an open question. There is a clear need to increase enrollment, but it is not clear, from this study, if any schools view increased use of simulation as a way of moving in that direction.

Connections to Prior Research

Prior research has already confirmed the immense capabilities of simulation as well as its effectiveness in preparing students to enter the health care field. It has clarified how to make simulation use as operational as possible and have the largest impact on student success. This study has attempted to apply that prior research and use the current pandemic to examine whether future simulation usage should increase and whether increased usage could positively impact enrollment. This study has also provided the percent of clinical hours replaced by simulation before and during the pandemic, information that was previously not available.

Nursing programs are truly the gatekeepers of a quality healthcare system for the future. Without highly effective nursing programs generating enough nurses annually, the healthcare industry in the United States will face major disparities (Haddad, Annamaraju, & Toney-Butler, 2020). Before the pandemic, many nursing programs were not meeting the maximum allowable usage of simulation, yet reporting that they were having issues with clinical placements (Peoples, 2020). Although prior research has shown clear benefits of simulation use for students (Hayden et al., 2014), schools had not started using it to replace many clinical hours nor maximized on the allowable percent. When asked why they had not maximized use of the technology, program representatives reported that they had enough clinical placements for their students. Previous studies have also pointed out that the number one reason for not being able to enroll more

students is the shortage of placements (Allen, 2008; Kavilanz, 2018). Prior research may not be aligning with responses from this study because the prior research included in the literature review are from national studies while this study is only in California. There may be differences in difficulty gaining clinical placement in urbanized states or more rural states. Increasing enrollment, however, has not been addressed in terms of using simulation as a tool to decrease reliance on clinical placements.

Now, during the pandemic, 90% of schools have increased their simulation usage, and some have even reached the new maximum allowable usage of 75% towards completion of clinical hours. Albeit most schools did not have a choice but to increase or maximize their use due to the loss of their clinical placements. The question now stands, whether schools will maintain their high usage even after the pandemic is over and clinical placements completely open back up to students. Much of this is depends on whether the California BON will approve a decrease in direct patient hours so that schools can utilize simulation, instead, toward the total required clinical hours. If schools can maintain a high usage and rely less on clinical placements, this could have an impact on the number of students a program can enroll. This research shows that schools can have a high simulation usage, as seen during the pandemic, and that students are displaying the same pass rates on the NCLEX exam when comparing 2019 scores to 2020 scores.

Study Limitations

My study looked at clinical simulation use in nursing programs; specifically, the changing usage of simulation around the COVID-19 pandemic and its potential implications on future admission rates. I did a survey followed by interviews of schools that met at least two of the five selection criteria; one of the selection criteria that had to be met was that the institution be public. However, there are limitations to this study pertaining to the respondents of the

survey, the survey and interview questions, and the conclusions that can be made from the correlation data.

The survey was distributed to 128 of the 149 nursing programs in California because contact information for either faculty or staff of the remaining schools could not be located. Of the 128 schools that were sent the survey, 35 schools responded to the initial mass email containing the survey link. A second round of emails was sent to the secondary contacts from 49 of the schools that did not respond to the initial email. I received 9 responses to total 43 responses from unique institutions. Although there was a substantial percent of responses to the survey, not all eligible institutions are represented by the survey data in the final sample. There is a possibility that simulation use is substantially different between the schools that participated in the survey and those that did not.

The positions held by survey respondents varied between simulation coordinators and technicians, faculty, department chairs and deans, and program directors. In addition to having different job titles, the time of employment varied from less than one year to over 40 years. This might be a limitation when respondents need to answer questions on a program's history of simulation use. Respondents might have varying levels of knowledge of the program's history during initial implementation of the technology. Additionally, respondents might have different levels of experience with simulation use and would be answering the questions to the best of their knowledge. This might limit the amount of knowledge some respondents have regarding the effectiveness of the technology or how it has impacted the program.

This is also true for questions pertaining to perception of benefit, so there is a sample bias between those that have been working with simulation for several years versus those that are new to simulation. A single participant's perceptions can also be altered based on their position

within the program (i.e. staff versus faculty). Since the survey was only sent to one person within each program, responses are likely to reflect the opinions of those who are in that particular position. For example, if a lab coordinator answered the survey, they would most likely answer that simulation is an effective tool because of their knowledge on how advanced the technology is and the expected learning outcomes at the end of running a simulation. However, they are most likely not seeing the NCLEX scores or participating in the debriefing to see if the learning outcomes were met. One should not assume that the respondents' opinions represent a consensus view within the institution or the view of other stakeholders.

Another limitation was that some of the survey and interview question were based on hypotheticals and personal opinions. Questions asked about future simulation use if the California BON were to hypothetically increase the allowable percentage past 25%. The interview then asked if the program could increase enrollment if simulation use was increased and if the program employed sufficient faculty. One of the main sub-research questions is about "perceived" benefits and if the perception of simulation efficacy impacts the percent of use in a program. Although a correlation analysis showed a positive correlation between perceived benefits and the amount of simulation an institution uses, evidence of association does not necessarily mean that variables are causally related. The perceived benefits that simulation provides may not be what influences the amount of simulation the program uses.

Lastly, the study is limited in overall data collection. The respondents might have held a role within the institution that has input into how much simulation is used. So, if the respondent stated that simulation is perceived to be highly beneficial to student clinical competence and the program also reports a high usage of simulation, that statement does not necessarily mean that the high usage is due to others' perception of benefit. This was a limitation in overall data

collection because the way a faculty member may answer a question might be different from the way a program director or technician might answer a question. If the respondents had all held the same job title, it is possible that the correlation between perceptions of benefit and simulation use might have differed.

Additionally, there was a positive correlation between the amount of simulation use during the pandemic and its predicted future use. This correlation was based on use during the COVID-19 pandemic and the predictions of survey respondents. Of course, future use may differ from those predictions. However, these responses are still useful, as they speak to the respondents' perceptions of the role that simulation will play in the future, including the perceived potential for expanded use.

Reflections on Conducting Research Amidst a Pandemic

Conducting a mixed-methods study amid a pandemic required data collection using methods that did not rely on face-to-face interactions. Although collection of data was easier online, the percent of individuals that may have been willing to respond if contacted over the phone or in person may have been higher. Recruitment for the survey was limited as program leaders and faculty were working from home. Telephone contact, which I would have used to recruit respondents, was not available so I had to utilize email addresses which can sometimes be overlooked if coming from an unknown email address or put directly into their spam folders. Although the survey did receive a 34% response rate, I may have been able to get more if I had gotten respondents on the line and had a chance to create good rapport. Creating a survey that asked clear questions regarding simulation use before and during the pandemic was slightly difficult because the questions had to be specific to the percent of simulation use that was used to replace clinical hours rather than the overall simulation use. Many programs use simulation to

replace a small percent of their clinical hours, but according to the survey in this study, most programs were not meeting the maximum percent of clinical hour replacement before the COVID-19 pandemic. Ultimately, the questions were written in a very detailed manner and examples of responses were given so that the survey takers were clear on what the question was asking for. The surveys were distributed by email and had a 34% response rate while the interviews were done over ZOOM.

Furthermore, had this study happened outside of a pandemic, the interviews would have been done in a more personal setting (office or meeting space) and respondents could have giving more thorough answers and may have felt more comfortable seeing a human sitting across from them. ZOOM interviews served the purpose of this study however, in person interviews offer a higher level of engagement and allow the interviewer (myself) to not only hear the interviewee's responses but to also read their body language when asked certain questions. Perhaps individuals would have been more engaged and provided more in-depth responses in a face-to-face interview. I had intended to interview respondents from schools that met all five selection criteria, but there was only one such school. The interviewee from this school was dismissive and flippant during the interview and the responses could not be used. Fourteen schools only met one or two of the criteria. After doing five interviews, which included the dismissive participant, I realized that I was getting strong consistent answers from the four schools that provided thorough responses. Additional interviews were unlikely to provide further insight or more information that was not already identified by their survey and interview response. At that point I decided that due to the lack of new information coming in from the interviews, the five interviews would be appropriate and would be used for inclusion of direct quotes.

Overall, the survey and interviews responses met the needs of this study and were able to answer all the research questions, but it remains that the entire study was done virtually and so is missing the human connection. Human connection is important to building trusting relationships with participants and therefore getting thorough and honest responses.

Recommendations for Practice

Even though this study was done on nursing programs in California, the findings about simulation use and enrollment can be generalized for nursing programs across the nation. The responses nationally would probably be fundamentally similar since questions in this study were largely based on facts that have been studied nationally and consistent across states: (1) factors that prevent higher admissions and (2) loss of clinical placements during the pandemic. One difference between nursing programs across the states was the approved percent of simulation by each state's BON (up to a pre-pandemic maximum of 50%). However, AB 2288 approved an increase of simulation use up to 75% for certain rotations during national emergencies. Therefore, the results from this study can be utilized by programs in states outside of California.

Based on the findings in this study, here are a few things that should be considered from a program or policy perspective. As demonstrated in Chapter Two, there is an upwards trend in the past and present percent of simulation use as well as positive perceptions of effectiveness of the technology. This suggests that the technology will continue to be used as much, if not more, over the next several years. It is important to realize the benefit of using simulation as not just a teaching tool but also as a way of providing students with opportunities to complete clinical hours. Additionally, once there is more faculty and staff buy-in to the myriad of benefits simulation provides, programs will be more willing to invest into hiring staff to run the technology and the hardware. Ultimately, with more nursing programs utilizing the maximum

simulation hours, they would be demonstrating their ability to integrate and utilize the technology successfully. As more schools see the opportunity to replace clinical hours, simulations could provide a way to address the shortage of clinical placements. Schools that are currently not at the maximum percent of replacement but are struggling to find preceptors or clinical placements should strongly consider integrating more simulation. The California Board of Nursing should also consider further raising the ceiling of replaceable clinical hours, which is currently at 25% outside of emergency situations, to accommodate this need. It remains to be seen whether the benefits of schools increasing to 25% would include increasing the standard training for faculty teaching simulation, allowing greater enrollment in the face of more clinical placements, or simply students who are more confident working with live patients. The State Board of Nursing should continue working towards removing barriers that prevent programs from using simulation on a more widespread basis. The demand for more nurses in healthcare is very strong but the way in which nursing programs and the state can meet this demand is multifaceted.

It would be beneficial to also gauge the student experience with higher simulation use. The student experience may in fact be a positive one and students' reflections of their own clinical experience might be one of low stress. Students may point out that the low stress environment was more conducive to their learning since making mistakes does not put real patient lives in danger. However, they may also reflect that their experiences are *not* on real patients and therefore they are not gaining true human interactions or experiencing real life patient responses. Additionally, if the amount of simulation use did increase, nursing programs may implement a required faculty training for simulation use and programs would more than likely need funding for that training. As simulation becomes an integral part of nursing

education, the BON or NCSBN should create a set of standards for simulation training and even offer an instructional simulation training course so that there is a baseline of knowledge amongst California faculty.

Directions for Future Research

Future research should investigate simulation use after the pandemic is over, taking into consideration minimum direct patient care hours and maximum simulation use to replace direct and indirect patient care hours. If schools are applying more simulation hours towards the total required clinical hours, it would be interesting to see if total enrollment has changed. If schools do increase their total enrollment because of increased simulation, NCLEX pass rates might be a good indicator of knowledge gained during their alternative clinical time. It might also be valuable to interview the preceptors who are mentoring students who have used high percentages of simulation to replace their clinical hours. With data pointing out that students are more confident and making less mistakes because of simulation use, it will be interesting to see if preceptors feel the same way.

If simulation use increases or if recent increases are sustained, nurse training might be more streamlined and effective, allowing programs to rely less on clinical placements; placements which are not a guaranteed annually for programs. With less reliance on clinical placements as a determining part of enrollment, programs can increase their cohort size. However, changes in enrollment due to the increased simulation use *during the pandemic* are beyond the scope of this research. Future research should investigate the actual impact the pandemic had on enrollment and if the use of higher simulation (for those schools that increased simulation percent) played a role in the programs ability to maintain their cohort size or potentially increase cohort size during the pandemic.

Conclusion

Nursing schools have used simulation to improve student confidence and to prepare students to work on live patients. This technology has been integrated across the nation but was not used at a high percentage to replace clinical hours until the COVID-19 pandemic. Previous research has shown the benefits of simulation and both the positive student and teacher experiences using the technology. However, the onset of the COVID-19 pandemic left a gap in knowledge regarding the impact of the increased use of simulation on student success and enrollment in the present and future.

Now that the study is complete, it is clear that schools do have the ability and resources to increase the amount of simulation use. We also see that even with the higher percentage of use to replace clinical hours, there is no significant difference in student's success from before the increase to after the increase. Schools and the states' BON might consider increasing the maximum amount of simulation use post-pandemic to free up clinical placements and potentially allow increased enrollment into nursing programs. For some schools, having more clinical placements available would allow them to increase the number of students admitted. However, most schools would also need more funding to increase the number of faculty before being able to enroll any more students into their programs. The issue of the nursing shortage must not only be addressed but resolved within the next few years if the nation is to have an adequate number of healthcare workers by the year 2030. By addressing the shortage of clinical placements and providing an acceptable alternative for students, this study aims to help nursing programs and stakeholders with their decision making for future simulation use directives.

APPENDIX A: PRE-LICENSURE NURSING PROGRAMS IN CALIFORNIA

Table A1

University Programs

UNIVERSITIES	CITY	PUBLIC (P) or PRIVATE (R)
American University of Health Sciences	Signal Hill	R
Azusa Pacific University	Azusa	R
Biola University	La Mirada	R
Brandman University	San Diego	P
California Baptist University	Riverside	P
California State University, Bakersfield	Bakersfield	P
California State University, Channel Islands	Camarillo	P
California State University, Chico	Chico	P
California State University, East Bay	Hayward	P
California State University, Fresno	Fresno	P
California State University, Fullerton	Fullerton	P
California State University, Long Beach	Long Beach	P
California State University, Los Angeles	Los Angeles	P
California State University, Northridge	Northridge	P
California State University, Sacramento	Sacramento	P
California State University, San Bernardino	San Bernardino	P
California State University, San Marcos	San Marcos	P
California State University, Stanislaus	Turlock	P
Charles R. Drew University of Medicine and Science, Mervyn M. Dymally School of Nursing	Los Angeles	R
Concordia University Irvine	Irvine	R
Dominican University of California	San Rafael	R
Gurnick Academy of Medical Arts	Concord	R
Holy Names University	Oakland	R
Loma Linda University	Loma Linda	R
Mount Saint Mary's University – Los Angeles	Los Angeles	R
National University	San Diego	R
Point Loma Nazarene University	San Diego	R
Samuel Merritt University	Oakland	R
San Diego State University	San Diego	P
San Francisco State University	San Francisco	P
Simpson University	Redding	R
Sonoma State University	Rohnert Park	P
The Valley Foundation School of Nursing at San Jose State University	San Jose	P
University of California, Irvine	Irvine	P
University of California Davis	Sacramento	P
University of California Los Angeles	Los Angeles	P
University of San Diego	San Diego	R
University of San Francisco	San Francisco	R
Vanguard University	Costa Mesa	B
West Coast University	North Hollywood	R
Western University of Health Sciences	Pomona	R

Table A2

Community College Programs

College	City	Public (P) or Private (R)
Allan Hancock College	Santa Maria	P
American Career College	Los Angeles	P
American River College	Sacramento	P
Antelope Valley College	Lancaster	P
Bakersfield College	Bakersfield	P
Butte Community College	Oroville	P
Cabrillo College	Aptos	P
Carrington College	Sacramento	P
Cerritos College	Norwalk	P
Chabot College	Hayward	P
Chaffey College	Rancho Cucamonga	P
Citrus College	Glendora	P
City College of San Francisco	San Francisco	P
CNI College	Orange	P
College of Marin	Kentfield	P
College of San Mateo	San Mateo	P
College of the Canyons	Santa Clarita	P
College of the Desert	Palm Desert	P
College of the Redwoods	Eureka	P
College of the Sequoias	Visalia	P
College of the Siskiyous	Yreka	P
Compton College	Compton	P
Contra Costa College	San Pablo	P
Copper Mountain College	Joshua Tree	P
Cuesta College	San Luis Obispo	P
Cypress College	Cypress	P
De Anza College	Cupertino	P
East Los Angeles College	Monterey Park	P
El Camino College	Torrance	P
Evergreen Valley College	San Jose	P
Fresno City College	Fresno	P
Gavilan College	Gilroy	P
Glendale Community College	Glendale	P
Golden West College	Huntington Beach	P
Grossmont College	El Cajon	P
Gurnick Academy of Medical Arts	Fresno	P
Hartnell College	Salinas	P
Imperial Valley College	Imperial	P
Long Beach City College	Long Beach	P
Los Angeles City College	Los Angeles	P
Los Angeles Co. College of Nursing & Allied Health	Los Angeles	P
Los Angeles Harbor College	Wilmington	P
Los Angeles Pierce College	Woodland Hills	P
Los Angeles Southwest College	Los Angeles	P

Table A2 (continued)
Community College Programs

College	City	Public (P) or Private (R)
Los Angeles Trade-Tech College	Los Angeles	P
Los Angeles Valley College	Valley Glen	P
Los Medanos College	Pittsburg	P
Mendocino College	Ukiah	P
Merced College	Merced	P
Merritt College	Oakland	P
Mira Costa College	Oceanside	P
Mission College	Santa Clara	P
Modesto Junior College	Modesto	P
Monterey Peninsula College	Monterey	P
Moorpark College	Moorpark	P
Mount Saint Mary's University – Los Angeles	Los Angeles	P
Mt. San Antonio College	Walnut	P
Mt. San Jacinto College, MVC	Menifee	P
Napa Valley College	Napa	P
Ohlone College	Newark	P
Pacific College	Costa Mesa	P
Pacific Union College	Angwin	P
Palomar College	San Marcos	P
Pasadena City College	Pasadena	P
Porterville College	Porterville	P
Reedley College at Madera Community College Center	Madera	P
Rio Hondo College	Whittier	P
Riverside City College	Riverside	P
Sacramento City College	Sacramento	P
Saddleback College	Mission Viejo	P
San Bernardino Valley College	San Bernardino	P
San Diego City College	San Diego	P
San Joaquin Delta College	Stockton	P
Santa Ana College	Santa Ana	P
Santa Barbara City College	Santa Barbara	P
Santa Monica College	Santa Monica	P
Santa Rosa Junior College	Santa Rosa	P
Shasta College	Redding	P
Sierra College	Rocklin	P
Solano Community College	Fairfield	P
Southwestern College	San Diego	P
Ventura College	Ventura	P
Victor Valley College	Victorville	P
Weimar Institute	Colfax	P
West Hills College Lemoore	Lemoore	P
Xavier College	Stockton	P
Yuba College	Marysville	P

APPENDIX B: SURVEY INSTRUMENT

Q1.1 Thank you for taking the time to complete this survey. Once you complete this survey, you will receive a $5 Amazon gift card. This survey will provide information on the use and integration of simulation practice into nursing education in California. Simulation programs have diffused throughout public and private nursing programs across the nation. The diffusion of this innovation has continued over the past 100 years. I'm interested in learning about how your program is using clinical simulation and what you see as some of the benefits and challenges.

Q1.2 What is the name of your institution?
(The name of the institution is only needed to ensure only one response from each institution is recorded. The names WILL NOT be used in the study and will be destroyed once data collection is complete).

Q1.3 Is your institution public or private?

- ◯ Public (1)
- ◯ Private (2)

Q1.4 What is your primary position/title within the nursing program?

- ◯ Department Dean (1)
- ◯ Department Chair (2)
- ◯ Program Coordinator/Director (3)
- ◯ Assistant Program Director (4)
- ◯ Faculty (5)
- ◯ Simulation Coordinator/Director (6)
- ◯ Simulation Operation Specialist (7)
- ◯ Other (8) _____

Q1.5 How many years have you been employed by this institution?

▼ Drop down selection of 1 year- 40 years or more

Q1.6 Do you hold a nursing degree?

- ◯ Yes (1)
- ◯ No (0)

Display This Question:
If Q1.6 = Yes

Q1.7 Was simulation technology used during you own personal education?

- ◯ Yes (1)
- ◯ No (0)

Display This Question:
If Q1.7 = Yes

Q1.8 In your personal opinion, what was the impact of your own simulation experiences in helping you prepare to enter the workforce?

- ◯ Highly detrimental (1)
- ◯ Somewhat detrimental (2)
- ◯ Neither detrimental nor beneficial (3)
- ◯ Somewhat beneficial (4)
- ◯ Highly beneficial (5)

Q1.9 The following questions pertain specifically to the institution by which you are currently employed.

Q1.10 How many students are admitted into all of the pre-licensure nursing programs at your institution each year (annual average)?

- ◯ 0-10 (1)
- ◯ 11-20 (2)
- ◯ 21-30 (3)
- ◯ 31-40 (4)
- ◯ 41-50 (5)
- ◯ 51-60 (6)
- ◯ 61-70 (7)
- ◯ 71-80 (8)
- ◯ 81-90 (9)
- ◯ 91-100 (10)
- ◯ More than 100 students (11)

Q1.11 Does the nursing program have difficulty coordinating clinical placements for students each year?

- ◯ No difficulty (1)
- ◯ Small amount of difficulty (2)
- ◯ Moderate amount of difficulty (3)
- ◯ Great difficulty (4)

Q1.12 If the nursing program were to increase student enrollment by 20%, would the program have difficulty coordinating clinical placements for students?

- ◯ No difficulty (1)
- ◯ Small amount of difficulty (2)
- ◯ Moderate amount of difficulty (3)
- ◯ Great difficulty (4)

Q1.13 Does the institution currently use any type of simulation technology to supplement student education?

◯ Yes (1)

◯ No (0)

Skip To: Q1.38 If Q1.13 = No

Q1.14 Of the programs offered at your institution, which utilize simulation technology? i.e. manikin based, virtual, live remote, hybrid, standardized patient.

	Yes (program uses simulation) (1)	No (program does not use simulation) (0)	Not Applicable (program is not offered) (9)
CNA (Q1.14_1)	◯	◯	◯
LPN/LVN (Q1.14_2)	◯	◯	◯
ADN (Q1.14_3)	◯	◯	◯
BSN (Q1.14_4)	◯	◯	◯
MSN (Q1.14_5)	◯	◯	◯
DNP (Q1.14_6)	◯	◯	◯
Masters Entry Pre-licensure (Q1.14_7)	◯	◯	◯

Q1.15 How many years has your nursing program used any form of simulation to supplement student education?

◯ 1-5 years (1)

◯ 6-10 years (2)

◯ 11-15 years (3)

◯ 16-20 years (4)

◯ More than 20 years (5)

Q1.16 Did your institution use the following types of simulation technology when simulation was <u>first integrated</u>?

	Yes (1)	No (0)
Manikins (Q1.16_1)	◯	◯
Computer based virtual reality (Q1.16_2)	◯	◯
Role play with other students (Q1.16_3)	◯	◯
Standardized patients (actors) (Q1.16_4)	◯	◯
Remote live simulations (Q1.16_5)	◯	◯
Virtual Simulations (Q1.16_6)	◯	◯
Hybrid simulation (Live and virtual) (Q1.16_7)	◯	◯
Other type of simulation (Q1.16_8)	◯	◯

Q1.17 Has your program changed the type of simulation used since initial integration?

Yes (1)
No (0)
I don't know (9)

Display This Question:
If Q1.17 = Yes

Q1.18 Does your program <u>currently</u> use the following types of simulation technology (compared to <u>initial</u> use)?

	Yes (1)	No (0)
Manikins (Q1.18_1)	◯	◯
Computer based virtual reality (Q1.18_2)	◯	◯
Role play with other students (Q1.18_3)	◯	◯
Standardized patients (actors) (Q1.18_4)	◯	◯
Remote live simulations (Q1.18_5)	◯	◯
Virtual Simulations (Q1.18_6)	◯	◯
Hybrid Simulations (Live and Virtual) (Q1.18_7)	◯	◯
Other types of simulation (Q1.18_8)	◯	◯

Q1.19 What were the primary goals that motivated the <u>initial adoption</u> of simulation?

	Not a motivator (1)	Not sure (2)	Somewhat a motivator (3)	Definitely a motivator (4)
To allow students to practice clinical skills in a low-stakes environment before working with real patients. (Q1.19_1)	◯	◯	◯	◯
To expose students to rare conditions that students would be unlikely to encounter in clinical placements. (Q1.19_2)	◯	◯	◯	◯
To expose students to specialties our program does not currently have clinical placements for (Q1.19_3)	◯	◯	◯	◯
To assess students' clinical skills (Q1.19_4)	◯	◯	◯	◯
To address scarcity of clinical placements (Q1.19_5)	◯	◯	◯	◯
To allow our program to enroll a larger number of students (Q1.19_6)	◯	◯	◯	◯

Q1.20 Use of simulation in our institution helps:

	Strongly Disagree (1)	Somewhat disagree (2)	Somewhat agree (3)	Strongly agree (4)
To ensure patient safety (Q1.20_1)	◯	◯	◯	◯
To promote better preparation of new nurses (Q1.20_2)	◯	◯	◯	◯
To support innovative teaching strategies (Q1.20_3)	◯	◯	◯	◯
To overcome preceptor shortages and lack of clinical sites (Q1.20_4)	◯	◯	◯	◯
Improving clinical judgement (Q1.20_5)	◯	◯	◯	◯
Improving decision making skills (Q1.20_6)	◯	◯	◯	◯
Teaching student basic skills (Q1.20_7)	◯	◯	◯	◯

Q1.21 What is your perception of the overall effectiveness of simulation on student NCLEX scores?

Highly detrimental — Highly beneficial

0 1 2 3 4 5 6 7

Q1.22 What is your perception of the overall effectiveness of simulation on student clinical competency?

Highly detrimental — Highly beneficial

0 1 2 3 4 5 6 7

Q1.23 Choose the best option for each statement.

	Decreased a lot (1)	Decreased some (2)	Not changed (3)	Increased some (4)	Increased a lot (5)
From the time when your institution first incorporated simulation [any type] into the curriculum to the time prior to COVID (March 2020), the overall use of simulation [any type] (in terms of the number of hours per student) had: (Q1.23)	◯	◯	◯	◯	◯

Q1.24 We increased our simulation in the following areas

- ▢ Manikin (1)
- ▢ Computer based virtual reality (2)
- ▢ Role play with other students (3)
- ▢ Standardized patients (actors) (4)
- ▢ Remote live simulations (5)
- ▢ Virtual simulations (6)
- ▢ Hybrid Simulations (live and virtual) (7)
- ▢ Other types of simulation (8)

Display This Question:

If Q1.23 = From the time when your institution first incorporated simulation [any type] into the curriculum to the time prior to COVID (March 2020), the overall use of simulation [any type] (in terms of the number of hours per student) had: [Increased some]

Or Q1.23 = From the time when your institution first incorporated simulation [any type] into the curriculum to the time prior to COVID (March 2020), the overall use of simulation [any type] (in terms of the number of hours per student) had: [Increased a lot]

Q1.25 What were the primary goals that motivated <u>increasing</u> simulation [any type] use before COVID (before March 2020)?

	Not a motivator (1)	Not Sure (2)	Somewhat a Motivator (3)	Definitely a Motivator (4)
To allow students to practice clinical skills in a low-stakes environment before working with real patients (Q1.25_1)	○	○	○	○
To expose students to rare conditions that students would be unlikely to encounter in clinical placements. (Q1.25_2)	○	○	○	○
To expose students to specialties our program does not currently have clinical placements for (Q1.25_3)	○	○	○	○
To assess students' clinical skills (Q1.25_4)	○	○	○	○
To address scarcity of clinical placements (Q1.25_5)	○	○	○	○
To allow our program to enroll a larger number of students (Q1.25_6)	○	○	○	○

Q1.26 What percent of student' clinical hours were replaced with any type of simulation before the COVID pandemic (prior to March 2020)? Example: If students require 500 clinical hours and 100 hours were completed in simulation [any type], the percent is 20%.

	0 10 20 30 40 50 60 70 80 90 100
Percentage	

Q1.27 What percent of students' clinical hours have been replaced with any type of simulations after March 2020? Example: If students require 500 clinical hours and 100 hours were completed in simulation [any type], the percent is 20%.

	0 10 20 30 40 50 60 70 80 90 100
Percentage	

Q1.28 Which of the following most accurately describes your programs use of simulation during the COVID pandemic (consider onset of COVID pandemic March 2020)?

◯ During the COVID pandemic, we are using simulation [any type] LESS THAN before. (1)

◯ During the COVID pandemic, we are using simulation [any type] ABOUT THE SAME AS before. (2)

◯ During the COVID pandemic, we are using simulation [any type] MORE THAN before. (3)

Skip To: Q1.31 If Q1.28 = During the COVID pandemic, we are using simulation [any type] LESS THAN before.
Skip To: Q1.31 If Q1.28 = During the COVID pandemic, we are using simulation [any type] ABOUT THE SAME AS before.

Q1.29 What were the primary goals that motivated <u>increasing</u> simulation use during COVID?

	Not a Motivator (1)	Not Sure (2)	Somewhat a Motivator (3)	Definitely a Motivator (4)
To allow students to practice clinical skills in a low-stakes environment before working with real patients (Q1.29_1)	◯	◯	◯	◯
To expose students to rare conditions that students would be unlikely to encounter in clinical placements. (Q1.29_2)	◯	◯	◯	◯
To expose students to specialties our program does not currently have clinical placements for (Q1.29_3)	◯	◯	◯	◯
To assess students' clinical skills (Q1.29_4)	◯	◯	◯	◯
To address scarcity of clinical placements (specifically after the pandemic) (Q1.29_5)	◯	◯	◯	◯
To allow our program to enroll a larger number of students (Q1.29_6)	◯	◯	◯	◯

Q1.30 What has been the impact to the increased simulation use?

	Large negative impact (1)	Small negative impact (2)	No impact (3)	Small positive impact (4)	Large positive impact (5)	Too soon to know (6)
Student NCLEX scores (Q1_30_1)	◯	◯	◯	◯	◯	◯
Student program completion (Q1_30_2)	◯	◯	◯	◯	◯	◯
Ability to provide student with opportunity to complete clinical hours (Q1_30_3)	◯	◯	◯	◯	◯	◯
Your belief that simulation allowance should be greater than the current 25% maximum. (Q1_30_4)	◯	◯	◯	◯	◯	◯
Belief that by increasing simulation usage, my institution could increase enrollment (Q1_30_5)	◯	◯	◯	◯	◯	◯
Based on your institutions increased simulation usage during COVID, what do you think has been the overall impact on students? (Q1_30_6)	◯	◯	◯	◯	◯	◯
Additional Comments Pertaining to Impact (Q1_30_7)	◯	◯	◯	◯	◯	◯

Q1.31 Based on use and outcomes of any type of simulation during COVID at your institution, what do you expect will be the long-term future use of simulation [any type] (post-COVID relative to prior to COVID)?

◯ I expect that over the long-term our institution will use simulation less than we did prior to COVID. (1)

◯ I expect that over the long-term our institution will use simulation the same amount that we did prior to COVID. (2)

◯ I expect that over the long-term our institution will use simulation more than we did prior to COVID. (3)

◯ Additional Comments (4) _____

Q1.32 Which resources would be most essential for increasing any type of simulation usage in the future at your institution?

	Not at all important (1)	Somewhat important (2)	Very important (3)
Financial Resources (Q1.32_1)	◯	◯	◯
Faculty Buy-in (Q1.32_2)	◯	◯	◯
Staff buy-in (leadership team) (Q1.32_3)	◯	◯	◯
Classroom Space (Q1.32_4)	◯	◯	◯
Instructor Training (Q1.32_5)	◯	◯	◯
More faculty to teach using simulation (Q1.32_6)	◯	◯	◯
BON increasing maximum allowable simulation use (Q1.32_7)	◯	◯	◯
Additional Comments (Q1.32_8)	◯	◯	◯

Q1.33 Did the following change for the incoming 2019 cohort compared to five years earlier, in 2014?

	Lower in 2019 (1)	About the same (2)	Higher in 2019 (3)
Number of applications received (Q1.33_1)	◯	◯	◯
Students offered admission (Q1.33_2)	◯	◯	◯
Students enrolled (Q1.33_3)	◯	◯	◯

Display This Question:
If Q1.33 = Students offered admission [Higher in 2019]

Q1.34 Which of the following factors contributed to the ability to increase admissions offers in 2019?

	Yes (1)	No (0)
Increased classroom space (Q1.34_1)	◯	◯
Hired more instructors (Q1.34_2)	◯	◯
Gained more clinical placements (Q1.34_3)	◯	◯
Increased Simulation Usage (Q1.34_4)	◯	◯
Other (Q1.34_5)	◯	◯

Q1.35 Did the following change for the incoming 2020 cohort (during COVID) compared to the previous year, 2019?

	Lower in 2020 (1)	About the same (2)	Higher in 2020 (3)
Number of applications received (Q1.35_1)	◯	◯	◯
Students offered admission (Q1.35_2)	◯	◯	◯
Students enrolled (Q1.35_3)	◯	◯	◯

Q1.36 Which of the following factors contributed to the increase in admissions offers in 2020?

	Yes (1)	No (0)
Increased classroom space (Q1.36_1)	◯	◯
Hired more instructors (Q1.36_2)	◯	◯
Gained more clinical placements (Q1.36_3)	◯	◯
Increased Simulation Usage (Q1.36_4)	◯	◯
Other (Q1.36_5)	◯	◯

Q1.37 Is the number of students enrolled in your program constrained/limited by the number of available clinical placements?

◯ Yes (1)
◯ No (0)

Display This Question:
If Q1.13 = No

Q1.38 If simulation was adopted for the purposes of replacing clinical hours, could the number of students offered admissions into the program each year hypothetically increase?

◯ Enrollment definitely could not increase (1)
◯ Enrollment probably could not increase (2)
◯ Enrollment probably could increase (3)
◯ Enrollment definitely could increase (4)

Display This Question:
If Q1.13 = No

Q1.39 What are the primary reasons any type of simulation has not been integrated into the curriculum?

	Strongly Disagree (1)	Somewhat disagree (2)	Somewhat agree (3)	Strongly agree (4)
No need for simulation usage (Q1.39_1)	◯	◯	◯	◯
Have enough clinical placements (Q1.39_2)	◯	◯	◯	◯
Financial barriers (Q1.39_3)	◯	◯	◯	◯
Faculty push back (Q1.39_4)	◯	◯	◯	◯
Lack of simulation instructors (Q1.39_5)	◯	◯	◯	◯
Lack of classroom/lab space (Q1.39_6)	◯	◯	◯	◯
Lack of administrative support (Q1.39_7)	◯	◯	◯	◯
Other (Q1.39_8)	◯	◯	◯	◯

Q1.40 The researcher will be conducting a small number of interviews to further understand the use of simulation in nursing programs. The interviews will be conducted over the phone or via web conference over the next 2 months and will last about 30 minutes. Interview participants will receive a $20 Amazon e-card. If you agree to an interview, you will be prompted to enter your name and email address on the following page. This information will not be shared with anyone besides the researcher.

Q1.41 Are you willing to be contacted for a virtual follow-up interview?

◯ Yes (1)

◯ No (0)

Display This Question:
If Q1.41 = Yes

Q1.42 If yes, please provide your name and best email to set up a ZOOM interview.

APPENDIX C: INTERVIEW PROTOCOL

Dialogue:

Hello and thank you for joining me on this ZOOM interview. I'm really excited to get your perspective on nursing clinical simulations and the background of simulation at your institution. The purpose of the study is to look at the changing use of simulation, especially during the COVID-19 pandemic. With the rapid changes taking place in healthcare and the new increased allowances of simulation usage during emergency situations, student outcome trends like NCLEX scores and completion are more important than ever. The study will then analyze how replacement of clinical hours with simulation could potentially help nursing programs of higher numbers of admissions.

1. What initially got you interested in the nursing education?
2. How long have you worked with simulation? In what capacity?
3. Is the perceived impact of simulation use associated with the program's percentage of use?
4. You stated in the survey that your program has increased the use of simulation since the onset of the pandemic and will continue using that higher amount of simulation after the pandemic.
    a. Do you think this will allow an increase in future enrollment? Why or why not?
    b. Will this increase in simulation use supplement the current clinical placements or replace them to free up spot with the current clinical placements?
5. You stated you increased enrollment as a result of the increased sim use. Tell me more about that. How many additional students did you enroll? Did you need more faculty?

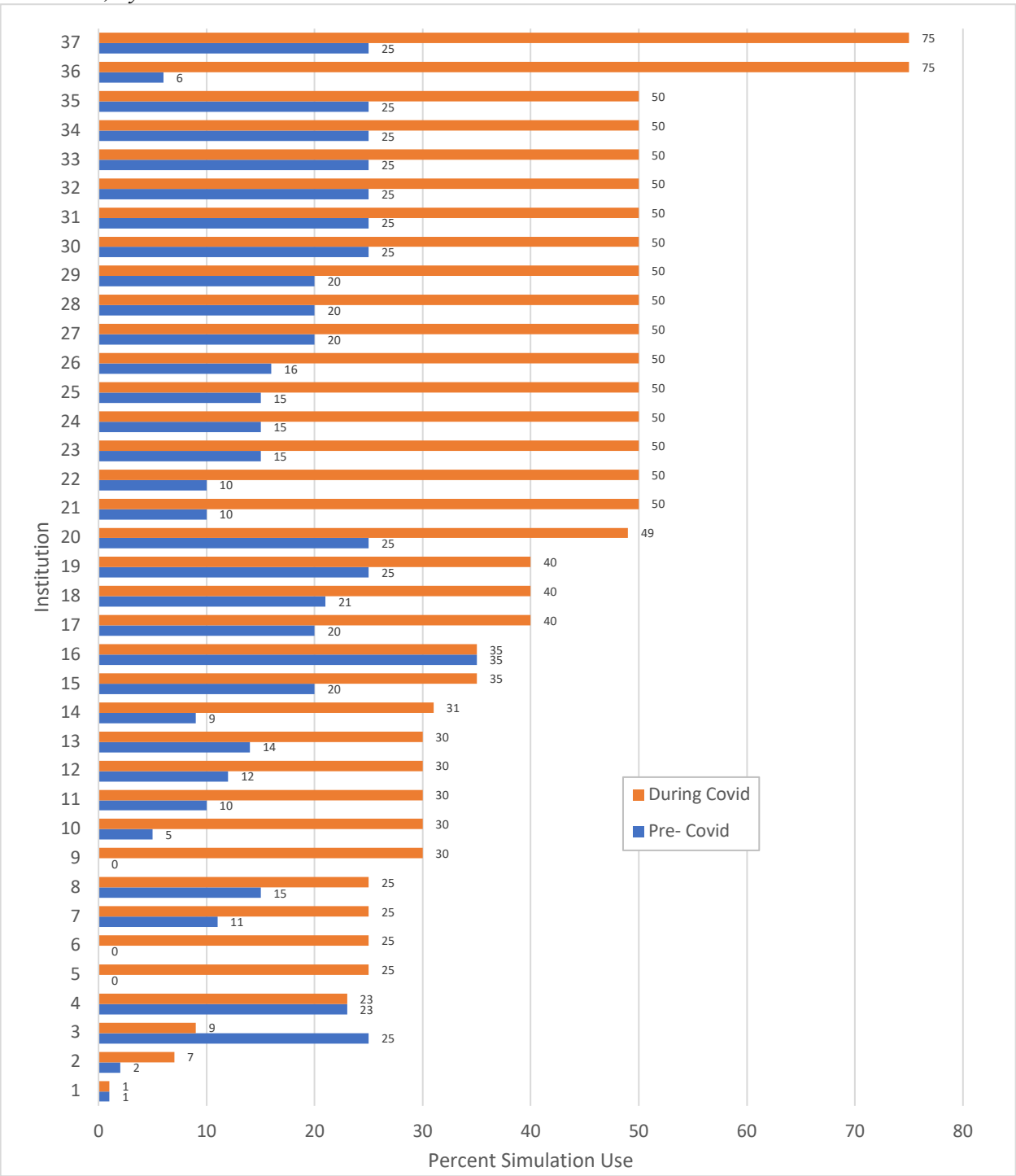
6. If simulation use was increased for the purposes of replacing more clinical hours, could the number of students offered admissions into the program each year hypothetically increase?

APPENDIX D: SIMULATION USE

BEFORE AND DURING THE COVID-19 PANDEMIC

Figure D.1

Percentage of Clinical Hours Replaced by Simulation Before and During the COVID-19 Pandemic, by Institution



REFERENCES

Abulebda, K., Auerbach, M., & Limaiem, F. (2021, October 1). *Debriefing techniques utilized in Medical Simulation*. StatPearls [Internet]. https://www.ncbi.nlm.nih.gov/books/NBK546660

Akhtar-Danesh, N., Baxter, P., Valaitis, R. K., Stanyon, W., & Sproul, S. (2009). Nurse faculty perceptions of simulation use in nursing education. *Western Journal of Nursing Research, 31*(3), 312-329. https://doi.org/10.1177/0193945908328264

Allen, L. (2008). The nursing shortage continues as faculty shortage grows. *Nursing Economics*, *26*(1), 35.

Allgeyer, R., Bitton, J. (2017). *Oregon nursing faculty: why are they leaving?* Oregon Center For Nursing.

Altman, S. H., Butler, A., & Shern, L. (2016, February 22). *Assessing progress on the Institute of Medicine Report the Future of Nursing*. National Center for Biotechnology Information. https://www.ncbi.nlm.nih.gov/books/NBK350166

Anatomy of a nursing BSN degree. Nurse Journal. (2021, October 20). https://nursejournal.org/degrees/bsn/degree-requirements

Anthony, M. (2018). Mrs. Chase. *Home Healthcare Now, 36*(4), 213-214.

Associated Press (Ed.). (2021, January 8). *California bypasses nurse staffing ratio rules amid virus surge*. Modern Healthcare. https://www.modernhealthcare.com/providers/california-bypasses-nurse-staffing-ratio-rules-amid-virus-surge.

National League for Nursing. (2017). *Average full-time salary for nursing faculty*. http://www.nln.org/docs/default-source/default-document-library/average-full-time-salary-of-nurse-educators-on-12-month-appointment-by-rank-and-carnegie-classification-2017.pdf?sfvrsn=0

Blash, L., Spetz, J. (2019). *California Board of Registered Nursing 2017-2018 annual school report*. University of California, San Francisco.

Blash, L., Keane, D., Spetz, J. (2016). *California Board of Registered Nursing 2014-2015 annual school report*. University of California, San Francisco.

Boese, T., Cato, M., Gonzalez, L., Jones, A., Kennedy, K., Reese, C., ... & Borum, J. C. (2013). Standards of best practice: Simulation standard V: Facilitator. *Clinical Simulation in Nursing*, *9*(6), S22-S25.

Bradley, C. S., Johnson, B. K., Dreifuerst, K. T., White, P., Conde, S. K., Meakim, C. H., ... & Childress, R. M. (2019). Regulation of simulation use in United States prelicensure nursing programs. *Clinical Simulation in Nursing*, *33*, 17-25.

Bosek, M. S., Li, S., & Hicks, F. D. (2007). Working with standardized patients: A primer. *International Journal of Nursing Education Scholarship*, *4*(1) XX-XX.

Bullin, C. (2018). To what extent has doctoral (PhD) education supported academic nurse educators in their teaching roles: an integrative review. *BMC nursing*, *17*(1), 1-18.

Burkholder, G. J., Cox, K. A., Crawford, L. M., & Hitchcock, J. H. (Eds.). (2019). *Research design and methods: An applied guide for the scholar-practitioner*. Sage Publications.

California Board of Registered Nursing. (2020). *BRN school survey interactive dashboard*. California Board of Registered Nursing. https://rn.ca.gov/forms/rnsurvey201718.shtml

California Board of Registered Nurses. (2021, April 8). *Board meeting pPacket. Supplemental materials to the board meeting.* https://www.rn.ca.gov/pdfs/meetings/brd/brd_materials_apr21.pdf

Charumilind, S., Craven, M., Lamb, J., Sabow, A., & Wilson, M. (2021). *When will the covid-19 pandemic end? An update.* McKinsey & Company.

Chau, M., Fleetwood, S., & Martin, P. (2017). *A brief on recruitment and retention of nursing faculty in Oregon*. Nurse Leadership Institute.

Chmielewski, N. (2021, April 6). Becker's Hospital Review. *Flatten the nursing-profession exodus curve: discussing the long-term COVID-19 impact on nursing shortage*.

Clark, C. (2020, April 07). *Texas A&M nursing students using virtual simulations for patient care experiences.* Texas A&M Today. https://today.tamu.edu/2020/04/07/texas-am-nursing-students-using-virtual-simulations-for-patient-care-experiences/

Cooper, J. B., & Taqueti, V. (2008). A brief history of the development of mannequin simulators for clinical education and training. *Postgraduate medical journal*, *84*(997), 563-570.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Durham, C., & Alden, K. (2008). *Enhancing patient safety in nursing education through patient simulation*. National Center for Biotechnology Information. https://pubmed.ncbi.nlm.nih.gov/21328731/

Exec. Order No. 39, 20 State Reg. (March 30, 2020).

Fang, D., Li, Y., Kennedy, K. A., & Trautman, D. E. (2017). *2016-2017 Enrollment and graduations in baccalaureate and graduate programs in nursing*. American Association of Colleges of Nursing

Flavin, B. (2018, July 9). *9 duties of a nurse that might surprise you.* Rasmussen University. https://www.rasmussen.edu/degrees/nursing/blog/surprising-duties-of-a-nurse/

Fogg, N., Wilson, C., Trinka, M., Campbell, R., Thomson, A., Merritt, L., Tietze, M., & Prior, M. (2020). Transitioning from direct care to virtual clinical experiences during the COVID-19 pandemic. *Journal of Professional Nursing : Official Journal of the American Association of Colleges of Nursing*, *36*(6), 685–691. https://doi.org/10.1016/j.profnurs.2020.09.012

Froneman, K., Du Plessis, E., & Koen, M. P. (2016). Effective educator student relationships in nursing education to strengthen nursing students' resilience. *Curationis*, *39*(1), 1-9.

Gaines, K. (2019, August 23). *Top 3 reasons nursing schools are rejecting applicants in 2019*. Nurse.org. https://nurse.org/articles/reasons-nursing-schools-reject-applicants/.

Galiatsatos, P. (2021, April 12). *COVID-19 lung damage*. Johns Hopkins Medicine. https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus/what-coronavirus-does-to-the-lungs

Gore, T., Hunt, C. W., Parker, F., & Raines, K. H. (2011). The effects of simulated clinical experiences on anxiety: Nursing students' perspectives. *Clinical Simulation in Nursing*, *7*(5), e175-e180.

Greene, M. Z., FitzPatrick, M. K., Romano, J., Aiken, L. H., & Richmond, T. S. (2017). Clinical fellowship for an innovative, integrated BSN-PhD program: An academic and practice partnership. *Journal of Professional Nursing*, *33*(4), 282-286.

Haddad, L. M., Annamaraju, P., & Toney-Butler, T. (2020, December 14). *Nursing shortage*. StatPearls [Internet]. https://www.ncbi.nlm.nih.gov/books/NBK493175

Harrington, D., & Simon, L. (2021). Designing a Simulation Scenario. *StatPearls*.

Hayden, J. K., Jeffries, P. J., Kardong-Edgren, S., & Spector, N. (2009). *The National Simulation Study: Evaluating simulated clinical experiences in nursing education.*[Unpublished research protocol]. National Council of State Boards of Nursing.

Hayden, J. K., Smiley, R. A., Alexander, M., Kardong-Edgren, S., & Jeffries, P. R. (2014). The NCSBN national simulation study: A longitudinal, randomized, controlled study replacing clinical hours with simulation in prelicensure nursing education. *Journal of Nursing Regulation*, *5*(2), S3-S40

Hendrix, L. (2020, April 08). *Nursing students using virtual simulations for patient care experiences.* Vital records news from Texas A&M health. https://vitalrecord.tamhsc.edu/nursing-students-using-virtual-simulations-for-patient-care-experiences

Howard, S. (2018). Increasing fidelity and realism in simulation. Lippincott Nursing Education [Blog]. nursingeducation.lww.com/blog.entry.html/2018/09/19/increasing_fidelity-zEj0.html

Hughes, R. (Ed.). (2008). *Patient safety and quality: An evidence-based handbook for nurses.* Agency for Healthcare Research and Quality.

INACSL Standards Committee. (2017). INASCL standards of best practice: Simulation^{SM}: Operations. *Clinical Simulation in Nursing, 13,* 681-687. https://www.nursingsimulation.org/article/S1876-1399(17)30294-3/fulltext

Ingeno, L. (2013, July 22). *Who will teach nursing?.* Inside Higher Ed. https://www.insidehighered.com/news/2013/07/22/nursing-schools-face-faculty-shortages

Jason, Z., & Hunt, A. (2015, May 25). A brief history of nursing simulation. *Boston College, Connell School of Nursing*. https://www.bc.edu/bc-web/schools/cson/cson-news/Abriefhistoryofnursingsimulation.html

Jeri, B. (2008). Relationships between nurse- and physician-to-population ratios and state health rankings. *Public Health Nursing, 25*(2), 244-252. https://pubmed.ncbi.nlm.nih.gov/18477375

Karim, S. (2021, March 23). *Nursing schools turn to simulations during the pandemic. But do they work?* Cal Matters. https://calmatters.org/education/higher-education/college-beat-higher-education/2021/03/nursing-schools-simulations-pandemic

Kavilanz, P. (2018). *Nursing schools are rejecting thousands of applicants in the middle of a nursing shortage.* CNN. https://money.cnn.com/2018/04/30/news/economy/nursing-school-rejections/index.html

Ketefian, S., & Redman, R. W. (2015). A critical examination of developments in nursing doctoral education in the United States. *Revista Latino-Americana de Enfermagem*, *23*(3), 363-371.

Keyserling, E. (2021, May 13). *In-depth interview vs online survey: which kind of research is right for professional services firms?* Hinge Marketing. https://hingemarketing.com/blog/story/in-depth-interviews-vs-online-surveys-a-marketing-directors-guide-for-brand

Khalaila, R. (2014). Simulation in nursing education: An evaluation of students' outcomes at their first clinical practice combined with simulations. *Nurse education today*, *34*(2), 252-258.

Kim, J., Park, J. H., & Shin, S. (2016). Effectiveness of simulation-based nursing education depending on fidelity: A meta-analysis. *BMC Medical Education*, *16*(1), 1-8.

Kowalski, S. D., Dalley, K., & Weigand, T. (2006). When will faculty retire?: Factors influencing retirement decisions of nurse educators. *Journal of Nursing Education*, *45*(9), 349-355.

Krupnick, M. (2020, December 21). *Despite high demand For nurses, colleges aren't keeping up*. NPR. https://www.npr.org/2020/12/21/947496118/despite-high-demand-for-nurses-colleges-arent-keeping-up

LaMorte, W. (2019, September 9). *Diffusion of innovation theory*. Behavioral Change Models. https://sphweb.bumc.bu.edu/otlt/mphmodules/sb/behavioralchangetheories/behavioralchangetheories4.html

Lapkin, S., & Levett-Jones, T. (2011). A cost–utility analysis of medium vs. high-fidelity human patient simulation manikins in nursing education. *Journal of clinical nursing*, *20*(23-24), 3543-3552.

Lateef, F. (2010). Simulation-based learning: Just like the real thing. *Journal of Emergencies, Trauma and Shock*, *3*(4), 348-352.

Madrigal, A. C., & Meyer, R. (2021, February 23). *The U.S. has passed the hospital breaking point*. The Atlantic. https://www.theatlantic.com/health/archive/2020/12/the-worst-case-scenario-is-happening-hospitals-are-overwhelmed/617301

Martiniano, R., Chorost, S., & Moore J. (2016, April). *Health care employment projections, 2014-2024: An analysis of Bureau of Labor Statistics projections by setting and by occupation*. Center for Health Workforce Studies, School of Public Health, SUNY Albany.

Matua, G. A., Seshan, V., Savithri, R., & Fronda, D. C. (2014). Challenges and strategies for building and maintaining effective preceptor-preceptee relationships among nurses. *Sultan Qaboos University Medical Journal*, *14*(4), e530-e536.

McKeon, E., & Gonzalez, R. (2004). HRSA begins FY 2005 nursing workforce development programs. *AJN The American Journal of Nursing*, *104*(12), 36.

McLernon, L. M. (2020). COVID-related nursing shortages hit hospitals nationwide. *Center for Infectious Disease Research and Policy.* https://www. cidrap.umn.edu/news-perspective/2020/11/covid-related-nursingshortages-hit-hospitals-nationwide

Medley, C. F., & Horne, C. (2005). Using simulation technology for undergraduate nursing education. *Journal of Nursing Education*, *44*(1), 31-34.

Meurer, J. (2017, March 9). *The disadvantages of simulation in nursing programs*. Advocate Search Group. https://advocatesearchgroup.com/disadvantages-simulation-nursing-programs/.

Monti, J. (2021, November 12). *Guide to entry level nursing.* Nurse Journal. https://nursejournal.org/degrees/entry-level-nursing-paths

National League for Nursing. (2014). Admissions to Nursing Programs 2013-2014. http://www.nln.org/newsroom/nursing-education-statistics/admissions-to-nursing-programs

National League for Nursing. (2018). *Biennial survey of schools of nursing, Academic Year 2017-2018*. http://www.nln.org/newsroom/nursing-education-statistics/biennial-survey-of-schools-of-nursing-academic-year-2017-2018

NCSBN. (2020, June 22). *Changes in education requirements for nursing programs during COVID-19*. National Council of State Boards of Nursing. https://www.ncsbn.org/Education-Requirement-Changes_COVID-19.pdf

NCSBN. (2021). *NCLEX pass rates.* https://www.ncsbn.org/1237.htm

Nehring, W., Ellis, W., & Lashley, R. (2001). Human patient simulators in nursing education: An overview. *Simulation & Gaming, 32*(2), 194-204.

Nehring, W. M. (2008). U.S. boards of nursing and the use of high-fidelity patient simulators in nursing education. *Journal of Professional Nursing, 24*(2), 109-117.

Nickerson M., Pollard M. (2010). Mrs. Chase and her descendants: A historical view of simulation. *Creative Nursing, 16*(3), 101-105.

NursingLicensure.org. (2020, November 4). *Am I too old to go back to school? In pursuit of the RN to BSN*. https://www.nursinglicensure.org/articles/too-old-for-rn-to-bsn

Nursing Programs: State of emergency, A.B. 2288, 2019-2020 Reg. Sess. (Cal. 2019) (enacted) https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB2288

Ostrov, B. F., & Healthline, C. (2020). *In face of coronavirus, many hospitals cancel on-site training for nursing and med students.* KHN: Kaiser Health News.

Padilha, J. M., Ribeiro, A., Rosa, J., Marques, D., & Machado, P. P. (2020). Clinical virtual simulation as lifelong learning strategy—Nurse's verdict. *Clinical Simulation in Nursing*, *47*, 1-5.

Peng, J., & Rewers, L. (2021, October 6). *Why so many nurses are quitting (and what to do about it)*. Advisory Board. https://www.advisory.com/daily-briefing/2021/10/06/nurse-turnover

Peoples, L. (2020, September 2). *Perspectives on creative clinical placement in the time of COVID-19*. American Association of Colleges of Nursing (AACN). https://www.aacnnursing.org/News-Information/News/View/ArticleId/24682/Perspectives-on-Creative-Clinical-Placement

Purdue University Global. (2018, August 16). *The 7 states with the greatest nursing shortages*. Purdue Global. https://www.purdueglobal.edu/blog/nursing/7-states-greatest-nursing-shortages

Quilici, A. P., Bicudo, A. M., Gianotto-Oliveira, R., Timerman, S., Gutierrez, F., & Abrão, K. C. (2015). Faculty perceptions of simulation programs in healthcare education. *International Journal of Medical Education*, *6*, 166-171.

Ray, S. R. (2017). *Issues related to implementing high-fidelity simulation in a nursing program* [Doctoral dissertation, Walden University].

Ring, E. (2019, February 6). *California's nursing schools need to up enrollment by 60 percent to avoid shortage*. California Policy Center. https://californiapolicycenter.org/californias-nursing-schools-need-to-up-enrollment-by-60-percent-to-avoid-shortage

Roberts, E., Kaak, V., & Rolley, J. (2019). Simulation to replace clinical hours in nursing: A meta-narrative review. *Clinical Simulation in Nursing*, *37*, 5–13.

Rogers, E. M. (2003). *Diffusion of innovations*. Free Press.

Rosseter, R. (2015). Nursing faculty shortage fact sheet. *American Association of Colleges of Nursing*.

Rosseter, R. (2019). Nursing faculty shortage fact sheet. *American Association of Colleges of Nursing*.

Rudolph, J. W., Simon, R., Dufresne, R. L., & Raemer, D. B. (2006). There's no such thing as "nonjudgmental" debriefing: A theory and method for debriefing with good judgment. *Simulation in Healthcare: The Journal of the Society for Simulation in Healthcare*, *1*(1), 49–55. doi: 10.1097/01266021-200600110-00006

RWJ Foundation. (2013, June 10). *Robert Wood Johnson Foundation announces $20 million grant to support nurse PhD scientists.* https://www.rwjf.org/en/library/articles-and-news/2013/06/a-new-generation-of-nurse-scientists--educators--and-transformat.html

Sanko, J. S. (2017). Simulation as a teaching technology: A brief history of its use in nursing education. *The Quarterly Review of Distance Education*, *18*(2), 77–85.

Sanko, J. S., & Mckay, M. (2017). Impact of simulation-enhanced pharmacology education in prelicensure nursing education. *Nurse Educator*, *42*(5S), S32-S37.

Shinnick, M. A., Woo, M., Horwich, T. B., & Steadman, R. (2011). Debriefing: The most important component in simulation? *Clinical Simulation in Nursing*, *7*(3), e105-e111. doi: 10.1016/j.ecns.2010.11.005

Shinnick, M. A., Woo, M. A., & Mentes, J. C. (2011). Human patient simulation: State of the science in prelicensure nursing education. *The Journal of Nursing Education*, *50*(2), 65–72. https://doi.org/10.3928/01484834-20101230-01

Smiley, R. A. (2019). Survey of simulation use in prelicensure nursing programs: Changes and advancements, 2010–2017. *Journal of Nursing Regulation, 9*(4), 48-61. https://doi.org/10.1016/S2155-8256(19)30016-X

Sofer, D. (2018). The value of simulation in nursing education. *AJN, American Journal of Nursing*, *118*(4), 17–18.

Starkweather, A. R., & Kardong-Edgren, S. (2008). Diffusion of innovation: Embedding simulation into nursing curricula. *International Journal of Nursing Education Scholarship*, *5*(1), 1–11. doi: 10.2202/1548-923x.1567

U.S. Bureau of Labor Statistics. (2015, July 13). *Registered nurses have highest employment in healthcare occupations; anesthesiologists earn the most*. https://www.bls.gov/opub/ted/2015/registered-nurses-have-highest-employment-in-healthcare-occupations-anesthesiologists-earn-the-most.htm

U.S. Bureau of Labor Statistics. (2021, September 8). *Registered nurses: Occupational outlook handbook*. U.S. Bureau of Labor Statistics. https://www.bls.gov/ooh/healthcare/registered-nurses.htm

Vaughn, N. (2020, October 29). *Nurse turnover rates: How to reduce healthcare turnover*. Relias. https://www.relias.com/blog/how-to-reduce-healthcare-turnover

Weir, W. (2012, March 29). *At 101, "Mrs. Chase" is a medical marvel*. Hartford Courant. http://articles.courant.com/2012-03-29/health/hc-mrs-chase-hartford-hospital-0328-20120327_1_doll-nursing-student-mannequins

Wolsters Kluwer. (2017, March 26). *Limited clinical sites for nursing students: Simulations are the answer.* https://www.wolterskluwer.com/en/expert-insights/limited-clinical-sites-for-nursing-students-simulations-are-the-answer

Xu, J., Francis, L., Dine, J., & Thomas, T. H. (2018). Unique experiences of direct entry BSN/BS-PhD nursing students: A Delphi study. *Nurse Education Today, 69,* 30–34. https://doi.org/10.1016/j.nedt.2018.06.024