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Upskilling the Medical Workforce: Opportunities in Health Innovations
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Thank you, Chairwoman Velázquez, Ranking Member Chabot, and members of the Committee for the opportunity to provide testimony on how we, in academic nursing, are re-envisioning the education of the next generation of nurses and nursing leaders to thrive in an ever-changing health care system. I am Nancy Fahrenwald, Dean and Professor at Texas A&M University College of Nursing, which educates over 400 students enrolled in undergraduate and graduate nursing programs at two geographic locations in Texas. In addition, I also serve as the Chair of the Government Affairs Committee at the American Association of Colleges of Nursing (AACN). AACN, represents 825 schools of nursing, 543,000 baccalaureate and graduate students, and more than 45,000 faculty members.[1]

With over twenty years of experience in nursing education, I have witnessed firsthand how innovation impacts health care delivery. I entered into the field of academic nursing at the birth of the digital age, when this amazing thing called email had just begun to be used in earnest. I have seen how technology and innovation have supplemented and enhanced nursing education so that students can become effective and proficient practitioners. I have experienced how academic nursing, and nurses in general, have been early adopters of these advances, not only in practice, but also in the way we educate the future nursing workforce.

In 2016, Professor Klaus Schwab, founder of the World Economic Forum, heralded the arrival of the Fourth Industrial Revolution, a new era of technology-driven change.[2] This new "revolution" is marked by rapid changes in technology.[3] Health professions schools, like Texas A&M University College of Nursing, are increasingly including clinical simulation, virtual reality, telehealth, and other forms of technology-based educational platforms within the curriculum, to prepare tomorrow's practitioners and caregivers. Today, as Dean of Texas A&M University College of Nursing, I collaborate with other A&M health professions colleges to educate our students in the largest and most geographically diverse clinical simulation laboratories in the state. In this setting, health care students are refining their skills in a highly specialized environment that allows them to work in hospital, clinic, and community settings and with patients from birth to adulthood.

In other nursing programs, we are also seeing an emergence of entrepreneurship laboratories or innovation classes.[4] For example, nursing students and faculty, with an interprofessional and

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[1] American Association of Colleges of Nursing. (2019). "Who we are." Retrieved from: https://www.aacnnursing.org/About-AACN.
[2] Schwab, K. (2019). The Fourth Industrial Revolution. Retrieved from: https://www.britannica.com/topic/The-Fourth-Industrial-Revolution-2119734.
[3] Ibid.
[4] Duke Nursing: Advancing Innovation Research and Clinical Practice. "Creating Pathways for Innovation." Summer 2019, Volume 15, Number 2. Retrieved from: https://nursing.duke.edu/sites/default/files/documents/summer_2019_dukenursing.pdf.

interdisciplinary lens, are working on prototypes and even developing products, using 3-D printers and laser cutters, to put new innovations into production and advance the future of healthcare and nursing.[5] So often our students and faculty have an idea, but may need a software expert or engineer to translate that idea into a tangible health care solution. We recognize that need and are seeing programs partner in unique ways to bring these creative and impactful innovations to fruition.

Adopting and integrating health and health care technologies, beginning in the educational setting, is imperative as nurses are at the forefront of health care throughout the country. The need for highly educated nurses is only expected to grow. In fact, by 2028, the demand for Registered Nurses (RNs) nationally is expected to increase 12%, representing an employment change of 371,500 nurses.[6] Further, the demand for most Advanced Practiced Registered Nurses (APRNs), sometimes serving as the only primary care practitioner in large rural and underserved areas, is expected to grow by 26%.[7] This demand on the workforce is coupled with the fact that in the next three years it is projected that 70,000 baby boomer RNs will retire annually.[8] In Texas, one of the country's fasting growing states, nursing workforce supply and demand reports predict a 20% deficit of full-time RNs and a 25% shortage of nurse practitioners by 2030, equivalent to almost 60,000 professional nurses and over 6,000 nurse practitioners.[9] [10]

The growing demand for RNs and APRNs presents a unique opportunity for the academic programs that prepare the future nursing workforce to answer the call. We need to ensure that students are able to rise to the challenge and as AACN outlined, are "adaptable, creative individuals able to work with diverse populations while being agile to respond to the fluctuating business needs and reimbursement realities."[11] Whether nurses are providing care in hospitals, nurse-managed health clinics, schools, or federally qualified health centers, or even establishing their own small businesses, pairing the products of health and health care innovation with foundational nursing principles is imperative for upskilling the future health care workforce. I am grateful for the opportunity to be here today to discuss ways that we are doing just that in academic nursing.

Integrating Innovation into Nursing Education

Access to online education and new technologies have become a standard in nursing education and are

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[5] The Ohio State University College of Nursing, "The Innovation Studio at Ohio State." Retrieved from: https://nursing.osu.edu/offices-and-initiatives/office-innovation-and-strategic-partnerships/innovationstudio.

[6] U.S. Bureau of Labor Statistics. (2019). Occupational Outlook Handbook- Registered Nurses. Retrieved from: https://www.bls.gov/ooh/healthcare/registered-nurses.htm.

[7] U.S. Bureau of Labor Statistics. (2019). Occupational Outlook Handbook- Nurse Anesthetists, Nurse Midwives, and Nurse Practitioners. Retrieved from: https://www.bls.gov/ooh/healthcare/nurse-anesthetists-nurse-midwives-and-nurse-practitioners.htm.

[8] Buerhaus, Peter, Lucy Skinner, David Auerbach, Douglas Staiger, et al. 2017. "Four Challenges Facing the Nursing Workforce in the United States." Journal of Nursing Regulation, Volume 8, Issue 2.

[9] Rosewicz Barb, Biernacka-Lievestro, Joanna, Newman, Daniel. "Western, Southern States Gain Residents the Fastest." February 27, 2019. PEW. Retrieved from: https://www.pewtrusts.org/en/research-and-analysis/articles/2019/02/27/western-southern-states-gain-residents-the-fastest.

[10] Texas Center for Nursing Workforce Studies, Texas Department of State Health Services. "Nurse Supply and Demand Projections, 2015-2030." October 2016. Retrieved from: file:///C:/Users/RStevenson/Downloads/SupplyDemandReport_ExecutiveSummary%20(1).pdf.

[11] American Association of Colleges of Nursing. "AACN's Vision for Academic Nursing- Executive Summary." January 2019. Retrieved from: https://www.aacnnursing.org/Portals/42/News/White-Papers/Vision-Academic-Nursing.pdf.

only growing. According to AACN's Vision for Academic Nursing, "increasingly, a design-build approach is being used with pairing of faculty with an instructional designer to promote innovation and effective teaching methods in the classroom."[12] These methods help address, "limited resources, rising education costs, and demands to expand enrollments as well as diverse student learning styles."[13] Nurses are required to have skills and knowledge across a wide-variety of practice settings, to keep up with continually changing and evolving healthcare systems, and to provide high-quality patient centered care across the lifespan continuum. Academic nursing is at the forefront of technological innovation to ensure that these competencies are met.

Educational Experience: The Use of Modern Technology to Simulate Real World Environments

Throughout my experience, I have seen revolutionary technologies incorporated into the nursing curriculum. From electronic health record platforms to simulation labs and adaptive learning to virtual reality, these technologies expand critical thinking skills in a safe, simulated environment, facilitate learning and growth for the nursing students, and improve patient-centered care.

In fact, one of the most remarkable changes to nursing education in the last decade has been the introduction of virtual simulation. According, to a 2017 Wolters Kluwer survey, virtual simulation is currently used in 65% of nursing education programs, and that number is expected to grow.[14]

At Texas A&M University, we have a Clinical Learning Resource Center (CLRC), which advances the knowledge of our students through interprofessional clinical simulation, including through virtual reality software programs, partial task trainers, human patient simulators operated remotely, simulated clinical care environments, and standardized patients.[15] For example, at the CLRC, a nursing student could "clock in" to experience a myriad of different care delivery environments, such as a rural clinic or even a telehealth setting. Clinical simulation laboratories, like ours, are places where simple and complex care scenarios are created to ensure students are exposure to the technologies that exist in health care and to particularly high-stakes healthcare events.

Through these environments, students have the hands-on experience of making decisions about patient care as if it were real, while also allowing faculty to remediate, debrief, and educate students on best practices. Nursing students are able to prepare for scenarios they may face in practice. It could be simple skills, such as learning to administer medication independently or documenting without a co-signer. The training could also be as complex as caring for a patient experiencing cardiac arrest, post-partum hemorrhage, or sepsis from infection. Students may experience these scenarios all by using technology, standardized patient models, or manikins. [16] In fact, our CLRC includes full-bodied computer-

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[12] I American Association of Colleges of Nursing. "AACN's Vision for Academic Nursing- Executive Summary." January 2019. Retrieved from: https://www.aacnnursing.org/Portals/42/News/White-Papers/Vision-Academic-Nursing.pdf.

[13] Ibid.

[14] Wolters Kluwer, "65% of Nursing Education Programs Adopting Virtual Simulation." Retrieved from: http://healthclarity.wolterskluwer.com/nursing-education-programs-virtual-simulation.html.

[15] Texas A&M University, "Clinical Learning Resource Center (CLRC) Mission and Vision." Retrieved from: https://health.tamu.edu/clrc/mission-vision.html.

[16] Aebersold, M., (April 3, 2018) "Simulation-Based Learning: No Longer a Novelty in Undergraduate Education" *OJIN: The Online Journal of Issues in Nursing* Vol. 23, No. 2. Retrieved from: http://ojin.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/Vol-

programmed manikins that can simulate a range of responses.[17] They can bleed, have dynamic heart rates, and even birth babies. *The Importance of Simulation in Nursing Education* outlines, "Nursing students who take part in education programs involving simulations perform less medical mistakes in clinical settings, and are able to better develop their critical thinking and clinical decision-making skills."[18] Simulation labs allow students to be confident and competent practitioners. According to the Institute of Medicine (IOM) report, *To Err is Human: Building a Safer Health Care System*, one of the recommended strategies to improve patient safety is through interdisciplinary team training, such as simulation.[19]

Other emerging technologies, such as augmented and virtual reality, may be used to enhance the educational experience and prepare future nursing workforce for the realities of their career. Some schools are investing in virtual anatomy tables that allow students to visualize human anatomy by 'virtually dissecting' patients.[20] By putting on 3D goggles, the student is able to see through the manikin and the different layers of their anatomy. They are able to practice procedures, such as inserting a feeding tube or conducting a physical exam.[21] Other mixed reality technology can enlarge, turn, or rotate organs with the movement of your hand or show how ultrasound beams go through a human.[22] These types of high-tech innovations, once dreamed up in science fiction novels, are now cutting edge tools that provide students an immersive, comprehensive, and live action learning experience, without the fear of harming a live patient.

Earlier this month, I was celebrating the work of our forensic nursing faculty and their outstanding master's and certificate education programs, cutting-edge research, and statewide outreach. The A&M Board of Regents recently approved the College of Nursing as a Centers for Excellence in Forensic Nursing. In our curriculum, we prepare forensic nurses, through simulated scenarios, to identify and treat patients who have experienced traumatic episodes, such as elder abuse, sexual violence, or human trafficking. We teach them how to talk with these patients and document the care based on protocol. At the conclusion of the simulations, we debrief with the students to discuss these training exercises. As a result, when faced with similar experiences in our communities, they are ready and able to step in and provide safe, trauma-informed, and evidence-based care. At a social event where we were discussing our center, a casual conversation resulted in one community member explaining to me, "I remember

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23-2018/No2-May-2018/Articles-Previous-Topics/Simulation-Based-Learning-Undergraduate-Education.html#Colleges.

[17] Texas A&M University, "Clinical Learning Resource Center (CLRC) Mission and Vision." Retrieved from: https://health.tamu.edu/clrc/mission-vision.html.

[18] Eyikara E, Baykara Z. The Importance of Simulation in Nursing Education. Retrieved from: https://eric.ed.gov/?id=EJ1141174.

[19] Kohn LT, Corrigan JM, Donaldson MS, editors. To err is human: building a safer health system A report of the Committee on Quality of Health Care in America, Institute of Medicine. Washington, DC: National Academy Press; 2000. https://www.ncbi.nlm.nih.gov/pubmed/25077248.

[20] Choi, J. (2013, February), *Jack Choi: On the virtual dissection table* [Video file]. Retrieved from https://www.ted.com/talks/jack_choi_on_the_virtual_dissection_table.

[21] Aebersold, M., (April 3, 2018) "Simulation-Based Learning: No Longer a Novelty in Undergraduate Education" *OJIN: The Online Journal of Issues in Nursing* Vol. 23, No. 2. Retrieved from: http://ojin.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/Vol-23-2018/No2-May-2018/Articles-Previous-Topics/Simulation-Based-Learning-Undergraduate-Education.html#Colleges.

[22] CAE Healthcare. Limitless learning. Retrieved from: https://caehealthcare.com/hololens/.

being in that situation, and it was the nurse that allowed me to survive." That is what this education is for, to be ready to meet people where they are and deliver high-quality personalized care.

Another aspect of our innovative training is in telehealth. Telehealth services are integral, especially in geriatric and post-operative care, and can reduce cost burden, increase quality of care, and lessen disruptions for patients.

As I prepare students to meet today's healthcare challenges, such as an aging population and the rural realities of Texas, telehealth technologies play a large role. [23] Through our curriculum, we are able to simulate those real-world scenarios and telehealth conversations. We work with our nursing students to be able to ask the right questions to help facilitate high-quality, patient-centered outcomes. Keep in mind, it is not just about the patient themselves, but also their environment. For example, we teach our students to ask questions like, do they a place to fill a prescription? What type of caregivers do they have in their community? Do they have access to transportation? By allowing that patient to stay in their home, or not drive hours to a healthcare facility, we are meeting them where they are, while remaining that trusted patient advocate.

Maintaining and Enhancing Federal Involvement through Title VIII Nursing Workforce Development Programs:

As you can see, technology is a major driver of change. One way the federal government is helping to facilitate and support that change in nursing education is through the Title VIII Nursing Workforce Development Programs. For over fifty years, the Nursing Workforce Development Programs (Title VIII of the Public Health Service Act [42 U.S.C. 296 et seq.]) have consistently and continually sustained the supply and distribution of highly-educated nurses by strengthening nursing education at all levels, from entry preparation through graduate study.

Nursing schools across the country are working to meet the rising demand and educate all qualified applicants interested in the profession. Though a 3.7% enrollment increase in entry-level baccalaureate programs was reported in nursing in 2018 by AACN, "this increase is not sufficient to meet the projected demand for nursing services, including the need for more nurse faculty, researchers, and primary care providers."[24] Each of the programs that comprise Title VIII have a unique mission aimed at promoting nursing care in all communities, especially in vulnerable and underserved areas. For example, the Nurse Faculty Loan Program, helps ensure we have faculty to prepare the nursing students of today to be innovative leaders in the healthcare workforce of tomorrow. According to AACN's report on 2018-2019 Enrollment and Graduations in Baccalaureate and Graduate Programs in Nursing, U.S. nursing schools turned away more than 75,000 qualified students in 2018 and pointed to a shortage of faculty, clinical sites, and clinical preceptors as the primary reasons for not accepting all qualified applicants into their programs.[25]

Title VIII programs help fund the innovations, which are at the cutting edge of our profession. They allow us to provide training, scholarships and loans, while helping to ensure we have a robust, diverse nursing pipeline. In my prior role as the flagship college of nursing dean in a rural Midwestern state, Title VIII

[23] Pew Research Center. (2010). Baby Boomers Retire. http://www.pewresearch.org/fact-tank/2010/12/29/baby-boomers-retire.

[24] American Association of Colleges of Nursing. (2019). Nursing Shortage Fact Sheet as of April 5, 2019. Retrieved from https://www.aacnnursing.org/Portals/42/News/Factsheets/Nursing-Shortage-Factsheet.pdf

[25] Ibid.

funds allowed our college to purchase simulation technologies and educate our faculty in developing new pedagogies. The faculty also created simulation scenarios for students that our rural nursing colleagues told us were important, such as farm injuries and emergency care of children injured in a rollover of an all-terrain vehicle.

We commend the House of Representatives for passing H.R. 728, the Title VIII Nursing Workforce Reauthorization Act, to ensure these programs continue to provide much needed federal support to nursing education and practice throughout the country. While we continue to work to move this vital legislation forward, we wanted to highlight the important role these grants and programs play in sustaining and enhancing our educational innovations. In that same light, we urge Congress to continue to increase funding for these vital nursing education programs through the annual appropriations process. Reauthorization, and continued funding, of Title VIII Nursing Workforce Development Programs, will ensure that nursing education, and the nursing workforce, continues to maximize new technologies, integrate health care innovation, and prepare for the ever-changing needs of our patients.

Adaptability and Agility: Innovations on the Horizon

While our curriculum may not be based in business, we are on the frontlines of health care and are utilizing innovative technologies to create advancements in delivery systems and address the social determinants of health, while working to minimize health disparities. Our students work in all healthcare settings, small businesses and large health care systems alike, and in every community nationwide.

While integration of these skills is necessary and is redefining the way that nurses are educated and how they practice, we remain steadfast in our foundational principles of putting patients first. As AACN leadership highlights, technological advances "will not replace the need for nurses or faculty, nor decrease the demand for humanistic, compassionate interaction with students and patients."[26] As we enter this new frontier, we are preparing nurses to enter the workforce more competently and confidently than ever before.

[26] Cary, Ann and Deborah Trautman. "Rounds with Leadership: Artificial Intelligence." American Association of Colleges of Nurses." Retrieved from: https://www.aacnnursing.org/News-Information/News/View/ArticleId/22796/Rounds-with-Leadership-11-28-18.