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A blueprint for nursing innovation centers

Taura L. Barr, PhD, RN, FAHA^{a,*}, Kathy Malloch, PhD, MBA, RN, FAAN^b,
Michael H Ackerman, DNS, RN, FCCM, FNAP, FAANP, FAAN^c,
Tim Raderstorf, DNP, RN^d,
Bernadette Mazurek Melnyk, PhD, APRN-CNP, FAANP, FNAP, FAAN^e

^aCenter for Healthcare Innovation and Leadership, The Ohio State University College of Nursing, Columbus, OH

^bCollege of Nursing, The Ohio State University, Columbus, OH

^cCenter for Healthcare Innovation and Leadership, College of Nursing, The Ohio State University, Columbus, OH

^dCenter for Healthcare Innovation and Leadership, College of Nursing, The Ohio State University, Columbus, OH

^eCollege of Nursing, Pediatrics & Psychiatry, College of Medicine, the Helene Fuld Health Trust National Institute for EBP, Columbus, OH

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ABSTRACT

Background: The interest in and demand for healthcare innovation has heightened amid the COVID-19 pandemic. Organizations are challenged to balance the goals of daily operations with innovation to stay relevant and compete in the marketplace. Innovation is critical for not only the success and sustainability of organizations, but the well-being of the faculty, staff, and clients they serve.

Purpose: In this article, we present an overview of several Nursing Innovation Centers in the United States as well as examples of colleges without formal innovation centers but who are addressing innovation in their programs.

Methods: We examined the subjective experience of nursing innovation in seven colleges of nursing using semi-structured interviews and thematic analysis.

Findings: We discuss four themes for creating an innovation center or innovation focus and six themes important for sustainability and impact. In addition, we provide a working model for these themes and provide lessons learned along with trends and recommendations for the future.

Discussion: This information provides guidance and a framework for academic and practice organizations aspiring to create opportunities for innovation to flourish in their institutions. We also encourage leadership to critically evaluate and address biases in faculty hiring, research evaluation, publication practices, educational opportunities and mentoring to overcome the diversity innovation paradox.

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*Corresponding author: Center for Healthcare innovation and Wellness, The Ohio State University College of Nursing, Columbus, OH 43210.

E-mail address: barr.428@osu.edu (T.L. Barr).

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Introduction

History of Innovation in the US and the Current State of the Science

Healthcare innovation has made significant advancements in response to the COVID-19 pandemic. Nursing as a profession has never been so revered for our innovativeness and clinical expertise. This is due in large part to the ingenuity and creativeness of our nurse colleagues on the front lines, pushing past barriers, creating innovative solutions, and lifting us up during this character-building time. (Casadevall, 2018; Woolliscroft, 2020)

Over the last decade, there has been an acceleration in innovation largely due to improvements and technological advancements that made it easier to rapidly capture, transmit and process large amounts of data, manifested by technologies like the internet of things (IoT), deep learning, genomic medicine, and mixed reality (Topol, 2019). However, the bottleneck in these technological advancements has been the elimination of noise, or the ability to identify opportunities. This practice of eliminating noise lies at the heart of innovation in the US: American inventors have a keen ability to identify successful opportunities from those that will not make it beyond the so called ‘valley of death.’ This ability to eliminate noise is an innovation competency that can be learned. In the late 19th and early 20th centuries, the Golden Age of Invention, this practice of eliminating noise and seizing opportunities is what helped America to become the world’s preeminent industrial nation, propelled by inventors such as Thomas Edison and Nikola Tesla in electrical illumination and Alexander Graham Bell and Elisha Gray’s telephone. Examining how innovation flourished in this period may be the key to creating the structures that support the future of innovation.

During the Golden Age of Invention, innovation was more prevalent in specific areas. These hotspots of innovation had one primary thing in common: the geographic areas open to disruptive ideas grew faster in terms of both their population and economy compared to those that were not (Ufuk, 2017). Innovation flourished in hotspots like Boston and the “Rust Belt” because innovative leaders created opportunities for people to easily interact with one another and connect with investors who could finance their vision. Innovation does not happen in a vacuum. Diversity of thought, culture, and opinion is critical to innovation’s success.

The Diversity Innovation paradox shows us that those who are more likely to be innovative are often left out of the innovation conversation. But an analysis of our history, confirms that innovation happens when opportunities are created to bring people together who would not otherwise come together, and are provided a place to brainstorm, disagree with and challenge one another, and ultimately support one another to co-create and take calculated risks.

Innovative organizations create structures that support innovation and by doing so, bring in half a billion dollars more in revenue over a five-year period compared to their not so innovative counterparts (Grove, 1999; Minor, 2017). In addition to the financial benefits, embracing innovation and bringing people together to innovate within a structure that has been demonstrated to work, such as a center, has been shown to enhance productivity, greater engagement with work, increase wellbeing, and have a positive impact on healthcare quality and patient safety (Marjanovic, 2018 & Walker, 2011). The combined impact of innovation on culture and financial return on investment, makes innovation a competitive necessity in our current environment.

Overview of Current Nursing Healthcare Innovation Cente

The aim of this qualitative study was to identify best practices for creating and sustaining a culture of innovation by evaluating the subjective experience of nursing leadership in colleges with and without innovation centers. Our team consulted with 10 experts in nursing innovation to recommend innovation centers and colleges of nursing with a national reputation in nursing innovation. These experts identified 7 colleges of nursing: 4 with dedicated innovation centers and 3 without an innovation center but a dedicated effort in innovation. These schools all have access to cutting edge technology and programs, world-class facilities, and faculty.4 are recognized in the US News and World Report has having high impact because of their track record of publications and grant funding. Although this is by no means an exhaustive review, we do believe they provide representation of nursing academia. *Table 1.*

After the colleges were identified, the team created a list of predefined questions to direct the semi-structured interviews, allowing for congruence amongst the interviews, while some flexibility was encouraged. One person conducted the interviews over the phone or video conference, with each of the center directors or innovation leads at their respective college. After the interviews were conducted, notes were transcribed and shared with the team for analysis.

Most colleges of nursing do not have innovation centers or a focused effort on innovation, thus there is tremendous opportunity to create and establish innovation-based centers in academic and practice-based nursing institutions (Albert, 2018). Nurses are critical to healthcare innovation, but historically have been left out of innovation initiatives because of a lack of education and confidence, and the patriarchal/physician focused structure of healthcare that has pushed nursing innovation into the shadows. Nursing education does not typically prepare nurses to innovate, thus, there is a competency gap that needs addressed (White, 2016); yet nurses are one of the most creative professionals known for their ability to think on the

Table 1 – Overview of Centers.

University & College	The Why?	Challenges	Lessons Learned	Future plans	Funding
<p>Innovation Centers University of Pennsylvania School of Nursing Innovation Center https://www.nursing.upenn.edu/research/innovation/</p>	<p>Innovation education of faculty and students. Build partnerships and new collaborations. Amplify nurses as innovators</p>	<p>Engaging students. Innovation & Health Design course is open to undergrad and grad students but is not required so gets limited involvement.</p>	<p>Strategic planning that aligns with a budget and goals of the college. Only research faculty participate in their Nursing innovation fellowship to make sure innovation becomes part of the culture.</p>	<p>Focus on student driven activities to enhance participation.</p>	<p>Launched via endowments and alumni support. Seeking additional funding sources for programmatic activities.</p>
<p>Duke University School of Nursing Health Innovation Lab https://nursing.duke.edu/tags/health-innovation-lab</p>	<p>Give life to clinician ideas</p>	<p>Getting adequate protected time to develop and launch the lab.</p>	<p>Ask for staff assistance upfront, create an advisory board to help guide the projects they undertake, and communicate more with faculty and students to keep them informed of what is going on so they can be engaged partners.</p>	<p>Build upon interprofessional educational opportunities.</p>	<p>Primarily funded by research grants with physical space in the college of nursing.</p>
<p>Cleveland Clinic Health System, Office of Nursing Research, and Innovation https://my.clevelandclinic.org/departments/nursing/about/specialties/nursing-research</p>	<p>Support nursing-led and collaborative innovations toward implementation and commercialization</p>	<p>Create the best infrastructure that supports sharing of innovative ideas Coach and guide nurses toward cultivation of innovative ideas</p>	<p>Clinical nurses may be risk-averse in sharing innovative ideas. Methods that engage, encourage and support initial vocalization are important</p>	<p>1) Increase the number of innovations that solve important nursing or healthcare problems. 2) Increase infrastructure resources needed to support the costs of prototyping.</p>	<p>Joint support by Cleveland Clinic Innovations and the Nursing Institute, plus research or prototyping grant funding as needed.</p>
<p>The Ohio State College of Nursing, Center for Healthcare Innovation and Leadership https://nursing.osu.edu/offices-and-initiatives/center-healthcare-innovation-and-wellness</p>	<p>Focused and intentional effort to develop innovation-based initiatives and build capacity. We wanted to capitalize on the great momentum we gained with the Innovation Studio and the MHI program. We also saw an opportunity to support of faculty to bridge the innovation competency gap.</p>	<p>Engaging research faculty, funding to support center initiatives, and maximizing the impact of the center across the college and university. We have a shared leadership team, which has taken time to come together and mesh ideals and values.</p>	<p>It is important to have a critical mass of faculty with competence and confidence to lead this effort. It's also critical to invest in strategic planning combined with funding to support initiatives. Faculty engagement happens with innovation is reframed to meet their needs and wants.</p>	<p>Enhanced interprofessional partnerships across the university and outside of the university, through business partnerships. Improve faculty engagement through fellowship programs and trainings that support, mentor and coach faculty.</p>	<p>Launched with internal funding, currently seeking, grants, investment, contracts, and endowment to sustain.</p>

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Table 1 – (Continued)

University & College	The Why?	Challenges	Lessons Learned	Future plans	Funding
Innovation Focused Programs					
Johns Hopkins University: REACH center and Center for Innovative Care in Aging https://nursing.jhu.edu/faculty_research/research/osi/	Research centers with an opportunity to innovate.	Negotiate for more time and effort to build and launch. Sustainability of the center beyond the center PI	Advocate and seek investments outside of grants and contracts. Share positions across centers to save resources and maximize effort.	Seek interprofessional opportunities through joint appointments and joint programming.	Primarily funded by research grants
New York University Rory Meyers College of Nursing https://nursing.nyu.edu/innovation	Innovation that fuels research, and research that fuels innovation.	Be intentional, strategic and make all meetings productive.	Innovation only works when team members hold one another accountable. Deal with challenges early; don't let them fester. Provide positive feedback as well as constructive feedback weekly.	Determine how the landscape has changed and pivot where and when necessary to stay relevant.	Primarily funded by research grants.
University of Connecticut School of Nursing https://cnsi.uconn.edu/	Educating the next generation of nurses to become positive change makers in healthcare. Nursing history reflects significant innovation contributions that are now necessities to healthcare delivery.	Recognizing the academic process for introducing changes to curriculum takes time. As a result, be proactive and realistic in expectations for strategic initiatives over each academic year.	Assess the existing culture's readiness for innovation. Provide opportunities for discussing the role of innovation in nursing with faculty and students. Identify opportunities for innovation education in existing curriculum courses.	Continue to seek funding sources for student and faculty innovation development. Continue to identify new opportunities to discuss and present the importance of educating nursing students on innovation science.	Primarily donor gifts, and grants with some funding from Healthcare Innovation Certificate Program fees (anticipated that the funding support will increase as the program grows).

spot and create workarounds to effectively manage their patients (Snow, 2019). The profession of nursing is ready to support the creation of innovation-based centers to accelerate healthcare innovation and embrace nursing as a leader in innovation (Fuller, 2019 & Broome, 2016). Our analysis and recommendations can be used as a guide for leadership considering the creation of an innovation center or support the creation of foundational innovation-based programs and initiatives.

Overview of Colleges and Institutions Studied

University of Pennsylvania, Nursing Director of Innovation

The University of Pennsylvania is known worldwide for its well-funded research programs and innovation initiatives. The university is home to several innovation programs, including the Penn Center for Innovation and the Penn Medicine Center for Healthcare Innovation, as well as an ecosystem that serves innovators and entrepreneurs around the world. Several years ago, in keeping with the innovation strategic priorities of the University, the School of Nursing embarked on a journey to bring a focus of innovation to the School.

Initially, the Associate Dean for Research & Innovation worked with school leadership and its Board of Overseers to develop a strategic vision for the innovation space and to frame what innovation meant at Penn Nursing. With this strategic vision as a foundation, Penn Nursing created and funded a Faculty Innovation Fellow who spent a year in residence at the Penn Medicine Center for Healthcare Innovation and supported student internships in this same center. Over the past 5 years, these efforts led to a cadre of faculty and students becoming engaged and committed to further developing innovation in their research, practice, and education.

A new position was created to ensure that innovation was infused in the research, practice, and teaching mission. Initially, as a part-time innovation specialist, within 18 months it was elevated to a full-time Director of Innovation position that represented the School across campus. The role established and solidified partnerships between the school of nursing and other academic units, as well as innovation entities outside of the university while amplifying nurses as leaders in health and healthcare innovation globally. The initiatives from the office of the Director of Innovation are already driving the education of the nursing profession to elevate nurses as innovators. In partnership with the Rita and Alex Hillman Foundation, the office developed an open source on-line curriculum and a national platform by which nurse innovators could share their knowledge and expertise. This unique suite of materials, the Design Thinking for

Health platform (www.designthinkingforhealth.org), is available free of charge to all nurses, nursing programs, and healthcare innovators. Funding for programmatic initiatives is augmented with gifts, endowments, and foundation grants.

One of the biggest initiatives undertaken has been the engagement of students. Engagement of students is happening through a number of initiatives including the interprofessional Innovation in Health: Foundations of Design Thinking course, as well as through initiatives such as the Penn Nursing Innovation Accelerator program.

Over 5 years, key lessons learned from the Penn Nursing team are (a) the importance of creating a strategic plan and aligning resources to assure goals can be accomplished; (b) start with a focused initiative and build a strong foundation; and (c) capitalize on the School's board of overseers (i.e external advisors) as fully engaged partners in informing and accomplishing an innovation vision. Penn Nursing's future goals are to (a) focus on student driven activities to enhance participation in innovation-based programming; (b) expand faculty and student reach nationally and internationally through partnerships and educational platforms; (c) engage social media to increase awareness; and (d) continue to capitalize on a robust research portfolio and strong practice partners to ensure evidence based products and processes can be further developed to support spread and scale. The Penn Nursing Innovation program is a great model for research-intensive institutions looking to embrace a culture of innovation. <https://www.nursing.upenn.edu/research/innovation/>

Duke University School of Nursing Health Innovation Lab

For the past 3 years, the Duke University School of Nursing (DUSON) Health Innovation Lab has served as an accelerator to translate innovative ideas, processes and technologies into clinical practice. The Director of the Center is a digital health scientist who saw an opportunity to give life to innovative clinician ideas. The lab provides an infrastructure and physical space for entrepreneurship, product development and testing, and modeling new care delivery processes. The lab is a space that sits within a larger 20,000 square foot simulated clinical environment.

The team has created a strong partnership with the Duke Health System and Schools of Engineering and Medicine to create opportunities for engineering and nursing students to work alongside innovative clinicians and research scientists. A 3-year internal grant from DUSON was awarded to launch the lab. Their key to creating a space for the lab was receiving a National Science Foundation (NSF) grant in collaboration with engineering faculty for a robotics project. After this, DUSON took note of the innovative work and wanted to support the lab in a much bigger way by giving them physical space in their new building. Today, they are

primarily funded on grants and receive some support from the Duke Health System. One of the biggest challenges for the lab aside from raising money to support it, has been getting protected time to develop it. Because most models of innovation take time to see a return on investment it can sometimes be hard to justify the required protected time for faculty to build innovative projects.

One of the lessons learned early in the process was to invest in people and negotiate for staff assistance early. It takes a team to launch a successful center and staff assistance to support the day-to-day scheduling and administrative requirements can be the key to doing so quickly and efficiently. The future of the DUSON Lab is to build upon interprofessional educational opportunities, primarily with the schools of engineering and medicine and seek additional partners to maximize their ability to bring clinical innovations to life. Currently they offer co-listed courses to engage in interprofessional educational opportunities that often lead to novel ideas coming into the lab for development. For example, every semester, clinical challenges are ‘pitched’ to engineering students in the hopes of garnering interest and building news teams. Many clinicians who have brought their ideas to the lab have found their partners this way. The DUSON Health Innovation Lab is a great example of how bringing together clinicians and engineers for the sake of education, can lead to the development of successful innovation-based partnerships simply through conversation and discussion. <https://nursing.duke.edu/tags/health-innovation-lab>

Cleveland Clinic Health System, Office of Nursing Research, and Innovation

The Office of Nursing Research and Innovation of the Cleveland Clinic Health System provides mentorship and guidance for nurses in all stages of research, from developing questions through developing manuscripts of completed research, and also, in all stages of the innovative process, from ideation to commercialization. A strategic mission of Cleveland Clinic is innovation, but historically most innovations were physician led. In 2006, the chief nursing officer identified an opportunity for nursing to embrace innovation and asked the Director of Nursing Research to attend Commercialization Council meetings and implement creativity sessions. In 2011, nursing innovation became a strategic initiative of the Nursing Institute; the Office name and the director’s job title were changed to include innovation. Innovation must be supported by leadership at the highest level to be successful. Since innovation is not often seen as mission critical, leadership must advocate for it, as it can be time intensive and many innovations require funding for the work of developing prototypes and assessing innovation value. Infrastructure support by the chief nursing officer provides an example of the importance of creating structures that support a culture of innovation, not just in

words, but in policies, incentives, and actions that support the vision and mission of an institution. Nurses often have trouble taking ownership of their own inventions and following through with next steps because they either lack knowledge or confidence in the innovation process. Therefore, the Director of Nursing Research and Innovation and her team use multiple methods to reframe innovation and make innovation more transparent. They encourage nurse innovators to communicate their ideas and to take the lead from idea generation to implementation. In 2018, the team hired a part time ‘innovation coordinator’ to encourage, support and guide nurses along their journey. Since the Office has employees with expertise in nursing research, some of whom were also innovators, it was a natural “marriage” of teams, especially since, research is sometimes needed to show the value of innovations.

Over time, one lesson learned for the Cleveland Clinic team was that some nurses with great ideas do not want to spend time and effort on cultivating them. To overcome innovation inertia, the Director and her innovation coordinator revised their innovation processes. Idle ideas are now shared with others, cultivated, and brought forward so that clinicians can benefit from their colleagues’ ideas. The Nursing Institute is fortunate in that they collaborate closely with Cleveland Clinic Innovations; the team that receives inventions, reviews them for viability and takes steps toward commercialization. The combined expertise of the Cleveland Clinic Innovations team and nursing innovation leaders help bridge the gap for nurses who are not trained in the language, skills or steps of innovation.

When nurses do not know who to share ideas with or how to make a case of the value of their innovations, they will be less likely to vocalize them initially and advocate for their implementation. An innovation coordinator coaches nurses so that when they submit to the Cleveland Clinic innovations team, innovation details (including drawings) and expected outcomes are developed and the innovator can pitch their idea. Cleveland Clinic Innovations leaders understand the value of promoting nursing innovations and now provide a more advanced level of prototyping support. When research is needed, nursing research personnel mentor the innovator team in grant support, often through internal grant funding.

The Cleveland Clinic Health System, Office of Nursing Research and Innovation is a great example of how nursing innovation can flourish in an institution when resources are maximized and coordinated to ensure that great nurse-conceived ideas are vocalized, mentored and processed toward local implementation, commercialization and gaining a return-on-investment. Mentoring and coaching remain a critical component of building innovation-based capacity and development in nursing. <https://my.clevelandclinic.org/departments/nursing/about/specialties/nursing-research>

The Ohio State University College of Nursing Center for Healthcare Innovation and Leadership

Our entry into innovation began with the development of a Master of Healthcare Innovation (MHI) Program in 2012. This development process showcased the need for non-academic support for the ecosystem. In conjunction with the MHI curriculum creation, the CON launched our inaugural Healthcare Innovation and Entrepreneurship Workshop in 2015. This workshop has continued annually as a two-day event focused on providing innovators and entrepreneurs the tools and network they need to be more innovative in their practice or take the entrepreneurial leap.

As these programs grew, so too did the need for a foundation of innovation that has been carefully developed over the past 9 years. We recognized that we needed leadership roles that stretched beyond the typical barriers found in traditional academia. Our first step was to create the nation's first Chief Innovation Officer in academic nursing in 2016, who quickly focused on giving nurses and other interprofessional innovators a voice through the Innovation Studio.

Funded by a philanthropic gift, the Innovation Studio started as a moveable makerspace/idea incubator focused on democratizing innovation across campus. The Innovation Studio makes seven-week long tour stops at high traffic locations across campus (lobbies of libraries, hospitals, colleges etc.) At the end of each tour stop, the Innovation Studio hosts a pitch day to learn about the innovations that interprofessional teams have created. The true uniqueness of the Innovation Studio is not that it is moveable or hosts pitch days; what is truly unique about the Innovation Studio is that it provides funding to every team that pitches their idea as long as the teams are made up of two or more Ohio State students, faculty, or staff, and their innovation has to improve the health or wellbeing of at least one person on the planet. Keeping the barriers to entry at a minimum has allowed for a diverse group of teams and ideas to be pitched to the studio since launching in March of 2017. Since then, a second, non-moveable Innovation Studio has opened a permanent space in a non-nursing building on central campus. We have funded over 200 teams to the sum of over \$150,000 and have seen our first of what we hope will be many innovations reach the commercial marketplace. We are actively seeking franchising opportunities to launch the Innovation Studio throughout academia and healthcare.

Continuing to build out the foundation of innovation, the CON hired a director of the MHI program in the fall of 2017. The MHI program is a cross disciplinary program that prepares future generations of innovation leaders. The program places a strong emphasis on complexity theory, complex adaptive systems, design thinking, as well as the culture of innovation. Rooted in quantum leadership and emotional intelligence, the program prepares individuals with a variety of backgrounds, to move innovation forward from point A to point C. One of the mantras of the program

is, “being comfortable with being uncomfortable,” where experimentation and tolerance of failure are givens. The program concludes with a team-based capstone project that begins with a design thinking course, where ideas are generated, iteration takes place and the phases of design are explored. The result of the design course moves the students into the two capstone courses where implementation and evaluation of the project are completed.

It is the philosophy within our College that the success of any Center is greatly dependent upon a strong academic program. There are many synergies between the MHI program and our innovation center including, student engagement, potential funding of projects, and relationships with industry that could lead to commercialization opportunities.

Bringing the CON's first Entrepreneur-in-Residence in the fall of 2019 completed the foundational build of our innovation team. Dr. Barr's arrival brought in the experience of a venture-backed academic entrepreneur, a rarity in nursing today. Her impact has been immediately felt through the development of a faculty mentorship program that was been piloted in 2020, with plans for a university-wide interprofessional release in 2021.

The combination of these efforts highlighted the need for a formal structure of innovation at the CON, which came to fruition in August of 2020 through the announcement of the Center for Healthcare Innovation and Wellness at The Ohio State University College of Nursing. The newly established center aspires to become the world's destination for developing innovative and entrepreneurial leaders who transform health and improve lives. The self-managed leadership team holds one another accountable and responsible for all aspects of the center. This allows management to be shared across the Core Team while a Governance Team ensures all decisions are consensus based. We believe shared interest and purpose lead to shared responsibility. <https://nursing.osu.edu/offices-and-initiatives/center-healthcare-innovation-and-wellness>

Examples of Innovation Initiatives Without a Formal Innovation Center

As most colleges of nursing likely do not have dedicated innovation centers, we also wanted to provide an overview of how to conduct and structure innovation outside of a formal innovation center. We believe these colleges provide an example for those who are looking to enhance their current programs to support innovation-based initiatives but may not want to formally launch an innovation center.

John's Hopkins University School of Nursing, REACH center and Center for Innovative Care in Aging

The REACH Initiative serves Baltimore City residents living with and at risk for HIV and associated co-infections. The Center for Innovative Care in Aging

advances novel behavioral interventions to enhance the health, well-being, and aging of diverse adults and their families in various settings including home and community. These two centers function very much like traditional research centers and are primarily supported via grants and contracts. However, the Dean supported startup funds to get the centers going and provided support for 5 years for two positions that were eventually backfilled with grant money. They do engage with companies from time to time, providing additional sources of revenue beyond grants. The work coming out of the centers is innovative and cutting-edge, which speaks to the innovative leadership of the center directors. Innovative leaders create cultures that promote innovation and new ways of addressing common challenges. Both center directors saw an opportunity to innovate in their area of research and through their passionate commitment have kept their centers going through successive grant funding for the past few years. The REACH Center also provides continuing education (CE) opportunities for clinicians, opening a novel revenue stream while promoting education and outreach.

In terms of lessons learned, they too have shared the same challenge as the DUSON team, which is to negotiate for more time and effort to support their innovative efforts up front. This difficulty in negotiating for time to build innovation is a recurring theme for research scientists and has implications for long term stability. For both of their centers, they are heavily dependent (although not solely) on research grants, thus sustainability is a concern. There are not many research scientists with grants to support the work of the centers and succession planning for a center like this is uncharted waters. Both center directors are the PI's of the grants that support the centers. This is a challenge for most academic research centers and highlights an important opportunity to innovate in this area to allow teams to emerge with multiple grants and funding streams, as well as seamless transitions when individuals move. Given the difficult funding landscape, the directors both agreed that advocating for and seeking investments outside of grants and contracts is a must for the future. They are exploring shared positions across centers to save resources, the creation of dual appointments outside of nursing to maximize effort, and interprofessional opportunities and joint programming to increase student involvement. These centers are a great model for traditional research centers who are looking for ways to amplify innovation within their research programs and how to sustain center funding in a difficult funding environment. https://nursing.jhu.edu/faculty_research/research/osi/

New York University Rory Meyers College of Nursing

Although the NYU College of Nursing does not have a separate innovation center, each of their research centers, has a focus on innovation. NYU Meyers is the

second-largest private university college of nursing in the US and is most known for their research and innovative, evidence-based approaches to healthcare delivery. The Hartford Institute for Geriatric Nursing leadership shared some of the most important aspects of keeping innovation alive at the college are through strategic planning, bringing together academic and business partners to the same table, and being intentional about making meetings productive. They identify operational versus aspirational type meetings. Aspirational meetings are networking opportunities and community building opportunities for scholars with similar interests to come together to brainstorm. In this meeting they bring big hairy problems, new work (specific aims pages, ideas, program/product enhancements), mock presentations, etc and discuss data/papers/abstracts and opportunities for collaboration. This is also where they bring team policies and practices to discuss and reach agreement (e.g. mission/vision/values, publication policy, develop strategy, etc.) The second type of meeting is operational. These meetings are smaller, just with teams or subsets of teams. They are driven by the operational issues at hand and scheduled to stay on task. These all meet weekly and are meant to keep everyone on the same page, troubleshoot or even better prevent upcoming risks, and set the agenda for the upcoming week.

Innovation research at NYU is largely dependent on research grants, although the team is looking to explore novel funding opportunities in the future, especially given the current landscape amidst the pandemic. When it comes to innovation, teamwork is a must. Innovation only works when team members hold one another accountable, yet do so with grace and respect, thus the teams deal with challenges early and provide positive feedback as well as constructive feedback to one another each week. They engage in project management to outline clear deadlines and client support/feedback. Their team is diverse and consists of research and clinical faculty, operational staff, students and post-docs and all are seen as having a seat at the table, a voice, and personal experience and insight to improve their research, programs and products. NYU is a great reminder of how team-based initiatives can drive innovation and how innovation can drive research. When these two go hand in hand, there is much more that can be achieved and what emerges is an entirely new process in healthcare transformation. The whole is greater than the sum of the parts. <https://nursing.nyu.edu/innovation>

University of Connecticut School of Nursing

The UConn School of Nursing's (SON) official innovation journey began in 2013, in collaboration with a health care entrepreneur and angel investor alumna. The initial efforts to stimulate innovation and innovative behaviors amongst the undergraduate students demonstrated the potential to develop the innovation knowledge, skills, and abilities of nursing students

before entering the workforce. Students began inventing solutions to pervasive healthcare problems, filing patents, and developing commercialization plans. Such outcomes led to an alumni gift to fund a Visiting Professorship for Innovation to develop and execute on a strategic plan to integrate innovation science into the core curriculum of all degree programs: Bachelor of Science, Certificate Entry in Nursing (CEIN), Master of Science, Doctor of Nursing Practice and Doctor of Philosophy. To achieve this goal, the Visiting Professor worked closely with UConn SON faculty to understand the culture and ultimately identified six strategic goals that aligned with each program and the strategic vision of the overall School of Nursing. The Dean instituted the three overarching prioritization areas of caring, innovating and advocating to guide the strategic and operational efforts across the school of nursing.

As of fall 2019, all entering students across all degree programs now receive core education on innovation science. Beyond the formal education, UConn SON's students and faculty are encouraged to pursue ideas and meet with the visiting professor to discuss the next steps for those ideas. Additional programs, mentoring, and independent study courses are offered within the school of nursing to foster their ideas for new innovations. In addition to integrating innovation science into the core curriculum programs, there was a need for an intensive certificate program for those nurses and healthcare professionals seeking to understand the theories, concepts, methodologies and application of innovation to healthcare. The Healthcare Innovation online graduate certificate program launched in January 2020 and is one of the first in the United States. The program is designed to be able to accommodate the working individual who is looking for a program that meets their temporal and geographical needs while learning from an expert in the field.

Beyond the school of nursing, the University of Connecticut's ecosystem and infrastructure includes multiple grant opportunities along with the Werth Institute for Innovation and Entrepreneurship, the Technology Incubation Program (TIP), and the Connecticut Center for Entrepreneurship and Innovation (CCEI) to support innovators and entrepreneurs in their process to solve problems at scale for the benefit of others. With an infrastructure across the University, the college of nursing visiting professor works with these interprofessional groups to offer more resources to students, faculty and alumni.

Innovation also holds an integral role in research. In 2018, the Dean rebranded the already established Center for Nursing Scholarship to become the Center for Nursing Scholarship and Innovation (CNSI). The CNSI is now better able to express the growing mission of supporting innovation in nursing, emerging healthcare technologies and techniques. The DeLuca Foundation visiting professor for innovation and new knowledge role is quite unique in academic nursing. We believe such a role can serve as a model for other schools of nursing

who are looking to integrate innovation into curricular programs. <https://cnsi.uconn.edu/>

Thematic Analysis

Examining the subjective experience of nursing innovation in colleges of nursing is important because there is a tremendous opportunity to capitalize on the momentum created by the pandemic to elevate nurses as innovators and entrepreneurs, yet the tools and strategies to thread a spirit of inquiry and innovation into nursing higher education has yet to be examined. This is essential to continue to support and train nurses to not only be recognized as innovators, but to feel confident and competent to lead innovation-based projects.

Seven semi-structured interviews were conducted between March and September 2020 with leadership at seven identified programs of nursing innovation. Interviews were carried out by one person, and typically lasted 1 hour. Open ended questions were used, and responses were recorded and transcribed. Transcripts were analyzed using thematic analysis, a qualitative method used for identifying, analyzing, and reporting patterns (themes) within data (Braun and Clarke, 2006). Through thematic analysis, we discovered four themes important for creating a culture of innovation and 6 themes consistent with sustaining a culture of innovation. These themes should be considered when developing an innovation center or proposing an innovation-based initiative. The four areas critical for culture when starting out are (a) Capacity building and faculty development, (b) Engaging faculty early and often, (c) Creating structures of innovation and an innovation ecosystem, and (d) Providing ongoing mentoring, support, and coaching. In addition to these foundational themes, we also identified six themes associated with sustainability and impact (funding, engagement, leadership, interprofessional collaboration, partnerships, and overcoming the innovation paradox). Figure 1. We provide an in-depth overview of each area, with recommendations on how to maximize the impact in each area. Table 2.

Recommendations

A Blueprint for a Strong Foundation

Create Structures of Innovation and an Innovation Ecosystem

Peter Drucker said that “Culture eats strategy for breakfast”, but what we forget is that structure creates culture. The artifacts we see in an organization are because of the underlying assumptions, values and beliefs created by structures in the organization. For example, if you reward innovation, you will create an innovative culture; if you don't, you will stifle it.

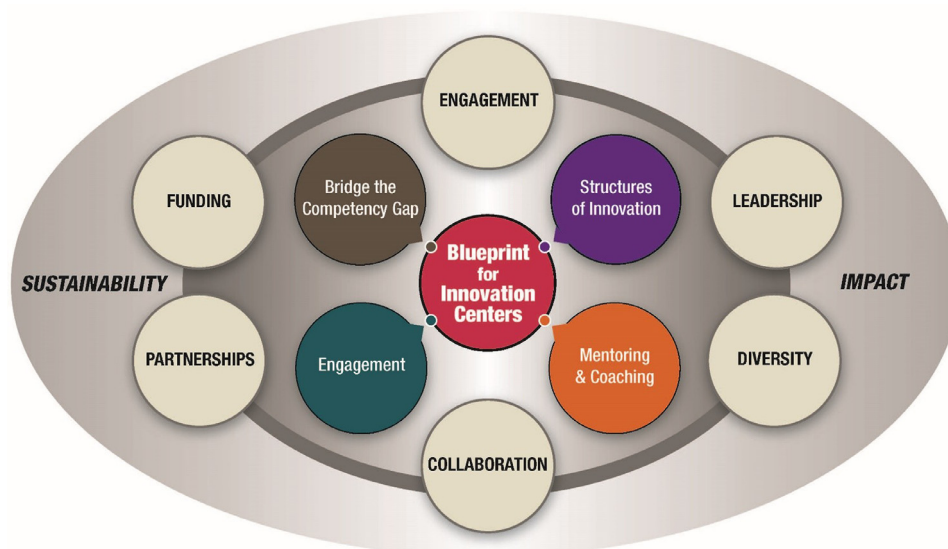


Figure 1. A working model for nursing innovation centers

Although its not that simple when you take into account all of the moving parts related to culture, structures of innovation are a great way to start off on the right foot. Many of the colleges interviewed have innovation in their values or as part of their strategic plan, so it is engrained into everything they do and recognized as a critical competency. In some colleges new positions were created to bring to life the vision and strategic plan, instead of expecting faculty to do this work on top of their current workload. And there was an emphasis on seed funding and grant calls to enhance innovation, allowing for protected time, support and collaboration. Integration into the curriculum is still lagging, however, given the emphasis on innovation in the DNP essentials for practice, there will be a need to create uniformity in education.

Capacity Building and Faculty Development: Competence and Confidence

Any effort to create a culture of innovation will fall short if there is not a critical capacity of faculty who feel confident, competent, and empowered to usher in innovation in their college. During our interviews we found that the most successful colleges were those who first put effort into faculty training and development to bridge the competency gap. (White, 2016) Many started with a small group of early adopters and influencers and supported their training in this area of innovation. Then this small group came together for strategic planning or a visioning exercise to determine how best to bring an innovation focus to their programs and curriculum.

Table 2 – Recommendations Based on the 6 Themes Identified for Sustainability and Impact

Funding	Given the landscape, creatively seek non-traditional funding opportunities outside of grants and contracts for innovation-based initiatives. Long term success should not be solely dependent on internal funding.
Engagement	Students: Integrate innovation-based concepts and competencies into the curriculum and offer workshops as immersion hours Faculty: First identify needs and wants, then focus on research commercialization and impact (outside of publications and grants). Provide ongoing support to faculty to integrate innovation into programs of research, education and practice through mentoring and coaching. Lastly, se students to engage faculty interest.
Leadership	Provide innovation-based leadership development, education, and mentoring to bridge the competency gap. Create a culture of innovation and ecosystem that values innovation.
Interprofessional Collaboration	Successful team collaboration needs to be viewed as more important than independent investigator driven research funding. Self-directed leadership teams should be created, instead of single director led initiatives. Diversity of thought, culture and experience is critical.
Novel Partnerships and Novel Partnership Models	Seek non-traditional partners in business and the community. Create new partnership models to enhance growth opportunities on both sides. Identify novel revenue streams and sharing of revenue.
Overcoming the Diversity Innovation Paradox	Focus on capacity building, leadership development and inclusion of women and underrepresented groups in innovation-based initiatives. Focus on the end-user experience and harness the power of technology. Ensure hiring and appointment biases are addressed.

Engage Faculty Early and Often

What we heard from most of the leaders interviewed was that innovation needed to be reframed for faculty to understand how innovation applied to their programs of research, practice or educational initiatives. Most nurses have an opinion that innovation is all about technology or gadgets, so an important first step is defining innovation for them in a way that resonates with them, so they can begin to see themselves as innovators. It's also important to identify what the faculty need and want when it comes to competency development, so initiatives can be targeted to enhance engagement. Lastly, most students are interested in innovation, so when faculty were encouraged to talk with students about their needs and wants, faculty become more interested in innovation-based initiatives.

Provide Ongoing Mentoring, Support and Coaching

In line with faculty development, is ongoing support for faculty to develop competency in innovation. Without a sustained effort to support faculty, most colleges found that faculty were not able to fully integrate innovation into their research, practice or educational initiatives. Because this is new, faculty need to be guided as to how to implement innovation, what it means for their respective programs and how they can continue to meet the requirements of their faculty position while being innovative and pushing the boundary. In our analysis, we found that few schools were providing ongoing support to faculty, thus we see this as an opportunity to enhance the impact of innovation initiatives in academia.

Six Themes for Sustainability and Impact

Funding

Interestingly, although funding was necessary to launch the center, meeting funding requirements was not the greatest challenge for the centers we interviewed. Most centers were launched or created to address the innovation gap in nursing, with the primary goal of education, mentoring and outreach. The centers were divided in terms of launching with internal money or research grants. Depending on how they launched, they remain heavily focused in that area. Given the rapidly changing funding landscape and the difficulty of obtaining succession funding for initiatives, it will be critical for innovation leaders to creatively seek non-traditional funding opportunities outside of grants and contracts for innovation-based initiatives. Thus, it makes sense to put an emphasis on obtaining internal support, alumni money, non-traditional grants/contracts and non-traditional revenue

streams for sustainability, such as collaborations with corporations and businesses.

Ongoing Engagement

The primary challenge amongst most of the centers has been engagement. Unless it is a required part of education or faculty role, innovation is not a priority, thus students and faculty have not fully engaged with the centers. The challenge of engagement is not unfamiliar, particularly in nursing undergraduate programs, where the courses are packed so tightly into the program. We have had similar challenges integrating genetic and genomic concepts and through this process learned that the best way to do so is to integrate innovation-based concepts into the curriculum, train faculty to speak the language through education and coaching and create lectures for undergraduate faculty to incorporate into their curriculum. An additional recommendation to address student engagement is to offer workshops as required immersion hours or clinical hours. In terms of faculty engagement, focusing on research commercialization and impact (outside of publications and grants) could improve engagement with the center. This is particularly important for tenure track and tenured faculty who must address the impact of their work for promotion.

Leadership

Leadership buy-in and support is key to launching an innovation center or initiative. Because leaders often have multiple competing priorities, it is important to make the case for innovation with evidence. Addressing return on investment and value of investment is imperative when making the case for a formal innovation center or initiative within an organization. A critical lesson reported by all center leadership interviewed was to ensure the activities of the center were supported and promoted by both nursing and university leadership. Making sure the goals of innovation are aligned with both the college and university strategic plan is critical. It also is a good idea for nursing innovation leadership to have a seat at the university innovation leadership table to ensure clear consistent communication and open access to resources. It was noted that there remains a significant competency gap for faculty to teach innovation-based concepts, thus it will be important to provide innovation leadership development, education, and mentoring to create a critical mass of faculty at the institution ready to implement the concepts. It remains important to actively negotiate for more protected time for innovation. Creating an innovation track for faculty is an intriguing opportunity, as it allows innovators not only protected time to develop their innovations, but also helping them to meet the requirements for promotion and tenure. Innovation projects are most

successful when led by frontline nurse champions to foster engagement and sustainability. (Luz, 2019)

Interprofessional Collaboration

Most centers agreed that their future is to increase interprofessional activities to engage faculty and students outside of nursing and enhance the impact of their programming beyond nursing. This interprofessional lens combined with a focus on students and educational activities to enhance engagement opens the opportunity for dual programming initiatives, like the Duke program between nursing and engineering students. Innovation thrives in teams; thus, the traditional academic model of independent scientist runs counter to the ecosystem needed for innovation to occur (Melnyk & Raderstorf, 2021) (Melnyk & Raderstorf, 2021). Successful team collaboration needs to be viewed as more important than independent investigator driven research funding.

Novel Partnerships and Novel Partnership Models

Each of the organizations we spoke to express a desire to partner with institutions/organizations that they do not traditionally partner with to enhance their impact. Some of the organizations expressed an interest in partnering with businesses, while others are seeking community partnerships to augment their impact. In all instances, the future of the center was clearly based on their ability to leverage partnerships in creative ways to not only sustain the center but create novel opportunities for innovation to occur. The SpaceX and NASA partnership is a great example of what can be done when we embrace novel partnerships and novel partnership models. Partnerships are the future of healthcare transformation and serve as a key in the acceleration of innovation. No one organization has the resources, skills, and knowledge to make the changes we seek in healthcare, nor create the technologies we desire. Thus, it will continue to be through novel partnership models that innovations are not only born but implemented in the world we live. Partnerships hold the key to unlocking some of the greatest challenges we face, particularly for bringing innovation to the underserved. It will be through these novel partnerships that we overcome the innovation diversity paradox.

Overcoming the Diversity Innovation Paradox

Diversity enhances innovation, yet underrepresented groups that diversify organizations are often left out of innovation or their innovations are devalued and discounted. Women and nonwhite scholars have a harder time funding their innovations and generally receive less uptake of their innovations. (Hofstra, 2020) After closely examining the themes that emerged from our conversations, we would like to briefly address the innovation diversity paradox and the fact that

leadership and resources drive innovation. In each of the centers, leadership and financing was a critical component in launching and sustaining the center. Nursing is an underrepresented group in innovation; to ensure that nurses and underrepresented groups are included as innovators, we recommend a push on building capacity in the healthcare workforce by addressing the innovation competency gap. (White, 2016) Ensuring that educational opportunities and support is offered to all healthcare professionals is critical. Another recommendation to bridge the gap is to ensure that programming is driven by end-user needs. In this case, the end-user is either the faculty or the student. Thus surveys, interviews and discussions are important to identify not only what the gaps are, but where the interest lies and how to provide it. We also see technology as taking center stage in bridging the competency gap, and not just in the form of tele-education, but tele-innovation programs and international networks. We must create a conversation that goes beyond the walls of academia. We urge all current and future centers to critically evaluate and address biases in faculty hiring, research evaluation, publication practices, educational opportunities and mentoring to overcome the diversity innovation paradox.

Summary and the Path Forward

Innovation is an investment, not an expense, which will have a terrific return on investment and value of investment (Melnyk and Raderstorf, 2021). Evidence supports that when individuals are given the permission to be curious and innovative, they are more fully engaged in their work with higher productivity and enhanced wellbeing (Raderstorf & Melnyk, 2020). A culture of innovation, which takes time to build and sustain, inspires people to participate in interprofessional problem-solving to generate solutions to current challenges and invent new products and services. The outcomes are a win-win for the organization and employee, with higher morale, revenue generation and cost savings.

This history of innovation in the US is a story of triumph and perseverance and a testament to the ability of humans to come together to make a lasting impact that transforms not only our experience but the experience of generations to come. Our legacy of innovation is built upon passionate people who desire to make an impact and it is our hope that the themes and recommendations gleaned from our evaluation of nursing innovation centers spurs passionate innovative leaders in organizations to create sustainable opportunities for innovation to flourish in their organization, regardless of whether they decide to create a center or not. How innovation is cultivated and sustained looks a little different at each organization, yet these foundational steps and cross-cutting themes become common stories that we can all lean into as we consider how to innovate in our respective organizations. Our collective path forward lies in our ability

to leverage creative partnerships, while making sure those who should be at the table, are. By focusing on capacity building and leadership development, bridging the innovation competency gap, the end-user experience and harnessing the power of technology, we will achieve healthcare transformation through innovation and nursing will lead the way.

Contribution Statement

Taura L. Barr – Conceptualization, Investigation, Data Curation, Writing – Original Draft, Project administration.

Kathy Malloch – Conceptualization, Supervision, Writing – Review & Editing.

Mike Ackerman – Methodology, Writing – Review & Editing.

Tim Raderstorf – Visualization, Writing – Review & Editing.

Bernadette Mazurek Melnyk – Writing – Review & Editing.

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