a loss of status and income as well as disdain from peers. Although leadership is making its way into clinical training, the workforce of the near future is already practicing. How can senior leaders enable and encourage front-line leadership among today's clinicians?

Surveys suggest that clinicians want a greater leadership role but feel unprepared[3] or disempowered.[4] Institutional leaders can encourage and support unit-level and front-line clinical leadership by framing the organizational purpose as value creation, giving local leaders the authority to make microsystem changes, tolerating the failure of some new delivery ideas, and creating professional pathways for clinicians who want to make leadership a career option. But data remain the single most important motivator and tool for a clinical leader. High-quality, comparative, unit-level and individual-level clinical and financial data[5] can both create the need for clinician leadership and be the starting point for the four tasks. Other critical resources include protected time, training and mentorship (provided by many academic centers either in house or through collaboration with professional societies and business schools), and clear organizational expectations of clinician performance.

CEOs may resist investing in developing clinical leadership and decentralizing control or may believe the process will be too slow to address current pressures. But the need is evident, the tasks are clear, and the skills are at hand — data orientation, the relentless pursuit of excellence, and a habit of inquiry are all second nature to clinicians. Ultimately, investment in such leaders will be essential to achieving the goals of health care reform.

Disclosure forms provided by the author are available with the full text of this article at NEJM.org.

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1. Curry LA, Spatz E, Cherlin E, et al. What distinguishes top-performing hospitals in acute myocardial infarction mortality rates? A qualitative study. Ann Intern Med 2011;154:384-90.
2. Beckman HB. Lost in translation: physicians' struggle with cost-reduction programs. Ann Intern Med 2011;154:430-3.
3. UnitedHealth Center for Health Reform and Modernization. Farewell to fee-for-service? A "real world" strategy for health care payment reform. Working paper no. 8. December 2012 (http://www.unitedhealthgroup.com/~/media/UHG/PDF/2012/UNH-Working-Paper-8.ashx).
4. Gilbert A, Hockey P, Vaithianathan R, Curzen N, Lees P. Perceptions of junior doctors in the NHS about their training: results of a regional questionnaire. BMJ Qual Saf 2012;21:234-8.
5. Lee TH. Turning doctors into leaders. Harvard Business Review. April 2010:50-8.

DOI: 10.1056/NEJMp1301814

The Nursing Workforce in an Era of Health Care Reform

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The foundation of the health care delivery system is its workforce, including the 2.8 million registered nurses (RNs) who provide health care services in countless settings. The importance of RNs is expected to increase in the coming decades, as new models of care delivery, global payment, and a greater emphasis on prevention are embraced. These and other changes associated with health care reform will require the provision of holistic care, greater care coordination, greater adherence to protocols, and improved management of chronic disease — roles that are inherently aligned with the nursing model of care.

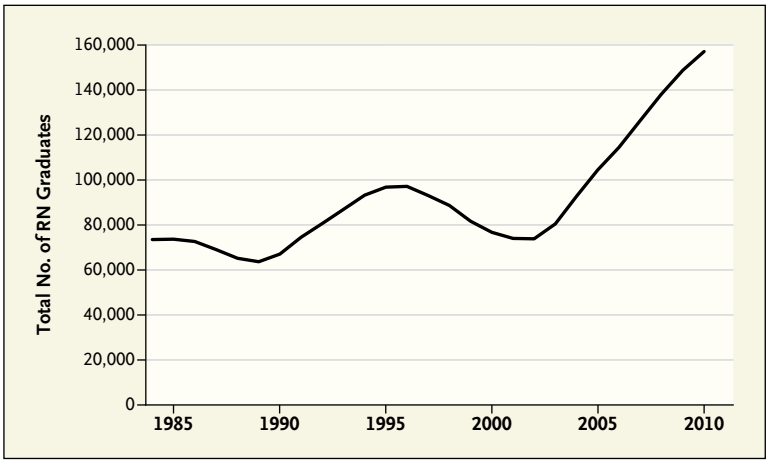
Will the nursing workforce be ready to respond to these challenges? Just 10 years ago, the answer would have been far from clear. The number of new entrants into nursing had fallen sharply in the 1990s because the generation of women born after the baby boom was not only smaller in size but had greatly expanded career opportunities in other professions. With fewer people becoming nurses, projections from a decade ago indicated that the size of the workforce would begin declining by the middle of the current decade, resulting in shortages of 500,000 to 1 million RNs by 2020. At the time, few observers thought that interest in nursing would ever increase to the level required to avert the looming shortage.

Yet in a surprising turnaround, merely a decade later, the shortages that were projected to be under way by now have not materialized. In fact, reports indicate that in some areas of the country nursing graduates are experiencing growing delays in obtaining employment.[1] Long-term forecasts now predict growth in the absolute number of RNs and strong per capita growth under certain scenarios.[2] This turnaround is the direct result of unprecedented levels of entry into nursing over the past decade (see graph). After fluctuating at about 80,000 for

two decades, the number of new RN graduates more than doubled from 74,000 in 2002 to 157,000 in 2010. If this surge in new RN graduates continues, it will go a long way toward reducing shortages that were projected for 2020 and beyond.

Two broad factors seem to have contributed to this surge in new RN graduates. First, there has been an increase in interest in nursing as a career. Despite expanding enrollments, nursing programs are turning away large numbers of qualified applicants.[1] Evidence of this growing interest first appeared midway through the 2000s, with a sharp increase in the number of people in their 30s taking advantage of 2-year associate's degrees to enter nursing.[2] More recently, the number of people in their 20s entering nursing has increased sharply, particularly in baccalaureate degree programs.[2] Nearly 5% of first-year college students in 2010 reported that nursing was their probable career choice — the highest level of interest since data were first collected in the 1960s.[3]

This remarkable growth in interest appears to have arisen from a confluence of factors. There was an increase in media attention to the nursing shortage, including a national campaign launched in 2002 by Johnson & Johnson, which continues to inform the country about the importance of the nursing profession, promote a positive image of that profession, and entice a new generation of men and women into nursing careers. This effort has been complemented by the development of health workforce centers in nearly three dozen states that have similarly promoted the nursing profession. Finally, the sluggish jobs recovery following the recession, coupled with continued growth in health care spending and jobs, has increased the relative attractiveness of nursing.



Total Number of Associate and Baccalaureate Degree RN Graduates, 1985–2010.
Data are authors' calculations, based on annual completions data from the Integrated Postsecondary Education Data System (http://nces.ed.gov/ipeds).

A second contributor to the surge of new RN graduates was the unanticipated dynamism of nursing education programs. According to our research funded by the Gordon and Betty Moore Foundation, using data from the Integrated Postsecondary Education Data System (http://nces.ed.gov/ipeds), the growth in new RN degrees since 2002 resulted from both the expansion of existing nursing programs and the opening of new programs; the total number of programs grew from about 1800 in 2002 to more than 2600 in 2010. Growth has occurred in private and public institutions, 2-year and 4-year universities, associate's and bachelor's degree programs, and especially in private for-profit schools (which grew from fewer than 20 programs granting fewer than 1000 degrees in 2002 to more than 200 programs granting more than 12,000 degrees in 2010). In addition, nursing education became increasingly innovative in meeting the growth in demand by developing new programs designed to appeal to both younger and older students.

Although the combination of growing interest in nursing careers and the dynamic response of the educational sector has improved long-term workforce projections, the future is by no means secure. Four uncertainties threaten the nursing workforce.

First, if demand for nurses continues to expand at historical rates through 2030, entry into nursing must continue to grow over the next two decades at a rate of 20% per decade in order to meet that demand. This projection highlights the need for ongoing reinforcement of the message being sent by the media and others that nursing continues to be an excellent career choice. The Affordable Care Act (ACA) will provide some support, with expanded grant programs for training and education of RNs and advanced-practice nurses.

A second uncertainty involves the uneven distribution of the

workforce. The per capita RN supply in the Western and Northeast regions of the United States has fallen behind that in the rest of the country because these regions are home to a greater number of older RNs who are retiring. Per capita RN supply is expected to decrease further in these regions over the next decade, whereas the per capita supply is projected to grow at double-digit rates in the Midwest and the South.[4]

A third uncertainty is the lingering effect of the recession. The slow jobs recovery swelled the ranks of the nursing workforce, as many RNs chose to work additional hours or delay retirement to bolster their household's economic security.[5] This temporary swelling of the workforce is expected to subside as the jobs recovery accelerates. The danger is that in the meantime, employers, educators, and policymakers will reduce their investments in nursing when they observe that there's a healthy workforce, and people who might otherwise be interested in nursing may choose other career paths because there are fewer available jobs or temporarily depressed wages.

A final uncertainty concerns the demand for RNs. The ACA may stimulate additional demand for RNs, with its increase in insurance coverage, expansion of nurse-managed health centers, and reform of the care delivery system, in which payment is to be linked to quality. However, it is unclear to what extent RNs, nurse practitioners, or other advanced-practice nurses will take the lead in these new models of care delivery and preventive care approaches championed by the ACA. It is also unclear whether RNs will be prepared with the skills needed for emerging roles in leading and managing teams, implementing patient-centered care, and adapting to other inevitable changes in RN responsibilities.

Despite the projections of severe shortages made just 10 years ago, a combination of policy efforts, a responsive education system, private-sector initiatives, and the effects of the recession has led to unexpected growth in the nursing workforce. If this growth continues, the nursing workforce will be better able to respond to the health care needs of Americans, including retiring baby boomers, and to the many challenges and consequences of the implementation of health care reform. This outcome is not certain, however, and is less likely if the surge in younger people entering nursing stalls, the workforce continues to grow unevenly across the country, or the nursing workforce is ill prepared to meet the challenges of the fast-changing health care delivery system.

Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

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1. Auerbach DI, Buerhaus PI, Staiger DO. Registered nurse supply grows faster than projected amid surge in new entrants ages 23–26. Health Aff (Millwood) 2011;30:2286-92.
2. American Association of Colleges of Nursing. AACN releases preliminary data from 2012 annual survey (http://www.aacn.nche.edu/news/articles/2012/enrolldata).
3. Pryor JH, Hurtado S, DeAngelo L, Palucki Blake L, Tran S. The American freshman: national norms fall 2010. Los Angeles: UCLA Higher Education Research Institute, 2010.
4. Buerhaus PI, Auerbach DI, Staiger DO, Muench U. Projections of the long-term growth of the registered nurse workforce: a regional analysis. Nurs Econ 2013;31:13-7.
5. Staiger DO, Auerbach DI, Buerhaus PI. Registered nurse labor supply and the recession — are we in a bubble? N Engl J Med 2012;366:1463-5.

DOI: 10.1056/NEJMp1301694

Complications of Mechanical Ventilation — The CDC's New Surveillance Paradigm

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Earlier this year, the Centers for Disease Control and Prevention (CDC) rolled out new surveillance definitions for patients receiving mechanical ventilation that promise to dramatically improve hospitals' capacity to track clinically significant complications in this population.[1] The new definitions replace the CDC's previous definition of ventilator-associated pneumonia (VAP) and are designed to achieve two primary goals: to broaden the focus of surveillance beyond pneumonia to encompass other common complications of ventilator care, and to make surveillance as objective as possible in order to facilitate automation, improve comparability, and minimize gaming.