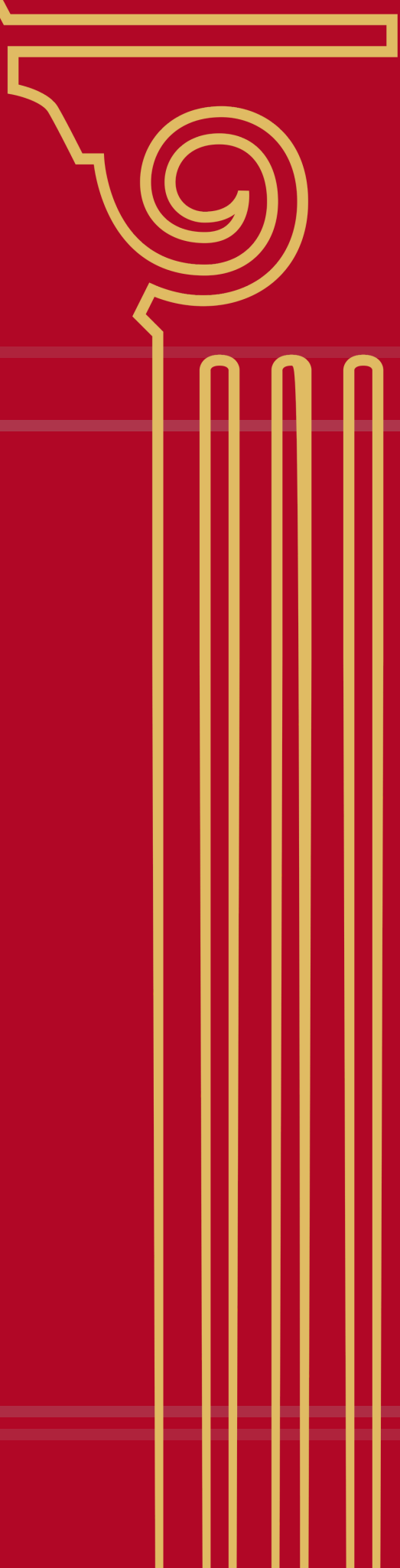




American Association
of Colleges of Nursing

The Voice of Academic Nursing



The Research-Focused
Doctoral
Program in Nursing:
Pathways to Excellence

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The Research-Focused Doctoral Program in Nursing: Pathways to Excellence

Introduction

The Doctor of Philosophy (PhD)¹ degree represents the highest level of formal education to prepare individuals to advance the scholarship of discovery for a given discipline (AACN, 2010). The PhD is a prerequisite for academia and certain senior leadership roles in multiple disciplines within academic institutions and development of independence in scientific or scholarly pursuits outside academia. The PhD is a research-focused degree that prepares individuals to create, translate, and communicate new knowledge as leaders within institutions of higher education and outside of academia. Postdoctoral study is recommended for individuals who plan to pursue careers in a research-intensive environment and wish to acquire expert understanding of the theories, methods, and analytics of a field. Conferral of the PhD demonstrates the graduate's strong scientific emphasis within the discipline as well as an understanding of the importance of translational science, dissemination of innovations, and engagement in interdisciplinary² collaboration. In the field of nursing, the PhD graduate is prepared to steward the profession, develop its science, define its uniqueness, maintain its professional integrity, and educate the next generation of nursing professionals. To achieve its vision of improving health outcomes for all people, particularly those in populations experiencing social and health inequities, the profession must produce and support PhD-prepared nurses, nurse educators, and nurse scientists who reflect the broad diversity of society as a whole.

Building on AACN's 2010 position statement on the research-focused doctorate, this update was influenced by these factors:

1. The need to advance the body of knowledge for nursing, which reflects burgeoning areas of scientific inquiry in basic and applied healthcare sciences. Given the emergence of new and reemerging infectious diseases, growth of racial and ethnic populations, demands of chronic illness care, changes in healthcare delivery, advances in data science and analytic approaches, and increasing globalization, strong scientific foundations are required to ensure effectiveness and efficiency as well as methods to translate knowledge to practice.
2. The dramatic evolution of data information science and precision health science mandated the integration of new knowledge paradigms into nursing science and the education and training of future nurse scientists.

¹ Research-focused doctoral programs in nursing include Doctor of Philosophy (PhD) and Doctor of Nursing Science (DNS) programs. As the majority of research-focused programs in nursing award the PhD, for the purposes of this document, the PhD degree is used in reference to all research-focused programs.

² The term "interdisciplinary" in this document refers broadly to all disciplines represented in the academic setting (not all of which may be considered a profession) and encompasses all health professions, including medicine, dentistry, pharmacy, etc.

3. The call for combined science and interdisciplinary research that (a) provides cutting-edge scientific knowledge and methods to address increasingly complex healthcare issues and (b) incorporates these concepts into PhD education.

Since the initial position statement was issued in 2010, the nursing profession, health care, and the science of nursing has evolved and continue to grow more complex. The evidence in the literature about PhD programs, students, and faculty experiences has accumulated over the past decade, which is reflected in this statement. Additionally, this statement reflects findings from comprehensive surveys of all PhD programs and their students as well as the contemporary experience of graduates and faculty. Despite the critical need for more nurse scientists in academia and other settings, enrollment in PhD nursing programs over the past decade has been relatively flat, and the number of PhD-prepared nurses has not increased in proportion to societal demand. Graduates of PhD programs also are reporting higher levels of interest in careers outside of academia. This report sets forth expectations and recommendations in response to the growing demand for researchers and leaders who can develop nursing science, steward the profession, and mentor novice nurse scientists and those who are engaged in research activities as part of baccalaureate (BSN), master's (MSN), and Doctor of Nursing Practice (DNP) programs. Educating nurse scientists to lead and function within research teams that span traditional and professional boundaries will require: (a) recruiting and retaining a much more diverse cadre of PhD students who reflect differences in race, culture, gender, religion, mental or physical abilities, age, sexual orientation, and/or other characteristics and who are committed to developing knowledge to address health inequities and disparities, (b) the implementation of updated curricula and experiential opportunities to develop skills in translating research to affect policy and practice at all levels, (c) faculty mentors who work across settings and lead interdisciplinary teams and whose research is externally funded, (d) increased emphasis on grant writing and innovative dissemination skills, and (e) a focus on post-doctoral study for PhD-prepared nurses who plan to focus on research careers.

It is with these considerations that the American Association of Colleges of Nursing (AACN) Task Force on Research-Focused Doctoral Program in Nursing has prepared this position statement on the preferred vision for PhD education in nursing.

Task Force Charge

In July 2020, the task force began moving ahead with its charge to revise AACN's 2010 position statement, *The Research-Focused Doctoral Program in Nursing: Pathways to Excellence*, with the goal of developing a vision for research-focused doctoral programs and graduates. The task force considered trends in higher education, nursing education, nursing and other health disciplines research, and career trajectories for research scientists, faculty, and leadership roles. The task force was charged with specifically addressing the following topics:

- I. Students
 - A. Pathways to research-focused nursing education for nurses and non-nurses, including post-baccalaureate, post-master's, and post-DNP programs
 - B. State of financial resources for students and their research
 - C. Guidance for individuals seeking careers in academia or other areas of practice
 - D. Expectations of and learning outcome criteria for students enrolled in PhD programs

- E. Recruitment, retention, progression, and graduation of a student population that is diverse and inclusive of individuals from underrepresented backgrounds
 - F. Expectations and recommendations for postdoctoral program fellowships and other potential career opportunities
- II. Faculty
- A. Strategies for sustaining the number of PhD graduates needed to teach and support the next generation with new knowledge for nursing and health care
 - B. Strategies to support the advancement of quality nursing science, including opportunities for faculty collaboration and the creation of consortia
 - C. Recommendations to increase the diversity of both faculty and students in research-focused nursing programs, and strategies to advance health disparities research
 - D. Criteria for excellence in research-focused doctoral programs in nursing, including:
 - 1. Necessary human, infrastructure, and learning support resources
 - 2. Faculty numbers, expectations, and experiences
- III. Curriculum and Evaluation
- A. Expectations for a comprehensive evaluation plan for program, student, and graduate outcomes
 - B. Recommendations for stakeholder organizations, including AACN, as appropriate
 - C. Expectations for programs and faculty, including support for students prior to and throughout the program
 - D. Relationship between the PhD and Doctor of Nursing Practice (DNP) degrees, including common areas of study
 - E. Recommendations for curricula to maintain quality while facilitating timely completion of the degree
 - F. Curricular approaches and essential elements

Task Force Processes to Meet Charge

To gain a broad perspective of research-focused doctoral education, trends, and national recommendations, the task force utilized a variety of strategies to examine the state of PhD education over the past decade. A review of the published literature from 2010-2020 was undertaken and resulted in a database of 197 publications from refereed journals. Between August 2020 and January 2021, the task force held five meetings via Zoom to review the charge and revise the position statement. Three subgroups from the task force were formed to focus separately on different aspects of the overall charge. In addition, to determine how best to address the production of nurse scientists, the task force sought input from national thought leaders with insight on the challenges and opportunities faced by research-focused faculty and students. These leaders included representatives from the National Institute of Nursing Research, the National Advisory Council for Nursing Research, the Robert Wood Johnson Foundation Future of Nursing Scholars Program, and Jonas Nursing and Veterans Healthcare.

To collect current data on programs and students, the task force developed a survey for PhD students (Appendix I) and a survey for deans (Appendix II). These were disseminated between December 2020 and April 2021. The information gathered from these surveys, included program characteristics such as number, enrollment status, and attrition rate of students; required credit hours and time to degree completion; extracurricular experiences such as engagement in teaching

and research assistantships, and the percent of students who worked full-time; and faculty credentials, funding, teaching load, and dissertation options.

At various points throughout the process, there were opportunities for the community of scholars who teach in PhD programs to provide input to the task force at AACN-sponsored conferences. The task force held an informational meeting about its work and progress at AACN's PhD Pre-conference in January 2021. At the main Doctoral Education Conference, the task force addressed questions posed by participants in small breakout groups and solicited input and insights from those in attendance in the areas of faculty, students, resources, curriculum, and evaluation. In October 2021 input was received from members of the Academic Nursing Leadership Conference, and two workshops were held by the task force in November 2021 for additional input from PhD program faculty and others.

The following report is divided into three sections: PhD students, faculty who teach in PhD programs and mentor both PhD students and postdoctoral scholars, and the curricula and experiential activities associated with PhD education. The task force was committed to incorporating evidence and data into this report to best inform the field. Each section includes recommendations for consideration by PhD programs.

The task force's vision for the use of this document was that it should be viewed as a framework for guiding discussions and evolutions in existing programs, as well as those under development. Members of the task force recognize that programs will reflect their university and school context. PhD program faculty will be responsible for the foci, course content, experiential learning, curriculum specifics, and excellence of their individual programs and graduates. The intent of this document is to share the latest evidence and expert thinking from the field in PhD education and to encourage dialogue about additional and/or alternative approaches to address the needs of today's and tomorrow's students, graduates, and faculty.

Students in PhD Nursing Programs

Research-focused doctoral programs in nursing focus on the generation and translation of the knowledge of the discipline through research. These programs provide an understanding of the environment within which nurses practice and prepare graduates to further the scholarship of the discipline by generating new knowledge. A hallmark of doctoral education is a highly individualized program of study that allows the graduate to develop expertise in the core knowledge and methods of the discipline as well as specific expertise in a selected area of research. In addition, programs should produce graduates who are skilled in teaching, leadership, health policy, and interdisciplinary teamwork (for both teaching and research).

Expected Outcomes of PhD in Nursing Programs Across Role Domains

Role Domain I: Develop the Science

The expected outcomes of a PhD in nursing program include student mastery of knowledge in a substantive area, congruent with other academic disciplines. As they pursue a research doctorate in nursing, students should expect to (a) articulate the history and philosophy of related sciences and knowledge construction, and how history and philosophy of related sciences have influenced

both current nursing knowledge and the rapidly evolving nature of the nursing discipline, and (b) critique and integrate different scientific perspectives that guide the conduct of inquiry and research. Such paradigms include but are not limited to race, feminism, and/or gender theories. Cultural humility (Tervalon & Murray-Garcia, 1998) requires a lifelong commitment to self-evaluation and critique as well using one's knowledge to partner with others to advocate for change to improve health disparities. Cultural humility in research includes having a nuanced understanding of (a) the power relations inherent in contemporary social processes, including the role of racism and sexism in shaping health outcomes, and (b) diverse analytic approaches that allow for deep examination and exploration of underlying factors influencing health disparities.

Recommendations:

1. PhD-prepared nurse scientists should utilize professional ethics and judgment to conduct original research, be proficient in communicating research findings to lay and professional audiences, and identify implications for policy, nursing practice, future research, and the profession.
2. PhD in nursing graduates should possess the knowledge and skills required to assume leadership in the conduct of culturally competent research and scholarship to improve nursing practice. Nurse scientists who engage in the study of people and their health must practice cultural humility.
3. Graduates should be able to generate new ideas based on a critical evaluation of existing knowledge and develop, apply, and test theories that guide research and nursing practice, including emancipatory paradigms, which have as a central focus the role of unequal power relations in shaping social processes, including health care.

Role Domain II: Steward the Discipline

The expected outcomes of preparation for “stewarding the discipline” are broad. In the introduction to *Envisioning the Future of Doctoral Education: Preparing Stewards of the Discipline*, a collection of essays commissioned for the Carnegie Initiative on the Doctorate, the PhD-prepared individual is defined by Lee Shulman as “a steward of [their] discipline or profession, dedicated to the integrity of its work in the generation, critique, transformation, transmission, and use of its knowledge” (Shulman, as cited in Golde, p. 3). This definition is the one most used by nurse scholars and informs the outcomes for graduates of nursing PhD programs proposed in this report.

Graduates of the PhD in nursing (across multiple academic and non-academic settings) should be able to integrate components of scholarship, including research, teaching, mentoring, and service to the profession. Morris et al. (2021) state that stewarding the discipline involves the generation of knowledge as well as leadership, conservation of history and fundamental ideas inherent in the discipline, policy development, and critique of inequities in the healthcare system. Given the unique nature of each PhD-prepared nurse's career, the process of stewarding will be performed in the context of prior experiences, expertise, and role expectations. For example, a stewardship portfolio might include leadership in major professional nursing associations designed to shape

and influence policy and practice. Disciplinary stewardship within academia might involve monitoring, evaluating, and revising curricula across programs and ensuring that accreditation standards are met. The PhD-prepared nurse should be able to critique and revise curricula to reflect current social, political, and ethical issues in health care. Finally, PhD-prepared nurses must strive to accomplish higher and broader scholarship and dissemination efforts by assessing and addressing ongoing issues of scholarly accountability, professionalism, and respect for all people.

Outcomes expected of graduates of PhD nursing programs include the ability to (a) provide leadership in analyzing, synthesizing, and articulating the sociopolitical factors shaping current health inequities; (b) articulate the sociopolitical history of nursing and the fundamental ideas inherent in the discipline, including its commitment to health promotion; and (c) engage in professional activities (in academia or another setting) that are informed by a commitment to generating new knowledge to reduce health disparities and improve health outcomes.

Recommendation:

1. The PhD in nursing graduate should be prepared to analyze, synthesize, articulate, disseminate, and translate the social and political contexts that shape health inequities.

Educational Pathways to the Research-Focused Doctorate in Nursing

As the landscape of academic nursing continues to transform, educational pathways to the PhD in nursing have changed accordingly. Over the past decade, the number of research-focused doctoral programs has increased from 78 in 1999 to 145 in 2020 (AACN, 2000; AACN, 2021d). These programs continue to prepare scholars and investigators to advance the knowledge base for nursing and health care and related areas such as health policy and informatics. PhD graduates are expected to provide leadership in the advancement of academic nursing, in collaboration with their colleagues in practice, and engage in stewardship for the profession. Although the focus and setting of this work may vary, graduates should be prepared to serve as role models and mentors.

In 2010, the AACN Task Force on the Research-Focused Doctorate in Nursing described multiple pathways to obtain a PhD in nursing (AACN, 2010). At that time, nurses could enter a PhD program after completing a baccalaureate in nursing, a master's in nursing, or a DNP degree. Some PhD programs admitted nurses with graduate degrees in other disciplines, and other programs admitted individuals with no nursing background or degrees.

Since that time, many nursing programs have streamlined educational pathways to address barriers to degree interest and pursuit. Varied pathways, innovative programming, and alternative delivery modalities (e.g., hybrid and/or completely online) offer students flexibility and support for achieving diverse career goals, consistent with AACN's vision for academic nursing (AACN, 2019). Another catalyst for clear and varied educational pathways to the PhD program is the need to prepare individuals to investigate research priorities focused on the future of nursing, health determinants, and care delivery (NACNEP, 2020) with a greater emphasis on health equity (National Academies of Sciences, Engineering, and Medicine [NASEM], 2021).

Given the need to advance and transform nursing science, all individuals who enter a PhD in

nursing program should complete an educational program that includes, at a minimum, the learning outcomes competencies delineated in *The Essentials: Core Competencies for Professional Nursing Education* (AACN, 2021b). Although the Essentials does not directly apply to the research-focused doctorate, the sub-competencies presented provide curricular guidance for creating seamless pathways between nursing degrees as well as efficient, effective doctoral program delivery. As a practice discipline, building on the entry-level (pre-licensure) and/or advanced-level (post-licensure) sub-competencies would augment the preparation of graduates to engage in the scholarship of discovery and scientific inquiry into clinical and socially relevant phenomena. It is also important to recognize that approximately 12% of PhD students are individuals from other countries (AACN, 2021d) whose educational preparation in nursing may vary considerably from American educational models (Institute of Medicine, 2011). Therefore, international PhD students may need additional support, mentorship, and socialization as they transition to doctoral education in the United States (Schneider, Bender, Madigan, & Nolan, 2020).

Some PhD tracks in nursing may prepare graduates for research in a non-clinical area relevant to nursing, such as health policy or informatics. These programs should include significant content and experiential experiences related to that substantive area of focus. Although research and teaching are the most frequently cited reasons for pursuing a PhD in nursing (AACN, 2021a), it is essential that PhD in nursing programs prepare nurse scientists to (a) bridge research, practice, and policy chasms in society; (b) assume emerging roles beyond academia (Polomano et al., 2021); and (c) steward the discipline by generating impactful nursing knowledge (Joseph, McCauley, and Richmond, 2021).

Recommendations:

1. Programs should consider identifying tracks or minor courses for PhD students that support knowledge and skills development in areas complementing their focus of inquiry.
2. PhD program curricula should consider the variation between American and international nursing education models to facilitate successful transition, progression, retention, and graduation of international students.

Pathways to the PhD in Nursing

Based on the AACN *Essentials* (2021b) for professional nursing education, there are two distinct pathways to the research-focused doctorate: Level 1 as a pre-licensure entry point and Level 2 as post-licensure entry. This is consistent with the multiple pathways originally described in AACN's 2010 position statement. In addition, a recent survey of PhD students in nursing (n = 568) revealed only a small number of individuals (1.8%) without a nursing degree (AACN, 2021a) chose to pursue a research-focused doctorate in nursing. The task force believes these individuals may need additional support before and/or during their program to achieve the goals set out in this document for PhD students and graduates in nursing science. These areas could include understanding and articulation of the need and skills to translate knowledge into practice, stewarding the discipline, phenomena related to health, and mentoring other students in nursing degree programs. One, but not the only, approach to provide this support and socialization into

the discipline of nursing could include completion of an accelerated baccalaureate or graduate entry master's degree either prior to admission or as part of the PhD program progression.

While a post-master's educational pathway for the research-focused doctorate is the most typical, degree completion time is similar to that of a BSN-PhD pathway. In a recent survey of 568 PhD students, 430 (75.7%) entered their program with a post-master's degree (AACN, 2021a). The average time to PhD completion in 2020 was 5 years, with at least 80% of schools reporting a completion rate of 6 years or less (AACN, 2021c). Peterson and colleagues (2015) found a similar time to degree completion for BSN-PhD students, averaging 5.7 years. These findings suggest that strategies are needed to maximize timely completion of a PhD degree in nursing for post-master's students.

Recommendations:

1. Facilitate entry into a PhD program early in the student's career.
2. PhD in nursing programs that admit individuals who do not have a nursing degree should consider how to ensure that students obtain the knowledge that support a career commitment to the discipline and profession of nursing. One option could be to complete an accelerated BSN or graduate entry MSN degree.
3. PhD programs should have intentional strategies in place to reduce time to degree completion, particularly for students with a graduate degree.

Financial Resources for PhD in Nursing Students

The availability of sufficient financial resources to complete a research-intensive doctoral program successfully remains elusive. Despite evidence of cost concerns and economic constraints among doctoral students and PhD graduates (Fairman et al., 2021; Peterson et al., 2015; Squires et al., 2014), mechanisms for financial support continue to decrease. Although students may be provided with tuition waivers, health insurance, or stipends (which are frequently associated with assistantships), needs such as housing and childcare typically remain unmet (Fairman et al., 2020).

Financial challenges are numerous for PhD students. Limited scholarship support, debt related to previous education, and responsibilities to home and family impede the ability of many students to pursue full-time PhD education, often delaying timely completion of a doctoral degree (Peterson et al., 2015). Among 107 PhD programs recently surveyed, the 3-year median percentage of students enrolled who worked more than 20 hours per week was greater than 85% (AACN, 2021c). Due to the financial necessity of maintaining employment, many students pursue their doctoral degrees through part-time study, further increasing time to degree. Over the past three years, only slightly more than half (52% to 55%) of doctoral students were enrolled full-time (AACN, 2021c). A 2021 survey of 568 PhD students found that only 63.7% were attending their programs on a full-time basis. These delays serve to limit the career horizon for nurse scientists.

Financial resources for students pursuing a research-focused doctorate are essential to their success, regardless of whether the sources are federal, foundation, private, or institutional funds (Nehls & Rice, 2014). Mechanisms for financial support should be available to all doctoral students, along with reasonable stipends that adequately cover living expenses. Such funds can promote full-time study or minimize the need for students to work full-time. International students are not eligible for financial support through federal funding mechanisms, therefore diversification of funding streams for students are needed beyond federal sources. Additionally, it is recommended that faculty be engaged in exploring avenues of support for their PhD students (e.g., grant assistantships, teaching assistantships, project management opportunities). Adequate financial assistance and scholarship support can reduce and potentially eliminate the economic barriers to doctoral education, thereby augmenting timely degree completion.

Recommendations:

1. PhD program scholarships and student funding should be a priority of deans, advancement officers, campus officials, professional organizations, and legislators.
2. Increase federal and foundation traineeship funds for both pre- and post-doctoral nursing education.
3. PhD programs are encouraged to infuse greater flexibility in curricular offerings to increase access, decrease financial challenges, and enhance opportunities that support both full and part-time study, with a focus on timely degree completion.

Diversity in the PhD in Nursing Student Population

According to the 2017 National Nursing Workforce Survey, Smiley, and colleagues (2017) noted that White females continued to comprise the vast majority of nurses in the U.S. workforce. Findings from this survey showed the gender, race, and ethnic diversity among registered nurses as follows:

- 9.1% male
- 5% of Hispanic or Latino origin
- 19.2% indicated that they were minorities: Asian (7.5%), Black/African American (6.2%), other (2.9%) and two or more races (1.7%)

The authors noted that these percentages, while slowly increasing, do not reflect the population of the United States. For example, the percentage of nurses in the survey who identified as Asian exceeded the 5.7% represented in the U.S. population, and the percentage of nurses who identified as Black/African American was below the 13.3% in the U.S. population (Smiley et al., 2017). As the population of the United States continues to shift, society will become more racially and ethnically pluralistic, with Non-Hispanic Whites projected to remain the single largest race or ethnic group for the next 40 years (Vespa et al., 2020).

Academic nursing leaders recognize the critical need to increase both the number and diversity of PhD-prepared graduates to become nurse researchers and faculty members. PhD programs in

nursing benefit from a rich diversity of experiences and perspectives, as well as greater opportunities for innovation afforded by a student population that reflects differences in race, culture, gender, religion, mental or physical abilities, age, sexual orientation, and/or other characteristics. Given the predominance of White women in nursing, schools should focus on increasing racial, ethnic, and gender diversity in PhD programs. This recommendation is not new. In 2004, the Sullivan Commission recommended that academic programs increase diversity in the health professions and advised schools to create new and non-traditional paths to becoming a nurse researcher. Current realities and calls for action reflected in the report on the *Future of Nursing 2020-2030* (NASEM, 2021) and the National Institute of Nursing Research's strategic plan (NINR, 2021) call for PhD programs to recruit and retain more students from diverse backgrounds.

In a recent study of PhD students, AACN (2021a) confirmed that White women represent the majority in research-focused doctoral programs in nursing. Among the 558 respondents, the majority were female (89.1%). Twelve students did not designate their gender (1.6%) or responded as non-binary/ gender-diverse (0.5%). Across the schools surveyed, the majority of student respondents indicated that they were White (71.7%), followed by Asian (10.6%) and Black/African American (8.1%). Most of the students were not Hispanic or Latino (91%). Thirty-five students (6.2%) declined to identify their race.

This evidence suggests that further focus on recruitment, retention, progression to graduation, and mentoring is essential to increase diversity, equity, and inclusion in nursing PhD programs. To achieve these objectives, two successful models should be considered: the Future of Nursing Scholars program (RWJF, 2015) and the Jonas Scholars initiative (Jonas Philanthropies, 2021). Recent literature such as *The Future of Nursing 2020-2030: Charting a Path to Achieve Health Equity* emphasizes key considerations for enhancing the recruitment, retention, and graduation of nurse scientists. This report calls for including promoting diversity, equity, and inclusion in nursing education and the workforce, as well as increasing the number of PhD-prepared nurses among the nursing profession's priorities for the next decade (NASEM, 2021).

Recruitment

Key strategies to *enhance recruitment* of students from a wide variety of diverse backgrounds include:

- Educating faculty in PhD programs to implement strategies for recruitment and retention of students based on the adoption of holistic admissions principles and practices.
- Building and sustaining partnerships with community colleges, Historically Black Colleges and Universities (HBCUs), Hispanic-serving Institutions (HSIs) offering BSN and MSN programs, and Tribal Colleges and Universities.

Enhancing diversity. AACN (2019) promotes four approaches to improving recruitment to PhD in nursing programs:

- Identify nurses who have an interest in and proclivity for research
- Create strong peer connections and real mentorship experiences

- Highlight the impact of nursing science and make it “come alive” for future PhD students
- Create opportunities for early exposure and develop a curriculum that reflects modernization in science

In response to projected changes in the population of the United States, efforts to recruit a more diverse cadre of nurse scientists require a heightened focus. Over the past decade, several schools were funded by the National Institutes of Health (NIH) using the Bridges to the Doctorate grants. NIH discontinued the Bridges to the Doctorate grants funding for nursing schools. These programs were very successful at recruiting, nurturing, and graduating diverse students who went on to become faculty and nurse scientists in research-intensive schools of nursing. Re-institution of this funding mechanism and the eligibility of nursing schools should be reconsidered by NIH as a viable funding investment to continue to diversify the professoriate and nurse scientist pool.

In addition to the strategies and approaches listed above, the task force supports the recommendations advanced in the Institute of Medicine (2004) report *In the Nation’s Compelling Interest: Ensuring Diversity in the Health Care Workforce* and the AACN’s (2009) cultural competency document *Establishing a Culturally Competent Master’s and Doctorally Prepared Nursing Workforce*. The task force understands that a culturally diverse faculty and student body will facilitate and strengthen efforts to achieve cultural humility for all nurse scholars.

Recommendations:

1. Continue to monitor changes in U.S. population trends and remain mindful of the need to retain students who represent patients, families, and communities served.
2. Schools of nursing and PhD programs should display clear commitments to diversity, equity, and inclusion in their vision, mission, and value statements that dovetail with holistic admissions policies and practices.
3. By 2025, PhD programs in the U.S. should establish admission cohort targets to ensure a first-year class that is approaching or exceeding 50% racially, ethnically, and gender diverse.
4. Implement and evaluate regularly (e.g., every 2 years) the admission, progression, and graduation data for diverse students using a doctoral advancement readiness self-assessment tool (DeWitty et al., 2016).
5. Make program adjustments based on predictors of success of all students, with particular attention to underrepresented minorities. Develop support structures in the program based on those predictors.
6. Programs should partner with minority organizations to glean timely and workable strategies for attracting and supporting PhD students.
7. Identify promising diverse scholars early in their career (i.e., pre-licensure programs) and provide programmatic support and resources for advanced research education and career development.

8. Create partnerships with minority scientists in collaboratives and foster transdisciplinary science mentorships and support for students to combat the isolation experienced by many minority PhD students.

Student recruitment. In a recent study of PhD students, the majority of students (75.7%) entered the PhD program through the post-master's route (AACN, 2021a). The two most frequently selected factors reported as considerations in choosing a PhD in nursing program were location and program reputation. However, cost, program distance and accessibility, and institutional tuition support also were cited. Less than half of PhD program matriculants (43.8%) had considered the DNP program before entering the PhD. Decision-making processes of students considering whether to pursue a DNP or PhD requires further study and analysis.

Recommendations:

1. Develop consortia and partnerships among PhD programs to maximize faculty and program expertise (e.g., the Council on Intercollegiate Collaboration).
2. Increase federal support and university fellowships significantly to enable students to pursue full-time PhD study. Meet with graduate school administrators to explore whether PhD in nursing students receive equitable access to university funding.
3. Counsel students regarding possible career paths for emerging scientists. Invite PhD graduates employed in a variety of academic, public policy, practice, federal agency, and private foundation settings to articulate examples of their programs of research and serve on mentoring teams and/or dissertation committees.
4. Encourage joint academic appointments for PhD graduates employed in other settings to provide models for students and help them envision new roles for PhD-prepared nurses.

International PhD Student Support Strategies

International students bring richness of global, multicultural, and diverse perspectives to the PhD in Nursing. In 2016, about 10 percent of students enrolled in research-focused nursing doctoral programs were non-US residents (Schneider et al., 2020), increasing to 12% in 2019 and 2020 (AACN, 2021d). To support international students in research-focused nursing doctoral programs, strategies are needed to include (but are not limited) to:

- Communicate to international students the expectations, objectives, and curricular requirements
- Facilitate international student connection with relevant boards of nursing related to required licensure and/or certification
- Guide/mentor international students in research topics relevant to their home countries or with a global agenda, if applicable
- Identify available resources or funding in support of international students
- Actively address issues of bias and/or discrimination

- Socialize international students by creating a sense of belonging
- Provide equitable research experiences for international students

Recommendations:

1. Formalize mentoring relationships with international students, preferably with either students or faculty from the student's home country.
2. Actively address any issues of potential bias and/or discrimination.
3. Connect students to international programs both on campus and in the community for networking and support.
4. Form a cohort or peer support, preferably students from the same country.
5. Tailor support services to meet identified needs of international students.
6. Enhance support service during the dissertation process such as selecting dissertation committee and chair that commit to success of the international students.

Retention and Progression to Graduation

In a recent study of current PhD students, 362 (63.7%) were enrolled full-time, 469, (82.6%) are expected to graduate by 2023 (AACN, 2021a). Time to graduation as well as full- and part-time enrollment statistics should be analyzed to ensure flexibility in program admission and retention as three-year, full-time doctoral programs may not be feasible for certain students. Diversity, equity, and inclusion efforts related to admission and program progression are important considerations for certain student populations and essential to increasing diversity in the nursing workforce and among nurse scientists.

Once the student is enrolled, retention and progression are of paramount importance. A number of students, faculty, and program characteristics have been identified as facilitators of successful student progression through the PhD program to graduation and the development of successful research careers. Barriers also exist that may serve as impediments to successful completion for even the most motivated and gifted students, including but not limited to emotional and cognitive stress and their mental health status. Of importance is the need to minimize the psychological impact that is often more pronounced among international students. Melnyk and colleagues (2021) found that students in nursing, medicine, and other health sciences experience more depression, anxiety, and stress when compared to their faculty. Likewise, depressive symptoms are common among international students (Schneider et al., 2020) Doctoral programs should determine that (a) facilitators are in place to ensure student success in achieving a role as an independent scientist, (b) barriers do not hinder appropriate preparation of graduates for a career in academe, and (c) resources and strategies are in place to support student physical, mental, and emotional wellness. Facilitators to the development of a research career that are intrinsic to the student include:

- A clear focus about their research program, the areas of knowledge in which they must obtain expertise, and the skills they will need to build a successful program of research.
- Understanding of and full engagement in their role as a mentee both during and following completion of their PhD studies.
- Sustained enthusiasm about their exposure to and experiential engagement in scientific discovery during their PhD studies.
- Ability to provide and benefit from feedback and constructive criticism.

In a study of characteristics and practices of nursing PhD students and the mentoring practices of their advisors, Nersesian et al. (2019, pg. 358) identified that students with the greatest likelihood of self-reported career readiness “(1) perceived their proficiency in key scholarly skills as high, (2) were older, (3) worked a larger number of hours per week, (4) had more responsibilities outside of school, (5) had both advising and mentoring support, (6) had a co-advisor, and (7) attended a private university.” Lessons learned from the Future of Nursing Scholars program and the Jonas Scholars program can be used as frameworks for maximizing retention and graduation progression during scholarly study. Both programs included careful student selection and mentor matches, program process improvement year-over-year with ensuing student cohorts based on ongoing student and faculty feedback, funding and scholarship support, and acknowledgment of the importance of team building and the networking capacity of the students.

Recommendations:

1. Ensure that the mentor assigned to a student has experience in and access to collaboration with scholarly teams aligned with the student’s learning goals and research interests.
2. Establish tracking systems for early identification of at-risk students and offer academic advising, mentorship programs, and peer support (Montgomery et al., 2021).
3. Progression of students should be monitored closely by program committees. A formal self-assessment should include the student’s performance in courses, conferences, presentations, publications, assistantships, practica, yearly goals for each of these competencies, etc. Recommendations for progression should be provided to the student and their mentor (or mentor team) following its review.

Career Opportunities in Academia and Other Settings

The faculty shortage in nursing has been well documented over the past two decades. This shortage is expected to increase due to demographic and societal trends. Therefore, to meet the demands for nurse scientists and educators in academe, PhD programs should consider using innovative approaches to bolstering the numbers and expertise gaps of program faculty. Some approaches could include:

- Using active scholars who have retired to support students via mentoring, committee membership, and course offerings.
- Employ visiting scholar appointments across universities.
- Mobilize the expertise of junior and/or non-tenure track faculty as members of

committees, co-mentors, and in other capacities.

Recent events, including the COVID-19 pandemic, social/political unrest, economic crises, and calls to address structural racism, illuminate the need for transformational change in healthcare delivery, which presents new opportunities for graduates from PhD programs. Nurse scientists need to pioneer innovation in systems redesign, evidence-based practice, informatics and technology, competency-based education, learning technologies, public policy, academic-practice partnerships, and in other areas. PhD-prepared nurses are encouraged to practice and conduct research in healthcare systems, governmental agencies, public health, and other industries. In its 2022-2026 strategic plan for a research agenda to advance nursing science, NINR (2021) suggests “addressing the whole picture of health, including looking at health equity, social determinants of health (the conditions in which people are born, live, work, play, and age) and the translation of science into policy and practice.” To address current and projected needs, the task force envisions expanded roles for PhD-prepared nurses practicing in the following three areas among others:

System-based practice: Changes include (a) the expansion of integrated health systems for care with an emphasis on care coordination across settings and the lifespan of individuals and populations, and (b) the promotion of interprofessional models of care and team-based science to address prevention and wellness, acute care, chronic disease management, and the social determinants of health. For students interested in roles in these or similar areas, a healthcare systems practicum that allows a deeper understanding and involves a scholarly project working with interprofessional teams across settings could be a very useful experience.

Informatics and technology: Distance learning and simulation technologies are influencing the education of future scientists, and patient care is increasingly provided through telehealth and new models of delivery. As more health systems integrate electronic health records, rich data repositories will offer new insights and opportunities to inform science and patient care delivery. PhD-prepared nurses who possess technology and data science skills will find a place in interprofessional teams within executive practice, working alongside colleagues from fields such as medicine, computer science, and informatics, to create new analytic approaches in health outcomes and translational science research.

Academic-practice partnerships: In *Advancing Healthcare Transformation: A New Era for Academic Nursing*, AACN (2016) envisioned a future of healthcare transformation through academic-practice partnerships. Partnerships among community organizations, individuals, and other stakeholders (including those involving nontraditional and diverse partners) will be needed to ensure that education programs are preparing graduates to address the multiple health needs of the changing population and health system. Students need exposure to existing partnerships, both within and outside of healthcare systems, to understand strategic power structures to help them achieve their research and scholarly goals related to improving health outcomes.

Recommendations:

1. Support the transition to competency-based education in nursing schools.

2. Consider the use of e-Portfolios to (a) record competency achievement transparently between the academic setting and practice partnerships, and (b) provide enhanced documentation of personal leadership development plans, earned badges, certifications, tenure-track evaluations, and self-reflection appraisals to outline accomplishments as a nurse scientist in the future.
3. Promote research and generate evidence to develop science to identify best practices for academic-practice-industry partnerships that support PhD students and programs.

Faculty Advancement of Nursing Science

A priority of PhD education is to advance nursing science and prepare stewards of the discipline. Golde and Walker (2006) describe the skills required for stewardship of a discipline: (a) *generation* of new knowledge and defending knowledge claims against challenges and criticisms, (b) *conservation* of the most important ideas and findings that are a legacy of past and current work, and (c) *transformation* of knowledge that has been generated and conserved by sharing with a variety of audiences both in and outside formal classrooms. As stewards, PhD-prepared nurses assume leadership of the discipline and of nursing knowledge development inclusive of philosophy of science, history, and empirical research (Morris et al., 2021). Doctoral faculty in PhD programs serve as stewards of the discipline by teaching and mentoring graduate students to begin to assume this responsibility. To support this goal, faculty must conduct and disseminate their own scholarship as well as prepare doctoral students for stewarding the discipline.

Faculty in nursing PhD programs are expected to model and engage students in the art of discovery. Through the *generation* of their own research and scholarly activities, faculty lead by example, allowing students to witness and learn from the successes and challenges of knowledge development and dissemination, including subsequent policy and practice implications (See Table 1). In addition, faculty must challenge students to explore and contemplate explanations and solutions relevant to nursing issues, including possible alternative perspectives. To acquire and generate knowledge, students must have access to a curriculum that provides strong foundational knowledge of the philosophical and theoretical underpinnings of research methods and analyses as well as the skills to conduct research. In addition, students benefit from being exposed to and mentored by diverse faculty with varied interests and perspectives who can (a) facilitate discussions of topics for nursing inquiry, (b) role model successful programs of research and team science, (c) disseminate research outcomes to varied audiences, and (d) facilitate strategic networking with scholars within and outside the discipline. Successful PhD education in nursing helps students develop “habits of mind” that promote curiosity, encourage creativity, demand critical thought, and identify discerning questions about matters important to nursing and health. Faculty should support student exposure to multiple scholars as the collaboration amongst many will benefit the growth of all.

As stewards who maintain and promote continuity, stability, vitality, and critical inquiry within the discipline, faculty must engage in the *conservation* of knowledge by teaching students how to review both classic and new literature critically to acquire the breadth and depth of knowledge required to appreciate gaps in knowledge and directions for further inquiry. By providing

strategic socialization opportunities for engagement with nursing scholars in the broader research community, faculty can prompt their students to consider how their research interests might fit into the larger context of nursing knowledge development.

The third component of stewarding the discipline, *transformation*, requires dissemination of research findings. Faculty need to encourage and assist students to share their research through posters and presentations at professional conferences, grant writing, publications, and communications with stakeholders with relevant interests. Through role modeling and coaching, faculty can provide a critical component of doctoral education by guiding students to assume these responsibilities.

To advance nursing science and the development of stewards of the discipline, PhD faculty should cultivate higher-level thinking by exposing learners to multiple and diverse perspectives that expand their consideration of problems and innovative possibilities for solutions. Faculty should encourage purposeful reflection and facilitate discussion in a safe environment to help students learn from their experiences and enhance self-awareness, and they should promote strategies that support lifelong learning. As stewards of the discipline, both faculty and graduates of PhD programs in nursing should be able to:

- Ask research worthy questions regarding nursing.
- Formulate appropriate strategies for investigating important questions.
- Conduct research studies that are important to informing nursing practice
- Analyze and evaluate the results of research investigations.
- Communicate research results to others to advance the field.
- Generate knowledge to inform policy development.
- Generate new knowledge based on systematic evaluation using all methods of scientific inquiry to inform nursing practice, education, and/or policy through translation of research findings (AACN, 2018).
- Focus on outcomes of individuals, families, communities, or populations.
- Develop and investigate unique programs of scientific inquiry at the basic, clinical, or population level to include testing interventions for efficacy, effectiveness, or implementation processes (AACN, 2018).
- Create new theoretical frameworks/theory to guide, test, and disseminate the work of new phenomena (AACN, 2018).

Recommendations:

1. PhD program faculty need to conduct and disseminate their own scholarship and prepare doctoral students for stewarding the discipline through (a) *generation* of new knowledge and defending knowledge claims against challenges and criticisms, (b) *conservation* of the most important ideas and findings that are a legacy of past and current work, and (c) *transformation* of knowledge that has been generated and conserved.
2. Faculty in nursing PhD programs model and engage students in the art of discovery. Through their own programs of research and scholarly activities, faculty lead by example, permitting students to witness and learn from the successes and challenges of knowledge development and dissemination, including subsequent policy and practice implications.

Table 1. Providing the Knowledge and Skills Needed to Steward the Discipline

Acquisition and Generation of Knowledge	
<p>Foci</p> <ul style="list-style-type: none"> • Theory • Informatics • Health Policy • Grantsmanship • Special Topic Electives • Philosophy of Science • Foundations of Nursing • Ethical Conduct of Research • Measurement and Statistics • Research Methods and Design • Practicums (research, education, policy, philosophical inquiry) • Aligning Student Interest in the Context of the Discipline • Health Equity 	<p>Lead discussions to help students identify clinical nursing problems that would benefit from research to inform practice</p> <p>Involve students in research practica through which they can experience research teams led by nurses or interprofessional colleagues</p> <p>Expose students to interprofessional research teams in which nurse scientists role model unique contributions (e.g., in knowledge; theory; unique designs such as MOST, SMART; intervention fidelity; measurement; use of qualitative research to inform or complement findings)</p> <p>Expose students to nurse scientists with active research programs in a variety of settings</p>
<p>Research Socialization</p> <ul style="list-style-type: none"> • Mentoring • Conferences • Collaboration • Visiting Scholars • Doctoral Forums • Research Practicums • Ethical Considerations 	<p>Help students connect philosophical underpinnings to the conduct of research</p> <p>Use individual development plans to help students map a 5- to 10-year career trajectory that includes research, community service and/or practice, ongoing education, and a regional/national/international policy focus</p>
Conservation to retain the essence of nursing: Hanging on, integrating, and forging ahead	
<ul style="list-style-type: none"> • Peer Mentoring • Visiting Scholars • Doctoral Forums • Faculty Mentoring • Health Policy Summits • Peer Reviewers for Journals • Essential Questions Seminars • Mock Review of Grants and Manuscripts • Engagement in Professional Organizations 	<p>Incorporate students on academic committees and course development work groups</p> <p>Facilitate networking for students at professional nursing conferences</p> <p>Encourage opportunities for students to stretch their comfort zone and participate in networks new to them</p> <p>Help students consider how their interests and future contributions will impact the larger landscape of nursing knowledge and practice</p>

Transformation via effective communication	
<ul style="list-style-type: none"> • Authorship • Creative Mindset • Sharing with the Public • Manuscript Development • Creating Poster Presentations • Communicating with Legislators • Developing Conference Abstracts • Delivering Professional Oral Presentations 	<p>Provide mock reviews of posters, papers, and presentations</p> <p>Attend health policy summits</p> <p>Support engagement in professional organizations that align with their interests</p>

Faculty Experiences and Expectations

Research-focused doctoral programs in nursing need a cadre of diverse, experienced, and well-qualified faculty to teach, guide, and mentor students on their educational journey. Faculty should possess a wide array of individual and collective (team) credentials and experiences to enrich the educational experience of future nurse scientists. Individual faculty members must have relevant degree preparation, including education, experience, and credentials aligned with the content they teach. Doctoral program faculty who are nurses should maintain active registered nursing licensure. A PhD degree in nursing provides optimal preparation for most core program faculty; however, the team should not be limited to nurses or other professionals with nursing degrees. Although nurse scholars continue to debate the pros and cons of the current hiring trends and the optimal use of multidisciplinary faculty in nursing graduate programs (Algase et al., 2021; Strumpf et al., 2021; Tubbs-Cooley et al., 2021), faculty with doctoral degrees in related fields (e.g., biological sciences, education, ethics, genetics, informatics, statistics, public health, law) can (a) add value and depth to the teaching and mentoring teams, (b) strengthen research teams, and (c) increase opportunities for extramural funding of team science. Faculty who have completed postdoctoral fellowships or other forms of research mentorship beyond doctoral degrees can provide an additional level of research expertise to the program. Regardless of the area of specialization, faculty with research-focused doctoral coursework should demonstrate effective leadership in developing the next generation of nurse scientists.

Nursing PhD students can benefit from exposure to faculty with doctoral-level clinical expertise, such as those with Doctor of Nursing Practice or Doctor of Pharmacy degrees. Several recent studies have described the benefits of a collaborative approach to doctoral education provided by teams of researchers and expert clinicians to facilitate research-practice collaboration and translational science (Bucholz et al., 2015; Jenkins, et al., 2020; Staffileno et al., 2016; Staffileno et al., 2017). AACN found that 65% of nursing PhD program directors reported offering at least one or more graduate courses to both DNP and PhD students, and 90% of respondents reported that nursing PhD students were given the opportunity to take interdisciplinary courses in other fields (AACN, 2021c). These results support the need for and value of faculty with both advanced research and advanced clinical preparation in a variety of disciplines. The complexity in healthcare issues cannot be addressed by nursing alone; interdisciplinary teamwork offers a viable solution that will support innovative nursing pedagogy and contribute to groundbreaking research in the field of health inequities and disparities (Flynn et al., 2021).

The majority of doctoral program faculty should be established researchers with current portfolios of research funding; regional, national, or international reputations for their expertise; and professional networks that extend beyond the university or local community. They should also demonstrate evidence of scholarship prior to the dissertation, such as publications and presentations, and hold organizational leadership positions at regional, national, and/or international levels. Experience working with and leading transdisciplinary research teams is important to provide strong role modeling and mentorship for future nurse scientists. Faculty with healthy and productive research team relationships can provide strategic introductions and facilitate entry opportunities for students in the initial phases of establishing research collaborations. Faculty should be able to leverage their research network as a basis for socializing doctoral students to the broader landscape of research consultation and partnerships.

In addition to having an established and recognized program of funded research and inquiry, doctoral faculty must have a demonstrated history of strong and effective teaching with positive outcomes, including a track record of successful student performance and course completion, positive student and peer evaluations on teaching effectiveness, and evidence of a commitment to continuous improvement of course content and pedagogical strategies. Given national trends in higher education, with the increasing demand for greater accessibility of course and program content, doctoral faculty should consider the advantage of being skilled in online course delivery, as well as traditional face-to-face delivery methods.

PhD program faculty must possess the ability and willingness to provide focused mentoring to doctoral students (Anderson et al., 2019; Xu et al., 2016). Effective faculty mentors (a) readily share their knowledge, expertise, time, and opportunities with students; (b) meet with individual student mentees on a regular basis to facilitate efficient progress and achievement of program milestones; (c) support student attendance and participation in regional and national scholarly events by providing opportunities for collaboration on research projects, publications, and presentations, and (d) make introductions and facilitate relationships that expand the student's network of supportive experts and potential research collaborators. Faculty mentoring effectiveness should be assessed by student outcomes (e.g., student satisfaction with mentoring support; student presentations, publications, awards, timely program completion, and employment in postdoctoral or academic positions).

Recommendations:

1. Nursing PhD program faculty have diverse expertise in their areas of research specialty and possess diverse educational credentials.
2. PhD program faculty demonstrate teaching and mentoring effectiveness through course, program, and individual student (mentee) outcomes.

Diversifying the Faculty in PhD Nursing Programs

AACN (2019) supports the development of a more representative nursing workforce and specifically promotes strategies to enhance diversity in nursing education. Diversity, equity, and inclusion are critical to nursing education and fundamental to developing a nursing workforce

able to provide high-quality, culturally appropriate, and congruent health care in partnership with individuals, families, communities, and populations (AACN, 2017a). In the AACN's position statement on *Diversity, Equity, and Inclusion in Academic Nursing* (2017a), *diversity* refers to "a broad range of individual, population, and social characteristics, including but not limited to age; gender; sex; race; ethnicity; sexual orientation; gender identity; family structures; geographic locations; national origin; immigrants and refugees; language; physical, functional, and learning abilities; religious beliefs; and socioeconomic status. *Inclusion* represents environmental and organizational cultures in which faculty, students, staff, and administrators with diverse characteristics thrive. *Equity* is the ability to recognize the differences in the resources or knowledge needed to allow individuals to fully participate in society, including access to higher education" (Kranich, 2001, as cited in AACN, 2017a, p. 1).

According to a 2017 AACN policy brief on diversity in academic nursing, between 2007-2016, nursing student diversity increased from 25.1% to 29.5%, faculty diversity increased from 10.9% to 15.9%, and the proportion of male faculty increased from 4.7% to 7% (2017b). AACN reports that from 2010-2019, the number of full-time minority students enrolled in research-focused doctoral nursing programs increased from 935 (23.3%) to 1,306 (33.6%), and the number of minority graduates increased from 93 (20.4%) to 223 (32%). Despite these gains, minority faculty represent only 17.3% of all faculty positions (AACN, 2020).

In its 2021 PhD program study, AACN revealed that the majority of PhD faculty are White (79.2%), followed by Asian and Asian-American (10.3%), Black or African American (8.2%), more than one race (1.1%), American Indian or Alaska Native (0.8%), and Native Hawaiian or other Pacific Islander (0.3%) across 94 respondent schools. Most of the faculty are Non-Hispanic or Latino (96.3%), and 87.6% of the core faculty are female. Of special note, there are still a considerable number of schools that do not have diverse faculty. For example, 60% of nursing schools do not have Hispanic or Latino faculty, 35% do not have any Black or African American faculty, and 27% do not have any Asian or Asian-American faculty. In addition, most schools do not have faculty who report that they are American Indian or Alaska Native (87%), or Native Hawaiian or other Pacific Islander (95%). Eighteen out of 98 schools do not have male faculty as core faculty in the PhD program. Although progress in increasing diversity has been shown from 2007 to 2021, more faculty from underrepresented groups need to be recruited to attract diverse nursing students and enrich the foundation of nursing science.

PhD nursing programs must create a vibrant and inclusive academic environment to accommodate today's learners. The diverse experiences and perspectives that arise from differences in race, culture, gender, mental or physical abilities, age, sexual orientation, or other disciplines are important to advancing nursing science and improving the richness of the doctoral program in nursing. To achieve these goals, it is recommended that PhD nursing programs increase faculty diversity along several dimensions, including race, ethnicity, gender identities, and proportion of faculty from other disciplines (e.g., psychology, statistics, sociology, rehabilitation, etc.). The benefits of diversity in research teams are similarly apparent beyond academia. In its 2016 diversity statement, the NIH emphasized that teams comprised of scientists with diverse backgrounds, life experiences, and perspectives tend to outperform homogenous teams, stating that "there are many benefits that flow from a diverse NIH-supported scientific workforce, including fostering scientific innovation, enhancing global competitiveness,

contributing to robust learning environments, improving the quality of the researchers, advancing the likelihood that underserved or health disparity populations participate in and benefit from health research, and enhancing public trust.”

To maximize faculty and program expertise, several nursing schools have developed consortia and partnerships among PhD programs (e.g., the Council on Intercollegiate Collaboration) as well as bridge programs with HBCUs and HSIs. For example, the Winston-Salem State University (WSSU) Division of Nursing has partnered with the Duke University School of Nursing to establish a Bridge to the Doctorate program. This program provides a research honor track for graduate nursing students from underrepresented groups enrolled at WSSU to prepare them for a seamless transition to a PhD program at Duke University (Brandon et al., 2014). Lack of diversity in nursing faculty has a tremendous impact on the PhD student body, affecting scholarly learning, culture, and knowledge generation, application, and dissemination. Increasing diversity in nursing faculty is essential to increasing diversity in the nursing workforce and addressing health disparities (AACN, 2017b). A body of literature has found that minority faculty can play a pivotal role in the recruitment and retention of minority nursing students (Lin, 2018). Faculty with diverse backgrounds, research, and clinical expertise are able to bring a broad range of experiences into the classroom, better identify alternative strategies to respond to various cultural groups and student learning needs and provide opportunities for students to enhance their cultural humility and engage with wider communities. Hamilton and Haozous (2017) report that the presence of faculty from under-represented minority groups in schools of nursing contributes to building a dynamic intellectual community, provides role modeling and support to minority students, reduces health disparity, and increases cultural competence for all faculty. All students are better educated and prepared for leadership and professional competitiveness in the multicultural national and global community.

A diverse faculty can create an intellectual and innovative community to provide guidance and oversight/advising for students in PhD programs; however, enhancing diversity in doctoral nursing education and inclusiveness in the nursing science community involves far more than simply hiring a diverse faculty. Continuous engagement and substantial strategies are essential to ensure that all faculty and students in the doctoral program, particularly those with different backgrounds and intellectual perspectives, are respected and valued. Recruitment efforts must be accompanied by supportive retention strategies. Cary, et al (2020) implemented the following strategies and monitors the efforts every two years: (a) not overburdening minority faculty by expecting them to provide representation on all committees, (b) ensuring that minority faculty are invited and encouraged to engage in programs on campus and nationally, and (c) ensuring that faculty members are treated equitably regarding selection for teaching release and development opportunities.

The importance of mentoring faculty is extensively evidenced in the literature. Studies have identified the substantial career challenges and obstacles encountered by minority faculty, such as lack of formal, structured mentorship programs, lack of faculty development (e.g., scholarship, promotion, policy, pedagogy), and lack of equity and inclusion (Hamilton & Haozous, 2017; Ro, Sin, & Villarreal, 2021). Mentorship has been described as an extremely important factor for career success (Kolade, 2016; Ro, Sin, & Villarreal, 2021), job satisfaction and a sense of belonging (Chung & Kowalski, 2012; Salvucci & Lawless, 2016), as well as

nursing faculty recruitment and retention (Nowell et al., 2017). Lack of an effective mentorship program was cited as a source of stress, frustration, and promotional stagnation (Kolade, 2016).

Ro and colleagues (2021) noted that mentoring programs are important support mechanisms and can include guidance related to academic promotion, research methodology, grant writing skills development, and minority faculty-specific development training, external alliances, workshops for leadership skills, course design, pedagogy, career development, and access to research opportunities. A group-based mentoring model (e.g., a group think tank) with a minority faculty, doctoral students, and a cross-cultural mentor can integrate cross-cultural and peer mentoring into academic communities to support diversity in academia (Julion et al., 2019).

Lack of collegial support is identified as another barrier for minority faculty (Kolade, 2016). Diverse faculty should be provided with guided exposure to campus-wide programs to cultivate collegial support and a sense of cultural inclusiveness (Zajac, 2011). Minority nursing faculty can be encouraged to network with minority faculty from other disciplines to share meaningful discussions and learn from one another (Ro, 2018; Ro, Sin, & Villarreal, 2021). In addition, minority faculty who may be successful in leadership roles should be identified and supported in developing leadership skills for success in administrative roles (Kritz, 2019; Ro, Sin, & Villarreal, 2021; Zajac, 2011).

A commitment to diversity in an institution's mission statement, strategic plan, and hiring process, in addition to the presence of a vocally supportive administration, are important factors in recruiting minority faculty (Hamilton & Haozous, 2017). The diversity statement will serve as a framework to operationalize diversity initiatives in the program as well as a reminder for the program and faculty to be dedicated to creating a culture of diversity, equity, and inclusion in the PhD learning community. Additionally, adequate student preparation to address evolving health issues requires exposure to diverse perspectives and cultures. Experts and scholars from various disciplines could be brought together to co-teach content on health equity and disparity and cultural diversity.

To recruit and retain faculty members from diverse backgrounds and perspectives, intentional strategies must be employed and may include these approaches:

- A program can create a faculty search committee for diverse faculty or recruit minority faculty from its own doctoral candidates (Zajac, 2011), and include minority faculty in selection committees (Ro, Sin, & Villarreal, 2021).
- Nursing schools can partner with the university diversity and inclusion office/council (e.g., use its tools, cultural intelligence workshops, or implicit bias training) to identify and mitigate implicit biases that could occur during review of faculty applications and consult minority faculty about their experiences of the recruitment process and suggestions for achieving a more diverse faculty (Cary et al., 2020).
- Promising scholars from diverse backgrounds can be identified early in their careers (e.g., a BSN-PhD pathway) and provided with programmatic support and resources for advanced research training and career development.
- Invite and encourage minority faculty participation in programs and committees but ensure that they are not overburdened by assigned committee work.

- Implement a mentoring program to advance retention, promotion, and tenure of minority faculty.
- Create a culture of collegial support.
- Ensure leadership development of minority faculty and provide opportunities to assume leadership roles.

All strategies for promoting diversity should be regularly monitored and evaluated. Climate and culture assessments can determine how well an environment is affecting the needs, success, and satisfaction of diverse faculty in the PhD nursing program (DeWitty & Murray, 2020).

Recommendations:

Based on literature reviews and discussions, the task force makes the following recommendations to increase diversity and inclusiveness in PhD nursing programs from a program and faculty perspective:

PhD Nursing Programs

1. The commitment to diversity and inclusion should be clearly stated in the PhD program's mission and goal statements.
2. Diversity, equity, and inclusiveness (DEI) perspectives need to be integrated into the PhD curriculum; students can take a focused course or learn through courses that involve DEI concepts. Students also should have opportunities to take interdisciplinary courses and courses offered in other disciplines.
3. Develop and utilize recruitment strategies to increase the diversity in the faculty from a variety of demographic backgrounds and other disciplines.
4. The PhD nursing program should develop and monitor retention efforts to support all faculty in professional development and promotion.
5. Nursing schools could develop consortia and partnerships among PhD programs, such as bridge programs with Historically Black Colleges and Universities and Hispanic-serving institutions.
6. Programs should establish and implement metrics for evaluating and monitoring changes in diversity and the standards of excellence.
 - a. Regularly evaluate the proportion of faculty diversity compared to student diversity in various dimensions
 - b. Evaluate faculty perceptions of and satisfaction with the diversity, equity, inclusive, and belonging culture and climate of a program and school
 - c. Evaluate the admission, progression, and graduation data to assess the influence of faculty diversity on the recruitment and retention of students

Individual Faculty in PhD Nursing Programs

1. Increase cultural competence levels and cultural humility through workshops or experiential activities.
2. Engage in interprofessional collaboration and leadership development activities.
3. Build partnerships with scientists from underrepresented groups and other disciplines and foster interdisciplinary science collaboration.
4. Provide additional mentorship and support for students to combat the isolation experienced by many underrepresented PhD students.
5. Strengthen networks of faculty within and outside the school/parent institution that could provide appropriate co-mentorship.
6. Increase the recognition of the importance of health disparities research.

Resources for Faculty Support and Development

Resources essential to meeting the goals of a successful research-intensive doctoral program include institutional/school support structures to provide the financial and academic needs of students and faculty. It is expected that these resources are housed at the graduate school or university level as well as within the school. Such support structures include the following:

- Resources to help faculty define the science of the future (i.e., merge the worlds of natural, applied, and human science into a multidimensional lens to deliver new and innovative health services to improve health outcomes)
- Creation of a culture of accountability in which all parties are involved in shaping nursing science and research agendas
- Purposeful recruitment strategies for faculty and students that focus on attracting diversity in thought, culture, and competencies
- External partnerships (e.g., industry and community) that forge new research endeavors and demonstrate the impact of nursing science
- Support to develop alternative models, such as the three-year PhD program option, which requires strong mentors in and outside of the school of nursing, adequate funding to promote full-time study, and clear benchmarks of progress throughout the program
- Access to funded training grants (i.e., allowable percentage of federal nurse traineeship funds for students in a research-focused doctoral program)
- Scholarships or stipends for financial support for doctoral students, ideally to encourage and allow full-time study to expedite program completion
- Competitive salaries for doctoral program faculty that are consistent with salaries for doctorally prepared nurses in service and industry
- Support for faculty sabbaticals to promote professional research growth and development, especially in areas that faculty identify a need

- Support for faculty to be able to have time to access the resources available on campus
- Free access to online and print journals, books, and literature as well as search support
- Peer review of proposals and manuscript in their developmental phases
- Research design expertise and technical support
- Financial support to allow faculty to present their research and network with their students at professional meetings
- IRB review management
- Data, information, and knowledge management, processing, and analysis support
- Communication and information technologies (including hardware, software, and technology support expertise)
- Budget assistance and compliance oversight
- Expertise in grant proposal development, management, and submission, including ethical and human subjects training and support
- Writing and editorial support
- Institutional support for library facilities, including databases, information technology, and state-of-the-art communication resources to support the scholarly pursuits of faculty and students
- Ability to assess faculty workload and make necessary adjustments to decrease workload through the use of teaching assistants and research assistants
- Adequate classroom, seminar, and laboratory space and facilities that support doctoral student study, seminars, meetings, and study groups as well as socialization among faculty and students
- Development of faculty expertise for online, virtual pedagogy
- Commitment to the need for self-care among the faculty
- Funding support for open access manuscripts so that nursing faculty/students in low resource countries can freely access publications without paying for them to increase global scholarship

Given the need to increase the number of PhD students to meet the needs of the future, it is imperative that schools of nursing invest in pathway programs, starting at the undergraduate level. Baccalaureate students with an interest in pursuing a career in research should be encouraged to matriculate directly into a PhD program after completion of their BSN. Faculty and advisors should be knowledgeable in assisting students and connecting them to resources.

The PhD program in nursing should be an integral component of any university with (a) a core mission that explicitly includes research, and (b) an environment that actively fosters interdisciplinary scholarship and collaboration, and should include the following core elements:

- An active research administration office in the school and/or university that provides resources and support (e.g., pilot study funds, statistical consultation, assistance with budget preparation and submission)
- Internal funds for competitive pilot projects or travel to meetings for scholarly presentations
- Funded postdoctoral trainees using a variety of mechanisms including federal funding, foundation funding, private philanthropy, industry, and/or health system funding

- Faculty with active programs of research and/or substantive expertise to mentor students and assist with their role preparations
- Facilities to meet faculty research needs (e.g., laboratories, interview rooms, supplies)

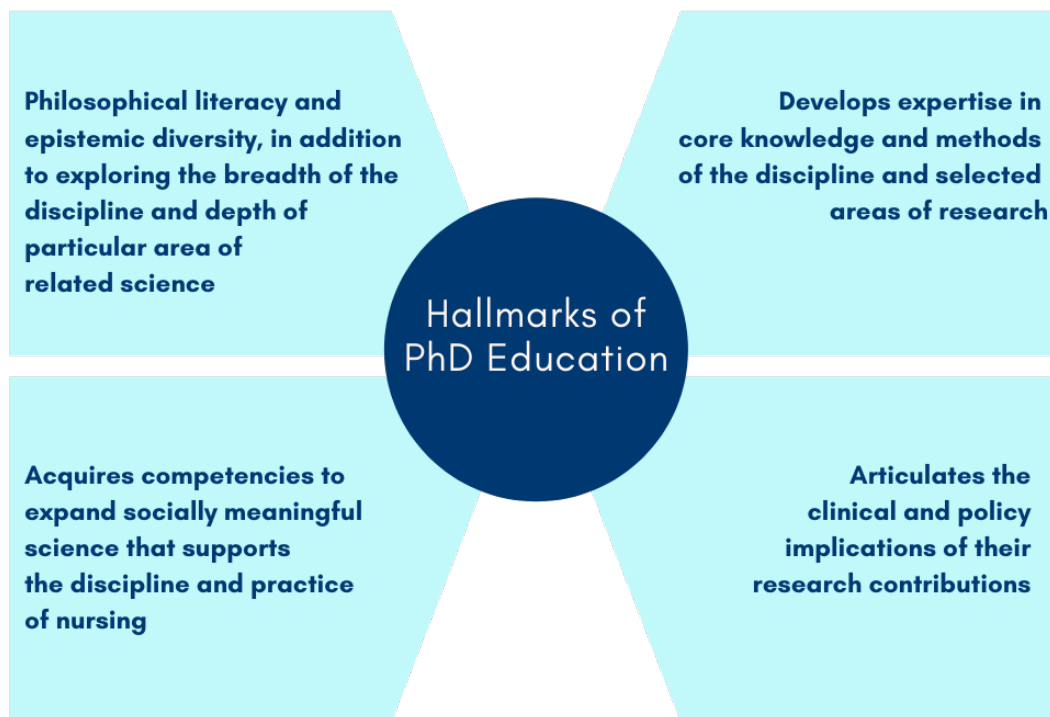
Recommendations for Deans:

1. Deans should collaborate with their advancement/development officers to focus on obtaining scholarships for PhD students through annual goal setting.
2. Deans should encourage the advancement/development officers to seek philanthropic donations for named faculty chairs within their PhD program to offset faculty salaries and allow for more dedicated research time.
3. Deans should negotiate with campus or school administration to ensure adequate and equitable distribution of scholarships, stipends, and tuition remission for PhD students in their programs.
4. Deans must ensure resources to support faculty and student grant writing either at the school or university levels.

Curricular Elements in PhD Programs in Nursing

PhD programs in nursing are expected to be housed in schools/colleges/departments of nursing and universities that provide a research-focused environment with faculty leaders, experts, and scientists, resources, and infrastructure to support the process of educating doctoral students to achieve all core outcomes, with an emphasis on one or more areas of nursing science.

The expected outcomes of the PhD program include mastery and extension of the knowledge of the discipline of nursing through research. A hallmark of doctoral education is a highly individualized program of study during which the student (a) explores the breadth of the discipline and a particular area of related science in depth (Villarruel et al., 2021), (b) develops expertise in the core knowledge and methods of the discipline and a selected area of research, and (c) acquires competencies to expand socially meaningful science that supports the discipline and practice of nursing (Fairman & Villarruel, 2021). The curricula should enable nurse scientists to articulate the clinical and policy implications of their research contributions (Villarruel et al., 2021).



In addition, PhD programs should prepare graduates with knowledge and skills in big data and data science, leadership, mentorship, advocacy, community building, health policy, and conducting team science or engaging in interprofessional teamwork (Giordano, et al., 2021), as well as cultural humility informed by an understanding of health equity, structural inequities in health, and social justice (Boehm et al., 2020; Villarruel et al., 2021). Joseph, McCauley, and Richmond, (2021) describes content on team-based science should prepare PhD nursing students to lead, build, and work with a team and appreciate the contributions of team members from other disciplines and allow for the expression of and appreciate the contribution of each team member across disciplines. To achieve these outcomes, program offerings should include the participation of DNP-prepared nurses, joint interprofessional/interdisciplinary classes or experiences, and experiential learning in the laboratories of other sciences, and include collaboration with community agencies and organizations, especially those representing underserved and marginalized populations (Joseph, McCauley, and Richmond, 2021). Furthermore, such co-educational opportunities not only benefit student researchers but allow scientists from other disciplines to better appreciate the distinct perspective that nursing brings to collaborative research. These types of experiences allow students to network strategically, learn to manage research projects jointly, engage in interdisciplinary publication activities, and share resources (Michael & Clochesy, 2016).

The curricula for the emerging nurse scientist must reflect evolving areas of science and technology (Giordano et al., 2021). The application of modules, as opposed to full courses, that can be added or removed to reflect trends in science and health care, is an option that could be implemented. Such modules provide flexibility within the program and can be tailored to meet the needs of the individual student's focus of inquiry. Finally, it should be emphasized that the knowledge and skills acquired in the research doctorate should be transferable to nonacademic settings, with an emphasis on process and outcome competencies (Villarruel et al., 2021). Over the past decade, the scientific foundation on which nurse scientists develop their research programs has adjusted in response to changes and new challenges in the field. For example, precision health provides the framework for understanding how illness affects individuals,

necessitating unique approaches to ensure a person-specific plan for disease management. Consequently, content on precision science must cover evolving topics in numerous fields such as related physiology, psychology, omics technologies, artificial intelligence and machine learning, the microbiome and environmental science, phenotypes, chronic disease management, translational science, and palliative care (Fairman & Villarruel, 2021; Henly et al., 2015; Smaldone & Larson, 2021).

PhD programs must prepare future generations of nurse scientists to function well in a data-rich world. Nurse scientists need to know how to ask the right questions about data and apply data science methods (Foster & Tasnim, 2020). All nurse scientists would benefit from data science concepts embedded in the core curriculum (Shea et al., 2019). PhD nursing students need a good understanding of the cutting-edge areas of science, including data science, precision health, omics, biobehavioral science, big data, informatics, and translational science (Conley et al., 2015; Henly et al., 2015a, 2015b, 2015c).

The NIH (2018) defines data science as “the interdisciplinary field of inquiry in which quantitative and analytical approaches, processes, and systems are developed and used to extract knowledge and insights from increasingly large and/or complex sets of data.” Data science encompasses approaches for the generation, characterization, management, storage, analysis, visualization, integration, and use of large, heterogeneous data sets (Topaz & Pruinelli, 2017). Nurse scientists need a thorough understanding of the complexities of data science to build knowledge for advancing nursing and health care (Shea et al., 2019). PhD nursing programs are recommended to incorporate emerging areas of science (e.g., informatics, symptom science, precision science, omics) into strategic plans and curricula to advance nursing science and guide PhD students to successfully engage with the scientific community. The PhD nursing program is encouraged to embrace innovative pedagogical approaches that prepare doctoral nursing students to understand data science methods and introduce nursing perspectives into data science roles.

A scoping review of the data management literature shows that academic institutions focus more on the observations or self-reporting of researchers collecting or managing data rather than the aspects of education and training (Perrier et al., 2017). In addition, the inclusion of data management content into the curriculum is often limited to single lectures or individual mentoring (Anderson et al., 2019; Raszewski et al., 2021a). Nursing doctoral programs need to develop consistent data management education, build awareness of data policies, and clarify student project data sharing and ownership (Raszewski et al., 2021a). Supporting advances in technology and training play a key role in advancing NINR efforts to expand the impact of nursing science (Grady, 2017). When integrating constructs and concepts of the informatics and data science throughout an existing PhD nursing curriculum, the Data Science Curriculum Organizing Model (Shea et al., 2019) can be referred to as a guide to evaluating nursing PhD curricula for ensuring that recommended data science concepts are present and for designing curriculum changes.

Similarly, up-to-date content regarding determinants of health, health equity concepts and theories, structural inequities in health, promotion of cultural safety, and social justice should be prominently threaded throughout courses and experiential activities in the PhD program (Joseph, McCauley, and Richmond, 2021; NASEM, 2021). Specifically, in addition to this content);

coursework should address health disparities, health economics, patient-reported outcomes, health promotion and awareness, workplace violence, military health, feminist theories, and LGBTI health (Henly et al., 2015; Joseph, McCauley, and Richmond, 2021; Smaldone & Larson, 2021; Villarruel et al., 2021). As defined by the Centers for Disease Control and Prevention, aspects of the social determinants of health include social and economic stability, physical and neighborhood environment, education, community and social context, and healthcare systems (Centers for Disease Control and Prevention, 2021). Issues related to the social determinants of health and health equity extend beyond national borders, affecting people worldwide; thus nurse scientists must engage in global health research and collaborate on international research teams to address these and other stressors (Lori & Madigan, 2021). The components of the curriculum of a research doctorate must prepare students to contribute to these efforts by incorporating subject matter content on sociocultural competency and political awareness, ethical conduct of research in other countries, obtaining institutional review board approval, research execution across international borders, emerging infectious diseases and the threat of epidemics, and capacity strengthening (Joseph, McCauley, and Richmond, 2021; Lori & Madigan, 2021).

Access to large data sets and the expectation of data sharing requires that graduates possess an understanding of big data, data analytics, data sharing, and data management (Henly et al., 2015; Joseph, McCauley, and Richmond, 2021; Smaldone & Larson, 2021; Raszewski et al., 2020; Villarruel et al., 2021). The rubric of big data covers such topics as informatics, technology, and data security (Joseph, McCauley, and Richmond, 2021). Graduates should understand data management plans that describe data creation, storage, sharing, preservation, and destruction (Raszewski et al., 2020).

As in other disciplines (e.g., engineering, business, chemistry), the major focus of the PhD program must be on the area of research specialization within the discipline, not on the process of teaching. If the purpose of the program is to prepare students for employment in such settings as research institutes, professional organizations, or the government, preparation in teaching might be an option but should not be a major component of their curriculum. However, it should be recognized that graduates may enter the academy at some point in their career where skills as an educator would be required (Dunbar-Jacob & Hravnak, 2021). Many individuals who acquire the PhD do seek to fill roles as educators and use their considerable expertise to educate the next generation of nurses. If the PhD program seeks to prepare individuals for research within academic settings or for careers that might transition to academia over time, then the curricula should strive to enable competencies in teaching and learning, include additional preparation in contemporary and antiracist pedagogical theory, and evidence-based teaching strategies, curricular design, teaching philosophy, preparation of the syllabus, and evaluation methods. This preparation will be important to augment the graduate's ability to transmit the science of the profession and mentor students at both levels of preparation (Dunbar-Jacob & Hravnak, 2021; Villarruel et al., 2021). This additional preparation may be provided via a variety of approaches such as through formal course work and teaching residencies, teaching assistantships, modules, or certificate programs during the PhD program.

Finally, to enable their success, graduates should receive preparation and assistance in career-building, which could include leadership and career cartography (stating the objective and providing a map of one's career) (Broome et al., 2021; Feetham & Doering, 2015), leadership

courses, CV development, job search and interview training, and help finding a postdoctoral fellowship or identifying a lifelong mentor or academic coach (Joseph, McCauley, and Richmond, 2021). Student career maps should allow a focus on both academic and non-academic roles, depending on the student's long-term goals.

In summary, the core curricular elements of PhD programs in nursing should ensure expected outcomes of mastery and skill acquisition regarding:

- Depth of knowledge and theoretical underpinnings in a substantive area
- Philosophy, ethics, and the responsible conduct of research
- Precision health
- Effects of climate change on health
- Determinants of health, health equity, and social justice (i.e., cultural humility, structural inequities in health, health disparities)
- Health economics, patient-reported outcomes, health promotion and awareness, promotion of cultural safety, military, and LGBTI health
- Global health and the conduct of global and rural health
- Scientific methods, including team-based science
- Advanced research design and statistical methods
- Data methods, management, data analytics, and big data
- Concepts and components of scholarship, design thinking, and innovation
- Mentored research experiences, including interdisciplinary mentors and teams
- Critical analysis of the extant literature
- Grantsmanship and competencies in dissemination, both written and oral, to various audiences
- Health policy engagement, implications of research on health policy and healthcare systems, and strategies to influence health policy and engage in advocacy
- Skill-building in leadership through didactic and non-course elements to prepare the next generation of nurse leaders
- Content on teaching and learning

As the number of students transitioning from entry and advanced level programs (BSN, MSN, and DNP) to PhD programs escalates, attention should be given to preparing these students for PhD study. There is a need to facilitate their transition from one program to the other through integrated, tailored clinical and didactic experiences in addition to faculty mentorship (Cromeens et al., 2021). Efforts should be made to consider the student's research education and associated competencies such as leadership development and data management. Fellowships can be implemented to build on clinical competencies obtained at entry-level to the profession to facilitate the generation of research questions pertinent to the practice of nursing. Integration into the leadership teams of the academic partnerships of the schools in which a PhD program is housed is one way to link these students into clinical experiences that are appropriate to their long-term goals in the PhD program.

Therefore, the following is recommended for incorporating relevant content into research-focused doctoral programs in nursing.

Recommendations

1. Curricula should address issues of diversity, equity, and inclusion, including cultural humility, racial inequality, health equity, cultural safety, and social justice.
2. Competency in teaching and learning, including contemporary pedagogical theory and evidence-based teaching strategies related to curricular design, teaching philosophy, preparation of the syllabus, and evaluation methods, should be provided for students whose career plans include an academic role.
3. Preparation in teaching may not be a required component of the program for students preparing for employment in non-academic settings, such as research institutes, professional organizations, or the government.
4. Integrated, tailored clinical and didactic experiences in addition to faculty mentorship should be provided to post-baccalaureate PhD students to facilitate the transition from the BSN to the PhD program.
5. The integration of data science into the curriculum is recommended. Available models and exemplars can be used to guide the integration of data science into the current curriculum or helping with the development of new courses; Foster and Tasnim (2020) discuss some models and exemplars). Other examples can be found at the University of Minnesota School of Nursing, the University of San Diego, the Columbia School of Nursing, and the National Institutes of Health (NIH, 2018).
6. A standard curriculum of data management practices needs to be established. Funding agencies and partners are increasingly requiring data management plans that describe creating, sharing, preserving, and destroying data. Data management is defined as the process of validating, organizing, securing, maintaining, and processing scientific data and determining which scientific data to preserve (Tabek, 2019). Raszewski et al. (2021b) provided examples in doctoral nursing programs and handbooks presenting data management instances across any aspect of the research data lifecycle. In dissertation proposal development, students need to be directed about data management plans, infrastructure, and data ownership agreements (Raszewski et al., 2021a, 2021b). The data management expectations can be included and guided in doctoral student handbooks.
7. PhD nursing programs are encouraged to create robust data management infrastructure, policies, practices. Nursing schools must adopt data management plans for student projects or research, enable data storage solutions for students, and create or incorporate data policies into student best practices (Raszewski et al., 2021a, 2021b).
8. PhD nursing programs could consider hiring faculty with expertise in the areas of informatics and data science. Simultaneously, nursing faculty must be given professional development opportunities or support to grow their knowledge and skills for teaching and mentoring students in the emerging areas of science. For nursing schools that have no such faculty, inter-departmental relationships are needed.

9. Nursing research in the emerging areas of data science needs to be fortified. Potential data science research may include segmenting populations to target health promotion, symptom management related to genetic risk or diseases, predictive analytics and preventive measures, monitoring of patient conditions and self-motivated care, merging of personal data from the IoT with EHR data, and use and analysis of social media data to provide information and social support and identify the impact of infectious disease on daily living. Best practices for conducting data science research and initiatives have been defined by several institutions, such as the NIH Office of Data Science Strategy (NIH, 2021a), National Institute of Nursing Research (NINR, 2021), National Consortium for Data Science (NCDS, 2021), and others. NIH Common Fund (NIH, 2021a) programs address emerging scientific opportunities and innovative, interdisciplinary directions for biomedical or behavioral research. Centers of the NIH included many areas related to nursing science, omics, and knowledge discovery based on big data. Also, there are increasing movements for data sharing and repositories, such as *All of Us* Research Program (NIH, 2021b).

PhD and DNP Curricular Partnership Innovations

PhD and DNP programs provide complementary approaches to the highest level of nursing education (Cygan & Reed, 2019; Michael & Clochesy, 2016), but they differ regarding goals and competencies. The academic preparation leading to the PhD and the DNP are distinct yet share some common threads. Over the past ten years, research-focused doctoral education has been guided by the AACN *Research-Focused Doctoral Programs in Nursing: Pathways to Excellence Report* (2010), while DNP programs have incorporated AACN's *The Essentials of Doctoral Education for Advanced Nursing Practice (Essentials)* (2006). The *Essentials* define the curricular elements that must be present in DNP programs. The revised *Essentials* (2021) include ten domains and concepts for nursing practice. Several concepts identified in the updated *Essentials* are germane to PhD and DNP educational preparation:

- Ethics
- Health Policy
- Social Determinants of Health

The unique competencies of both groups of doctorally prepared nurses must be combined and leveraged to ensure that the profession assumes a leadership role in the integration of research into practice (Michael & Clochesy, 2016). The following section highlights a few selected examples of innovative approaches to co-learning between PhD and DNP programs, team-based scholarship, and collaborations among faculty.

Edwards et al. (2016) describe the realization of complementarity through collaboration and collegiality among faculty and students in PhD and DNP programs. At one institution, three formal core courses were planned for joint enrollment between PhD and DNP students: Health Policy Leadership, Measurement of Clinical Outcomes, and Interprofessional Collaboration. Merrill et al. (2013) describes efforts to foster collaborative scholarly activities among students and faculty of the PhD and DNP programs by introducing targeted cross-program curricular strategies, including joint coursework assignments, scholarly seminars with cross cutting themes, shared governance experiences, and extracurricular professional service activities.

Opportunities for students from both programs to be exposed to one another and work together must be planned intentionally and engage faculty from both programs as well. Buchholz et al. (2015) present potential opportunities for collaboration (a) prior to student enrollment, featuring faculty working together with students on projects that implement the best evidence and generate new knowledge in recruitment materials, and (b) during foundational coursework, which could include core coursework in nursing inquiry and analytical methods, or policy and bioethics. Evidence shows there is a benefit for co-enrollment in one or more classes, as it creates an opportunity for academic socialization and the establishment of working relationships and yields higher numbers of and greater quality of working relationships between students.

An alternative approach to just placing students in didactic courses is a strengths-based program that begins with the orientation process described by Lusk and Marzilli (2018). The authors apply a three-pronged framework to identify individual student strengths, facilitate collaboration among DNP and PhD students, and set the foundation for implementation of a strengths-based curriculum during the doctoral educational experience. “Strengths-based education involves a process of assessing, teaching, and constructing intentional learning activities to help students identify their inherent talents and develop those talents into strengths through the process of academic, personal, and leadership development” (p. 327).

Another innovative approach involves grounding the experience for PhD and DNP students in clinical phenomena. Edwards et al. (2016) outline strategies to engage PhD and DNP students and faculty in collaboration, collegiality, and sharing resources. Planned classroom assignments maximize collaboration and complementarity by placing DNP and PhD students together to work on joint projects. In addition, students engage in complementary residency activities such as:

- Team-based literature reviews
- Pilot research projects and participation in quality improvement projects at the school or other clinical sites
- Poster presentations at research or practice conferences
- Article submission to professional or professional practice journals
- Interprofessional collaborative experiences
- Research, practice, or leadership grant proposal submissions
- Participation in local, state, and national organizations that influence health policy by both groups of students

Dual PhD-DNP Programs

Dual degrees in health care are not a new phenomenon; the MD-PhD was first instituted in 1956 at Case Western University. Loescher, Love and Badger, (2021) explain that unlike dual degrees in medicine, dual degree programs in nursing may reach into areas such as behavioral research and practice-related research: “Thus, PhD-DNP nurses are well positioned to accelerate the knowledge cycle from clinical problem to research questions and results, to clinical practice change, and ultimately, to policy” (p. 430). The researchers note that there are currently six such programs in the United States, one of which (University of Arizona) implemented an alternative approach to the apprenticeship model with mentorship to provide more intensive research

training online. Nursing science priorities framing the substantive areas of the program are data and systems science, health determinants science, and precision science; the research focus of the dual doctoral degree must be grounded in one of these areas. Examples of additional student assignments include analyzing data from an ongoing study at a distance, inclusion on research teams, and secure video conferencing to facilitate secure data sharing. In addition, the DNP graduate must demonstrate competency in all areas designated in the *Essentials* (AACN, 2021b).

PhD-DNP students complete coursework for both programs and follow a prescribed plan of study. Students transitioning from the DNP program must identify a research focus for their dissertation as well as its proposed target population, anticipated research questions and methods, and professional goals for science and practice. Students transitioning from the PhD program must provide a rationale for the change and identify a potential mentor who aligns with their clinical interest and professional plans after obtaining the dual degree. These students are not required to complete a DNP project but must incorporate a practice focus into the dissertation research. There is some variability in the PhD-DNP programs currently offered: (a) the length of programs is between 4-6 years; (b) the entry point may be either the BSN or MSN; and (c) the format varies between hybrid, online, or in-person (although most programs provide a part-time option).

Recommendations:

1. Incorporate co-learning opportunities for PhD and DNP students (e.g., combined courses, team assignments), combined orientations, and other opportunities for collaboration.
2. Facilitate team-based scholarship among faculty and students from both doctoral programs.
3. Incorporate pedagogies that advance scholarship and integrate common areas of the research-focused doctorate curriculum (e.g., data science, systems science, implementation science, translational research, and improvement science) with areas of study in the *Essentials* (e.g., ethics, health policy, and health disparities).

Goals and Characteristics of Postdoctoral Programs

The postdoctoral fellowship is now regarded as an important support for graduates who intend to pursue a career in a research-intensive setting (Downs & Morrison, 2011; Schnall, 2020; Sherry et al., 2013). Postdoctoral fellowships are designed to help nurse researchers gain needed experience, focus on the conduct of research in a specific area, supplement existing skills, and master new methodologies, all under the guidance of a mentor (AACN, 2006; Conn, 2005; Giordano et al., 2021). Contemporary postdoctoral fellowships provide the fellow with interprofessional and multi sector research experiences and opportunities to showcase their work to wider audiences via scholarly research publications and presentations at professional proceedings or other venues (Conn, 2005; Giordano et al., 2021; NASEM, 2021). Most graduates will need support to create one or more proposals for research grant funding in pursuit of the terminal goal of a postdoctoral fellowship (Lor et al., 2019).

Importance of Postdoctoral Fellowships

Postdoctoral fellowships reap important benefits for the profession, the academy, the mentor, and the fellow. With regard to the profession, they advance the science of nursing in the culture and workforce through the “development of the research base required to support evidence-based practice and add to the body of nursing knowledge” (NASEM, 2021, p. 201). Additionally, postdoctoral fellowships assist with the identification of new ways to employ technology to support nursing, and they generate more effective approaches to promoting leadership and lifelong learning (AACN, 2019; Schnall, 2020). Most importantly, nursing scholarship improves outcomes for clients, families, communities, and populations (Abraham et al., 2021).

Within academe, fellowships increase the standing of institutions because they support and promote research specializations and targeted disciplines. Such assistance leads external agencies (e.g., the Carnegie Classification of Institutes of Higher Education) to acknowledge the institution as research-focused, thereby positively affecting academic standing (Giordano et al., 2021). Similarly, postdoctoral fellowships benefit schools, departments, and faculty mentors by advancing the science of nursing and increasing their standing within the profession and ability to garner beneficial research funding (Avery et al., 2021). Faculty who serves as a postdoctoral mentor experience rewards that may include (a) the professional satisfaction of mentoring a relatively new nursing researcher as they establish their own program of research; (b) recognition for their assistance and expertise; and (c) advanced standing within nursing and academia, including the achievement of promotion and tenure (Hadidi, Lindquist, & Buckwalter, 2013).

Fellowships offer innumerable benefits that help the doctorally prepared nurse to develop as an independent researcher. The mentoring paradigm provides a supportive environment in which the postdoctoral fellow can (a) engage in career progression activities; (b) focus on skills to advance a program of research that fosters additional depth in a specific area of nursing science; (c) pursue interprofessional and intercollegiate research; (d) craft and submit research grants; and (e) obtain opportunities to share their research with wider audiences through professional publications, meetings, and other such venues (Abraham, et al., 2021; Giordano et al., 2021; Hadidi, Lindquist, & Buckwalter, 2013).

Characteristics of a Robust Postdoctoral Fellowship Program

Institutional Characteristics. Targeted capital and human resources are associated with productive doctoral and postdoctoral fellowship programs. Bevil and colleagues (2012) surveyed schools of nursing with doctoral degrees to describe the resources available for research support. Of the 170 eligible schools, 120 (70.6%) responded to the survey. The majority of responding schools (61.7%) were based in an academic health center, and 75% reported having a dedicated research office that offered various services for scholarly support, faculty development, and research productivity, including assistance with information technology, data- and non-data-based manuscript preparation and editing, and grant writing. Of the schools with research offices, 59% reported receiving funding from the National Institutes of Health within the past year, with greater funding associated with offices that were more fully established for longer periods and/or employed more staff or services (e.g., research director, grant administrator, statistician, clerical staff, research packages and research space, and support services).

An appropriate research infrastructure is not the only factor required for a successful postdoctoral nursing fellowship program. Additional supports identified as critical for success include adequate funding for postdoctoral fellowships; available mentors with appropriate skill sets and enthusiasm; release time that allows mentors to engage with fellows regularly; dedicated space and equipment (e.g., computer access, workspace, file cabinets, shelves, telephone, adequate light, sufficient temperature control); software and computer training/resources; potential opportunities to audit specific courses; time allotted in which to write for publication and present/attend interdisciplinary conferences and seminars; and exposure to other scholars interested in similar research areas (Broome & Fairman, 2018; Giordano et al., 2021; Nolan et al., 2007; Patrician et al., 2013; Schnall, 2020; Sherry et al., 2012; Vance et al., 2020).

Mentor Characteristics. The successful postdoctoral fellowship is founded on the work of a strong mentor and mentor team of individual scientists in and outside of the discipline. Strong mentors will have a (a) history of funded research aligned with the interests of the fellow; (b) desire to serve as a scholarly role model and share their expertise; and (c) willingness to provide guidance on numerous aspects of the research process, including finding appropriate funding sources, drafting a fundable research grant, and preparing scholarly manuscripts and professional presentations (Abrecht & Greiner, 1992; Conn, 2005; Downs & Morrison, 2011; Fairman et al., 2021; Giordano et al., 2021; Hadidi, Lindquist, & Buckwalter, 2013). Mentors and co-mentors can support the fellow's goals by providing strategic introductions to professional research contacts to forge collaborations that may last throughout the course of the fellow's career (Abrecht & Greiner, 1992; Giordano et al., 2021; Hadidi, Lindquist, & Buckwalter, 2013; Sherry et al., 2013).

Fellow Characteristics. Research indicates that NIH-funded postdoctoral training grants are associated with a higher level of research productivity (Jacob & Lefgren, 2011). Factors associated with success as a postdoctoral fellow include:

- A strong commitment to research scholarship and dissemination
- Persistence and self-direction
- Openness to critique
- Skills and knowledge appropriate to understand a phenomenon
- Ability to develop new research ideas and secure funding support
- Interpersonal skills required to develop, participate in, and/or lead an interprofessional research team
- Understanding of the principles of ethical conduct of research (Villarruel et al., 2021)

To better assess interest and awareness of postdoctoral education, AACN conducted a survey of doctoral students at 147 schools throughout the nation (AACN, 2021a). A total of 568 PhD students at 53 different schools responded. One hundred forty-one (24.8%) student respondents indicated that they intended to pursue postdoctoral training after graduation, 209 (36.8%) reported that they would not pursue postdoctoral training, and 218 (38.4%) were unsure. In this survey, reasons given for pursuing postdoctoral training included a desire to deepen research and dissemination skills (57.4%), gain experience to be competitive for a position in a research university (29.1%), and gain/deepen educational and policy skills (6.4%). These findings suggest that faculty must provide more direction about postdoctoral study and related opportunities to assist students who are unaware of or unsure about the value of these experiences. In a

companion AACN study (2021c), deans of 107 schools that offer a PhD program reported that less than 50% of their PhD students are pursuing postdoctoral fellowships.

Postdoctoral Fellowships: Core Curricula

Specific elements are crucial for the creation of a solid postdoctoral fellowship. Before the postdoctoral fellowship is established, it is essential that the potential fellow and mentor discuss their respective goals and ensure that they are in alignment (Downs & Morrison, 2011; Sherry et al., 2013; Vance et al., 2020) and that all relevant considerations have been addressed.

Once a fellowship has been established, core curricula will typically consist of several objectives, including mastery of new methodologies in which the fellow may not have full expertise due to lack of adequate exposure, opportunities, or time (Giordano et al., 2021). Fulfilling objectives may entail enhancing competencies in (a) prospective study design; (b) primary data collection; (c) advanced qualitative or quantitative methods; (d) recruitment of human subjects; (e) effective interaction with human subjects; and (f) collaboration with staff to design, implement, and evaluate a research study (Giordano, et al., 2021). Additionally, postdoctoral fellowships often provide multidisciplinary research opportunities, such as leading an interprofessional research and mentoring team, designing consortia model programs, or engaging in policy, industry, government, and health systems research. The fellowship may involve intercollegiate opportunities with other schools/colleges/departments of nursing (Giordano, 2021; Horstman et al., 2021; NASEM, 2021).

Postdoctoral fellowships address a broad area of priorities; some are housed in schools of nursing, and some are located within other disciplines that support the postdoctoral fellow's goals and aspirations. Nurse mentors in PhD programs should support fellows who elect to complete their postdoctoral fellowship outside of a school of nursing or in another department or university. Interdisciplinary research encourages the advancement of the science of nursing as well as advancement in other disciplines.

In a recent survey of doctoral students (AACN, 2021a), 24.8% of those surveyed reported that they planned on pursuing a postdoctoral fellowship following graduation. Of these 141 respondents, 8.5% reported that they did not feel at all prepared in their area to work with a team on research projects, 9.9% reported that they did not feel at all prepared to assume a leadership role in professional nursing, and 6.2% responded that they were not at all prepared to prepare and present their research at professional conferences. These data suggest curricular areas that must be addressed during the course of a postdoctoral fellowship.

The breadth of postdoctoral fellowships has grown tremendously over the past decade. Selected areas of focus for postdoctoral fellowships include:

- Specific diseases
- Data science
- Informatics
- Symptom management
- Specific populations, such as those experiencing social exclusion vulnerable and underserved groups

- Promotion of health and disease prevention in marginalized communities
- Integration of genomics into care and treatment approaches
- Family caregiving and development of technology to promote healthy aging
- Community-based approaches to improving quality of life and care for older adults
- Health leadership research
- Health policy
- Clinician training to drive policy-relevant research and partnerships for improving health and health care

Regardless of the area of focus or major components of the curriculum, all postdoctoral fellowships should respond to the overarching goal of achieving health equity through nursing charted in the *Future of Nursing: 2020-2030* (NASEM, 2021).

Systematic Program Evaluation

Comprehensive assessment (program evaluation) refers to a coordinated and inclusive system of multiple assessments, each of which is valid and reliable for a specific purpose and for the population with which it will be used (U.S. Department of Education, n.d.). Although program evaluation is used as an indicator of quality in research-focused doctoral programs in nursing (AACN, 2010), not all programs undergo institutional accreditation due to variability in program structure (e.g., university graduate department, school of nursing, etc.). Other programs may engage in internal evaluation as a component of the institutional program review process. Regardless of the program structure, a comprehensive, systematic, and ongoing evaluation plan is an essential element of success and must be a component of the research-focused doctoral program from its inception (AACN, 2010). In many cases, university graduate schools dictate the format of the systematic review, the type of experts to be brought in for it, and other protocols. In other instances, the dean of the school, in collaboration with the PhD program coordinator, will invite experts in PhD education in nursing and related fields to conduct the review and author a written report.

Essential components of the evaluation plan include assessment of the extent to which (a) students are supported in their progression through the program to meet competencies set by the faculty, (b) graduates attain the desired outcomes of the program, (c) students meet process and outcomes standards, (d) there is ongoing feedback from a variety of sources, and (e) there is adequate support and an efficient and effective use of resources (AACN, 2010; Broome, et al, 2011; Harrington, et al., 2014; Smaldone & Larson, 2021; Villarruel et al., 2021). One valuable assessment framework for post-doctoral studies can be found in a paper published by Kim et al. (2020) who conducted two studies to assess the content and construct validity and reliability of the Quality of Nursing Doctoral Education (QNDE) instrument. The four domains of the QNDE are program, faculty, resources, and evaluation. Construct validity of the QNDE was verified by confirmatory factor analysis and content validity by the content validity index. The evaluation domain measures whether (a) program evaluation systems adhered to ethical and procedural standards, (b) students and graduates participated in evaluation activities, (c) program evaluation is rigorous, systematic, ongoing, and comprehensive, (d) program evaluation focuses on university and program mission, and (e) utilization of data on student performance is communicated to internal and external constituents (Kim et al., 2020). Thus, the QNDE is a

reliable and valid instrument to assess the quality of the research focused doctoral program in nursing's evaluation plan.

Recommendations:

1. A comprehensive evaluation plan, supported by sufficient resources, must be in place and should include the following:
 - Be systematic, ongoing, comprehensive, and focused on the specific mission, goals, and outcomes of the university and program, which should be assessed on an ongoing, regular basis (e.g., regular, systematic internal/external evaluations of the program within a specified timeframe, such as every 5 years).
 - Assess outcomes of holistic recruitment practices and student progression through the program.
 - Assess the extent to which graduates attain the desired outcomes of the program. For example, graduates can be surveyed immediately prior to graduation, and again at 1, 3, 5, and 10 years after graduation (the 3-year point allows assessment of postdoctoral fellowship and related accomplishments).
 - Include comprehensive process and outcome data to (a) assess the extent to which the program demonstrates indicators of quality and (b) determine patterns, trends, and future directions (e.g., regular surveys of graduates are conducted to assess their current status and productivity).
 - Engage students and graduates in the evaluation process as part of their learning experience (e.g., student feedback is solicited regarding specific courses, mentoring, and general academic milieu).
 - Include data from a variety of internal and external constituencies (e.g., consistent collection of data from faculty, students, and communities of interest).
 - Compare program processes and outcomes with the standards of the parent graduate school/university and research-focused doctoral programs in nursing (e.g., benchmarks).
 - Provide ongoing feedback to program faculty, administrators, and external constituents to promote program improvement.
 - Adhere to ethical and procedural standards of program evaluation (i.e., confidentiality).
2. The evaluation plan should provide comprehensive data to determine patterns and trends and recommend future directions at regular intervals (e.g., faculty members receive annual evaluations and feedback, and there is readily available evidence demonstrating use of data to support continuous program improvement). Likewise, the plan must assess whether the program is supported with adequate human, financial, and institutional resources, and whether the program uses resources efficiently and effectively. The program must be fiscally sound (e.g., a specific budget is allocated to ongoing evaluation of the doctoral program). Evaluation data must include faculty, student, and program outcome data, which will be provided to appropriate audiences, and that there will be demonstrated evidence that the data are used to promote ongoing program improvement.

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