

Innovations in the Education of Health Professionals

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Dramatic and unprecedented changes in health care have altered the health care landscape and have significant implications for health professions education. This issue of the NCMJ explores these changes and highlights innovative models across the health professions that are designed to prepare graduates to practice in the emerging health care system and to deliver high-quality care in a cost-effective manner. These new educational programs—which include training for future doctors, nurses, dentists, pharmacists, and various allied health professionals—aim to prepare providers to meet the needs of North Carolina communities, and they use new educational models to give graduates the competencies they need to practice in health care teams and to contribute in other ways to improved health outcomes for the people of the state.

Health care is in a period of dramatic and unprecedented change. Responding to society's demands for high-quality, lower-cost health care, health systems are consolidating into large integrated networks of institutions and providers. Accountable care organizations are being formed to align goals and resources, to improve efficiency, to focus on the overall health of the population, and to give patients a better experience of care [1]. The greater focus on population health also means that the definition of health care must be broadened beyond traditional clinical settings to include community organizations and new types of health professionals and auxiliary staff.

The rapid changes in health care organization have significant implications for health professions education. Numerous reports have emphasized the need for clinicians who can practice evidence-based medicine, make better use of technology to deliver high-quality care, and work as members of interdisciplinary teams to provide patient-centered care [2]. Reflecting the spirit of the times, the American Medical Association recently announced that it was offering \$11 million to fund innovations in undergraduate medical education, and 82% of the nation's 141 medical schools applied to compete for funding. Ten schools received grants, including the Brody School of Medicine at East Carolina University (ECU). In nursing education, the Institute of Medicine's report *The Future of Nursing: Leading Change, Advancing Health* [3] and work by the Robert Wood Johnson Foundation have catalyzed

programs to increase the number of baccalaureate-degree nurses, to further the development of nurse clinicians, and to offer doctorate of nursing practice (DNP) degrees [4-6].

North Carolina is experiencing the same dramatic changes in the organization of health care as those occurring nationwide. According to President of the North Carolina Hospital Association William Pully, the number of independent hospitals has decreased in the past 2 years from 142 to 24 (personal conversation; August 22, 2013). The North Carolina Medical Society has reported similar consolidation in the ownership of physician practices, including a decline in the number of independent cardiology practices from 196 to 4 between 2009 and mid-2011 [7]. Moreover, almost all of the integrated health systems in North Carolina have adopted either Epic or Cerner electronic health record systems over the past several years, and there has been rapid growth in the numbers of patient-centered medical homes and accountable care organizations.

Demographic changes are amplifying these effects. Over the past 2 decades, North Carolina has been one of the fastest-growing states in the United States, and as the state's population approaches 10 million, North Carolina is now the 10th most populous state in the country [8]. The state's population is also aging at a slightly higher rate than the national average, accelerating the ongoing increase in the number of patients with chronic diseases. Finally, the growth rate of North Carolina's Latino population is one of the highest in the country, and underrepresented minorities now make up approximately 33% of the state's population [9]. North Carolina thus needs to increase its supply of health professionals, to update their skills to practice 21st-century health care, and to improve the diversity of the workforce—all at a time when the model of care is changing dramatically and state investments in education are shrinking.

In response to the dramatic changes occurring in the health care system, changes are also under way in the education of North Carolina's health professionals. This issue

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of the NCMJ explores these changes and highlights how educational programs across various health professions are using innovative models to prepare graduates to practice in a rapidly changing health care system.

Health Professions Education in North Carolina

North Carolina has a rich set of resources for educating its future health care workforce and for retraining the existing workforce to meet the demands of the changing health care system. The state is home to 5 medical schools, 16 baccalaureate-degree nursing programs, 59 associate-degree nursing programs, 3 pharmacy schools, 2 dental schools, and a wide array of allied health degree programs at community colleges, private colleges and universities, and campuses of the University of North Carolina (UNC) system.

The North Carolina Community College System is the largest producer of nursing and allied health graduates in the state. The commentary by Batts in the current issue [10] describes the breadth of health science programs that are offered at the state's 58 community colleges and the contributions these programs have made to the state's health care workforce. In addition to providing an overview of these programs, Batts describes a comprehensive effort to improve the retention of at-risk students, thereby strengthening the capacity of community colleges to prepare graduates for service in the state's health sector.

The academic health centers have experienced substantial student growth in the past 5 years, both through increased enrollment at existing campuses and through the addition of a new osteopathic medical school at Campbell University. The UNC School of Medicine has increased enrollment from 160 students per class to 180 students per class [11], and it has accommodated that growth by adding 2 clinical campuses—one at Carolinas Medical Center in Charlotte and another in Asheville, the latter of which is operating in association with Mission Health and the Mountain Area Health Education Center. ECU Brody School of Medicine has also grown modestly in the past 3 years, from 75 students per class to 80 students per class [12]. Finally, Campbell University admitted its first class of 160 medical students in 2013, and it will be the second largest school in the state once it reaches a full complement of classes in 2016 [13].

The number of advanced practice nurses in North Carolina has grown significantly in the past 25 years, primarily as a result of the large number of degree programs for nurse practitioners (NPs). Eight universities in the state (6 public and 2 private) offer NP graduate programs, and enrollment in these programs has grown steadily in recent years. In addition, most of these programs are in the process of seeking approval (or have already received approval) to convert their master's level NP programs to doctoral programs that would allow students to earn a DNP degree.

For some time, North Carolina has been home to 4 physician assistant (PA) programs—at Duke University, Wake Forest University, Methodist University, and ECU. In the

past 2 years, new PA programs have been established at Campbell University, Elon University, High Point University, and Gardner-Webb University. UNC Chapel Hill also recently announced its intention to establish a PA program in collaboration with the US Army Special Forces Command at Fort Bragg; this program is designed to give Special Forces medics an educational pathway to a PA degree. Finally, there is a new rural-track PA program that is a joint venture between Wake Forest University and the College of Health Sciences at Appalachian State University (ASU).

Several UNC campuses have created new schools of allied health sciences, and others are consolidating allied health degree programs that were historically housed elsewhere, such as in schools of education. As noted by Thomas in his commentary in this issue [14], ASU has opened a new College of Health Sciences with both new and relocated degree programs in the health fields. Similar consolidations are occurring at UNC-Charlotte and UNC-Wilmington. Private universities are also adding new allied health programs, including several new programs in physical therapy, occupational therapy, and other allied health fields. Although there has been a modest expansion of health programs at the campuses of the UNC system and at community colleges, the largest growth over the past decade has been at a number of private colleges and universities. In addition to a new PA program, High Point University is planning a new doctor of pharmacy (PharmD) program. New nursing and allied health degrees are also being planned or are already being offered at a number of other campuses.

The North Carolina Area Health Education Centers (AHEC) program serves as an important resource in developing health professionals for the state. Through its many programs across the state, AHEC promotes opportunities in health professions for underrepresented minorities. AHEC also serves as a primary vehicle for coordinating and supporting the placement of health science students from academic health centers in community sites for part of their clinical training; nearly 2,000 community preceptors across the state give students real-world experiences that complement their on-campus course work and clinical experiences. AHEC's 16 primary care residencies are a major source of family physicians, pediatricians, general internists, obstetricians, and general surgeons. AHEC is also the largest provider of continuing education for health professionals in the state; nearly 200,000 providers attend AHEC-sponsored continuing education programs each year. In addition, AHEC provides site-based education for providers through its practice support services; it currently works with more than 1,100 practices in the state, which have a total of more than 4 million patients [15].

Trends Affecting the Education of Health Professionals

Several trends have implications for the education of health professionals: changes in the organization of health

care, shortages of providers, suboptimal distribution of providers, and changes in the setting of care. More emphasis is also being placed on interprofessional teams, population health improvement, technology-assisted simulation, and distance learning.

Changes in health care organization. Dramatic changes are occurring in the way that health care is organized, and health care institutions and providers are seeking to develop systems that can enhance quality of care while reducing waste and lowering costs [16]. As the development of accountable care organizations and patient-centered medical homes continues, care will increasingly be moved out of the hospital and into primary care and community settings, which will create a need for enhanced care coordination, more effective use of information technology in the clinical setting, and improved care transitions. Health professions education lags behind on many of these changes because of the separation of the educational process from care delivery and because of the silo effects of having separate schools of medicine, nursing, pharmacy, and other health care fields [17]. This separation must be bridged if the health care system of the future is to function effectively.

Shortage and distribution issues. With a rapidly growing and aging population and a larger-than-average cohort of health professionals who are due to retire over the next decade, it seems increasingly likely that North Carolina will experience a shortage of primary care providers, nurses, rehabilitation professionals, and other types of health professionals in the years ahead. North Carolina has been a net importer of health professionals of all types for many years, and it may be that future needs can be met by increasing efforts to recruit and retain providers from other states. However, if we assume that other states are going to redouble their efforts to keep graduates closer to home, then the educational infrastructure in North Carolina will likely need to expand to keep up with the growing demand for providers.

Although there are differing views regarding the severity of the shortage of health professionals in the state, there is broad consensus that North Carolina has serious problems with regard to specialty distribution and to the geographic distribution of both primary care providers and specialists. Of the state's 100 counties, 86 are currently designated by the federal government as whole-county or part-county primary care health professional shortage areas (HPSAs) [18]. Numerous policy and programmatic efforts have been made over the years to address these geographic imbalances, including scholarship and loan repayment programs, targeted recruitment efforts, and educational programs whose location and focus is designed to prepare graduates who are more likely to remain in the state and to practice in underserved communities. AHEC primary care residencies, especially in family medicine, were established to address this issue, and 2011 data show that 53% of AHEC primary care residency graduates remained in the state to practice, compared with only 32% of those who completed a

non-AHEC residency; AHEC residency graduates were also slightly more likely to settle in a nonmetropolitan county [19]. Two articles in this issue [20, 21] describe innovative residency programs that are extensions of the AHEC concept and are designed to prepare family physicians and primary care pediatricians for practice in rural areas or smaller communities.

Previous studies of rural-track family medicine residencies have shown that graduates of such residencies are much more likely to practice in rural areas or other communities in which there is a shortage of providers. A study of residents who trained in safety-net settings showed that higher percentages of graduates of these programs chose to practice at safety-net sites, such as rural health clinics, federally qualified health centers, and critical access hospitals [22, 23]. A sidebar in this issue by Crane and Jones [20] highlights the outcomes of the rural-track family medicine residency program in Hendersonville and shows that more graduates of this program have settled in rural communities and in counties designated as HPSAs. Both the kinds of residents recruited to the program and the curriculum are designed to maximize the likelihood that graduates will eventually practice as family physicians in a rural community, preferably in North Carolina.

The Pediatrics Primary Care Residency Program at the UNC School of Medicine, which is described in this issue by Byerley and Gable [21], was started in 2011 and will graduate its first class in 2014. The program is a joint effort of the UNC Department of Pediatrics and the Pediatric Teaching Program at Cone Health in Greensboro, and it is designed to prepare primary care pediatricians who will practice in North Carolina. An unexpected benefit of the program is that the residents in this program are thus far more racially and ethnically diverse than are residents in the standard pediatrics program at the UNC School of Medicine.

Changes in educational settings. As care increasingly moves out of the hospital and into ambulatory and primary care settings, the education of health professions students is moving as well. North Carolina has a long history of reliance on community preceptors for providing a substantial portion of students' educational experiences, and many of these preceptor arrangements are facilitated by the AHEC infrastructure. For example, nearly 60% of the required clinical experiences of students at the UNC School of Medicine occur at AHEC sites across the state (unpublished data from W.P.N., former vice dean for education, UNC School of Medicine). Although the trend to move training out of the hospital and into the outpatient setting is usually positive for students, it has significant implications for how education is paid for, how faculty and community preceptors are organized and prepared to teach, and the administrative infrastructure required to assure high-quality educational experiences for students.

Several articles in this issue speak to innovations in community-based teaching of students. The commentary by

Chadwick, Wilson, and Anderson [24] provides an overview of the community service learning centers being developed by ECU School of Dental Medicine. ECU is effectively creating mini-campuses at 10 sites across the state, which will have full-time faculty, residents, and students—along with all of the clinical staff needed to operate a teaching dental practice.

Another new program designed to prepare primary care providers for rural practice in the state is a joint venture between the PA program at Wake Forest University and the College of Health Sciences at ASU. As described in this issue by Bushardt, Whitt, and Gregory [25], this program will admit its first class in 2014 and will focus on recruiting students from the mountains. Students will spend most of the first year of the program on the ASU campus in Boone, North Carolina, which will hopefully stimulate their interest in practicing in a rural mountain community.

Health care teams and interprofessional education.

Increasingly, care is being organized around teams of providers as a strategy to improve care and reduce costs. The educational system must therefore adapt and develop new models for interprofessional education in the classroom and in the clinical practice setting. Creating high-quality interprofessional experiences at specific sites—such as hospitals, primary care practices, or health departments—has proven challenging historically, due to differing lengths of rotations, differing curricular objectives for each health professions school, and the need for additional staff and faculty to coordinate such experiences.

In spite of these challenges and the lack of clearly identified funding streams, there are encouraging signs that interprofessional education will receive a much stronger focus in the coming years. The commentary by Baxley and Cunningham [26] speaks to the important role that health professions education can play in systems improvement, including controlling costs and reducing errors. They describe a series of initiatives under way at ECU, both within the Brody School of Medicine and in partnership with the other health science schools on the campus. These initiatives offer a multidimensional, multidisciplinary approach to educating health professionals with the aim of preparing graduates who can function effectively in a changing health care system.

New competencies needed in an era of reform. As dramatic change continues to take place in how health care is organized and delivered, new competencies are required. In addition to a strong foundation of medical knowledge, health professionals also need to have a thorough knowledge of population health, systems of care, quality improvement, and behavioral health. Providers must also learn how to work in teams and how to use health information technology to enhance care and care coordination, and they must have strong communication skills. These competencies are increasingly being included in the requirements of national educational accrediting bodies, but it can be challenging to operationalize them effectively in the didactic and practicum curricula.

Improving the health of populations is a critical societal need. Over the past decade, several new public health training programs have opened at universities in North Carolina, the UNC School of Medicine has added population health as a core competency for all medical students, and a number of DNP programs have begun to include population health in their curricula. The commentary by Sheline and colleagues [27] describes efforts by Duke University School of Medicine to incorporate population health and leadership into its curriculum, both for medical students and for family medicine residents. The Primary Care Leadership Track at Duke, which was launched in 2011, offers a special curriculum in population health, leadership, quality improvement, and related topics to a select group of students who plan to pursue leadership positions in primary care. The curriculum includes both didactic work and community-based experiences, including an 8-month longitudinal integrated clerkship. For family medicine residents, the Population Health Improvement and Leadership curriculum includes topic-specific readings, a journal club, and small-group discussion sessions.

In response to the need for new competencies, a number of schools and programs are changing how the educational process is organized. The commentary by Heck, Latessa, and Beaty [28] describes the longitudinal integrated curriculum offered to third-year medical students at the Asheville campus of the UNC School of Medicine. Launched in 2009, the program's longitudinal integrated clerkships are designed to enhance student participation in the comprehensive care of a group of patients over time. This longitudinal curriculum also gives students a continuous learning relationship with supervising clinician-preceptors, most of whom are practicing clinicians rather than full-time faculty. Heck and colleagues describe the success and growth of the Asheville campus, the early outcomes of the students participating in the longitudinal curriculum, and the high level of satisfaction with the model by patients, students, and faculty [28].

New models of education are also taking advantage of technology and simulation in organizing and delivering content for students and are changing the way faculty and students relate to one another. As described by Roth and colleagues [29], the Educational Renaissance initiative undertaken by the UNC Eshelman School of Pharmacy aims to prepare pharmacists for the role they will play in a health care system that provides high-quality, cost-effective, patient-centered care. Important elements of the new curriculum include delivering key content outside of class through self-directed modules, thus freeing up classroom time for faculty-student interaction and higher forms of thinking; fostering scientific inquiry and innovation to encourage critical thinking and to position students to be change agents; and rethinking the admissions process in order to admit students with the skills needed for the health care system of the future.

Campbell University School of Osteopathic Medicine is using technology-assisted simulation to strengthen the

training of students in order to achieve better outcomes in knowledge, skills, and behavior. As described in the commentary by Maddox and Schmid [30], the school is using simulation as an adjunct to patient care experiences. The school's new simulation center includes objective structured clinical examination (OSCE) suites, for teaching and testing communication skills, physical exam skills, and clinical assessment skills; a virtual hospital, which offers training in a variety of advanced skill areas; and an acute care area, where patient simulators represent critically ill patients in a range of clinical case scenarios.

Nurses are the largest group of health professionals and are major contributors in transforming the way health care is delivered. Thus nursing is being challenged to significantly increase the educational preparation of its workforce. The commentary by Johnson [4] describes an innovative model for increasing the number of registered nurses who are able to complete a baccalaureate degree. By utilizing the strengths of both the community college system and the public university system in North Carolina, the Regionally Increasing Baccalaureate Nurses (RIBN) initiative allows students, particularly those in rural communities, to access an affordable bachelor of science in nursing (BSN) program early in their careers. Students are dually admitted to an associate degree in nursing (ADN) program at a community college and to a BSN program at a partner university, and they are able to complete both the ADN and the BSN degree in 4 years, while also gaining work experience. A sidebar by Dickerson [5] describes how the RIBN initiative is being implemented in a rural community college in Eastern North Carolina.

In an effort to address high-priority workforce issues and to maximize the strengths of existing institutions, universities are collaborating on several new degree initiatives. The commentary by Brandon and colleagues [6] describes a partnership between Duke University School of Nursing and Winston-Salem State University (WSSU) Division of Nursing that aims to increase the representation of ethnic minority nurses in research-focused doctoral programs. This Bridge to the Doctorate program combines a research honors track in WSSU's master of science in nursing (MSN) program with mentored research experiences and enhanced course work, all of which are designed to ensure that participating students are highly competitive for entrance into Duke's biomedical and behavioral science PhD programs in nursing and related disciplines.

Overton [31] describes another collaborative program: a new postprofessional baccalaureate degree program in neurodiagnostics and sleep science (NDSS), which is a joint effort of the Department of Kinesiology in the College of Health and Human Services at UNC-Charlotte and the Departments of Allied Health Sciences and Neurology at the UNC School of Medicine. The NDSS program uses distance-learning technology to give sleep science professionals an opportunity to earn a baccalaureate degree while remaining in their communities.

Looking Forward

Health care in North Carolina is undergoing transformative change, and this issue of the NCMJ highlights educational programs in various professions that are designed to anticipate and to catalyze that change. We need to prepare the next generation of health care professionals to practice in a health care system that must improve quality and patient experiences while lowering costs. As educators, our challenge is both to increase the workforce to keep up with population growth and the explosion of chronic disease, and to change the model of care to help improve the performance of the health care system.

As the articles in this issue illustrate, there is a natural opportunity for innovation in the collaboration between academic centers and community care, and such collaboration has long been a defining characteristic of health professions education in North Carolina. However, we are just at the beginning of the process, and our curricula must continue to evolve. To facilitate progress, we must insist on evaluating outcomes, sharing both successes and failures across communities and professions, and developing the organizational and financial structures necessary to sustain innovative curricula that produce good outcomes.

Finally, it is important to keep in mind that educational reform is broader than the initial phases of health professional training that are the focus of this issue. Health care reform and its associated changes are creating a demand for new kinds of professionals, including quality improvement consultants, primary care case managers, and new kinds of community workers. We must identify and evaluate these new professional roles, and the individuals filling these roles will need training paths, career ladders, and regulation. Even more important is the development of more effective ways of retraining the current health workforce. We do not have time to wait for the current workforce to age out; instead we must train both today's and tomorrow's health care professionals in the competencies required by the changing health care system. **NCMJ**

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