

# Training for Future Generations: Innovations in the Medical Education of Physicians in North Carolina

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North Carolina's five medical schools are responding to the changing health care landscape and continued shortage of rural, primary care physicians through curricular innovations. Early indications suggest that these innovations—involving themes of longitudinal training, immersive experiences, practice transformation, and health equity promotion—will lead to a new physician workforce.

**N**ow more than ever innovation must be a centerpiece for physician training. While we undergo a substantial period of change, our state's communities still experience continued unmet needs, poor health outcomes, maldistribution of services, and skyrocketing costs. We cannot afford to miss the opportunity to improve North Carolina's physician workforce through innovations in medical education.

## The Challenge

The largest challenges to supplying the right quantity, specialty, and distribution of care remain insufficient primary care physicians, geographic maldistribution of accessible services, and the lack of diversity in medical schools and practice to match the population served [1]. With an expanding and aging population in North Carolina, the maldistribution of both specialty and primary care throughout the state remains a primary driver limiting access. Health Professional Shortage Areas (HPSAs) persist in all regions of the state with 85 of the 100 counties having designations as medical care shortage areas (see Figure 1). We have one of the oldest physician workforces in the country, with 26.6% of our physicians exceeding 60 years of age [1]. The crisis reveals itself most disproportionately in areas where marginalized populations and limited access already exist. Rural areas have poorer health outcomes with limited resources and higher social and economic restraints [2]. Given these demographic challenges and the projected increase in rural workforce strains, even worse health outcomes would be expected for rural communities in upcoming years. Medical education offers the opportunity to respond through training the right students in the skills needed to thrive in these settings.

Annually, 645 students enter a medical school in North

Carolina. Despite an average of 39% remaining in the state to practice as clinicians (see Figure 2), less are in primary care (see Figure 3) and fewer than 3% of North Carolina-trained students choose to initially practice primary care in an underserved area [3]. Furthermore, of 436 North Carolina medical school graduates from the class of 2012, only four were in practice in primary care in rural North Carolina five years after graduation [4].

## The Role of Medical Education in North Carolina

If one of our goals as educators is to train physicians who will influence the current disparities in health outcomes, we are not succeeding. Medical education continues to rely on traditional methods and static curricula in a rapidly advancing health care landscape [5]. Physician responsibilities now include delivering high-quality care that translates to improved health outcomes and lowering the cost of care while also maintaining personal well-being [6]. Therefore, a different type of training must prepare physicians for this future.

While ensuring a well-trained physician workforce is multifactorial, medical education crucially guides the trajectory of individuals and the overall workforce impact. With five institutions dedicated to medical education throughout the state, we are positioned to make a difference. United by a collective desire to train for the future needs of the state and produce healthier communities, each institution is actively contributing to innovations within their curricula.

## Meaningful Longitudinal Opportunities

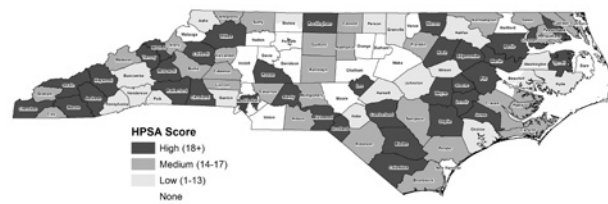
Across the state, longitudinal curricula have provided opportunities to re-invigorate creativity when determining the location, schedule, and content of clinical experiences. Unlike traditional, rotational curricula, medical students in Longitudinal Integrated Clerkships (LIC) provide compre-

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**FIGURE 1.**  
**North Carolina Primary Care Health Professional Shortage**  
**Area Scores**



Source: HRSA, Bureau of Health Workforce (BHW), division of Policy and Shortage Designation (access 020819); Map created by Joan Colburn, MLIS, UNC Health Sciences at MAHEC (021019).

hensive and continual care for patients over time. The learning relationships that students experience across disciplines during their clinical years occur at the level of patients, communities, and teachers. In addition to strong academic outcomes in LICs, students who complete them also are more likely to consider primary care and rural careers [7]. By pairing learners with the comprehensive care of a group of patients, clinical skills are learned in the context of social determinants of health, disease, and wellness [8]. Students not only learn experientially, but they more directly participate in enhancing care over time.

North Carolina has a decade-long history with LICs, starting with the development of the Asheville campus through the University of North Carolina School of Medicine in 2009. Charlotte and Asheville have LIC branch campuses and the Duke University School of Medicine also has an LIC within its Primary Care Leadership Track. Duke and the University of North Carolina at Chapel Hill (UNC) hosted the annual CLIC (Consortium for Longitudinal Integrated Clerkships) international conference for longitudinal education in the fall of 2015. Faculty in these programs collaborated with each other and with leaders across the country and beyond to lead enhancements to this innovative educational model. Local LIC results have reinforced national trends. At the Asheville campus, early outcomes are promising with 18 of 21 (86%) of their practicing graduates in primary care and 8 of 21 (38%) practicing primary care in rural North Carolina.

Additionally, the longitudinal aspects of curricula emphasize the skills that will develop graduates into future leaders. The Duke Primary Leadership Track capitalizes on camaraderie, experiential community participation, and complementary didactic leadership training. Ten students are selected annually, at admission to the medical school, to participate. The curriculum spans all four years and includes organizing service projects in the community, working with a community agency on health issues weekly during the LIC, a shared experience in Primary Care Seminars, and the implementation of a population health improvement project [9]. Outcomes to date include increasing primary care residency placement in a traditionally specialty-driven

environment, plus the program's early focus on social determinants of health raises awareness across medical professionals [10].

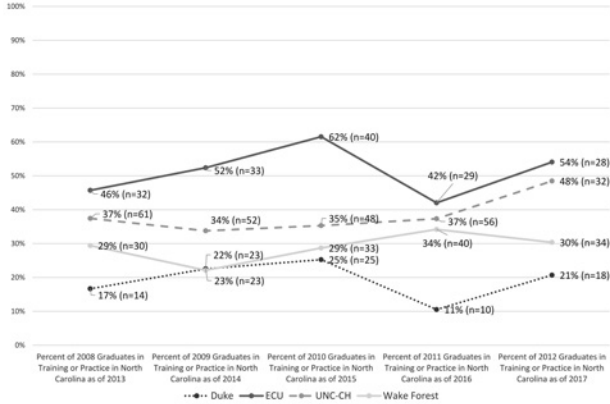
Another innovative program that takes full advantage of the efficiencies and intent of longitudinal experiences is the FIRST (Fully Integrated Readiness for Service) program at UNC. In this three-year MD curriculum, students have longitudinal family medicine clinics throughout their medical school curriculum, automatically match in a North Carolina Family Medicine residency program, and receive loan repayment, streamlining the process for practicing in rural or underserved areas in the state. This program makes it easier for medical students to choose primary care by shortening time to practice, providing match security, and reducing student debt. The program started in 2015 and has expanded from Chapel Hill to include the Asheville and Charlotte campuses.

### Immersive Experiences in Areas of Need

Medical education has traditionally occurred in urban and academic settings. These locations offer substantial resources to train students surrounded by academic expertise but may inherently amplify ongoing disparities in physician distribution. With higher quantities of learners, additional learning environments present an opening for training in less urban areas. These decentralized immersive experiences provide the opportunity not only to train in a different location but attain a different skill set rooted in placed-based education. The context of a patient's life, including the social, environmental, cultural, and physical aspects of where they were born, grow up, and function are best displayed when medical professionals are able to share in some of the experience by living in a similar setting [11]. Finally, training occurring in rural environments increases the likelihood of eventually practicing in areas of higher need [12].

At Campbell University School of Osteopathic Medicine, educators leverage the strengths and needs of surrounding communities at six regional campuses. With an emphasis on both primary care and rural, underserved care in the curriculum, all students have exposure to rural clinics and critical access hospitals [13]. Recognizing some of the challenges posed by training away from larger academic hospitals, Campbell initiated the Primary Care Champions Fellowship program to train practicing clinicians to be leaders in practice innovation and community-based education. The specific goals of the program are to directly improve educational capacity by developing teachers, enhance a network of partnerships, and ultimately improve recruitment and retention to rural areas. The initial graduating classes demonstrate higher primary care residency placements, which aligns with the school's goal to care for underserved populations [13]. Other institutions have similarly seen opportunities for immersion and have dispersed clinical education to other areas of the state.

**FIGURE 2.**  
Percent of NC Medical School Graduates in Training or Practice in North Carolina 5 Years After Graduating



Source: Cecil G. Sheps Center for Health Services Research at UNC.

### Leading Health Transformation

The dynamically changing health environment demands a re-envisioned workforce. As health systems dramatically shift the manner in which care is delivered, physician leaders require new competencies [14]. Lifelong learning, change management, and the ability to teach quality improvement become required skills of training.

In the last five years, ECU's Brody School of Medicine has developed tracks of distinction to directly address these needs within the physician workforce. The Leaders in Innovative Care Scholars program (LINC) aims to give future physicians greater clinical exposure to a person-centered career that encompasses leadership, change management skills, and interprofessional practice [15]. The program enrolls up to 10 medical students per year to engage in longitudinally focused learning on patient safety, quality improvement, population health, and team-based care. The program curriculum builds upon an early immersive summer program, continual didactic reinforcement of principles, and mentorship to produce a capstone project. The more than 35 clinical quality improvement projects throughout the ECU physicians' network and Vidant Health are providing key skills to program participants, while directly enhancing care delivery.

### Promoting Health Equity through Education

By 2060, it is estimated that underrepresented groups will comprise 57% of the US population [16]. Ongoing disparities in health outcomes amongst minorities pose an increasing threat to promoting healthy communities. Recognizing the challenges of meeting the diverse workforce needs of our state requires addressing health disparities and social determinants of health [17]. The necessary knowledge, skills, and attitudes continue to evolve as our systems change toward more interprofessional teams functioning

within communities. In order to have these skills, early exposure during medical education and continual reinforcement are key.

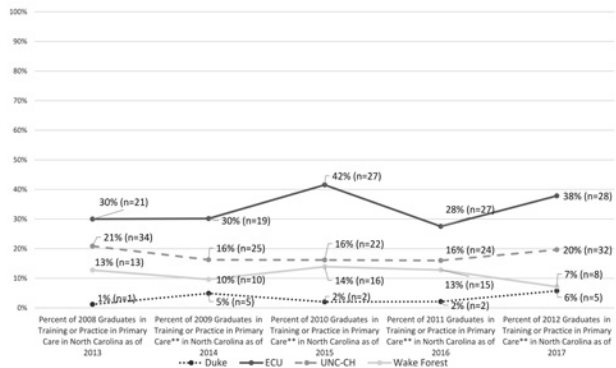
The Health Equity Curriculum developed at Wake Forest School of Medicine exemplifies the importance of collaboration at both the academic and community level. Students in their third year of training directly explore how health disparities impact the lives of patients in vulnerable communities. The curriculum was developed collaboratively with the UNC School of Medicine and encompasses 10 structured modules focused on the social determinants of health. The format ensures that didactic learning is complemented with experiential activities and an evaluative component. Collaboration and community engagement are essential to the learning experience and have promoted enhanced partnerships. Although early in its implementation, students have already demonstrated an improved understanding of how to effectively engage with community organizations and navigate resources for marginalized patients (Nancy M. Denizard-Thompson, MD, email communication, February 3, 2019).

ECU similarly supports experiential health education through broad cultural experiences rooted in service. Medical students work domestically and internationally with medically underserved, marginalized, and rural populations during their medical school career [18]. With 30 current scholars, over 2,000 hours of service have been completed. Community service projects are focused in Eastern North Carolina but also include individually designed initiatives implemented in 10 different countries [18].

### Next Steps

North Carolina's five medical schools have already initiated innovations that should translate to better-trained learners, but it is still early to understand their full impact. When measuring the impact, we must recognize that physi-

**FIGURE 3.**  
Percent of NC Medical School Graduates in Training or Practice in Primary Care in North Carolina 5 Years After Graduating



Source: Cecil G. Sheps Center for Health Services Research at UNC.

cian choices in practice area, setting, and specialty are multifactorial and go well beyond their experiences in medical school training.

The foundational work by the academic institutions throughout the state must serve as a catalyst for further transformation that equates to better health for our communities. Rooted in all of these innovations is the desire to place students in needy communities where they hope to practice. While some of the most dramatic forms of innovation come from groundbreaking technology and advancements that change the paradigm overnight, in the case of medical education, the opportunity to transform comes through a deliberate process of challenging one another to build upon successes. As we look at the cumulative efforts, it is already evident that collaborative efforts across medical schools and other pipeline programs will produce expedient results. By leaning on one another's ingenuity, we have a path forward that is both informed by the traditional approaches of our past and inspired by our community.

Even though we should continually seek to innovate, it is likely that the path forward is not wanting for innovative breakthroughs, but reliant on the strength to further implement together what we already know to be right (see Table 1). NCMJ

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**TABLE 1.**

### Recommendations for Educating Future North Carolina Physicians

**Recruit the right students**—from diverse, rural, and underserved backgrounds. Recruit people with the genuine desire to do the work.

**Teach them the right content and skills**—to be able to provide meaningful and high-quality care and challenge them to help solve our dire health problems.

**Immerse them in the right settings**—so they learn the value of serving underserved populations and can visualize themselves in practice.

**Train them to deliver care with an interdisciplinary approach**—so that all learners both lead and follow, to share in our strengths and amplify our impact.

**Embrace technology that enhances care delivery**—developing ultrasound, telehealth, and telelearning, and anticipating artificial intelligence use.

**Translate education to improved clinical outcomes**—by showcasing the models where learning sites provide exemplary care for communities in need.

Source. UNC Health Sciences at MAHEC, Asheville, North Carolina

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