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The *North Carolina Medical Journal* is published in January/February, March/April, May/June, July/August, September/October, and November/December. Periodicals postage paid at Morrisville, NC 27560 and at additional mailing offices. **POSTMASTER:** Send address changes to the *North Carolina Medical Journal*, 630 Davis Drive, Suite 100, Morrisville, NC 27560. **Canada Agreement Number:** PM40063731. Return undeliverable Canadian addresses to: Station A, PO Box 54, Windsor, ON N9A 6J5, e-mail: returnsil@imex.pb.com.

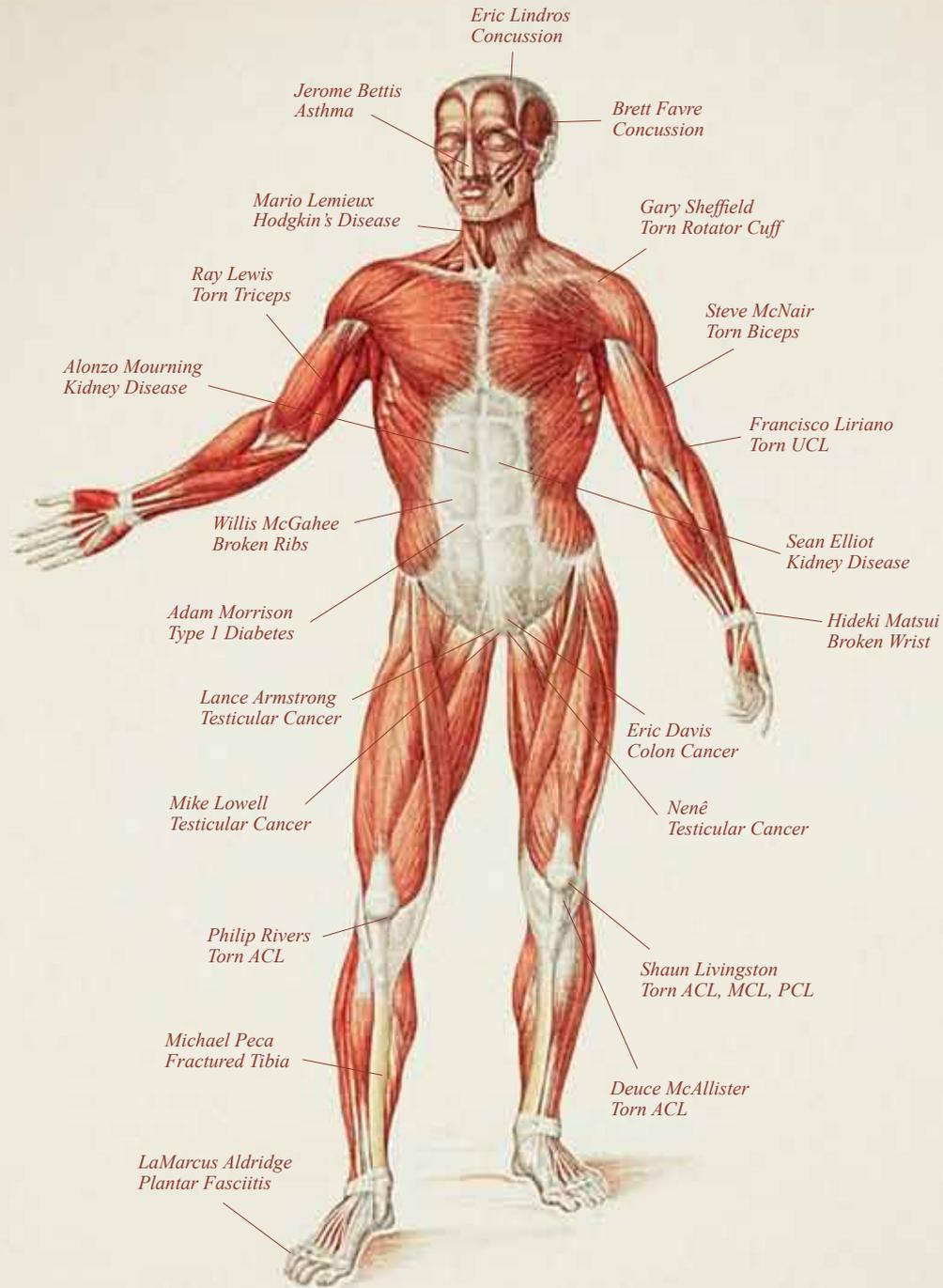
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Members of these organizations receive the *North Carolina Medical Journal* as part of their membership fees. Additional major funding support comes from **The Duke Endowment**.

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Phone: 919.401.6599; Fax: 919.401.6899; e-mail: ncmedj@nciom.org; <http://www.ncmedicaljournal.com>

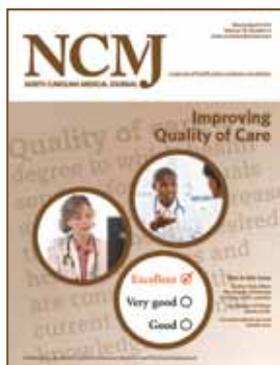
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Articles

- 105** Correlates of Tanning Facility Densities in North Carolina
Julianne Treme, Samuel K. Allen
- 111** Analyzing State-Based Silver Alert Programs: The Case of North Carolina
Takashi Yamashita, Dawn C. Carr, J. Scott Brown

Policy Forum

Improving Quality of Care

INTRODUCTION

- 118** Spotlight on Quality
Peter J. Morris

ISSUE BRIEF

- 119** Transforming Quality of Care in North Carolina
Warren Newton, Don Bradley

INVITED COMMENTARIES AND SIDEBARS

- 126** The NC Quality Center: Empowering Excellence in Health Care
Carol Koebler, Joanne Campione
- 129** Project to Prevent Central Line-Associated Bloodstream Infections in the Medical Intensive Care Unit [sidebar]
David Avalos, Deirdre Lemon
- 131** Eliminating Early Elective Deliveries at New Hanover Regional Medical Center [sidebar]
Lydia N. Wright, Barbara Buechler, Hannah Haigh Brownlow
- 133** Lean Health Care
Henry C. Hawthorne III, David J. Masterson
- 134** Lean Events at Columbus Regional Healthcare System and Sampson Regional Medical Center [sidebar]
Henry C. Hawthorne III, David J. Masterson
- 137** Quality Improvement in North Carolina's Public Health Departments
Greg D. Randolph, Jim Bruckner, Claire H. See
- 138** Case Study: Quality Improvement in the Macon County Health Department [sidebar]
Jim Bruckner, Claire H. See, Greg D. Randolph
- 142** Improving the Quality of Care for Medicaid Patients with Chronic Diseases: Community Care of North Carolina
C. Annette DuBard

- 143** Collaborative Quality Improvement Efforts Yield Success for Asthma Patients [sidebar]
Kelly B. Garrison, Caroline T. Brown
- 148** The Role of the Quality Improvement Organization
Jill McArdle
- 151** Quality Improvement in the Age of Electronic Health Records: The North Carolina Improving Performance in Practice Program
Sonali Batish
- 155** The Perils of Quality Improvement Activities: A Physician's Perspective
W. James Stackhouse
- 159** The Role of Health Plans in Improving Quality of Care
Dan Barco, Peter Chauncey

DEPARTMENTS

- 103** Tar Heel Footprints in Health Care
*Evan Richardson, CNM
Anne M. Williams*
- 163** Running the Numbers
Regional Variation in Quality of Health Care Across North Carolina's 100 Counties
Mark Holmes
- 168** Spotlight on the Safety Net
Rural Health Group
Libby Betts
- 170** Philanthropy Profile
Health Care Quality and Patient Safety: Funding a Movement
Mary L. Piepenbring

Correspondence

- 172** Pretty But Imperfect
James Stewart Campbell
- 173** An Alternative to Emergency Department Care for Dental Pain and Infection
Douglas F. DeGroot
- 174** North Carolina's Oral Health Strategies
Kathy Higgins

Errata

102

Reader Services

- 175** Classified Advertisements
- 176** Advertiser Index

About the cover

According to the Institute of Medicine of the National Academies, "quality of care is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge."

Harris-Wehling J. Defining quality of care. In: Lohr KN, ed. Medicare: A Strategy for Quality Assurance. Washington, DC: National Academy Press, 1990: 116-139.

Published by the North Carolina Institute of Medicine and The Duke Endowment

ERRATA

NCMJ 73(5), published in September/October 2012, contained an error in the article "The State of Racial/Ethnic Diversity in North Carolina's Health Workforce" by Victoria McGee and Erin Fraher. The title for Figure 1 (on page 339) should read "Racial/Ethnic Diversity of North Carolina's Population Versus Selected Health Professions, 2009."

NCMJ 74(suppl), published in March 2013, contained an

error in the article "Community-Based Services: Stopgap for Runaway Medicaid Costs" by Kim Dawkins Berry and Gayla S. Woody (pages S21-S24). The value of Medicaid services for those 60 years of age or older during State Fiscal Year 2010-2011 was \$2.7 billion, not \$3.7 billion.

The corrected articles are available on the NCMJ Web site at: <http://www.ncmedicaljournal.com/archives>.

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Tar Heel Footprints in Health Care

*A periodic feature that recognizes individuals whose efforts—
often unsung—enhance the health of North Carolinians*

Evan Richardson, CNM



Evan Richardson, CNM, works as a senior practice consultant for the Center for Quality Improvement of the Mountain Area Health Education Center (MAHEC). Richardson's background as a midwife and practice manager gives her a combination of clinical and administrative experience that strengthens her ability to coach and support practices as they implement electronic health record (EHR) systems, work to meet meaningful use standards, improve quality of care, and strive for National Committee for Quality Assurance recognition as a patient-centered medical home.

Richardson received both her BSN and MSN from Columbia University, with a clinical focus in midwifery. After practicing midwifery for about 10 years, Richardson became the practice manager and co-owner of her husband's primary care practice in Asheville. In 2005, while learning the ins and outs of running a small medical practice, Richardson and her husband jumped at an exciting opportunity to be the first practice in Western North Carolina to enroll in the Improving Performance in Practice (IPIP) national pilot program, which puts quality coaches in primary care practices to help providers with quality improvement (QI) work related to diabetes and asthma. Excited about redesigning the way they were providing care, Richardson and her husband took advantage of the relative lack of bureaucracy in their small practice to get their staff involved and to rapidly implement QI changes.

Through the IPIP program, Richardson was invited to present at 2 national level conferences—the National IPIP Conference in 2006 and the Institute for Healthcare Improvement's Annual Office Practice Summit in 2007. These experiences exposed Richardson to a larger community of providers and practices engaged in health care innovation and sparked her strong interest in QI work. Several years

later, Richardson joined the expanding MAHEC consulting team to work with practices on QI projects and EHR implementation.

Richardson and her colleagues at MAHEC's Center for Quality Improvement serve over 100 practices in 16 counties in Western North Carolina. The team of consultants works with practices to implement 4 key drivers of change, including effective use of EHR systems, protocols for implementing evidence-based guidelines, population management, and a team-based approach to care. The consultants can incorporate condition-specific tools and resources depending on the practice's goals.

Richardson's work as a QI consultant has been highly praised. Ann Lefebvre, MSW, CPHQ, associate director of the North Carolina Area Health Education Centers Program, says, "Evan has a deep passion for improving the quality of health care and is committed to helping the practices in her region do their very best in caring for their patients. Her compassion and desire to assist the primary care practices in her region are an inspiration to others."

Richardson's passion for QI and her drive to empower the practices in her region were apparent as she discussed her work. Throughout her interactions with practices, she maintains the core message that the medical community can make a difference in health care and that medical practices do not have to be victims of the changes imposed by the health care system. With the rapid rate of change and deluge of new information facing medical practices, Richardson's experience both as a provider and practice manager strengthens her relationships with the practices in her region and gives her valuable insight into their needs. **NCMJ**

Electronically published April 16, 2013.

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0029-2559/2013/74220

*"I'm not afraid to be the pale girl in the bathing suit.
It doesn't bother me anymore."*

*"I have friends who use
tanning beds or lie out in the sun.*

I tell them about Jaime.

*Jaime was in her early 20s
when she was diagnosed with
melanoma, and she died right
before she turned 30.*

*One person dies from
melanoma every hour.*

*After Jaime's death, I completely
walked away from tanning.*

*People think it's safe. But
I know it's not. You could die-
just like Jaime did."*

-Amanda Asplin



Learn more about Jaime's skin cancer story at
www.aad.org/PSA

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Correlates of Tanning Facility Densities in North Carolina

Julianne Treme, Samuel K. Allen

BACKGROUND The indoor tanning industry is currently receiving increased attention from policymakers, but this industry has not been well researched. Our study examines economic, demographic, and climate-related variables to better understand variations among North Carolina counties in terms of the number of tanning beds and booths per capita during a recent 3-year period.

METHODS This study used regression analysis to estimate the magnitude and statistical significance of correlations between the density of tanning beds and other relevant variables from 2007 through 2009.

RESULTS The number of indoor tanning beds per capita in a county is positively correlated with the county's unemployment rate and with the proportion of the county's population that consists of white females 18-49 years of age; there is also a weakly positive correlation with the number of days per year of hot weather in the county. All else being equal, tanning beds are marginally more common in counties with higher rates of unemployment, with a greater number of days when the temperature exceeds 90 degrees Fahrenheit, and with residents who are more likely to engage in risky behaviors (as measured by the gonorrhea infection rate and the percentage of the population who smoke cigarettes).

LIMITATIONS The data span a 3-year period (2007-2009) during which economic conditions were depressed.

CONCLUSION Economic, demographic, geographic, and climate-related factors should be considered when policies that affect the tanning industry in North Carolina are being developed and implemented.

The indoor tanning industry has been under intense scrutiny in recent years. Congress included a provision in the Patient Protection and Affordable Care Act of 2010 that introduced a 10% excise tax on fees for indoor tanning services beginning July 1, 2010 [1]. The tax applies to services provided using electronic products designed for tanning that contain 1 or more ultraviolet lamps operating at wavelengths between 200 nm and 400 nm [2]. The tanning industry was targeted for this tax because of the well-documented link between indoor tanning and skin cancer [3-6].

More than 1 million Americans tan indoors every day [7], 70% of whom are white females between 16 years and 29 years of age [5]. According to the indoor tanning industry, individuals between the ages of 16 years and 19 years comprise one of the fastest-growing groups of indoor tanners [8].

As of July 2012, North Carolina was 1 of 33 states that regulated the use of tanning facilities by minors. In North Carolina, adolescents under the age of 13 years are banned from tanning indoors unless they have a prescription from a physician, and adolescents under 18 years of age must have parental permission to tan indoors. California and Vermont, which have the most stringent age-based bans, prohibit indoor tanning by anyone under the age of 18 years. North Carolina introduced legislation in fiscal year 2011-2012 that would have prohibited individuals under the age of 18 years from using a tanning bed without a prescription from a physician, and similar legislation was also introduced in January of 2013. State legislation was proposed in 2009 that would have increased the age below which use of tanning equipment would require a prescription (from 13 years to 15 years), but this legislation failed to pass [9, 10].

To protect the general population from melanoma, the International Agency for Research on Cancer recently recommended that policymakers prohibit minors from using indoor tanning facilities [10]. However, Palmer and colleagues [11] found no significant relationship between a state's indoor tanning youth-access laws and whether adolescents in that state were using indoor tanning services; the authors concluded that current youth tanning laws were not working. Research has also shown that tanning salons fail to follow US Food and Drug Administration (FDA) recommendations regarding tanning frequency. The FDA recommends that indoor tanning be limited to no more than 3 visits during a consumer's first week of using a tanning facility. Despite this recommendation, a 2009 study by Pichon and colleagues [12] found that 71% of the tanning salons surveyed permitted first-time customers to tan daily. A smaller survey described in a 2012 congressional report included similar findings; this survey also noted that some salons did not even require 24-hour intervals between tanning sessions, according to salon employees [13].

Among young adults, tanned skin is associated with health, vitality, and beauty [14]. However, people with fair skin are at the greatest risk of developing skin cancer, so tanning among this group is dangerous [15]. Indoor tan-

Electronically published April 16, 2013.

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N C Med J. 2013;74(2):105-110. ©2013 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2013/74201

ning before the age of 35 years is linked to a 75% increase in the risk of melanoma [16], which is the deadliest form of skin cancer and one of the most common types of cancer among adolescents [17]. The United States currently spends about \$1.8 billion each year on treatment for skin cancers, including \$300 million on treatment of melanoma [18]. The American Academy of Dermatology Association predicted that the new tanning tax, in combination with state laws that have increased regulation of the indoor tanning industry, will significantly reduce the incidence of skin cancer and the future costs of treating it [18].

The health effects of exposure to ultraviolet light have been studied in many settings, but few studies have examined the predictors of tanning-facility density using county-level data, and no such studies have previously been conducted in North Carolina. Given the established link between indoor tanning and skin cancer, identifying county characteristics that are associated with an increased number of tanning salons per capita may aid in the prevention of skin cancer in North Carolina. The density of tanning facilities on a county level may be associated with economic characteristics, such as income and unemployment rate [3]; with the demographic makeup of the county [19]; and/or with average climate conditions in the county [20]. For example, higher levels of income can lead individuals to pursue more education, a healthier lifestyle, and a safer environment.

Our study examined the number of tanning facilities per capita in each county in North Carolina using regression analysis. Based on economic models and previous empirical findings in related research, we predicted that tanning facility prevalence would be significantly correlated with socioeconomic, demographic, and climate characteristics of the county. We therefore analyzed the following variables from 2007 through 2009: income; unemployment rate; prevalence of young, non-Hispanic, white females in the population; and mean temperature and precipitation values.

Methods

Our study aimed to identify possible connections between a county's economic, demographic, and climate-related traits and the number of tanning beds or booths in the county relative to the size of its population (ie, the density of tanning devices). While property values and the costs associated with leasing retail space may influence a tanning supplier's location decisions, tanning suppliers ultimately rely on customer demand. Therefore, we expected that tanning bed densities would be primarily driven by customer demand and by the aforementioned economic, demographic, and climate-related characteristics. To empirically investigate the roles of demand-side factors, we turned to available data from North Carolina.

Data Sources and Sample

Our sample consisted of 300 county-level observations for each variable (1 observation per year, over a 3-year

period, for each of the 100 counties in North Carolina) and included data about the number of indoor tanning beds per capita for every county in North Carolina during fiscal years 2006-2007, 2007-2008, and 2008-2009 (the most recent years for which complete economic, demographic, and tanning data were available). Calendar year data come from the beginning year when matched with fiscal year data on tanning outcomes; for example, 2006-2007 tanning data is matched to 2006 data on income, unemployment, etc. Comparable data from other states are incomplete or unavailable. The dependent variable in our study was tanning-salon density, measured as the number of individual indoor tanning devices (such as beds or booths) per 10,000 residents in each county. These data were obtained from the Registration and Tanning Branch of the Radiation and Protection Section of the Division of Environmental Health in the North Carolina Department of Environment and Natural Resources. We obtained economic and demographic data from the US Census Bureau and data pertaining to climate from the State Climate Office of North Carolina. The following demographic information was collected for each North Carolina county: the percentage of the county's total population that consisted of non-Hispanic white women between the ages of 18 years and 49 years, and the percentage of the county's population that consisted of non-Hispanic white women over the age of 55 years. Estimated coefficients for men and women in other age and racial/ethnic groups were not statistically significant, so these groups were removed from the latter analyses. The remaining coefficients were robust to the removal of the insignificant groups. County-level health data were obtained from the North Carolina State Center for Health Statistics [21]. A county's designation as rural or urban was determined using guidelines from the North Carolina Rural Economic Development Center. Binary indicator variables were also created to distinguish between the state's 4 regions: the Mountains, the Piedmont, the Inner Coastal Plain, and the Tidewater region. Summary statistics for these variables are displayed in Table 1.

Analysis

We estimated a regression model to evaluate how variables relating to income, demographics, geography, and climate affect the number of indoor tanning beds per 10,000 residents. The results are shown in Table 2. We estimated the model with real income per capita and with the unemployment rate, as well as with the square of those variables. This allowed for the model to capture nonlinear effects of income and unemployment separately.

Results

We used regression analysis to look for correlations between observable county characteristics and the location and quantity of indoor tanning beds. Evidence suggests that suppliers in this market face a significant amount of competition in North Carolina. The median number of indoor tanning establishments per county is 15, and 90% of counties

TABLE 1.
Summary Statistics for Certain Variables in North Carolina's 100 Counties in 2007, 2008, and 2009^a

Variable	Mean	SD	Minimum	Maximum
Access to tanning salons				
Number of beds per 10,000 population	9.90	4.29	0	29.6
Number of establishments per 10,000 population	2.95	1.39	0	10.4
Economic variables				
Real per-capita income ^b	\$29,329	\$5,117	\$19,604	\$48,017
Unemployment rate	5.78%	1.48%	3.2%	11.2%
Demographic variables				
Percentage of population consisting of non-Hispanic white women aged 18-49 years	15.5%	4.05%	6.2%	24.3%
Percentage of population consisting of non-Hispanic white women aged >55 years	11.7%	3.77%	3.8%	22.2%
Climate-related variables				
Summer precipitation, in inches ^c	3.39	0.91	1.386	8.433
Average daily temperature	59.21° F	3.81° F	42.66° F	64.45° F
Average number of days per year with temperatures >90° F	3.16	1.52	0.04	7.00
Average number of days per year with temperatures <32° F	5.31	2.14	0.67	10.26
Variables relating to risk-taking				
Percentage of population who smoke cigarettes	16.55%	5.44%	4.2%	30.8%
Number of cases of gonorrhea infection per year per 100,000 population	153	130	0	828
Number of counties classified as rural ^d	60			
Number of counties per region				
Inner Coastal Plain	23			
Tidewater region	18			
Piedmont	34			
Mountains	25			

Note. SD, standard deviation.

^aTanning salon variables (the number of tanning beds per 10,000 population and the number of establishments per 10,000 population) are based on fiscal years; all other variables are for calendar years.

^bReal per-capita income is stated in 2009 US dollars, adjusted for inflation based on the Consumer Price Index for all urban consumers.

^cSummer precipitation is monthly average precipitation from June 21 to September 21.

^dClassification of counties as rural or urban was based on guidelines provided by the North Carolina Rural Economic Development Center.

have 8 or more such establishments. Moreover, each establishment tends to be modest in size, with the average tanning salon having approximately 4 tanning beds. With little market power and no county-level regulation, decisions about the locations of tanning salons are likely based on demand in local markets. Thus we expected that the observed tanning densities would reflect the collective preferences of consumers within each county.

Table 2 reports the regression results. The model controls for North Carolina's 4 geographic regions and suggests several statistically significant correlations between economic, demographic, and climate-related variables and the density of indoor tanning beds. The combined quadratic and level coefficients for unemployment suggest that tanning-bed density is likely to increase as unemployment rises, but that prevalence of tanning beds peaks at an unemployment rate of roughly 9% and then declines. During the time frame of our study, the average unemployment rate in North Carolina was 5.78% [22]. This suggests that, controlling for other factors, indoor tanning salons are more likely to be found in areas with above-average unemployment levels. (We do not mean to suggest that tanning salons deliberately locate in counties with high unemployment rates. However, choosing employment in less stable industries is consistent with risk-taking behavior.)

The data also show that counties with a higher proportion of non-Hispanic white women between the ages of 18 years and 49 years are likely to have a higher density of tanning beds. An increase of 1 standard deviation in the percentage of the population that fall into this category corresponds to more than 2 additional tanning beds per 10,000 residents.

Climate also likely plays a small but statistically significant role in the location and quantity of indoor tanning facilities in North Carolina. Counties with more days of hot weather tend to have a slightly greater density of indoor tanning salons, all else being equal. An increase of 1 standard deviation in the number of days per year when the temperature exceeds 90 degrees Fahrenheit corresponds to about 1 extra tanning bed per 70,000 people.

The remaining variables in the model are imprecisely estimated, yet they exhibit reasonable signs and magnitudes. For instance, in our sample period, tanning bed densities rose with real income per capita (which is negatively correlated with unemployment) up to a level above the average income level, after which tanning bed densities declined.

In the process of developing the model presented in Table 2, we explored several alternative specifications, including some with county-specific intercepts to capture unobservable characteristics that do not vary over time. Of the

TABLE 2.
Results of a Regression Model in which the Dependent Variable Is the Number of Tanning Beds per 10,000 Residents

Explanatory variable	Regression coefficient	95% confidence interval
Economic variables		
Real per-capita income	.0008	-.0001727 to .00175
Real per-capita income squared	-9.87×10^{-09}	-2.39×10^{-08} to 4.15×10^{-09}
Unemployment rate (%)	5.430264*	3.149724 to 7.710805
Unemployment rate (%) squared	-.2898244*	-.4417533 to -.1378956
Demographic variables		
Percentage of population consisting of non-Hispanic white women aged 18-49 years	.5674358*	.3309592 to .8039125
Percentage of population consisting of non-Hispanic white women aged >55 years	.1109791	-.1449861 to .3669442
Climate-related variables		
Average number of days per year with temperatures >90° F	.0894524 [†]	-.3544025 to .5333073
Average number of days per year with temperatures <32° F	-.6169223	-1.322748 to .0889032
Rural geography	-.0655824	-1.555282 to 1.424117
Geographic region^a		
Inner Coastal Plain	2.032985	-.5108412 to 4.576812
Piedmont	.3746929	-1.868801 to 2.618186
Mountains	.6608259	-2.625353 to 3.947005

Note. Year effects were found and were statistically significant ($P < 0.01$). These statistical conclusions are based on t tests of the null hypothesis that the true coefficient is zero. Thus, low P-values (< 0.1) indicate that we reject the null hypothesis and conclude with high ($\geq 90\%$) levels of confidence that the true coefficient is not zero. Adjusted $R^2 = 0.37$. Each regression has 297 observations. County observations have been pooled since the inclusion of year dummy variables does not qualitatively alter the results above. The demographic results for non-Hispanic white women aged 18-49 years are robust, and results for other demographic groups are not statistically significant. Statistical significance is based on robust (county-clustered) standard errors. All data are for calendar years.

^aThe Tidewater region was selected as the reference group; therefore, this region has been omitted from the table.

* $P < 0.01$.

[†] $P < 0.1$.

99 counties that had indoor tanning salons during the 3 years covered by our study, only 8 counties stood out as being markedly distinct from the norm: Cherokee, Edgecombe, Gaston, McDowell, Mitchell, Rutherford, Stanly, and Surry had twice as many tanning beds per capita as the rest of the state, and they had 50% more indoor tanning establishments per capita. In these 8 counties, real income per capita was 10% lower and the unemployment rate was 15% higher than in the other 92 counties in North Carolina; in addition, these 8 counties experienced 5% fewer days with temperatures above 90 degrees Fahrenheit and 20% more days with temperatures below 32 degrees Fahrenheit. These 8 counties also had higher proportions of white women of all ages, including nearly 15% more white women between the ages of 18 years and 49 years.

In comparison with the average of North Carolina's other counties, the 8 standout counties also differed in other meaningful ways. First, their investments in higher education were dramatically lower. The average rate of college completion in these counties was less than half the rate in the rest of the state. This observation could imply that residents in these counties place relatively less importance on the future. These 8 counties also exhibited evidence of greater risk-taking behavior relative to the other 92 counties in North Carolina. Rates of smoking in these 8 counties were approximately 25% higher than in the rest of the state, and

rates of gonorrhea infection were 20% higher. Moreover, the rate of childbirth among women with less than a high school education was nearly 20% higher in the 8 standout counties compared to the rest of the state. However, the average number of cases of skin cancer per capita was only slightly higher in the 8 standout counties than in the rest of the state. Table 3 compares these standout counties with the remaining counties in North Carolina.

Discussion

Although the health effects of ultraviolet light exposure have been studied in many settings, few studies have examined the relationship between economic data and indoor tanning salons in North Carolina. Part of the reason for this deficiency is the difficulty in obtaining reliable demographic, economic, and tanning salon data at a micro level. As a result, several of the papers in medical journals that have estimated the density of indoor tanning facilities in certain US cities obtained their data from telephone books. Palmer and colleagues [11] examined the number of tanning facilities in 80 US cities and found that tanning-facility density was predicted by the percentage of the population that is white, by household income, and by daily temperature. They selected the 20 most populous cities in each of 4 US regions and collected data on the number of tanning facilities using Yellow Pages telephone directories. The number of listings

TABLE 3.
How 8 “Standout” Counties (Cherokee, Edgecombe, Gaston, McDowell, Mitchell, Rutherford, Stanly, and Surry) Compare with the Rest of North Carolina (“Average” Counties)

Variable ^a	“Average” counties	“Standout” counties	Statistical significance
Access to tanning salons			
Number of beds per 10,000 population	9.19	18.8	P<0.01
Number of establishments per 10,000 population	2.84	4.21	P<0.01
Economic variables			
Real per-capita income ^b	\$29,608	\$26,133	Not significant
Unemployment rate (%)	5.68	6.90	P<0.01
Demographic variables			
Percentage of population consisting of non-Hispanic white women aged 18-49 years	15.4	17.0	P<0.05
Percentage of population consisting of non-Hispanic white women aged >55 years	11.5	14.1	P<0.01
Climate-related variables			
Summer precipitation, in inches ^c	3.4	3.3	Not significant
Average daily temperature	59.3° F	57.9° F	Not significant
Average number of days per year with temperatures >90° F	3.2	3.0	Not significant
Average number of days per year with temperatures <32° F	5.2	6.6	P<0.01
Variables relating to risk-taking			
Percentage of population who smoke cigarettes	16.2%	20.6%	P<0.01
Number of cases of gonorrhea infection per year per 100,000 population	150	186	P<0.1
Number of cases of cancer per year per 100,000 population	439	442	Not significant
Number of births to mothers with less than a high school education, per year per 100,000 population	93	119	P<0.1
Percentage of counties classified as rural ^d	59%	75%	P<0.1
Distribution of counties by region			
Inner Coastal Plain	24%	13%	Not significant
Tidewater region	19%	0%	Not significant
Piedmont	35%	25%	Not significant
Mountains	22%	63%	P<0.01

Note: A t test for the comparison of 2 means was used to determine statistical significance.

^aTanning salon variables (the number of tanning beds per 10,000 population and the number of establishments per 10,000 population) are based on fiscal years; all other variables are for calendar years.

^bReal per-capita income is stated in 2009 US dollars, adjusted for inflation based on the Consumer Price Index for all urban consumers.

^cSummer precipitation is monthly average precipitation from June 21 to September 21.

^dClassification of counties as rural or urban was based on guidelines provided by the North Carolina Rural Economic Development Center.

under the heading “Tanning Salons” was counted for each city. Hoerster and colleagues [23] also identified commercial indoor tanning facilities in 116 large US cities using the Yellow Pages directories; they then computed the number and density of such facilities for each city and looked for associations between tanning-facility density and selected geographic, climate-related, demographic, and legislative variables.

Our study found a statistically significant connection between the unemployment rate in a county and its density of indoor tanning facilities. This research also contributes to the existing literature by examining more specific demographic variables than those considered in other studies: the percentage of the population comprised of non-Hispanic white women between the ages of 18 years and 49 years, and the percentage of non-Hispanic white women older than 55 years. This new information enables a more specific analysis of the impact of these demographic factors on tanning-bed densities. Finally, our study is one of only a few to

examine the North Carolina indoor tanning salon industry [24, 25]. North Carolina’s diverse geography and climate arguably make it a suitable and representative state in which to conduct such studies.

Our results make some initial connections between tanning salon locations and underlying county-level economic, demographic, geographic, and climate-related characteristics. This information should improve policymakers’ understanding of how the indoor tanning excise tax and economic determinants will impact the state’s tanning industry.

Our main conclusion is that the number of indoor tanning beds per capita is associated with demographics (specifically, the proportion of the population comprised of non-Hispanic white women between the ages of 18 years and 49 years); economic health, as measured by the unemployment rate; and, to a lesser degree, exposure to extreme heat, as measured by the average number of days with temperatures above 90 degrees Fahrenheit. Tanning beds tend to be

located in counties with higher unemployment rates and a greater number of days when the temperature rises above 90 degrees Fahrenheit. Eight counties in North Carolina have a particularly high density of indoor tanning beds compared to the rest of the state.

Because we are investigating correlations, we cannot claim causal links between variables. We only want to suggest that there may be a connection between the aforementioned economic, demographic, and climate-related variables and the number of tanning beds per capita. However, Table 3, which highlights the differences between the 8 standout counties and the rest of North Carolina, does paint a picture consistent with the idea that tanning salons are more likely to be found in areas where residents tend to undertake other types of risky behavior, tend to be less forward-looking, and have less education.

This study estimates the associations between the density of indoor tanning beds and the unemployment rate, climate-related variables, and demographic variables. Previous studies have focused on the relationship between tanning salon usage and climate or skin cancer rates, and our study contributes to the existing literature by examining more specific demographic, economic, and climate-related variables in North Carolina. Results from this research offer policymakers initial insights into the magnitude of the state's indoor tanning industry and the economic determinants of the location of tanning facilities. Our study also shows which North Carolina counties are likely to be most affected by the excise tax on indoor tanning, which is meant to help finance the Patient Protection and Affordable Care Act. Our future research will pair the most recent tanning-bed data with economic, education, and health variables to determine whether the indoor tanning salon tax is high enough to discourage indoor tanning salon use. NCMJ

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Acknowledgments

The authors would like to thank Lindsey Sackett and Trevor Stanley for their outstanding data collection efforts.

Financial support. We acknowledge support from the Cameron School of Business Research fund from the University of North Carolina at Wilmington, as well as generous support from the BB&T Research Fund.

Potential conflicts of interest. J.T. and S.K.A. have no relevant conflicts of interest.

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Analyzing State-Based Silver Alert Programs: The Case of North Carolina

Takashi Yamashita, Dawn C. Carr, J. Scott Brown

BACKGROUND Recent discussions about securing the autonomy and safety of older people in a cost-effective way have culminated in the establishment of “Silver Alert” media-alert policies in more than half of US states over the past 5 years. Although these policies have been established with exceptional legislative speed, research has not yet examined how these policies have been implemented across geographic areas.

METHODS Data from the 587 Silver Alerts activated in North Carolina in 2008, 2009, and 2010 were analyzed. Zero-inflated negative binomial regression and exploratory spatial analyses were employed.

RESULTS Despite a policy focus on older adults and individuals with cognitive impairment, activation of Silver Alerts in a county was not related to the proportion of the population 65 years of age or older or to the prevalence of poor mental health in the county. Rather, a 1-unit increase in the proportion of the population comprised of African Americans increased the rate of Silver Alert activation by a factor of 1.019 ($P < 0.01$). Additionally, spatial analyses suggested that the number of Silver Alerts in a county was related to its proximity to North Carolina’s state capital, Raleigh.

LIMITATIONS These results should be interpreted with caution because an exploratory analytic approach was employed in both regression and spatial analyses.

CONCLUSION The current mission and implementation of the Silver Alert program should be reviewed, given that significant effects were observed for the proportion of African Americans in a county and the county’s distance from the state capital, but not for the proportion of older adults in the county or for the prevalence of impaired mental status.

The population of older Americans has grown rapidly in recent decades, resulting in increasing political and social interest in programs that support older adults’ ability to continue living in the community [1, 2]. The Silver Alert (SA) program is a state-funded public notification program that provides media outlets (eg, television, radio, newspaper, Internet) with descriptive information (eg, name, sex, race, place last seen) about adults with cognitive impairments who have wandered away [3]. Support for SA programs has been inspired by anecdotal cases in which a delay in initiating search and rescue efforts may have contributed to catastrophic outcomes for missing older adults [4].

SA programs have been advanced as a key public health strategy for protecting older adults who are presumed to be at high risk of dangerous wandering [5]. Between 2006 and August 2010, 28 states enacted SA legislation [6], and an additional SA program went into effect in Nevada on January 1, 2012 [7], bringing the total number of states with SA programs to 29. However, no research has been published to date examining whether the programs operate according to their mission: to achieve specific target outcomes effectively and efficiently and to reach all populations equally across target areas [6, 8]. Such analysis is crucially needed, since SA programs serve a key role in states’ efforts to manage the risk of wandering by older adults.

Conceptual Model

A conceptual model described by Handler, Issel, and Turnock [9] can serve as a useful framework to guide analy-

sis of public health system performance. This model calls for an explanation of how the public health system in question should operate, how it achieves specific target outcomes, whether these outcomes are achieved effectively and efficiently, and whether they are provided to target populations equally. This model is valuable for research seeking to understand both the intentions of programs that serve as a means of addressing essential public health practices (eg, monitoring a health problem, enforcing laws and regulations for individual safety) and how these programs function within the context of available resources. This conceptual model is therefore appropriate for assessing whether the mission of a public health program aligns with the way it is operationalized—which is the purpose of the present research.

So far, North Carolina is the only state to have provided information about the SAs that were initiated between 2008 and 2010. As a result, we were able to perform an exploratory analysis of the utilization patterns of North Carolina’s SA program. Specifically, our research was guided by the following question: Is the North Carolina SA program operating according to its mission?

Electronically published April 16, 2013.

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N C Med J. 2013;74(2):111-117. ©2013 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2013/74202

The mission of the SA program in North Carolina is explicitly stated in the legislation that established the program: “to provide a statewide system for the rapid dissemination of information regarding a missing person who is believed to be suffering from dementia or other cognitive impairment” [10]. The program was initially limited to individuals with cognitive impairments over the age of 18 years, but the legislature later added a special provision for individuals with autism who are younger than 18 years of age [11]. To address the question of whether the program was operating according to its mission, we conducted our initial exploration and description of the data using a combination of Geographic Information Systems (GIS) analysis (using a computer-based system to manage, visualize, and analyze spatially referenced data, such as data with county identifiers) [12] and model-based statistical analysis.

Methods

Data

Data on the SA notifications in 2008, 2009, and 2010 were obtained from the North Carolina Department of Crime Control and Public Safety (which has since been renamed the Department of Public Safety). A total of 587 alerts were activated: 128 in 2008, 239 in 2009, and 220 in 2010. The publicly available data on these alerts is limited to the last name of the missing person, county of residence, city where the alert was initiated, date the alert was canceled, and recovery status. However, we were able to locate more detailed information in some cases—such as age, sex, and race—by conducting an extensive search of all media articles and other reports relating to individual SA cases initiated during the study period (eg, online news archives of local and regional newspapers, police reports). In many cases, complete data were not available: One or more pieces of basic demographic information—age, sex, and/or race—could not be obtained for approximately 54% of individuals.

Because of the limited availability of data, the common structure of local governments (ie, county government), and concerns regarding personal privacy, we focused on county-level data as a reasonable unit of analysis. Additional county-level data came from multiple sources, including the 2007-2008 American Community Survey [13]; the 2007 US Census Current Population Survey Small Area Income and Poverty Estimates [14]; the 2002, 2004, 2006, and 2008 Behavioral Risk Factor Surveillance System (BRFSS) surveys [15]; the County Health Rankings compiled by the Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute [16, 17]; and the US Census Bureau [18].

Outcome Measure

The log population-adjusted counts of SAs activated in 2008, 2009, and 2010 for each county in North Carolina were measured in units per 100,000 county adult population and logged to standardize the unit for cross-county comparisons.

Predictor Measures

The predictor variables and covariates were selected based on the mission of the SA program as articulated in its legislation (ie, to ensure the safety of older adults and adults with cognitive impairments) and based on the availability of data. *Older population* and *African-American population* are the proportion of the county's total population that consisted of residents 65 years of age or older and the proportion that consisted of non-Hispanic African American individuals, respectively. *Poor mental health days*, derived from the County Health Rankings, is the average number of days per month when individuals in each county reported that poor mental health interfered with their daily activities. *Median income* is the median income of each county in 2007. Median income was measured in \$1,000 increments and logged to address nonnormal distribution issues for statistical analyses. *Rural area* is recorded if a county is classified as rural according to the US Census 2000 criteria [19]. Other measures (eg, political affiliation) were explored but were not found to be useful for understanding the factors shaping frequency of SA activation in North Carolina (analyses not shown).

Analysis

We performed 2 types of analyses: GIS analysis and model-based statistical analysis. The various measures were visualized and color-coded in a map format using ArcGIS 9.3 software [20] to document and visually identify the spatial distribution of SA activations. Ring buffer analysis was conducted to examine the spatial pattern of SA activations [21]. In this study, our preliminary visual examination of the maps suggested the application of a ring buffer analysis based on the geographic center (ie, county centroid) of Wake County, where the state's capital (Raleigh) and the North Carolina Department of Public Safety are located. To include surrounding counties, concentric rings 30, 60, 90, 120, and 150 miles from the Wake county centroid were added to the map, and we computed the average number of SAs within each ring (adjusted for the corresponding population of adults 18 years of age or older). Counties were included in each ring if their county centroids were located inside that ring.

All statistical analyses were conducted using SAS 9.2 software [22]. Descriptive summary statistics (means, proportions, and standard deviation [SD] as appropriate) are reported for all measures. Also, a zero-inflated negative binomial regression with maximum likelihood estimation was used to examine the association between the number of SAs activated and various predictors using the SAS PROC COUNTREG procedure [23-25]. Zero-inflated negative binomial regression is suitable for count data that have a highly skewed distribution with a large number of zero counts. Although a Poisson regression model is frequently used in studies with count data, our preliminary analysis showed significant overdispersion (the variance is larger than the mean), which violates one of the Poisson regression

assumptions [23, 26]. Thus, zero-inflated negative binomial regression was more appropriate to manage the overdispersion in the count data [27]. We also examined the data with a negative binomial regression model, but the overall results were consistent with zero-inflated negative binomial regression (results not reported).

Additionally, given the comparatively short data collection period and the lack of any SA program utilization in some counties, we explored an alternative approach using empirical Bayes estimates to account for extremely low county rates that might be observed as zeros due to the short observation period. However, given the strong possibility that some counties may refuse to participate in the SA program—North Carolina law does not mandate that local law enforcement agencies participate in this program—it was not possible to precisely separate unobserved zeroes due to low activation rates from such structural zeroes. Considering the uncertainty associated with the presence of several possible underlying mechanisms of structural/observed zeros and the descriptive nature of our analysis, we did not employ empirical Bayes estimates. In other words, this study aims to document utilization patterns of the SA program so as to inform more advanced analytic approaches in future research, but it does not aim to address reasons for the underlying process of SA utilization. Although our preliminary analysis indicated a possible spatial autocorrelation in the residual term in the regression model, there is currently no commercial software that is capable of incorporating spatial autocorrelation (eg, a spatial lag model) [28] into negative binomial regression models [29]. Since a newly developed, advanced analytic approach—the spatial Poisson hurdle model [30]—may be able to address possible spatial autocorrelation in regression analysis, we used a rigorous description of spatial patterns of SA policy utilization to establish a basis for future research. Therefore, we employed a combination of exploratory spatial analysis and standard regression analysis in this study.

Results

A total of 587 SAs were issued during the study period: 128 in 2008, 239 in 2009, and 220 in 2010. The vast majority of SA cases concluded with the missing person being recovered within the same year, although in 11 cases the person was found dead. The average length of time a person was missing was 3.45 days (range, 0 to 97 days). For the 371 cases in which the missing person's age was known, the average age was 54.9 years (SD = 23.17 years). The majority of SAs issued for an individual whose race was known were issued for whites ($n = 149$), followed by African Americans ($n = 109$) and individuals in the racial category "other" ($n = 11$). Among the cases in which the sex of the missing person was known, there were more missing males ($n = 292$) than missing females ($n = 139$). After excluding 2 cases in which important information was missing (eg, name of county), 585 SA cases were used for the county-level analysis.

Table 1 summarizes 6 characteristics of the 100 counties in North Carolina and shows correlations between variables of interest. All variables of interest showed significant variability across counties in North Carolina. The numbers of SAs issued in counties also varied significantly (mean = 5.9; SD = 10.5): 9 counties had more than 15 SAs activated, but 24 counties (almost 1 in 4) had no SAs activated during the same time period. The disproportionate distribution of SAs across counties is shown in Figure 1.

Table 2 shows the results of a zero-inflated negative binomial regression predicting the number of SA cases with selected measures ($\chi^2 = 32.45$; degrees of freedom [df] = 6; $P < 0.01$). Only the proportion of the population comprised of African Americans ($P < 0.01$) was statistically significantly associated with the population-adjusted log count of SAs activated at the county level (ie, the logged rate). Among the counties with the opportunity to utilize SAs, a 1-unit increase in the proportion of African Americans in the population increased the expected rate of SAs by a factor of 1.019, holding all other covariates constant. In other words, counties with the opportunity to utilize SAs and with greater proportions of African Americans activated SAs more frequently than did counties with smaller proportions of African Americans. Because SA counts are population-adjusted, the significance of the proportion of African Americans is not the result of such counties having larger or smaller populations. We also examined the non-population-adjusted count and found that the county population was statistically significant (results not reported). Surprisingly, the proportion of the county's population that was 65 years of age or older—a specific target population for North Carolina's SAs—is not related to the number of SA activations.

Figure 2 shows the results of a ring buffer analysis based on the centroid (geographic center) of Wake County. For rings with radii of 30, 60, 90, 120, and 150 miles, the average number of SAs issued per 100,000 adult population and the number of counties within each ring (in parentheses) were 1.40 (4), 1.46 (22), 1.31 (38), 1.09 (61), and 0.92 (76), respectively. In terms of the geographic distribution, the number of SAs decreases with distance from the Wake County centroid beginning at a threshold of 60 miles.

Discussion

In this study, the conceptual model described by Handler and colleagues [9] was used to guide an examination of the utilization patterns of the SA program in North Carolina, focusing on its mission (purposes) and its role as a public health program. Although the legislated mission of SAs can be applied to all adults, and especially cognitively impaired adults, emphasis has been placed on the ability of SA policies to ensure the safety of older adults who are at increased risk of wandering and becoming missing [31, 32]. The fact that neither the proportion of older people in a county nor the average number of days per month when residents of the county reported being in poor mental health were sig-

TABLE 1.
Correlations Between the Number of Silver Alerts in a County and Variables Thought to Affect this Number

<i>Descriptive summary of counties in North Carolina</i>					
Variable	Number of counties	Mean per county	Standard deviation	Minimum	Maximum
Number of Silver Alerts issued (N=585) ^a	100	5.85	10.55	0	85
Total population in 2009	100	93,809	141,085	4,078	913,639
Percentage of population aged 65 years or older ^b	100	14.9	3.7	7.3	24.8
Median income in 2007 US dollars	100	\$41,808	\$7,586	\$29,043	\$65,487
Percentage of population comprised of African Americans ^b	100	21.2	16.5	6.0	61.6
Percentage of population with 4 years of college or more education ^c	100	16.1	7.9	8.2	51.5
Number of days per month when residents reported that poor mental health interfered with their functioning	100	3.43	0.6	1.9	4.7
Rural area designation ^d	100	21.0%	—	—	—

<i>Correlations between variables of interest</i>								
Variable number	Description of variable	Pearson's correlation coefficient (r) for variable numbers 1-7						
		1	2	3	4	5	6	7
1	Number of Silver Alerts issued (N=585) ^a	—						
2	Total population in 2009	.73***	—					
3	Percentage of population aged 65 years or older	-.39***	-.47***	—				
4	Median income in 2007 US dollars	.38***	.53***	-.44***	—			
5	Percentage of population comprised of African Americans	.15	.02	-.25*	-.31**	—		
6	Percentage of population with 4 years of college or more education	.56***	.61***	-.24*	.64***	-.18	—	
7	Number of days per month when residents reported that poor mental health interfered with their functioning	-.18	.20*	.02	.04	-.14	-.17	—

Note. *P<0.05, **P<0.01, ***P<0.001.
^aThis is a raw count (not used in regression analysis) after 2 cases were excluded due to insufficient information.
^bData from the American Community Survey 2008.
^cEstimated by countyhealthrankings.org using multiple years of data from the US Census (2000) and American Community Surveys (2005, 2006, 2007).
^dRural area designation is a dichotomous variable excluded from the table of correlations (Table 1B).
 Data sources: North Carolina Department of Public Safety; US Census Bureau; County Health Rankings [16].

nificantly correlated with the number of SAs activated in the county suggests that the mission might not be a fit at the county level. With regard to utilization patterns, data visualization indicates that the population-adjusted number of SAs gradually decreases as the distance from the geographical center of Wake County increases. This “distance decay” effect may indicate that the mission is not being equally applied across all North Carolina counties.

Using the framework proposed by Handler and associates to enumerate our findings within a broader public-health-system context, we found that several factors appear to influence the inconsistencies between the mission of the program and its structure, processes, and outcomes. First, the structural capacity of the program might be shaped by the macro context of the program. The more populous geographic areas are often major media centers—with a greater number of television stations, radio stations, and newspapers—and thus they may be able to implement media alerts more efficiently and effectively. Furthermore, locations with more frequent use of SAs are also those closest to the state’s political center—Raleigh (located in Wake County)—which is also where the North Carolina Department of Public Safety and the state news media are located. In other words, commitment to the SA program may be greater in areas where the SA policy receives greater political support [33].

This poses major concerns about inequality in this public health program, in that SAs are employed less often in places that are less populated (ie, rural areas), even though missing adults may be more difficult to locate in those areas.

Our other findings suggest that these macro-level factors might be associated with health disparities. Counties in which the population includes a greater proportion of African Americans have activated more SAs. Although this may be due to the fact that counties with a greater percentage of African Americans tend to be nearer to the political center of the state (Wake County), it may also be related either to the fact that African Americans are more likely than individuals of other racial groups to have mental health problems, including dementia [34, 35], or to the fact that African Americans are more likely to lack access to care for these problems [36]. Of the SAs in North Carolina in 2008, 2009, and 2010 for which we were able to obtain detailed information, about 40% of the missing individuals were African American. This is significant because African Americans made up only 21.6% of the state’s population in 2010, while whites comprised 73.7% of the population [37].

The lack of connection between the broader intentions of SA programs and the actual utilization of SAs in North Carolina precludes a full evaluation of the public health out-

TABLE 2.
Results of Zero-Inflated Negative Binomial Regression on the Log^a Population-Adjusted Number of Silver Alerts Issued in North Carolina During 2008, 2009, and 2010

Variable	Correlation coefficient	Standard error	P-value
Percentage of population aged 65 years or older	0.019	0.032	0.554
Median income, measured in \$1,000 increments and logged	-0.148	0.789	0.851
Percentage of population comprised of African Americans	0.019	0.007	0.007
Number of days per month when residents reported that poor mental health interfered with their functioning	0.091	0.136	0.506
Rural area designation	-0.288	0.321	0.370

Note. Model fit: $\chi^2 = 32.45$, degrees of freedom (df) = 6, $P < 0.01$. χ^2 value was computed as $2 \times [\log\text{-likelihood (full model)} - \log\text{-likelihood (null model)}]$.

^aLogged (base 2).

Data sources: North Carolina Department of Public Safety; US Census Bureau; County Health Rankings [16].

comes and efficacy of these programs [38]. Based on issues identified in our exploratory analysis, several steps need to be taken in order to ensure the appropriateness of SAs as a public health program: more meticulous record keeping by local and state governments (including the locations at which the individual went missing and was recovered, detailed demographic information about the missing person, and his or her health status) and use of a computer-based surveillance/analysis system (eg, GIS) [39-41].

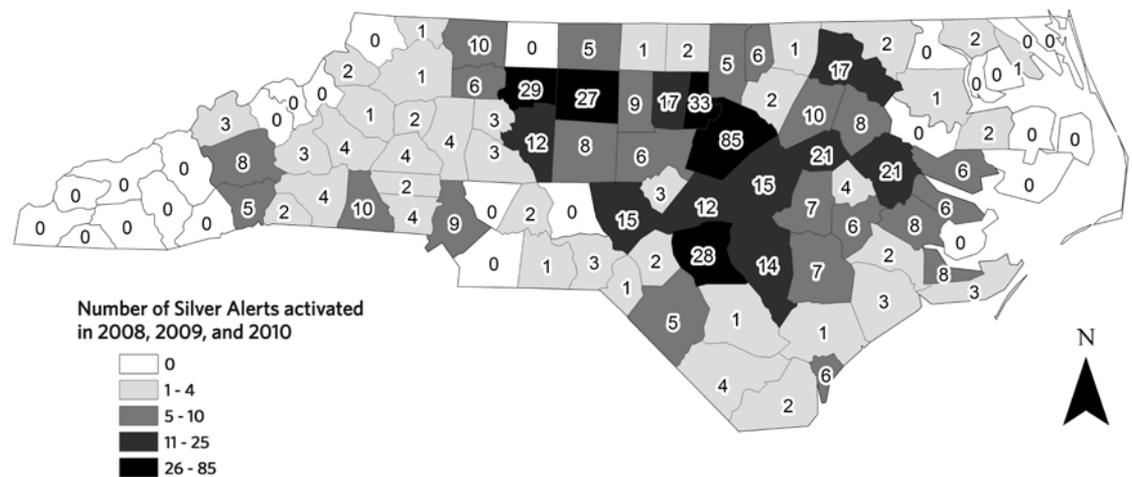
The current study is not without limitations. First, despite an exhaustive search, detailed demographic information regarding all SAs was not publicly available. Also, our summary statistics and analyses were limited to the data available. Second, whereas our exploratory spatial analysis and regression analysis of SAs at the county level provided a useful descriptive summary and insights for future research, the descriptive nature of the modeling approach requires that results be interpreted with caution. Third, individual-level analysis (eg, the locations at which the missing individual was last seen and recovered) was not possible. However, it

would be more desirable to capture within-county spatial patterns of SA activations. Fourth, one of the covariates in our statistical model—the average number of poor mental health days—might not serve as the most accurate indicator of the prevalence of specific cognitive impairments in the county, although the number of poor mental health days is likely to be highly correlated with the prevalence of such impairments. Finally, because we conducted an exploratory analysis of only the first 3 years of the North Carolina SA data, the results of this study should be viewed as an initial evaluation, not a conclusive critique.

Conclusion

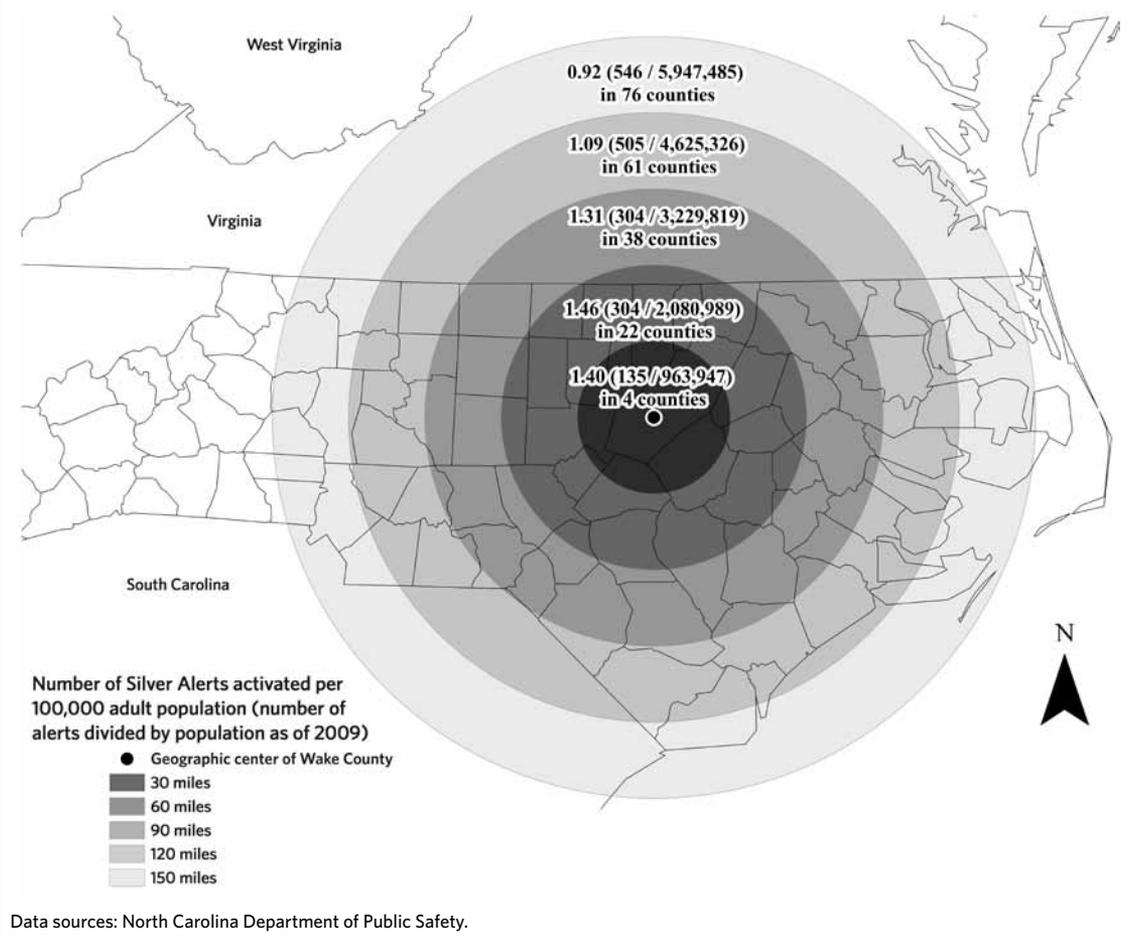
This study shows that initial utilization of SAs in North Carolina differs from the intention of the SA policy. Given that the number of SAs activated was significantly affected by the proportion of African Americans in the county's population and by the county's distance from the state capital, but not by either the proportion of the population consisting of older adults nor by the prevalence of poor mental health

FIGURE 1.
Number of Silver Alerts Issued in Each North Carolina County During 2008, 2009, and 2010



Data sources: North Carolina Department of Public Safety.

FIGURE 2.
The Population-Adjusted Average Number of Silver Alerts Issued in North Carolina During 2008, 2009, and 2010 Within Areas Delimited by the Distance from the Geographic Center of Wake County



in the county, we recommend that the mission and current implementation of SA policy be reviewed. Also, this study demonstrates the usefulness of GIS-based initial exploratory data analysis for evaluating newly implemented health policies such as the SA program and for generating hypotheses for future research. Although the SA program is still in the initial stage of implementation and SAs sounds like a very important way of ensuring the safety of older adults, we need to be cautious in an era when state resources are scarce about whether the funds used to address the broader problem of wandering are being used in the most efficient and effective way possible [42]. We have concerns about this policy having been implemented without the collection of publicly available data to assess its utilization patterns and its contribution to the public health system. Thus, detailed record-keeping and systematic review of the policy clearly need to be an immediate focus of the research and public policy agenda. **NCMJ**

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Acknowledgments

This research protocol was approved by the Miami University Institutional Review Board.

Financial support. This research received no specific grant from any funding agency. The contribution made by Dawn C. Carr was partially supported by NIH grant (5T32 AG000272-09).

Potential conflicts of interest. All authors have no relevant conflicts of interest.

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POLICY FORUM

Spotlight on Quality

Introduction

David Mechanic, a medical sociologist at the University of Wisconsin, taught that a health care system could be measured by 4 A's and a Q: accessibility, affordability, acceptability, accountability, and quality. The attention paid to each of these measures has never been equal. Access to care has long been the popular belle of the ball, while quality was just the tag-along stepsister, hanging out with the other unpopular wannabe, accountability.

Even a few of the big A's get little respect these days, but the Affordable Care Act is expected to be a game changer. By drawing our attention to all 4 A's and the Q, the Affordable Care Act will challenge us to think about health care in new ways and to make changes that improve multiple dimensions of care.

This issue of the NCMJ puts the spotlight on quality, which thrusts us into an alphabet soup of acronyms and new terms. This issue speaks about PDSA cycles, Lean, RIEs, QIOs, and more. For the uninitiated, I am referring to plan-do-study-act rapid cycle quality improvement projects; Lean (or smart) processes that increase value while lowering cost; rapid improvement events; and quality improvement organizations, which are learning forums that can transform health care outcomes for individuals, families, communities, and providers.

This alphabet soup might be laughable, but the stakes are serious. The Institute of Medicine of the National Academies ominously titled its millennial studies of quality *To Err is Human* and *Crossing the Quality Chasm*, reminding us of our failures and of how far we need to come. The increasing focus on quality has led to the development of processes that drive us to ask simple questions, find thoughtful solutions, and achieve meaningful outcomes. For example, asthma care can be improved so that patients have fewer days with symptoms, miss fewer days of school, and need fewer emergency room visits or hospitalizations. Nosocomial infections can be prevented with improved techniques of catheter care. And customer service can be enhanced with shorter waits when scheduling appointments, shorter waits in waiting rooms, quicker consultations, and improved satisfaction for both patients and providers.

The issue brief by Warren Newton and Don Bradley invites us into the history of quality improvement and the delivery of quality health care in North Carolina, while also explaining the evolving science and art behind the acronyms of the quality movement. It is a great story, and one that can only get better.

Peter J. Morris, MD, MPH, MDiv
Editor in Chief

Transforming Quality of Care in North Carolina

Warren Newton, Don Bradley

North Carolina is entering a period of transformative change in health care, as health system consolidation, health care reform, and payment reform combine to dramatically reshape health care. In this turbulent time, maintaining focus on quality of care will be critical. North Carolina has been a national leader in efforts to improve quality of care, starting from classic research in the 1950s on the measurement of quality and culminating in major statewide efforts to improve care through the North Carolina Area Health Education Centers Program, Community Care of North Carolina, the North Carolina Hospital Association, Medicaid, Blue Cross and Blue Shield of North Carolina, academic centers, and many other partners. The purpose of this issue of the NCMJ is to highlight initiatives to improve quality across the continuum of care and across the state. This overview puts these initiatives in context and addresses 3 fundamental questions: Can quality of care be measured and improved? What does the landscape of quality in North Carolina look like now? What should North Carolina's priorities be for improving quality of care moving forward?

Health care in the United States has always been dynamic, with ongoing changes occurring in medications, technology, and payer relationships. Now, however, we are entering a period of not just usual but transformative change, as health system consolidation, health care reform, and payment reform combine to dramatically reshape health care. In this turbulent time, maintaining focus on quality of care is critical. The quality of health care in the United States has always been a paradox: Our technical advances and improvements in outcomes for specific diseases and conditions are celebrated around the world, but overall health outcomes and quality of health care for the US population have steadily worsened compared to other countries [1]. Recognizing these trends more than a decade ago, the Institute of Medicine of the National Academies issued reports that called attention to substantial and pervasive problems with quality of care in the United States [2, 3]. Medical errors are one of the leading causes of death nationally, and McGlynn and colleagues [4] have demonstrated that almost half of patient encounters across the continuum of care do not meet evidence-based and consensus-based measures of quality of care.

North Carolina has been a national leader in efforts to improve the quality of health care, from classic research in

measurement of quality to major statewide efforts to improve care through the North Carolina Area Health Education Centers (AHEC) program, Community Care of North Carolina (CCNC), the North Carolina Hospital Association (NCHA), Medicaid, Blue Cross and Blue Shield of North Carolina (BCBSNC), and academic centers. The purpose of this issue of the NCMJ is to highlight the statewide organizations that are working together to improve quality of care and to describe specific ongoing projects that are occurring across the continuum of care—in health departments [5, 6], physicians' offices [7], intensive care units (ICUs) [8], labor suites [9], and rural hospitals [10, 11]. For example, Randolph and coauthors describe the Center for Public Health Quality and its work to promote quality improvement (QI) in local health departments across the state [6], and their sidebar provides details of some of the QI projects undertaken in Macon County [5]. In other sidebars, Garrison and Brown show how a QI project enhanced care for patients with asthma [7], Avalos and Lemon describe their efforts to prevent central line-associated bloodstream infections in a medical ICU [8], and Wright and coauthors offer insights gained during their efforts to eliminate early elective deliveries [9]. In addition, Hawthorne and Masterson describe the use of Lean principles to improve the quality and safety of health care delivery at 2 rural hospitals [10], and in an accompanying sidebar, they provide examples of specific Lean events at those hospitals [11].

In this issue brief, we address 3 questions: First, can quality of care be measured and improved? Second, what does the landscape of quality look like now in North Carolina? Third, what should our priorities be moving forward?

Can Health Care Quality be Measured and Improved?

Clinicians often question whether quality can be measured accurately. Unlike more concrete measurements—for example, the level of sodium in a serum sample—quality is perceived as being subjective and based solely on reputation (eg, Dr. X is a provider of high-quality care because he is at Y

Electronically published April 16, 2013.

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N C Med J. 2013;74(2):119-125. ©2013 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2013/74203

facility or trained at Z institution). In the 2001 report *Crossing the Quality Chasm* [3], the Institute of Medicine's Committee on Quality of Health Care in America identified 6 aims for the health care system: safety, effectiveness, patient-centeredness, timeliness, efficiency, and equity. These general aims were widely accepted and have been widely applied, but the broad concepts have been interpreted in different ways.

Fortunately, more than 50 years of work has refined the measurement of quality, and much of this work has been done in North Carolina. In 1955, Mindel Sheps contrasted prerequisites for care, elements of performance, and effects of care—in other words, structure, process, and outcomes—which is the framework we use today [12, 13].

Structure refers to features of the health care system—such as the number of hospital beds, the presence of magnetic resonance imaging equipment, and the availability of particular types of providers—without which comprehensive care cannot be delivered. To address such needs, the Hill-Burton Act of 1946 provided construction grants that supported the building of hospitals across North Carolina in the 1950s. In the 1960s and 1970s, the AHEC program, programs in family medicine, and training programs for physician assistants and nurse practitioners were launched with the goal of furnishing primary care providers for rural and underserved communities in the state.

As major initiatives increased the numbers of hospitals and doctors, emphasis began to be placed on *process*: the question of whether what was being done was appropriate—whether the right tests, medications, and operative techniques were being used [14, 15]—and whether other process measures, such as accessibility of care and continuity of care, were suitable.

Finally, spurred by Wennberg's work demonstrating variations in medical care between neighboring communities within a relatively small area [16, 17], outcomes of care began to be emphasized starting in the 1990s; from this perspective, high-quality care is that which achieves the best outcomes. For example, in considering care for hypertension, the best care is that which lowers the rate of stroke or other sequelae. In addition to survival and major morbidity, important outcomes include patient satisfaction [18], quality of life [19], functional status [20], and cost [21]. Great attention has been paid to the psychometric features of these measures—whether the instruments measure what they intend to measure with both reliability and validity—and there are now reliable and valid outcome measures that can be used in research or in routine clinical practice.

Another key distinction in the measurement of quality of care is between technical and interpersonal aspects of care [22, 23]. Technical aspects of care refer to those aspects under professional control, such as specific drugs, operative techniques, or hardware, whereas interpersonal aspects of care emphasize the quality of the patient experience. Some clinicians are skeptical about the validity of measurements

of patient satisfaction, but the psychometric features have been established for more than 20 years [18]. In a trend led by the American Board of Medical Specialties and large integrated providers such as Kaiser Permanente, measurement of patient satisfaction has evolved into measurement of patient experience, with a shift in focus from the episodic ("How satisfied were you with this visit or hospitalization?") to the ongoing ("Do you have problems making appointments in a timely fashion?").

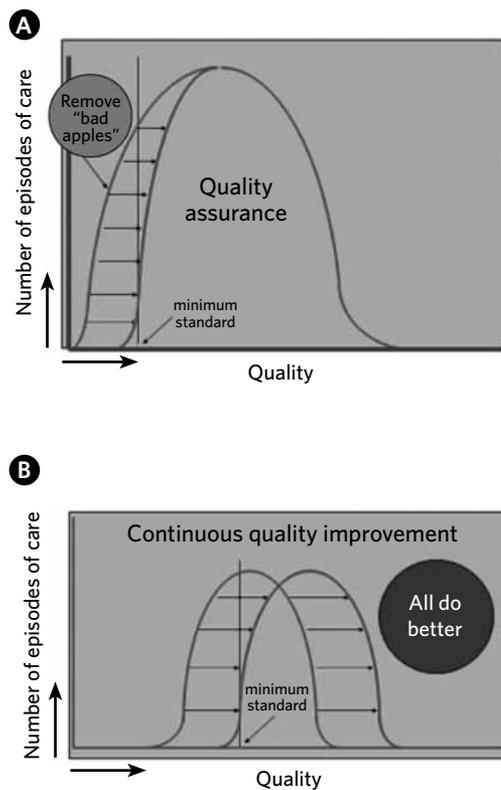
As cost of care has become an urgent issue, measurement of cost and cost-effectiveness has become a critical component of studies of quality of care. Such measurement is challenging, however, as patients and providers are often confused about the language of cost. Most patients are familiar with what they are charged, but there is often a dramatic difference between what is charged and what is covered by insurance. Moreover, the allowed insurance payment is yet again quite different from the cost of providing the care, which includes both the direct cost of supplies and personnel and the indirect costs of the infrastructure necessary to provide care. Specifying the perspective is also important when considering cost. The perspective of the patient (who, from a cost standpoint, is impacted chiefly by copays and coinsurance) is different from the perspectives of the physician, the hospital, the payer, and society.

Another key conceptual issue is the measurement of care provided to specific populations. Traditionally, health care has focused on individual patients who are seen in the office or the hospital, and public health professionals have led efforts to address risk factors for disease in the broader population, such as obesity prevention and smoking cessation programs. Increasingly, however, clinicians refer to populations for whom they are providing care, such as the patients in a primary care practice with diabetes or the patients receiving care from a transplant service. This shift has occurred in part because focusing on a target population—a denominator of care—allows effective measurement of access, quality, and cost. The worlds of public health and clinical medicine are beginning to merge. As a recent Institute of Medicine report [24] underscored, closing the gap between public health and primary care is critical to improving the health of the overall population.

Can quality be improved? Most current activity is based on ideas developed by Deming [25] more than 50 years ago. Drawing on observations of automobile assembly-line techniques, he called for improving the manufacturing process so that defective cars were not made, rather than waiting until manufacturing was complete to inspect the cars and reject any that were defective. His ideas, adopted initially by Toyota, led to dramatic improvements in quality and ultimately to the legendary rise of the Japanese automobile industry.

Deming's ideas have direct relevance to health care. The top portion of Figure 1 depicts the traditional goal of quality assurance: Look for "bad apples," be they doctors or hospitals,

FIGURE 1.
How the Goal of Continuous Quality Improvement
Differs from that of Quality Assurance



Note: The goal of quality assurance (A) is to ensure that all episodes of care meet a minimum standard (indicated by the vertical line); episodes on the low-quality side of the curve are eliminated by removing "bad apples" from the system. In contrast, the goal of continuous quality improvement (B) is to improve the quality of every episode of care, thereby moving the whole curve to the right, in the direction of higher quality.

and "reject" them, by removing their licenses or closing them down. Over the past generation, increasing work in many health care settings has improved our ability to identify and modify processes in health care that lead to bad outcomes. The goal of continuous QI, shown in the bottom portion of Figure 1, is to move the entire quality curve to the right, by improving the average quality score rather than simply weeding out poor performers. Experience has allowed the development of specific QI techniques (including rapid cycling, QI coaches, and registries), the extension of QI approaches to access to care and efficiency of care, and the broader adoption of Lean culture, which consists of systematic attempts to remove waste from processes of care.

So what is the current status of quality measurement and QI? Although there will continue to be discussion of new measures and of which measures are best, no one doubts that it is now both feasible and important to explicitly measure quality as we deliver and pay for care. Moreover, quality is no longer merely an academic issue. Quality was moved onto the national political agenda dramatically by 2 key

Institute of Medicine reports published in 2000 and 2001: *To Err is Human* [2] and *Crossing the Quality Chasm* [3]. After the recession in 2008, in which the bankruptcies of General Motors and Chrysler were attributed in large measure to the cost of health care for their employees, the advocacy of major international corporations [26] called additional attention to the economic impact of the poor performance of our health care system [27].

The North Carolina Health Care Quality Landscape

North Carolina has developed a number of large-scale collaborative efforts to improve the quality of health care. The scale and impact of these efforts is unique nationally. The oldest and best developed is CCNC, which over the past 15 years has developed a statewide system of 14 networks devoted to the care of Medicaid patients [28, 29]. As DuBard describes in her commentary [30], CCNC's major contributions to quality of care have been statewide involvement of primary care clinicians and community partners, the spread of evidence-based practice guidelines for chronic disease, claims-targeted care management, and many specific statewide interventions—including interventions for emergency department overuse, asthma, diabetes, transitions of care, generic medications, and medication reconciliation. The NCHA has been a national leader in interventions for patient safety and transparency, and its NC Quality Center offers valuable leadership, as discussed in the commentary by Koeble and Campione [31]. The AHEC program, collaborating with CCNC and many other organizations, has led the Improving Performance in Practice program [32] and the Regional Extension Center initiative, both of which are working to improve office systems to support QI in rural and underserved practices, as reported in the commentary by Batish [33]. The state's Medicare Quality Improvement Organization, The Carolinas Center for Medical Excellence, has supported the use of electronic health records (EHRs) and other aspects of QI, many of which are described in the commentary by McArdle [34]. Finally, as discussed by Barco and Chauncey [35], BCBSNC has consistently advocated for QI; their work over the years has led to North Carolina having many more practices and clinicians being recognized by the National Committee for Quality Assurance than any other state of comparable size. These organizations, supported by leadership and funding from The Duke Endowment and the Kate B. Reynolds Foundation and by ongoing work in academic centers, have made North Carolina a national leader in QI.

Delivery of health care in North Carolina is also changing dramatically. Most visible is the consolidation of health care providers into large integrated systems, which has proceeded with blinding speed. According to a letter from the North Carolina Medical Society dated August 10, 2011, there were 196 independent cardiology practices in the state in 2009, but there were only 4 such practices by mid-2011. President of the NCHA William A. Pully reports that inde-

pendent hospitals in the state have followed a similar pattern of consolidation (written communication, December 4, 2012). This dramatic trend is occurring for many reasons, including contracting leverage, capital needs for EHRs, fear of changes in the environment, and the need to manage populations under accountable care organizations. Operational integration will take much longer than acquisition but will offer opportunities for efficiency and for more systematic approaches to patient care. In the short term, however, consolidation adds significantly to the total cost of care, since providers are able to negotiate higher rates with commercial insurance companies and therefore get paid more despite performing the same amount of clinical work.

Another major change has been the spread of health information technology. A widespread conviction based on experience with integrated systems and experience in other countries is that adoption of health information technology will improve efficiency and enhance quality and safety. Therefore, in early 2009 the federal government invested substantially in many aspects of health information technology. The transition has proved both costly and difficult, as EHRs reduce productivity and access in the short term and mid term, and practices wanting to use EHRs to improve quality of care have required sustained support [36]. In North Carolina, the large integrated health systems are moving as quickly as possible to implement system-wide records. Carolinas HealthCare System and Mission Health System have chosen Cerner Corporation's EHR, and all of the other systems in the state have chosen Epic System's EHR. AHEC has also helped more than 1,100 individual practices install EHRs; the scale of AHEC's work is unique nationally, as is their integration of EHR adoption with QI and with the meaningful use incentive program of the Centers for Medicare & Medicaid Services (CMS). In addition, working with AHEC, BCBSNC has introduced the North Carolina Program to Advance Technology for Health, which provides funding, training, and help with EHR maintenance to practices that could not otherwise afford an EHR system [37].

Unfortunately, the attempt to develop a statewide health information exchange has failed. Over the long term, the failure to develop an integrated information structure will be a major limitation on QI. Epic EHR systems will provide some ability to share clinical information, but a robust statewide infrastructure would have allowed care management and transparency across systems and payers. Mission Health System and New Hanover Regional Medical Center have led the development of more robust regional health information exchanges, which are beginning to demonstrate the potential of sharing clinical information across sites. CCNC has made its informatics center [29] into a major resource for improving care for Medicaid patients, driving case management for the sickest patients and providing clinicians with information at the point of care. Perhaps the most promising current projects are the collaboration of CCNC with BCBSNC and CMS on the Southern Piedmont Beacon

Community Program [38] and a multipayer demonstration project of advanced medical homes in rural counties [39]. These projects are attempting to integrate information across insurers and to drive case management and clinical care. I believe that such information, aggregated by primary care practices, is a precondition for major improvements in care.

As this article goes to press, the Governor has proposed a dramatic plan to reorganize Medicaid. Details are still pending, but key elements of the plan include the development of 3–4 competing statewide coordinated care networks; integration of medical, mental, and other aspects of care; and capitated payment. This proposal is further evidence of the transformative nature of our times, and it provides an object lesson in the importance of maintaining a focus on quality and transparency.

Mental Health

No description of North Carolina's health care landscape would be complete without some mention of mental health care. A previous issue of the NCMJ laid out both the challenges and the opportunities for the future. In the late 1980s and the 1990s, in North Carolina as in other states, funding for mental health care was largely carved out from medical care, and overall mental health funding has declined significantly compared to funding for other aspects of health. In North Carolina, the well-intentioned but incomplete reform of the public mental health system, combined with downturns in the economy during the past decade, has greatly weakened the public mental health system. The significance of these trends is substantial, and many people believe that the overall health cost curve cannot be shifted without attention to mental health care—both care for those with severe and persistent illness and care for those with mood and other disorders, the latter of which could be sensibly integrated with primary care [40]. For purposes of quality of care, it is critical that mental health conditions be included in the list of comorbid conditions that greatly affect outcomes and that QI initiatives include attention to mental health care, if possible.

Priorities for the Future

The health of North Carolina's citizens has faced challenges over the past 2 generations. In the 1940s, North Carolina had one of the highest rates of rejection of draftees in World War II, which represented striking evidence of the poor health status of its citizens compared to those of other states [41]. In 2012, after 2 generations of investment and economic development, the prevalence of diabetes and obesity (9.3% and 27.8%, respectively, in 2010) were continuing to increase in North Carolina, immunization rates for children 19–35 months of age had dropped to below 90% for the first time in 8 years, and the rates of infant mortality and low birth weight remained high compared with other states [42]. America's Health Rankings [42] rated North Carolina

33rd among US states in 2012 (up from 35th in 2011). There has been some progress, but it has been painfully slow.

Why haven't we made more progress? Borrowing from Berwick [43], one answer is that the health care system needs to be redesigned at 4 levels: patients' experiences and expectations; the microsystems that actually provide care; the organizations that support those microsystems; and the social/political/economic environment that shapes those organizations.

Patient Experience and Expectations

Up to 75% of health care costs are driven by patient lifestyle choices such as smoking, inactivity, and poor diet. Providers, payers, and policymakers need to align incentives for healthy and affordable health care decisions. This includes both lifestyle choices and choices made in ongoing health care, from involvement in care for chronic diseases to decisions about elective procedures. It is also important that patients trust that clinicians' and payers' recommendations are aligned with improving patient health rather than increasing profits. Access to care and continuity of care are key drivers of patient experiences and can be measured directly as we put together "balanced scorecards" for clinical care. Finally, we need more transparency in terms of cost and clinical quality/outcomes, consistent assessment and improvement of patient experience, and greater patient involvement in the process of care through patient advisory councils and similar structures.

Microsystems of Care

Many of the commentaries in this issue illustrate the potential of microsystem changes to improve quality across the continuum of care. The scale and variety of these efforts is remarkable and sets North Carolina ahead of the field nationally. The poster child for microsystem transformation is Medicare's focus on hospital readmissions. Beyond specific projects, prioritizing which quality measures are most important is critical. Small offices and current EHRs cannot improve scores on multiple measures of quality simultaneously; hospitals and even large academic systems can only work on limited numbers of problems at one time. Moreover, few existing measures capture the multiple comorbidities that are characteristic of the sickest and costliest patients. Related to the number of measures is the reality that different payers track different measures; in many ways, we live in a quality Tower of Babel. The solution is for payers, providers, and the public to collaborate and to do the hard work of prioritizing what is most important to the health and economy of North Carolina. In other states, the insurance commissioner has played a critical role in setting the quality measures to be used and in requiring transparency, in much the same way that we regulate the content and labeling of foods and drugs.

Sustainability of QI depends on payment reform. Traditional payment systems reward volume and proce-

dures, and they encourage lack of coordination of care and siloed providers. It is no accident that serious work to improve transitions of care only began with changes in payment to hospitals for readmissions! Furthermore, ratcheting down on fee schedules can have a perverse effect, as providers and hospitals may respond by increasing volume. Transitioning from our current fee-for-service system will be difficult and complex. Internal disagreements among provider organizations are also common when clinicians' interests, financial perspectives, and administrative necessities collide. Better physician leadership and collaboration with payers are needed to transition from medical piecemeal to value-based systems.

Supporting Organizations

Local efforts to improve quality of care are necessary but not sufficient. As Stackhouse mentions in his commentary, clinicians and their organizations have ongoing reservations about the process [44]; we must continue to engage them. More broadly, the state will continue to need statewide organizations and initiatives such as CCNC, the NC Quality Center, AHEC's Improving Performance in Practice program and Regional Extension Center, and the North Carolina Health Quality Alliance. These statewide collaborative efforts are what set North Carolina apart from other states. These efforts need both policy support and financial support. To build a system that supports quality, we must bring providers, communities, and employers into the process; provide independent review; coordinate statewide initiatives; and address disparities across regions, races, and rurality.

Often unremarked is the inevitable transition that the workforce must undergo as we move from a hospital-focused system with siloed professionals to one that places greater emphasis on primary care, community-based care, and interprofessional teams. This workforce will be critical for QI. In recent years, many new training programs for nurse practitioners and physician assistants have begun, and 2 medical schools have expanded. However, large majorities of physicians, nurse practitioners, and physician assistants now go into subspecialties, and interprofessional education is just beginning. AHEC has led efforts to train new kinds of primary care providers and teams of providers [32, 33, 45, 46]. Collaboration between community colleges and traditional health affairs campuses will also be necessary, even as we emphasize social accountability for our educational institutions [47, 48].

Environment

QI requires a nonpunitive and trusting environment, adequate financial information, clinical resources, and determined leadership. Although North Carolina has made significant progress—by passing tort reform in 2011 [49], by establishing the CCNC informatics center, and by launching the multipayer project—several critical barriers remain. Trust is sorely lacking among patients, providers, payers,

and the government. As we look at other countries' universal health coverage and their better health outcomes, a notable difference is the willingness of their citizens to accept government leadership.

The economic recession and slow recovery have added to our challenge by decreasing funding for systematic change at the state level while increasing demand for affordability and improved outcomes. Political gridlock at the federal and state levels has hindered efforts to create health information exchanges, reform mental health care, expand coverage, and fund pilot programs that could help us learn how to improve the organization and effectiveness of health care. Finally, health care reform itself will significantly reduce the funding to hospitals across the state, just as we must begin to transition workforces from hospitals to ambulatory and community settings. The community benefit that has traditionally been provided by hospitals must be preserved even as funding streams change focus.

We have come a long way, but we still have a long way to go. Moving forward, our goal should be a focus on the Triple Aim [28] of improving health outcomes, ensuring better patient experiences, and increasing affordability—and we should strive to achieve these goals all at the same time and as soon as possible. We believe that the Triple Aim should become the standard for setting metrics, determining program priorities, and making decisions. This will require collaboration, leadership, accountability, and a laser-like focus on outcomes and behavior change. **NCMJ**

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Acknowledgment

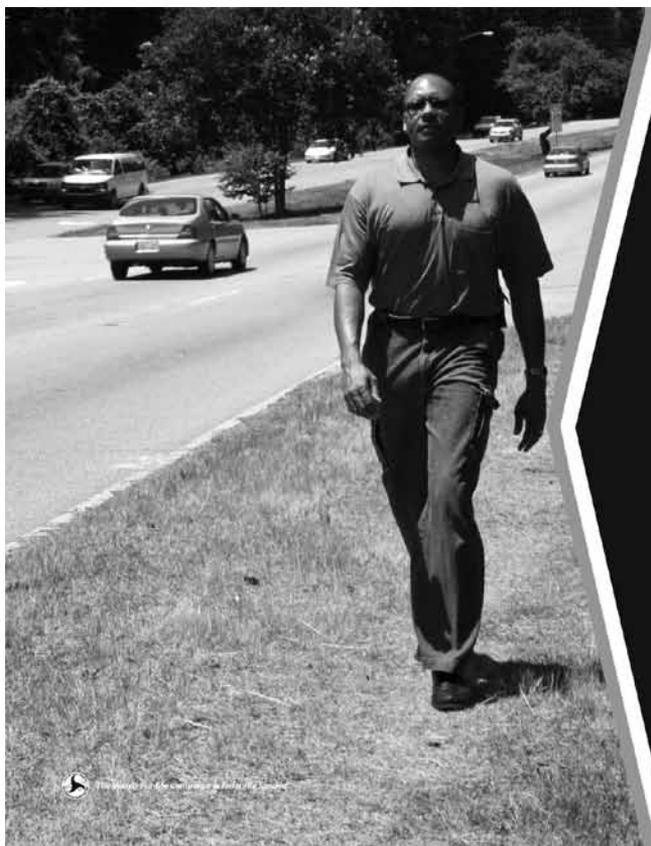
Potential conflicts of interest. W.N. and D.B. have no relevant conflicts of interest.

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The NC Quality Center: Empowering Excellence in Health Care

Carol Koebler, Joanne Campione

The NC Quality Center is transforming health care quality and patient safety in North Carolina by providing leadership, direction, and a vision to ensure that North Carolina delivers the best health care possible.

At the State Hospital Association Executives Forum in the summer of 2004, President of the North Carolina Hospital Association (NCHA) William Pully heard a talk by Donald M. Berwick, a leading authority on health care quality and improvement. Following this talk, Pully began to speculate about how the NCHA could increase its presence in driving health care transformation at the state level; at the urging of Mary L. Piepenbring, a vice president of The Duke Endowment, and with the support of the NCHA Board of Trustees, Pully soon submitted a grant application to establish the North Carolina Center for Hospital Quality and Patient Safety. Later that year, The Duke Endowment awarded the NCHA a 5-year grant, and the center was established.

In 2012, the center was renamed the NC Quality Center (NCQC) to reflect its growth beyond the hospital setting, and its mission was updated to reflect its efforts across the continuum of the health care delivery system. The mission of the NCQC is to partner with providers and communities in their efforts to provide safe, high-quality health care. To support health care providers and their communities in these efforts, the NCQC provides educational and collaborative programs as well as analyses of quality of care and patient safety data.

Foundational Elements

The NCQC initially focused its activities on the Institute for Healthcare Improvement's 100,000 Lives Campaign. However, the center wanted to do more to assist organizations in their efforts to improve quality of care and patient safety at a systems level. Taking into account lessons learned by leaders in the military and in high-risk industries such as aviation and nuclear power, the NCQC established the foundational elements for a highly reliable health care organization (Figure 1). The NCQC recommends that hospitals strive to develop a strong safety infrastructure by incorporating these elements: teamwork and communication, a fair and just culture, reliable processes, proactive

assessment of risk, and continuous organizational learning. These elements become the cornerstones of patient safety and quality of care, and they serve as the glue that makes new best practices successful and sustainable. The NCQC has established specific educational and collaborative programs for each element, developed a team of well-educated trainers, built tools and data systems to assist hospitals, and infused the foundational elements into all of the programs led by the NCQC. In addition, the NCQC's leaders promote trust and transparency of information as key attributes of a culture of patient safety.

An example of a program devoted to one of these foundational elements is the NCQC's Just Culture collaborative program, which began in 2006. This collaborative program focuses on promoting a safety culture that is fair and just, yet accountable [1]. This 2-year collaborative program is based on the Just Culture model developed by David Marx and promoted by the company Outcome Engenuity. To date, 3 Just Culture collaborative programs have concluded, and 2 programs are currently in progress. To measure the internal culture of the hospitals that are part of the collaborative, staff members of each participating hospital take the Agency for Healthcare Research and Quality's Hospital Survey on Patient Safety Culture at the beginning of the program and again at the end of the program. The results of the 2010 Just Culture collaborative program show improvement in 8 of the 12 survey dimensions (Figure 2). For 2 highly relevant dimensions—nonpunitive response to error and communication openness—the proportion of respondents who viewed the dimension positively increased by 5%. In comparison, national trends showed increases of only 1% and 0.5% in these 2 dimensions, respectively, between 2010 and 2011 [2].

Current Initiatives

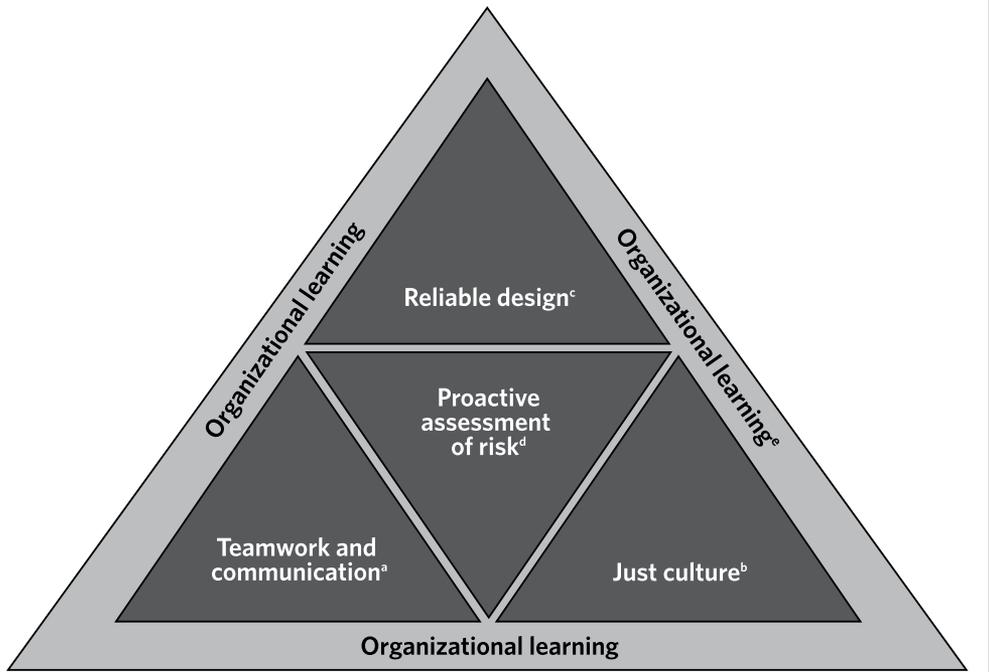
The NCQC initially aligned its priorities and goals with those set by the National Priorities Partnership. In response to the Affordable Care Act, the US Department of Health

Electronically published April 16, 2013.

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NC Med J. 2013;74(2):126-132. ©2013 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2013/74204

FIGURE 1.
The NC Quality Center's Foundational Elements for a Highly Reliable Health Care Organization



^aOptimizing teamwork and communication within health care.
^bPromoting a safety culture that is fair and just, yet accountable.
^cDesigning reliable processes and systems by applying Lean principles, taking human factors into account, and relying on evidence-based science.
^dLearning from unwanted events that occur and implementing changes to reduce the risk of them happening again.
^eCreating an environment that encourages continuous learning.

and Human Services (DHHS), in partnership with key stakeholders (including the National Priorities Partnership), released the National Strategy for Quality Improvement in Health Care [3]. This strategy, a national blueprint for all health care stakeholders across the nation, prioritizes quality improvement efforts, harmonizes the efforts of the stakeholders, and outlines a measurement strategy for collective success. The majority of the NCQC's work is aligned with the first of 6 priorities outlined in this national strategy: making care safer by reducing harm caused in the delivery of care.

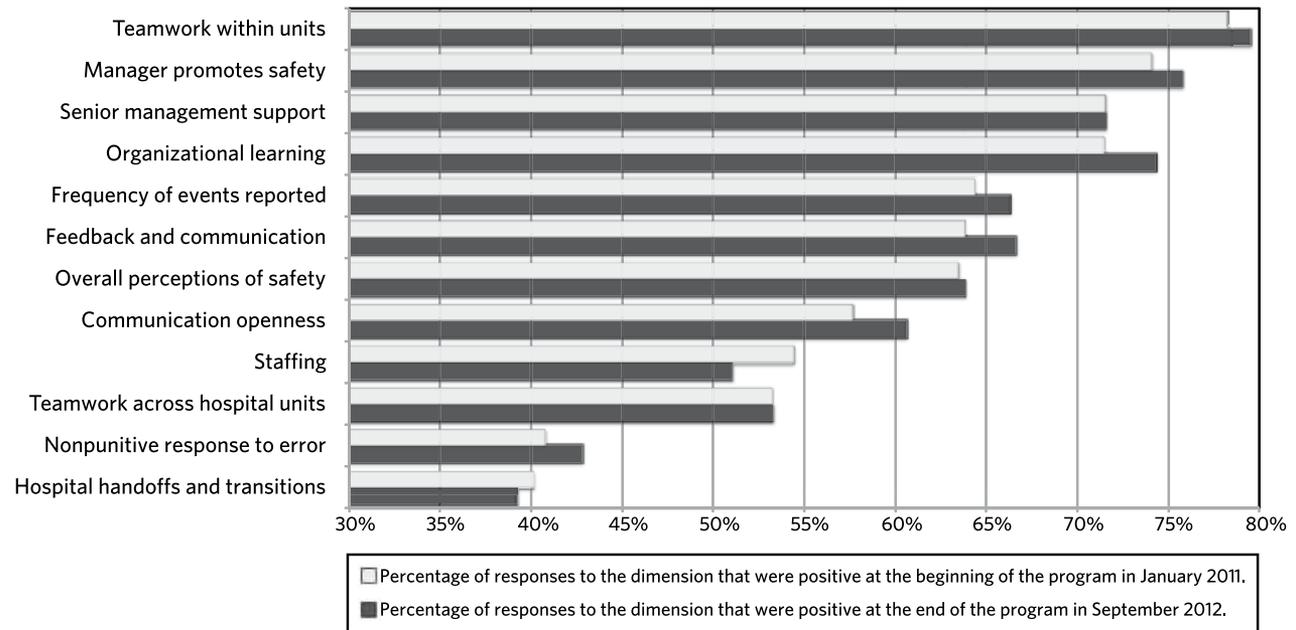
At the national level, many organizations are collaborating and partnering to affect the goals of the National Strategy for Quality Improvement in Health Care. Tasked by DHHS, the Centers for Medicare & Medicaid Services (CMS) is leading the national Partnership for Patients initiative to reduce patient harm. This initiative established hospital engagement networks to identify best practices for reducing the incidence of hospital-acquired conditions, to diffuse and teach those best practices to hospitals, and to assist hospitals with the implementation of new strategies. The NCQC is leading 1 of the 27 regional hospital engagement networks in partnership with the Virginia Hospital and Healthcare Association. Through this national initiative, the NCQC is providing collaborative learning networks on adverse drug events, catheter-associated urinary tract infections, central line-associated bloodstream infections,

injuries from falls and immobility, obstetric adverse events, pressure ulcers, surgical site infections, venous thromboembolisms, ventilator-associated pneumonia, and preventable readmissions.

The workhorse of the NCQC programs is the collaborative based on the Institute for Healthcare Improvement's Collaborative Model for Achieving Breakthrough Improvement [4]. When staff members from the hospitals participating in a collaborative meet, either in person or through webinars, they have an opportunity for true collaboration and shared learning; they can describe their quality-improvement goals, compare their outcome measures, and openly discuss their struggles and the barriers they face. In addition to the Just Culture program, other collaborative programs offered by the NCQC focus on preventing health care-associated infections; reducing avoidable readmissions; improving maternity care; and providing reliable core processes of care—processes that have been established as being central to good outcomes and that are used at the right time for every applicable patient.

In 2008, the NCQC was proud to be the first organization in North Carolina to be certified as an official federal Patient Safety Organization (PSO) by the Secretary of DHHS. This designation allows health care organizations to confidentially report information about serious patient safety events to the NCQC and ensures that this information is protected from legal discovery. PSOs were established as part of the

FIGURE 2.
Percentage of Positive Responses on the Agency for Healthcare Research and Quality's Hospital Survey on Patient Safety Culture, Measured Before and After Participation in the 2010 Just Culture Collaborative Program of the NC Quality Center



Patient Safety and Quality Improvement Act of 2005 [5] to encourage facilities to investigate the root causes of an adverse event through a standardized reporting process that allows for organization learning, prevention strategies, and feedback.

One of the keys to the success of the NCQC's programs is that the center partners with similar organizations, such as The Carolinas Center for Medical Excellence and the North Carolina Department of Public Health, in order to optimize resources, reduce duplication of efforts, and offer a single initiative to the health care community. The NC 39 Weeks Campaign is a new and wonderful partnership that includes the NCQC, the March of Dimes Foundation, the Perinatal Quality Collaborative of North Carolina, Community Care of North Carolina's Pregnancy Medical Home, the television station FOX50, and the radio station MIX 101.5 WRAL-FM. The goal of the statewide partnership is to prevent a scheduled elective delivery before a pregnancy reaches full term.

Commitment to Transparency and Measurement

The NCQC promotes the open sharing of hospital performance measures for the purposes of improvement, accountability, and learning. Studies show that comparative hospital quality reports intensify hospital quality improvement efforts, improve an organizational culture in ways that promote quality of care and patient safety, and positively influence hospital operations by placing higher priority on quality of performance [6, 7]. Therefore, as an immediate goal in 2006, the NCQC launched www.NCHospitalQuality.org, a public Web site that reports and compares hospital-level quality perfor-

mance scores for nonfederal acute-care hospitals in North Carolina. In addition to providing consumers with standardized and reliable information about quality of care, the site's objective has been to provide performance benchmarks that will assist and stimulate hospitals' efforts to continuously improve their quality of care.

Beginning in July 2007, the NCQC began publicly reporting hospital-specific scores for a measure called "optimal care." Hospitals receive separate optimal care scores for 4 different health conditions: heart attack, heart failure, pneumonia, and surgery. The optimal care measure employs an all-or-none methodology to determine whether a patient with 1 of the 4 conditions received all of the recommended treatments for which he or she was eligible. This methodology supports the notion that achieving a desired clinical outcome requires the completion of a full set of tasks; thus, it puts an emphasis on system-wide implementation of reliable processes of care that require teamwork, communication, and involvement from all levels of staff.

Before the optimal care scores were introduced, the Web site was reporting condition-level summary scores that were aggregates of the individual scores. In comparison, the optimal care scores have been lower as a result of this method's more stringent and sensitive scoring. Use of these scores therefore raises the bar for performance and increases their ability to improve outcomes [8]. The optimal care scores were not public measures, so with the backing of the NCHA Board of Trustees and the NCQC Board, the NCQC set out to get consent from each hospital to allow The Carolinas Center for Medical Excellence to calculate these scores and

Project to Prevent Central Line-Associated Bloodstream Infections in the Medical Intensive Care Unit

David Avalos, Deirdre Lemon

In an attempt to reduce the rate of central line-associated bloodstream infection (CLABSI) in its medical intensive care unit (ICU), Gaston Memorial Hospital in 2009 joined the NC Prevent CLABSI Collaborative that had been formed by the North Carolina Center for Hospital Quality and Patient Safety (now known as the NC Quality Center). Our team was comprised of nursing managers, clinical nurse specialists, infection preventionists, risk managers, ICU staff nurses, and members of the IV team. At this time, we did not focus on the Comprehensive Unit-based Safety Program recommended by the collaborative. Instead, we focused on house-wide initiatives, such as hand hygiene campaigns and “scrub the hub” campaigns, and we also initiated multidisciplinary patient care rounds. Although we did see some reductions in CLABSI rates, those lower rates were not sustainable.

When we decided to participate in the continuation of the NC Prevent CLABSI Collaborative that began in August 2011, we knew that we had to make some changes. Therefore the Comprehensive Unit-based Safety Program was adopted in 2011 and was utilized during the second phase of the collaborative. We knew that staff buy-in was a key factor and that staff members had to own this project in order for it to succeed. We created a Medical ICU Performance Improvement Project focused on CLABSI rate reduction. Medical ICU staff members were encouraged to participate in team meetings, and their input was viewed as essential.

Medical ICU CLABSI rates were posted monthly and were discussed at every unit meeting so that staff members were made aware of their progress. Whenever a CLABSI was identified, staff members were asked to participate in a defect analysis, which helped them to take ownership of the situation and to hold one another accountable. Members of the staff began to engage in conversations and to explore additional opportunities for improvement. They began reporting concerns about other areas of the hospital where practices differed from those followed in the medical ICU. Their feedback was instrumental in helping to identify the need to implement our nursing strategies in other departments, such as respiratory therapy, anesthesia, and radiology, and to impart those strategies to laboratory personnel and any other health care workers who accessed the vascular system.

Staff members created a central line maintenance bundle, which was used as a teaching tool and in competency check-offs. “Super users” were trained in aseptic technique and blood culture collection. The super users then trained their peers and performed competency checks. The maintenance bundle checklist was also used as an audit tool to track compliance. This tool was later reformatted and is currently used hospital-wide as a competency check-off.

The strategies and outcomes discussed in the NC Prevent CLABSI Collaborative were also a standing agenda item for our Vascular Access Safety Team Committee. We

post them on a public Web site. The chief executive officer of each NCHA hospital effectively consented to the public posting of the hospital’s report card, knowing that these scores would be displayed alongside those of the hospital’s peers and could look less favorable than what was previously displayed.

Because the NCQC is, in a sense, a “department” of the NCHA, the center is challenged by the NCHA Board of Trustees to raise the bar and to move faster. For example, since 2006, the state’s average score for each of the 4 optimal care conditions has shown a steady upward improvement. Yet, in 2010, the NCHA Board wanted to be sure that the low performers were not being left behind. This concern resulted in the addition of the Hospital Quality Dashboard to the performance report Web site. The dashboard clearly shows which hospitals are in the top and bottom quartiles for each of the 4 optimal care conditions, as well as showing the 30-day mortality rates for 3 conditions, the 30-day readmission rates for 3 conditions, and 2 dimensions of the patient perception of care survey. The dashboard design is also used to measure the NCQC itself by setting internal organizational goals (such as measuring levels of hospital

participation in programs and hospital participation in surveillance of hospital-acquired infections) and setting targets for quality and patient safety that continuously push for greater improvement.

Challenges

The health care patient safety and quality improvement community continues to struggle with the lack of real-time data and the need for reliable methods of measurement that allow for quick provider feedback and reveal trends in patient safety [9]. While claims data can be used for some measurements, this source has several limitations, including incomplete information, the need to account for changes in coding and definitions, and the fact that claims databases lag at least 6 months behind the actual provision of care. Collection strategies have been used for the past 10 years or longer that require the review of individual patient charts or the reporting of complications and adverse events by providers. This approach is time-consuming and expensive, and it often results in sample sizes that are too small to result in reliable measurements. Therefore, the NCQC provides measurement services to hospitals that facilitate the creation

measured the success of our initiatives and performed return-on-investment analyses to justify hospital-wide adoption of our strategies. We had been using neutral needleless connectors on our peripheral lines and mechanical valves on our central lines, but we decided to switch to use of a positive pressure displacement valve for both peripheral and central lines. We implemented the recommendation of the Centers for Disease Control and Prevention that all patients with a central line be bathed using a product containing chlorhexidine gluconate [1-3]. We eliminated the use of bath basins and began using pre-packaged baths for all patients. We also began requiring that a second health care worker be present for all central line insertions, and this intervention prompted better compliance with central line insertion practices and helped to prevent routine use of femoral insertion sites for central lines [1-3].

During our involvement with the NC Prevent CLABSI Collaborative, an outbreak of vancomycin-resistant enterococcal (VRE) bacteremia occurred, which opened up communication with physicians, surgeons, the chief medical officer, and the chief nursing officer. Their involvement improved cooperation between departments. For example, the medical ICU partnered with Environmental Services to perform a thorough cleaning of not only all patient rooms but also all common areas in the medical ICU. We also worked with the laboratory to perform active surveillance for VRE bacteria and to perform VRE screenings on every patient admitted to a critical-care bed [4].

During our continued involvement in the NC Prevent CLABSI Collaborative, we have focused on the Comprehensive Unit-based Safety Program and have been able to decrease CLABSI rates hospital-wide. The key to our

success has been the involvement of bedside nurses and their taking ownership of the unit's infection rates by doing what is right for patients and developing a culture of safety for all patients. **NCMJ**

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Acknowledgment

Potential conflicts of interest. D.A. and D.P.L. have no relevant conflicts of interest.

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Electronically published April 16, 2013.

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of larger sample sizes to better understand the impact of quality improvement interventions and to prioritize areas for improvement.

Moving Forward

With health reform and the need for more efficient, high-quality care come new challenges for the NCQC and for North Carolina's health care providers. Hospitals and physician clinics must be "meaningful users" of certified electronic health records technology by 2014 or they will face negative Medicare payment adjustments in 2015. Hospitals and physicians are also facing new pay-for-performance programs that require very tedious data collection and measurement. Furthermore, the Affordable Care Act includes a new program to reduce payments for hospitals with worse-than-expected readmission rates. This change should result in new community partnerships and better postdischarge communication aimed at improving the transition of care after a patient's hospitalization.

With new competing priorities, the workload of hospital staff is increasing at a pace that exceeds resources and training. Real or perceived staffing deficiencies can put a patient at risk for a health care-acquired complication or

an adverse event; however, a strong safety climate (which is one of the NCQC's foundational elements) can ameliorate the stress levels of those who work with high-risk patients [10]. Therefore, the NCQC will continue to educate and lead organizations as they build a strong culture of patient safety that instills fairness and accountability.

The NCQC and the NCHA embrace the opportunity to offer their leadership and vision to all of North Carolina's health care providers as they tackle new challenges with a dedication to better teamwork across all health care settings and to patient-centered, high-quality care. **NCMJ**

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Acknowledgment

Potential conflicts of interest. C.K. and J.C. have no relevant conflicts of interest.

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Eliminating Early Elective Deliveries at New Hanover Regional Medical Center

Lydia N. Wright, Barbara Buechler, Hannah Haigh Brownlow

In the fall of 2009, New Hanover Regional Medical Center (NHRMC) joined the Perinatal Quality Collaborative of North Carolina's project to eliminate elective deliveries before 39 weeks of gestation. NHRMC's stated aim was to decrease the proportion of births before 39 weeks of gestation that are elective to 5% or less, and to accomplish this goal by September 30, 2010. The baseline data for NHRMC indicated that 28% of deliveries that took place between 37 weeks and 38 weeks plus 6 days of gestation were not medically indicated. Most of these early elective deliveries were scheduled cesarean sections.

A 3-pronged approach was implemented to meet this aim. First, the department of obstetrics and gynecology adopted the reduction of elective deliveries to 5% as its quality goal for 2009-2010. Physicians agreed not to induce labor or schedule a cesarean section at a gestational age of less than 39 weeks without a medical indication. Hospital administrators also agreed to facilitate this goal. Second, education focusing on current evidence regarding the advantages of not delivering before 39 weeks of gestation was provided to nursing staff and other providers who care for pregnant women. This information was presented at department and staff meetings, sent via email, and reviewed during a visit to each obstetrics and gynecology group. Third, the process for scheduling inductions was changed. Inductions had previously been scheduled by health unit clerks, but this function was shifted to the registered nurse clinical coordinators for labor and delivery, who did not schedule any delivery requested prior to 39 weeks of gestation unless it was medically necessary. Examples of conditions that might necessitate a delivery before 39 weeks of gestation include preeclampsia, uncontrolled diabetes, intrauterine growth restriction, nonreassuring fetal tracing, placenta previa with bleeding, fetal demise, chorioamnionitis, and placental abruption. If a clinical coordinator was unsure about the medical necessity of an indication for induction, he or she could contact the manager for labor and delivery or the medical director of obstetrics.

The Obstetrics Safety Team (a multidisciplinary quality team) completed retrospective chart reviews of all scheduled deliveries between 37 weeks and 38 weeks plus 6 days of gestation to ensure that they were medically indicated. The chart was required to contain not only the indication for the delivery, but also the supporting data for the indication. For example, the chart could not simply state that oligohydramnios was the indication; it also had to include the specific amniotic fluid index level. If any patient was found to have delivered prior to 39 weeks of gestation without a medical indication, the admitting physician would be contacted; if, after review, there was no medical indication for the delivery, the provider would be counseled by the medical director of obstetrics. This personal communication between the medical director and her colleagues was essential for success.

In the department of obstetrics, results of the chart reviews were shared at all meetings of the medical staff, the nursing unit, and the Unit Practice Council. Graphs of results were posted on all units. Finally, staff members maintained a running total for the number of days that had passed since the last elective delivery. NHRMC celebrated its 1-year mark on March 24, 2012. In terms of the proportion of elective deliveries that occurred before 39 weeks of gestation, this rate was 6% in September 2010, 2% in September 2011, and 0% in September 2012.

Of course, there were challenges. Although the department voted to restrict elective deliveries before 39 weeks, not all members of the department were in attendance at that meeting. It took time to achieve buy-in from everyone. Patients admitted through the obstetric triage department did not always meet the criteria for a medically indicated delivery. Also, the criteria for accepted medical indications were initially not well defined, but this situation improved with the publication in August 2011 of an article synthesizing the available information regarding the conditions that can result in late preterm and early term births and specifying the optimal timing of delivery for specific conditions [1].

Success continues today as the department looks forward to celebrating 2 years without an elective delivery prior to 39 weeks of gestation; we hope to achieve this milestone on March 24, 2013. *NCMJ*

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Acknowledgment

Potential conflicts of interest. All authors have no conflicts of interest.

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Electronically published April 16, 2013.

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Lean Health Care

Henry C. Hawthorne III, David J. Masterson

Principles of Lean management are being adopted more widely in health care as a way of improving quality and safety while controlling costs. The authors, who are chief executive officers of rural North Carolina hospitals, explain how their organizations are using Lean principles to improve quality and safety of health care delivery.

Health care delivery systems, including hospitals and physician practices, must respond to the new reality of public, governmental, and payer demands for improved outcomes at lower costs. A growing number of them are turning to the principles, practices, and philosophy of Lean manufacturing, which uses a process of continuous improvement to eliminate waste and improve efficiency and customer service. The rural hospitals that the 2 of us lead, Columbus Regional Healthcare System and Sampson Regional Medical Center, adopted Lean management systems about 2 years ago. We joined a collaborative of 6 rural hospitals that are all receiving support to adopt Lean management principles from the North Carolina Center for Rural Health in conjunction with Simpler Consulting, with funding assistance from The Duke Endowment and the Golden Leaf Foundation.

Over the years, there have been many initiatives and programs that have promised to help hospitals and providers “do more with less.” Why do we believe that Lean management is a better answer for our organizations?

First, unlike tactics that are designed solely to reduce costs, meet productivity goals, or address specific quality indicators, Lean management systems are designed to focus on meeting customer needs. A naturally occurring outcome of doing so is the provision of care that is of higher quality and that costs less. In other words, a Lean approach provides the “how” in the form of a new organizational focus on continuous improvement in meeting customer needs, whereas other initiatives often focus on “what” to do to reduce costs or to increase quality, using predetermined prescriptive tactics.

Second, Lean management includes a commitment to respect the people involved in health care delivery. Unlike the top-down tactics that frequently frustrate those of us in the health care industry, Lean management puts analysis, decision making, and process design back in the hands of the real experts, those on the frontlines: doctors, nurses, therapists, technicians, dieticians, registrars, environmental service personnel, and others. Lean management gives health care

providers and workers a means of retaking ownership of their health care delivery processes.

Third, Lean management provides a platform and creates an organizational appetite for continuous and proactive (rather than sporadic and reactive) improvement—and it does so in a way that is critical of processes, not people.

As health care organizations have started to implement Lean principles, we are overcoming any concern that such principles are only applicable to manufacturing. We are also learning key lessons that can accelerate health care’s adoption of Lean principles. John Toussaint and Roger Gerard, 2 national leaders of Lean health care, in their 2010 book *On the Mend*, share one such key lesson: the concept of middle flow. They say that they have found that delivery of health care generally occurs in 3 flows: upstream, middle, and downstream.

Upstream is everything that happens before a doctor sees the patient, from setting appointments to getting vital statistics, laboratory tests, and asking why the patient wishes to see the doctor. The downstream flow includes getting additional information to the patient, running follow-up tests, dispensing prescriptions, and setting new appointments.

Upstream and downstream flows, they say, are fertile ground for reducing waste and for improving quality through the efforts of Lean teams to redesign and standardize processes. The middle flow includes provider-patient interactions and decision making, areas in which improvement and standardization are generally best left to individual medical professionals [1].

Adoption of Lean principles in health care is still in its relative infancy, although tremendous results have already been achieved by national Lean leaders such as Denver Health, ThedaCare, and Virginia Mason Medical Center—organizations that are consistently achieving excellent outcomes at lower costs. Case studies from these and other nationally recognized organizations are available in an excellent recent discussion paper published by the Institute

Electronically published April 16, 2013.

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Lean Events at Columbus Regional Healthcare System and Sampson Regional Medical Center

Henry C. Hawthorne III, David J. Masterson

Lean methods, which emphasize continuous improvement to eliminate waste and improve efficiency and customer service, are increasingly being employed in the health care setting. Over the past 2 years, Columbus Regional Healthcare System and Sampson Regional Medical Center have held more than 50 Lean events, 2 of which are described here.

Improving Mammography Services at Columbus Regional Healthcare System

In November 2012, a rapid improvement event (RIE) team was convened to study and improve delivery of mammography services to patients receiving care at Columbus Regional Healthcare System. The RIE team was led by a frontline mammography assistant and also included leaders from the departments of imaging and patient financial services; frontline staff members from the departments of mammography, imaging, and pharmacy (for “a fresh set of eyes”); a staff member from a local obstetrics and gynecology practice; a radiologist; and a patient who had shown interest in sharing her experiences and helping to identify opportunities for improvement. Due to time constraints, the radiologist did not participate for the entire week but was consulted when process changes were identified that required radiologist input, buy-in, or design assistance.

In preparation for the event, team members gathered data about the delivery of mammography services, mapped out the current state of the process, and proposed balanced goals for improvement. The chosen goals were: to achieve an 86% reduction in the average time until the next available appointment for a diagnostic examination; to reduce the time from testing to delivery of results to the patient’s primary care physician by 90%; to increase weekly mammography volume by 15%; and to increase the gross margin of profit per mammogram by 15%.

The team mapped how the process should look from

the patient’s perspective; used this preparatory work to evaluate the current process map; and identified which components of the process were truly valuable for patients, which were wasted steps, and which steps involved a waste of resources. The team then created a series of experimental process changes intended to reduce waste and to ensure the inclusion of components that add value for patients. By midweek, the team had tested and tweaked most of these changes, and they were able to spend Thursday finalizing a new process and creating tools that would be used to train staff members once the new process was ready for broader implementation.

Many preconceived notions about problems in the process were dismissed during the course of the week, and unexpected opportunities were discovered. The biggest win came in the team’s discovery that time was being wasted due to hand-offs (transfers of reports between technicians, radiologists, and transcriptionists). This discovery dispelled the belief that technicians, transcriptionists, or radiologists were causing delays while working on the reports. In fact, the data showed that the hand-offs and resulting queues were the points at which time was being wasted, and the team was able to redesign the process to eliminate several hand-offs.

Real-time data collection during the event and during the first 2 weeks afterward revealed that Columbus Regional Healthcare System was approaching or achieving its quality and patient satisfaction goals: The amount of time from testing to delivery of results had decreased by 83% for diagnostic examinations and by 74% for screening examinations. The RIE team also received anecdotal validation of these improvements from a community gynecologist whose patient was scheduled for a screening mammography on the Thursday of the event, when new processes were being tested. Three hours after her test was completed, the results arrived in the gynecologist’s office, and the patient was informed of her results that same

of Medicine, titled “A CEO Checklist for High-Value Health Care” [2]. Columbus Regional Healthcare System, Sampson Regional Medical Center, and the other hospitals in our North Carolina collaborative are making great strides as well (see Table 1). Our early results are due both to events that focus on rapid improvement and to the deployment of Lean thinking and Lean tools across our organizations.

Our organizations started their Lean work by clarifying organizational needs and prioritizing areas of focus (called *value streams*); we then formed multidisciplinary teams to study each organization’s top priority value stream in order to understand the various processes within that value stream. Value streams provide a new way to look at health care delivery from the patient’s vantage point, as opposed

to the departmental or service-line viewpoint typically adopted by hospitals. For example, the emergency-care value stream at Columbus Regional Healthcare System includes all processes from patient entry into the emergency department through discharge, admission, or transfer, and includes multiple departments (registration, emergency, laboratory, imaging, cardiopulmonary, etc) because of their role in upstream, middle, and downstream flows. Sampson Regional Medical Center chose surgical care as its top priority value stream. Once we defined and evaluated the various processes within each organization’s top priority value stream, we embarked on the real work: rapid improvement events (RIEs).

RIEs are typically weeklong events for teams that are

day. This rapid turn-around not only allowed the practice to provide significantly better care but also avoided creating patient anxiety; even for a screening mammography, the longer a patient waits for her results, the more she may become concerned that something may be wrong. Indeed, one downstream benefit of the new process is the positive impact on the referring office. This gynecologist said that his staff was thrilled about getting the results so quickly because they knew that being able to report results promptly would save them from spending hours responding to phone calls from worried patients.

Improving Preoperative Visits at Sampson Regional Medical Center

Surgical services were strategically selected as the first area of focus for Lean intervention at Sampson Regional Medical Center. Despite strong performance in this area, it quickly became evident that there was ample opportunity to improve quality, cost, and service. In March 2011, a surgical services team embarked on a weeklong attempt to improve the presurgical process.

When nurses, surgical technicians, registrars, and a certified registered nurse anesthetist mapped the flow of the presurgical process, it became evident that patients were unnecessarily having to run through a maze of testing and waiting that created a less-than-favorable first impression of surgical services at the medical center. With the assistance of the surgery practices, the RIE team decided that preoperative visits should be scheduled. This was a change from the previous process of sending the patient from the surgeon's office directly to the hospital, which was a recipe for built-in delays and unnecessary spikes in volume.

By the middle of the RIE week, team participants had rearranged an examination room and established it as a one-stop location for all patients arriving for preoperative visits. Patients scheduled for preoperative visits now experienced no delays in service because the nurse, the electrocardiography technician, the phlebotomist, and the registrar came to the patient, rather than the patient having to go to them. By the end of the week, plans were under way to cross-train the nurse to perform electrocardiography and phlebotomy duties; anesthesia providers had

agreed to come to the examination room as necessary; and the registration staff had developed plans for bedside registration.

Today, preoperative visits are scheduled, and more than 90% of patients arrive on time for their appointment, which eliminates unnecessary waits. Visits that had previously taken 2 hours have been shortened to less than an hour, including the time spent in radiology. Surgery practices have reported an increase in patient cooperation since patients can usually schedule preoperative visits at their convenience, rather than having to go from the surgeon's office directly to the hospital. Press Ganey (a company that works with health care organizations to improve clinical and business outcomes) now consistently ranks Sampson Regional Medical Center as being in the top decile of medical centers in North Carolina with regard to patients' satisfaction with the entire surgical experience [1]. Also, the surgeons and anesthesiologists at Sampson Regional Medical Center have become very engaged in the hospital's Lean transformation after witnessing the improved quality, improved patient satisfaction, and reduced expense that have resulted from this RIE. **NCMJ**

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Acknowledgments

Potential conflicts of interest. H.C.H. and D.J.M. have no relevant conflicts of interest.

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Electronically published April 16, 2013.

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made up, predominantly, of the frontline staff members who are most involved in the particular process being improved. Through the application of various Lean tools and intensive data gathering and analysis, the RIE team studies the existing process in order to identify waste and variation, and then the team develops a series of rapid experiments to improve the process. The RIE team is empowered to test and refine these experiments and, based on the results, to develop and implement a new process by the end of the week, complete with a means to follow up and measure success after the event. Improvement goals for these events are typically balanced across quality, safety, human development, financial, and growth domains, and they are rarely incremental. In fact, these teams generally strive for break-

throughs: for 30% to 50% improvement in the goals they set out to achieve.

Our 2 organizations have together held more than 50 Lean events across 6 value streams to date (see our other article in this issue, on pages 134-135, for brief descriptions of 1 event at each facility). Based on the improvements we have achieved, both of our organizations are rapidly expanding our RIE capacity, with long-term goals of holding multiple improvement events each month. We have also both been working to spread Lean thinking and concepts beyond focused improvement events into day-to-day operations at the departmental level, so that we can engage greater numbers of frontline staff members more rapidly. We are also beginning to apply Lean concepts to strategic planning at

TABLE 1.
Selected Accomplishments Attributable to Adoption of a Lean Management System at 2 Rural Hospitals in North Carolina

Columbus Regional Healthcare System Whiteville, North Carolina	Sampson Regional Medical Center Clinton, North Carolina
<ul style="list-style-type: none"> The number of patients seeking emergency care who leave the emergency department without being seen has been reduced by more than 50%. Emergency department “door to doc” time has been reduced by 40%. Twenty-two months have passed during which there have been no cases of ventilator-associated pneumonia. National ranking of employee engagement improved from the 62nd percentile in 2011 to the 89th percentile in 2012.^a More than \$2 million in operating and capital costs have been eliminated. 	<ul style="list-style-type: none"> The number of occasions on which the usual 7:30 AM start time in the operating room has been delayed has been reduced by 90%. The proportion of surgeries that missed their scheduled operating room start time has decreased from 50% to less than 10%. The proportion of surgeries that were preceded by a preoperative appointment has increased from 62% to 90%. The length of preoperative appointments has been cut in half; they now last less than 60 minutes, and 91% of patients arrive on time. All preoperative antibiotics are administered an hour or less before surgery commences.

^aAs measured by The Jackson Group against their employee engagement survey database.

the executive and board levels.

Although the specific accomplishments we have achieved to date at Columbus Regional Healthcare System and Sampson Regional Medical Center are significant, the real power of the Lean approach rests in its empowerment of the people actually doing the work and in its focus on continuously improving value to patients. The Lean philosophy has a cumulative impact as it begins to define an organizational culture.

We recognize that we are still just planting the seeds for broader transformation. We believe that we can achieve sustainable breakthrough results broadly across each of our organizations. And we believe that this higher level of performance is where the organizations we lead and other health care delivery systems can begin to positively influence the cost, quality, and service curves in health care. **NCMJ**

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Acknowledgments

We thank Jeff Spade, the North Carolina Center for Rural Health, The Duke Endowment, the Golden Leaf Foundation, and all those who made our rural hospital Lean collaborative possible.

Potential conflicts of interest. H.C.H. and D.J.M have no relevant conflicts of interest.

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Quality Improvement in North Carolina's Public Health Departments

Greg D. Randolph, Jim Bruckner, Claire H. See

North Carolina has been a leader in the application of quality improvement (QI) to public health practice. Over the past decade, numerous developments have served to accelerate the adoption of QI in North Carolina's local health departments. The outstanding results from the widespread application of QI should help North Carolina to become a healthier state.

For decades, numerous industries—including health care—have used quality improvement (QI) methods and tools to reduce errors, improve efficiency and effectiveness, and improve customer satisfaction. Recently, public health professionals have begun to focus on applying QI methods to improve the practice of public health.

One of the main factors driving the increasing adoption of QI methods in public health in North Carolina and across the country is the escalating and unsustainable cost of health care in the United States, which has caused leaders to focus on improving population health. An example of this focus is the increasing influence of the Triple Aim Initiative of the Institute for Healthcare Improvement, which lists improving population health as 1 of its 3 aims (the other aims are lowering the per-capita cost of health care and improving the patient experience of care) [1]. The Triple Aim framework has been embedded into many aspects of federal policy related to health care reform.

Governmental fiscal austerity is placing enormous pressure on health departments to do more with less. Tight budgets and fewer resources are powerful drivers for implementing QI methods in public health—especially the use of Lean methods, which focus on continuously reducing waste and increasing efficiency. Austerity is also stimulating the brisk pace of change in public health; for instance, legislation was recently passed in North Carolina that allows local health departments to be consolidated into human services agencies [2]. Public health leaders and managers therefore need change-management skills, the acquisition of which is facilitated by adopting QI methods.

Accreditation is another important driver of QI adoption. Accreditation has traditionally been a quality assurance activity; in public health, however, accreditation has been designed to drive health departments to implement QI methods. This motive applies to both North Carolina's man-

datory local health department accreditation program and the voluntary national accreditation program of the Public Health Accreditation Board. Data from North Carolina's local health department accreditation program suggests that this program has indeed promoted adoption of QI by North Carolina's local health departments [3].

Background and History of QI in Public Health Departments in North Carolina

North Carolina has been a leader in the application of QI principles to public health practice. For example, in 2001 the Cabarrus Health Alliance enrolled in the Institute for Healthcare Improvement's learning collaborative on improving access and efficiency in outpatient clinics, making it one of the first health departments in the country to use formal QI methods to improve its services. Cabarrus Health Alliance's success with QI continued as members of this department spread QI methods throughout their agency over the ensuing decade, becoming a model for institutionalizing QI methods both for health departments in North Carolina and nationally [4].

North Carolina is 1 of only 2 states that mandate that all local public health departments in the state be accredited. In 2005, the North Carolina General Assembly established an accreditation system for local health departments and required that all departments apply for initial accreditation by December 1, 2014 [5, 6]. As of May 25, 2012, 69 of North Carolina's 85 local health departments had been accredited [7]. Accreditation ensures accountability and standardization of local public health services, and it promotes the implementation of QI activities in local health departments [8].

What makes the current accreditation program so successful is the fact that it is not punitive. Instead, the program follows QI principles and builds on the collaborative strength of local public health departments, ultimately assuring that they are implementing best practices in their performance

Electronically published April 16, 2013.

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NC Med J. 2013;74(2):137-141. ©2013 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2013/74208

Case Study: Quality Improvement in the Macon County Health Department

Jim Bruckner, Claire H. See, Greg D. Randolph

The Macon County Public Health Department (MCPH) was accredited in December 2008. MCPH has always focused on providing quality services to the residents of Macon County, North Carolina. However, in 2009, the focus of the department's quality program shifted with the establishment of a part-time position for a quality program manager, implementation of a quality improvement (QI) program, and establishment of a QI Council. These changes were no simple task for MCPH to achieve, as they required the total commitment and support of the county manager, the Macon County Board of Health, and the department's leaders.

Over the past 4 years—in partnership with staff from the Center for Public Health Quality, the North Carolina Institute for Public Health, the North Carolina Public Health Academy, the North Carolina State University Industrial Extension Service, and the Robert Wood Johnson Foundation's Multistate Learning Collaborative—MCPH began to focus on changing its quality culture. We started by providing training sessions for staff and management, including: The Change Process, Change Management, Introduction to Performance Improvement, Performance Improvement in the Workplace, Introduction to Lean Process Terminology, Lean 100, the Public Health QI 101 Program, the QI Advisor Program, Traits of Highly Effective Teams, and Introduction to Triple Aim. This training phase took 2 years to complete, but the department will reap an enduring benefit from these efforts. Most of the classes mentioned above—The Change Process, Change Management, Introduction to Performance Improvement, Performance Improvement in the Workplace, Introduction to Lean Process Terminology, Lean 100, Introduction to Triple Aim, and Traits of Highly Effective Teams—were conducted in the first 6 months of implementation. Once staff members had a basic understanding of the change

process and the basic principles of QI and Lean, we sent 2 teams to the Public Health QI 101 Program. Upon their return, the QI 101 team members shared their experiences and what they had learned with other MCPH staff members. While the training phase was taking place, staff members participated in a number of small QI initiatives in an effort to gain understanding of the process and to help cultivate QI buy-in from all involved.

QI methods have proven to be an invaluable asset for MCPH. Once we felt we were on our way, with the initial trainings completed and a few small-win projects under our belt—projects accomplished in a short time frame, addressing relatively simple problems, and viewed as likely to be successful—we then began focusing on projects that would have a greater impact on the organization's overall performance, improve patient/customer service outcomes, and achieve demonstrable cost savings. We reinvested any cost savings from waste reduction efforts into other mission-critical activities.

One of the first major projects we undertook was to increase access to services through improvements in our appointment scheduling process. We began by participating in the Center for Public Health Quality's Public Health QI 101 Program. MCPH had historically scheduled clinics in half-day increments, and by specific program group and type. This siloed system created a considerable backlog in access at some clinics, with patients having to wait 1 or 2 months for an appointment, while other clinics had high no-show rates and/or appointment slots going unfilled. The team's aim was to make it possible for all patients to be seen within 72 hours of calling to make an appointment, while also improving patient and staff satisfaction. The team measured progress by tracking 3 metrics: the amount of time that patients had to wait between calling to make an appointment and being seen

of the 3 core functions of public health—assessment, policy development, and assurance—as well as integrating these best practices with the 10 essential public health services [6, 9, 10].

Also in 2005, the North Carolina Division of Public Health (DPH) took a visionary path by creating a new position: Director of Performance Improvement and Accountability. The director's charge was to promote accreditation and QI activities across the public health system in North Carolina. It quickly became obvious that significantly more resources and infrastructure would be required to support QI methods across 85 local health departments and DPH, which collectively employ a workforce of approximately 10,000 people [11].

That same year, the Robert Wood Johnson Foundation launched the Multistate Learning Collaborative to explore

the role of accreditation in improving performance and stimulating states' capacities to use QI methods. North Carolina was 1 of the first 5 states to participate in this 5-year initiative, which eventually expanded to involve 18 states. North Carolina's participation spurred numerous QI activities in the state, such as the highly successful Child Health Collaborative led by Cabarrus Health Alliance in partnership with the Children and Youth Branch of DPH, and it created additional demand for building QI capacity in the state's local health departments.

Another major milestone occurred in 2008. At that time, the Beaufort County Health Department became one of the first health departments in the country to apply Lean QI methods, which focus on using tools to reduce waste from all processes and on developing a culture that fosters waste reduction [12]. Beaufort County partnered with the North

in the clinic, the number of appointment slots available versus the number that were unfilled, and the number of appointments kept.

Team members first conducted several short work sessions in which they defined the scope of the problem, made visits to other health departments that had already implemented a more integrated scheduling system, and clarified the project goals. North Carolina State University's Industrial Extension Service then assisted the team in kicking off a 4-day kaizen event (4 consecutive days of rapid cycle improvement activities using Lean tools and plan-do-study-act cycles). During the kaizen event, the team conducted brainstorming sessions, created work-flow diagrams, performed gemba walks (directly observing the processes being improved), and developed detailed process maps in an effort to identify problem areas, generate ideas for potential changes, and test those ideas on a small scale. The team developed a timeline to implement the changes, and plans were set in motion. The end result was better than anyone had expected. Almost immediately, all programs impacted by the implementation of the new scheduling process were scheduling patients for visits in less than 72 hours, and no-show rates decreased, visit numbers increased, and staff downtime was virtually eliminated. In addition, patient and staff satisfaction increased.

Due to the enormous successes of this and subsequent small-win projects, MCPH successfully conducted additional QI initiatives resulting in positive changes in quality of services. Some of these QI projects brought about improvements in child health visit flow, environmental health complaints, medical records flow, the client feedback process, laboratory flow, men's health, school health information technology, vaccine storage and management, and the work flow of the Special Supplemental Nutrition Program for Women, Infants and Children (WIC). As a result of these efforts, MCPH staff members have also been invited to participate in several regional QI initiatives, including the Western North Carolina 22-County Regional Community Health Assessment, the Diabetes

Management Project, the Senior Health Issues Project, the Childhood Obesity/Healthy Kids Project, and community transformation projects.

To encourage the ongoing engagement of staff members in continuous improvement and to keep them informed regarding the status of QI/Lean projects, MCPH has established a shared computer directory for each project, which is accessible by all staff members. Stored in the directory are each team's aim statement, kaizen event documents (gemba walks, process maps, and flow diagrams), team meeting notes, and other team-related communications. In addition, MCPH has a hallway lined with bulletin boards highlighting each team's activities and the results of their work.

MCPH is committed to continuing its QI/Lean journey, paying close attention to improving the quality of care and the patient experience, improving efficiency throughout the agency, and ultimately improving the health of the community. NCMJ

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Acknowledgments

The authors would like to thank Kerri Ward for her invaluable assistance in preparing the manuscript. The authors would also like to thank Dorothy Cilenti, Lou Anne Crawley-Stout, Amanda Cornett, and Tilneil Gary for reviewing this manuscript and making thoughtful suggestions to improve it.

Potential conflicts of interest. All authors have no relevant conflicts of interest.

Electronically published April 16, 2013.

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NC Med J. 2013;74(2):138-139. ©2013 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2013/74209

Carolina State Industrial Extension Service to pilot the use of Lean methods in their family planning clinic, which was struggling with inefficiencies and long wait times for clients. The pilot program was a major success—staff members on the initial pilot team cut their clinic visit times in half and generated tremendous engagement and excitement among other staff members. Because of this success, Beaufort County's incubator network—the Northeastern North Carolina Partnership for Public Health—launched Lean QI projects in all 10 of the partnership's health departments, again with impressive results and cost savings [13].

Development of the Center for Public Health Quality

Given the increasing importance of QI and the fact that the North Carolina public health system lacked adequate

resources to support its implementation, public health leaders began working together to design a comprehensive resource. In 2008, DPH leaders worked with the North Carolina Association of Local Health Directors, the North Carolina Institute for Public Health, North Carolina Area Health Education Centers, the North Carolina Hospital Association, and 3 foundations—the Duke Endowment, Blue Cross and Blue Shield of North Carolina Foundation, and the Kate B. Reynolds Charitable Trust—to plan the design of a comprehensive quality center for North Carolina's public health system. The plans were finalized in 2009, and the foundations provided start-up funds for the Center for Public Health Quality (CPHQ), which would focus on providing QI training and support for North Carolina's 85 local health departments. The mission of the CPHQ is to collaborate with local, state, and national partners to transform the pub-

lic health system so that it fosters and supports continuous QI. The CPHQ works at both the state and local level to provide training, share evidence-based approaches about what works in public health, promote performance measurement, lead strategic QI initiatives, and engage leadership in driving organizational change to support continuous improvement.

The CPHQ developed training programs for every local health department across the state and for the staff members who lead QI efforts for their agencies. The training programs were adapted from the highly successful North Carolina Area Health Education Centers QI 101 program, which employs the Model for Improvement, a QI method that is commonly used in health care settings. Given that the value of Lean QI methods was clearly demonstrated by the Northeastern North Carolina Partnership for Public Health, the CPHQ also worked in partnership with the North Carolina State University Industrial Extension Service to integrate Lean methods and tools into all of its training programs.

From the beginning, demand for the CPHQ's training programs was high among local health departments. At one point, a waiting list of 23 agencies had accrued, requiring the center to quickly expand its training capacity. Due to the high demand for QI training and support among local health departments, the CPHQ could not meet DPH's demand for support of its QI efforts in the first years that the center was in operation. Fortunately, in late 2010 the CPHQ was awarded a 5-year grant from the National Public Health Improvement Initiative of the Centers for Disease Control and Prevention, which allowed the CPHQ to greatly expand its QI programs for DPH.

Progress in Local Health Departments

A primary focus of the CPHQ is building the capacity of the North Carolina public health workforce to use QI methods and tools to improve programs and services. Local health departments have been pioneers in these efforts, and the programs they developed are now being used successfully at the state level within DPH.

Building Workforce Capacity: The Public Health QI 101 Program

The Public Health QI 101 Program is an 8-month, longitudinal, experiential learning program designed to help staff

members of a local health department build their expertise in using QI methods and tools while simultaneously improving the quality of their programs and services. The program is based on principles of adult learning, and participants learn by applying QI methods and tools to a specific project in their health department. The program begins with a half-day of training for health directors and their designated QI leaders. During the training, participants are assisted in selecting a project and an appropriate team, instructed regarding the role of leaders in supporting QI efforts, and taught how to apply strategies to change the culture so that it better supports continuous improvement. Over the next 2 months, members of the project teams attend 3 webinars that assist them in outlining their QI project aims and teach them how to create a detailed map of their current process. Teams then attend a 2-day workshop during which they learn a variety of methods and tools for testing and implementing process changes. After returning home from this first workshop, the teams spend 3 months—the action period—attending action-period webinars and conducting a 4-day rapid cycle improvement event within their organization. At the end of the action period, teams attend the second and final 2-day workshop, during which they share their accomplishments and learn about and create plans for sustaining and spreading the use of QI methods. After the second workshop, health directors are also engaged via webinars that encourage them to continue developing strategies to support their QI teams in sustaining the gains from their projects, as well as to spread QI methods throughout their organizations.

Dramatic improvements and returns on investment have been achieved by the 47 local agencies in North Carolina that have completed the Public Health QI 101 Program [14]. For example, the Beaufort County Health Department's Special Supplemental Nutrition Program for Women, Infants, and Children achieved a program-wide 17% increase in the proportion of postpartum mothers who were engaging in breastfeeding (from 32% to 49%) [15]. A team from the Yadkin County Health Department streamlined their cervical cancer screening process and decreased the time for abnormal result notifications from 36 days to 12 days; they also eliminated enough waste to see 65 additional patients per month, and they generated new revenues of \$78,000 per year. The return on investment was calculated to be

Project focus area	Improvement achieved
Child health	Immunization rates for children younger than 2 years of age increased from 71% to 86%.
Maternal health	The wait for an initial prenatal appointment decreased from 54 days to 15 days.
Women's health and family planning	Total visit time decreased from 2 hours and 40 minutes to 1 hour and 49 minutes.

Note: Data are from an internal evaluation performed by the Center for Public Health Quality.

\$2.27 for each dollar invested in the project (unpublished data). See Table 1 for additional examples of results from the Public Health QI 101 Program. Cornett and colleagues [14] recently published an article in the *Journal of Public Health Management and Practice* that provides comprehensive data showing the overall impact of the program.

Public health leaders have been very pleased with the results from their QI efforts in the Public Health QI 101 Program, which in many cases can be transformative. For instance, a leader in the Appalachian District Health Department remarked, "Specific changes through this process have increased revenue collected at the time of visit, and created a system that flows more smoothly, allowing our clinician to provide services to more clients. QI has created an environment of possibilities for the staff at the health department that were never considered before."

Developing QI Leaders: The QI Advisor Program

The ultimate goal of the CPHQ's training programs is to create a culture and an infrastructure that support continuous improvement in all public health agencies. To build on the initial QI capacity developed in the Public Health QI 101 Program, the QI Advisor Program provides advanced QI training to those individuals who will be leading QI efforts in their agencies. These QI advisors coach, mentor, and facilitate improvement teams on an ongoing basis and help the leaders of their agencies to strategically create an infrastructure and a culture that support continuous improvement. To date, 34 QI advisors representing 17 local health departments and 5 DPH programs have been trained in North Carolina.

Evaluation of data from the first cohort of participants in the QI Advisor Program revealed that the program had a substantial impact. For example, the percentage of participants who reported being confident in their ability to provide technical assistance to a QI team increased from 32% at baseline to 89% after completion of the program. In addition, all 11 members of the first cohort of QI advisors reported that they provided technical assistance to at least 1 QI team during the year following their QI 101 experience; on average, each advisor supported 4 projects during that year.

Conclusion

North Carolina's public health departments have developed a tradition of being national leaders in the adoption and application of QI methods. A rapidly growing number of North Carolina's health departments are poised to establish a culture and infrastructure that will allow them to be continuously improving organizations, which will be critical to helping our state achieve its goal of becoming one of the healthiest states in the nation. **NCMJ**

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Acknowledgments

The authors would like to thank Kerri Ward for her invaluable assistance in preparing the manuscript. The authors would also like to thank Dorothy Cilenti, Lou Anne Crawley-Stout, Amanda Cornett, and Tilneil Gary for thoughtfully reviewing the manuscript and making suggestions to improve it.

Financial support. The Center for Public Health Quality is funded by The Duke Endowment, Blue Cross and Blue Shield of North Carolina Foundation, and the Centers for Disease Control and Prevention.

Potential conflicts of interest. All authors have no relevant conflicts of interest.

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Improving the Quality of Care for Medicaid Patients with Chronic Diseases: Community Care of North Carolina

C. Annette DuBard

Community Care of North Carolina's provider-driven approach to quality improvement has benefitted tens of thousands of North Carolinians with diabetes, asthma, hypertension, heart failure, and cardiovascular disease, and it has achieved better results than commercial Medicaid managed care nationally. Substantial opportunities remain, however, particularly for patients with complex care needs.

Community Care of North Carolina (CCNC) is a state-wide, community-based, physician-led system of regional networks committed to establishing access to a primary care medical home for vulnerable populations and equipping those medical homes with the multidisciplinary support needed to assure comprehensive, coordinated, high-quality care. As more and more Americans are living with chronic medical conditions, the need to improve chronic disease care is increasingly urgent. Approximately two-thirds of total health care spending in the United States is associated with care for individuals who have multiple chronic conditions. CCNC recognizes that improving the health care experience requires improving the way that health care is delivered; CCNC also recognizes that solutions must be local, taking into account the context of each patient, each provider, and each community. Our aim is to "lift all boats" on a rising tide of high-quality care.

Foundation for Quality

The cornerstone of CCNC's approach to quality improvement is to establish a connection to a primary care medical home for each and every Medicaid recipient. Access to care is a prerequisite for quality of care. Assuring such access requires providers who are willing to accept Medicaid patients into their practices. However, achieving such acceptance has been a persistent challenge for Medicaid programs throughout the nation, and a lack of willing providers in many states may threaten the success of health coverage expansion efforts under the Affordable Care Act. In challenging economic times, increased demand for Medicaid coverage due to joblessness is compounded by lower tax revenues, which creates budgetary pressures that frequently compel states to cut costs by lowering provider reimbursement

rates. The inevitable downstream effects are fewer providers accepting Medicaid patients and more barriers for patients seeking care outside of the emergency department. North Carolina has persistently chosen a different path, preserving primary care provider reimbursement rates while pursuing cost savings by providing care that is better coordinated, higher in quality, and less wasteful. CCNC further encourages provider participation by providing practices with access to shared resources that allow them to better respond to the needs of very complex or challenging patients. Through their CCNC participation, over 1,600 primary care practices, located throughout every county of the state, have collectively made a commitment to provide access and continuity of care for more than 1.25 million Medicaid recipients.

CCNC encourages health care providers to become engaged in quality improvement in a variety of ways. For individual patients who have the highest risk of poor health outcomes, local CCNC networks provide care management support, including care coordination across providers and settings of care, medication management, and patient and caregiver coaching in self-management of chronic conditions. Care managers and clinical pharmacists are embedded within large practices to help maximize provider time and effectiveness. Through the CCNC Provider Portal (a Web-based tool), providers can securely access information about individual patients and can also obtain population-management reports for their own panel of Medicaid patients, including feedback on clinical quality of care and identification of patients with unmet care needs. A critical element to CCNC's success centers on the ability of the networks to locally implement system changes that are needed to improve quality in practices. The network clinical directors are instrumental in engaging community providers to implement the quality initiatives. Credible and provider-friendly reports are powerful tools, particularly when accompanied

Electronically published April 16, 2013.

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N C Med J. 2013;74(2):142-147. ©2013 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2013/74210

Collaborative Quality Improvement Efforts Yield Success for Asthma Patients

Kelly B. Garrison, Caroline T. Brown

An important function of the Community Care of North Carolina (CCNC) networks is to engage physicians in efforts to continually improve quality of care for enrolled patients. When considering quality improvement (QI), people often think of expensive technology or additional work, yet that does not have to be the case.

In the fall of 2011, we began to consider the possibility of collaborating on a QI project related to asthma, when Caroline Brown, supervisor of the pediatric residents at Wake Forest Baptist Health's Downtown Health Plaza, contacted Kelly Garrison, QI coordinator for the Northwest Community Care Network (NCCN). At that time, Downtown Health Plaza had an emergency department utilization rate for asthma of 27.1 visits per 1,000 member-months (MM) and an inpatient utilization rate for asthma of 3.2 admissions per 1,000 MM, compared to a state emergency department utilization rate of 11.4 visits per 1,000 MM and a state inpatient admission rate of 1.4 admissions per 1,000 MM. Further evidence of a need for improved asthma care was furnished by the results of a recent chart review, which revealed significant inconsistencies in the approach to care taken by various providers.

The goals to be accomplished during the first phase of the QI project were simple. Over a 3-month period, the percentage of patients with asthma who had a continued

care visit that included an assessment of symptoms was to increase from 38% to 50%, the percentage of patients with asthma who had a documented assessment of environmental triggers of their asthma was to increase from 11% to 50%, and the percentage of patients with asthma who were given a written asthma action plan was to increase from 30% to 50%. We anticipated that appropriate diagnosis, treatment, and control of patients' asthma would lead to decreased hospital utilization.

This resident-based clinic, which provides care for more than 7,000 pediatric Medicaid patients, would not initially turn to use of an electronic health record or other technology in its quest for increased quality; instead, the clinic would develop its own internal process to ensure the highest quality of care.

In the beginning, changes in care were implemented only 1 day per week, with members of the nursing staff asking 2 questions to every patient: first, "Have you ever been diagnosed with asthma?" and then, "Have you been prescribed or have you used an inhaler in the past 12 months?" A "yes" response to either question would prompt the resident and attending physicians to initiate a series of steps that would guarantee that each component of the asthma visit was completed. The physicians used a checklist that included the following items: discussion

by benchmarks and comparisons to peers, which help motivate providers to improve processes that will enable them to provide the best care. The focus is on implementing evidence-based best practices in the medical home.

Clinical quality improvement activities are tailored to the needs and capacities of each practice, and such activities are often pursued in partnerships with other stakeholder organizations that have aligned goals. CCNC provides material support to practices seeking National Committee for Quality Assurance recognition as a patient-centered medical home. CCNC also coordinates with the North Carolina Healthcare Quality Alliance and with North Carolina Area Health Education Centers (AHECs) to engage practices in focused quality improvement projects through initiatives such as Improving Performance in Practice and Infrastructure for Maintaining Primary Care Transformation (IMPACT). Quality improvement teams in each of CCNC's 14 networks have dedicated resources for focused quality improvement activities in pediatrics, maternity care, and care of adults with chronic, disabling conditions. Countless other quality improvement activities represent local collaborations between the CCNC network, provider groups, academic centers or hospital systems, local public health departments, and other stakeholders. These local relationships have been cultivated over

a period of 2 decades. For more information, please visit www.communitycarenc.org.

Progress

Since its beginning in 1998, CCNC has used performance measurement and feedback to help meet its goals of improving the quality of care for Medicaid recipients while controlling costs. This process has evolved over time to meet the changing needs of the program, such as enrollment expansion in aged, blind, and disabled Medicaid eligibility categories beginning in 2008. CCNC aims to stay current with changes to evidence-based clinical practice guidelines over time and to align measures with other quality initiatives, such as the National Committee for Quality Assurance Diabetes Recognition Program, the Heart Stroke Recognition Program, and the Healthcare Effectiveness Data and Information Set; the Physician Quality Reporting Initiative; the meaningful use measures of the Electronic Health Record Incentive Program; and the "core sets" of quality measures for Medicaid-eligible children and adults issued by the Centers for Medicare & Medicaid Services.

A quality measurement and performance workgroup with representation from all 14 CCNC networks convenes annually to review performance measures. The goals of the workgroup are to identify measures with clinical importance (based

of the severity and frequency of the patient's symptoms; documentation of the patient's asthma control test score; identification of triggers; classification of severity; updating the patient's asthma action plan; review of medications taken by the patient; consideration of care management, pulmonary referral, or additional resources; and scheduling a follow-up appointment.

After several plan-do-study-act cycles were completed and changes to the process had been made, the process was implemented throughout the clinic and throughout the week. After the new process and checklist had been in place for 2 months, a chart review was completed to look for improvements in the percentages of patients receiving a continued care visit with an assessment of symptoms, an assessment of triggers, and an updated asthma action plan. The results of these audits demonstrated improvements of at least 30% in each area.

This collaborative QI effort between NCCN and the Downtown Health Plaza demonstrated exciting results. CCNC's 2012 chart audit showed remarkable improvements, which were noted in the annual Quality Measures and Feedback Report. On 2 measures—the percentage of patients with a continued care visit that included assessment of symptoms and the percentage of patients with an assessment of triggers—the clinic's score was 100%. The clinic had also increased the percentage of patients with an asthma action plan from 25% to 72%. In addition, the clinic saw a decrease in its emergency department utilization rate for asthma, from 27.1 visits per 1,000 MM to 21.9 visits per 1,000 MM, and a decrease in the number of inpatient admissions, from 3.2 admissions per 1,000 MM

to 2.0 admissions per 1,000 MM.

To further improve quality of care, NCCN purchased iPads (Apple) that can be used to aid in patient education. Through the use of CCNC's online Provider Portal, which houses a patient education site called *Meducation*, clinic staff members can show patients and families videos in various languages demonstrating the appropriate use of metered-dose inhalers, spacers (aerosol holding chambers used with inhalers), and various medications.

Overall, what makes each of the CCNC networks successful is its ability to work with primary care physicians at the ground level on issues that are important to the physicians' practices. NCCN hopes that continued support of local primary care physicians will yield additional successful QI efforts that will aid in achieving the mission and vision of the network. **NCMJ**

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Acknowledgment

Potential conflicts of interest. K.B.G. and C.T.B. have no relevant conflicts of interest.

Electronically published April 16, 2013.

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N C Med J. 2013;74(2):143-144. ©2013 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2013/74211

on disease prevalence, disease impact, and potential for improvement), scientific soundness (judged by the strength of evidence underlying the clinical practice recommendation; evidence that the measure itself improves care; and the reliability, validity, and comprehensibility of the measure), and the feasibility of implementation. Workgroup recommendations are presented to CCNC network leaders, and final measures are chosen by a vote of the network clinical directors.

CCNC contracts with AHECs to perform independent, randomized chart reviews using an electronic data abstraction tool for more than 26,000 recipients in more than 1,300 CCNC practices annually. Patients are eligible for chart review on the basis of having asthma, diabetes, hypertension, ischemic vascular disease, or heart failure. Practice-level results with patient-level detail are available on a next-day basis. Additional quality measures are derived from Medicaid claims data, and these results are updated every 3 months.

CCNC quality measures were expanded in 2009 beyond diabetes and asthma to include a broader set of chronic conditions. As shown in Table 1, improvements have been realized over the past 3 years for every chronic condition studied, and North Carolina consistently outperforms national norms for Medicaid populations in which benchmark data are available. Because of the broad reach of CCNC, even modest incremental improvements in these measures can

have a large impact on the health of the population. CCNC providers care for more than 159,000 Medicaid recipients with hypertension, more than 136,000 Medicaid recipients with asthma, more than 82,000 Medicaid recipients with diabetes, and more than 30,000 Medicaid recipients with advanced cardiovascular disease. Table 2 shows the benefits of higher quality of care in absolute terms, both relative to CCNC's own performance 3 years ago and relative to national norms for commercial managed care companies. The difference is thousands more North Carolinians receiving recommended chronic disease care today, which sets the stage for better health and lower health care costs in the future.

Opportunities

In addition to providing retrospective performance measurements and feedback, CCNC continually seeks to proactively identify concrete quality improvement opportunities and to enable providers to efficiently address them.

A "care alert" system, released in the fall of 2010, scans claims data on a weekly basis to identify patients who are not receiving recommended services. Care alerts are posted within the patient's record on CCNC's secure Web-based Provider Portal and are included in population-based reports for primary care practices that provide medical home services. For example, primary care practices can readily

TABLE 1.
Quality of Care for Chronic Conditions in the CCNC-Enrolled Medicaid Population, 2009-2012

Condition	Measure	National Medicaid HEDIS		
		Mean ^a (2011)	CCNC 2009 ^b	CCNC 2012 ^c
Diabetes	HbA _{1c} control <8%	48.1%	60.0%	60.7%
	HbA _{1c} control >9% ^d	43.0%	28.9%	27.3%
	Blood pressure control <140/90 mm Hg	60.9%	63.9%	66.0%
	Cholesterol control (LDL <100 mg/dL)	35.2%	45.0%	46.9%
	Annual foot examination	—	71.2%	78.4%
	Nephropathy monitoring ^e	77.8%	82.6%	83.8%
Asthma	Continued care visit with assessment of symptoms	—	69.5%	73.2%
	Assessment of triggers	—	47.9%	71.5%
	Action plan	—	30.6%	40.6%
	Appropriate pharmacological therapy for persistent asthma	85.0%	—	95.5%
Hypertension	Blood pressure control <140/90 mm Hg	56.8%	60.8%	63.8%
Cardiovascular disease	Use of aspirin or another antithrombotic medication	—	79.8%	84.5%
	Lipid testing	82.0%	76.6%	79.8%
	Cholesterol control (LDL <100 mg/dL)	42.1%	43.3%	46.8%
	Smoking status and cessation advice	—	79.8%	86.5%
Heart failure	Ejection fraction documented	—	81.9%	87.8%
	Beta blocker therapy for systolic dysfunction	—	90.4%	92.0%

Note. All measures except nephropathy screening were obtained through annual independent randomized chart reviews. HEDIS, Healthcare Effectiveness Data and Information Set of the National Committee for Quality Assurance; CCNC, Community Care of North Carolina; HbA_{1c}, glycosylated hemoglobin level; LDL, low-density lipoprotein cholesterol level.

^aMean proportion of patients in Medicaid managed care organizations nationally who received this care or achieved this test result in 2011. Benchmark data is not available for all measures.

^bProportion of Medicaid patients receiving care from one of the CCNC networks who received this care or achieved this test result in 2009.

^cProportion of Medicaid patients receiving care from one of the CCNC networks who received this care or achieved this test result in 2012.

^dHbA_{1c} control >9% indicates poor diabetes control; for this measure, a lower percentage is better.

^eNephropathy monitoring determined through Medicaid claims review; preliminary 2012 result based on July 2011-June 2012 dates of service.

retrieve a list of their Medicaid patients who are overdue for a diabetes eye exam, or they can see which patients are overusing asthma rescue inhalers without using a controller medication. Use of these reports has increased steadily, but the ongoing volume of active alerts signifies that considerable gaps in care remain.

Physician practices are increasingly transitioning to electronic medical records, which creates new potential for using electronic clinical data to identify gaps in care and to generate prompts to the care team. Some practices are already able to utilize information technology in this way, but others are struggling to develop this capability. CCNC is currently developing capabilities to interface with clinical data from participating practices that want help with data analytics and reporting to support their quality improvement efforts. By utilizing key clinical information that is not available in claims data, these new capabilities will allow for more timely identification of patient care gaps and more frequent assessment of the clinical process and outcome measures needed for rapid-cycle quality improvement work.

CCNC has also recently developed new tools for recognizing geographic variations in clinical care and outcomes,

because such variations may signal our best opportunities for focused improvement efforts. The North Carolina Community Health Information Portal displays measures of quality, access, and utilization at the county level, as well as indicators of disease prevalence and social determinants of health, such as poverty, education level, and environmental factors. A sample display is shown in Figure 1. For clinical quality measures related to chronic disease care, the data typically show a spread of 10 percentage points between the lowest- and highest-performing quartiles of counties. This mapping interface, available at www.communitycarenc.org/nc-hip/, is intended to equip health care providers and public health organizations with tools to reliably assess health status, disease burden, and care needs in the communities they serve and to effectively organize collaborative quality improvement activities.

Challenges

For patient populations characterized by a high prevalence of complex medical, social, and behavioral concerns, the narrow focus of standard, disease-specific quality measures falls short of capturing many of the prevailing con-

TABLE 2.
Population Impact of Improvements in Quality of Care for North Carolina Medicaid Recipients

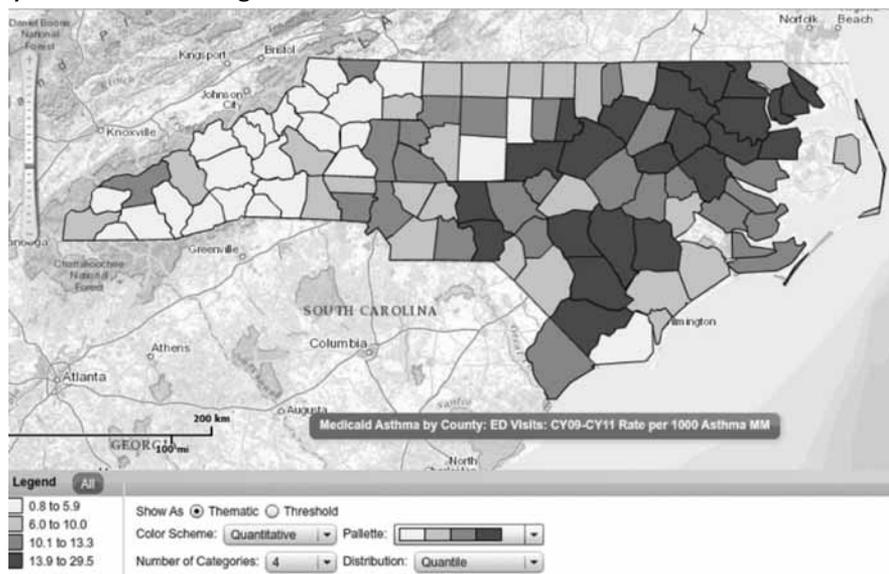
Impact of quality improvements over the past 3 years ^a	Impact relative to national norms for Medicaid recipients in commercial managed care organizations ^b
For 82,216 CCNC-enrolled Medicaid recipients with diabetes	
<ul style="list-style-type: none"> • 576 more have good blood glucose control. • 1,315 fewer have poor blood glucose control (HbA_{1c} >9.0%). • 1,727 more have good blood pressure control. • 1,562 more have good cholesterol control. • 5,899 more received an annual foot examination. 	<ul style="list-style-type: none"> • 10,359 more have good blood glucose control. • 12,908 fewer have poor blood sugar control (HbA_{1c} >9.0%). • 4,193 more have good blood pressure control. • 9,619 more have good cholesterol control. • 4,933 more received appropriate nephropathy screening or management.
For 136,529 CCNC-enrolled Medicaid recipients with asthma	
<ul style="list-style-type: none"> • 5,052 more had continuity of care visits that included symptom assessment. • 32,221 more had an asthma trigger assessment by their primary care provider. • 13,653 more have an asthma action plan. 	<ul style="list-style-type: none"> • 14,336 more received appropriate pharmacological therapy.
For 159,776 CCNC-enrolled Medicaid recipients with hypertension	
<ul style="list-style-type: none"> • 4,793 more have good blood pressure control. 	<ul style="list-style-type: none"> • 11,184 more have good blood pressure control.
For 30,164 CCNC-enrolled Medicaid recipients with cardiovascular disease	
<ul style="list-style-type: none"> • 1,056 more have good cholesterol control. • 1,418 more are taking aspirin or other antithrombotic therapy. • 965 more had cholesterol screening. • 2,021 more received tobacco use screening and cessation advice. 	<ul style="list-style-type: none"> • 1,418 more have good cholesterol control.

CCNC, Community Care of North Carolina; HEDIS, the Healthcare Effectiveness Data and Information Set of the National Committee for Quality Assurance; HbA_{1c}, glycosylated hemoglobin level.

^a2012 CCNC performance relative to 2009 CCNC performance.

^b2012 CCNC Performance relative to the 2011 Medicaid Managed Care Organization National HEDIS mean.

FIGURE 1.
Use of Geomapping to Identify Quality Improvement Opportunities: Rate of Emergency Department Visits Among North Carolina Medicaid Patients with Asthma



This screenshot from the North Carolina Community Health Information Portal (www.communitycarenc.org/nc-hip) displays regional variation in emergency department (ED) visit rates for North Carolina Medicaid patients with asthma, by county location of the primary care provider. Counties are grouped into quartiles. For the quartile of counties with the lowest ED visit rates for asthma, which are located predominantly in the western part of North Carolina, the asthma ED utilization rate during calendar years 2009, 2010, and 2011 was less than 6.0 visits per 1,000 asthma member-months, which translates to approximately 6 visits per year for every 83 patients with asthma. (Member-months measure both the number of individuals and the number of months per year when they were eligible for Medicaid.) For the quartile of counties with the highest rates, which are located predominantly in the eastern part of North Carolina, asthma ED visits were more than twice as frequent, exceeding 13.8 visits per 1,000 asthma member-months.

cerns of patients and their caregivers, or of payers and purchasers of health care. Individuals with multiple chronic conditions account for two-thirds of total US health care spending, visit multiple physicians during the course of a year, and are at greatest risk for hospital admission, readmission, and functional decline [1, 2]. Indeed, among the highest-cost 10% of Medicaid recipients, over half have 5 or more chronic conditions [3]. Recognizing that complex problems require complex solutions, CCNC's focus has evolved away from emphasizing individual provider performance on disease-specific indicators toward tackling the "messier" situations most germane to the experience of the patients we serve. Major CCNC initiatives launched or accelerated within the past few years include those on transitional care; motivational interviewing; comprehensive medication management; patient self-management of chronic disease; behavioral health integration; chronic pain; palliative care; substance abuse screening, brief intervention, referral, and treatment (SBIRT); novel medical home models for pregnant women and residents of adult care homes; and an accountable care collaborative for children with complex medical conditions. For patients with complex

care needs, whose care involves not only the primary care medical home but also multiple specialists and service providers in multiple settings, quality is not easily captured in a numerical score or readily attributable to any single physician. Quality of care is a reflection of the health care system as a whole, and excellence is a shared responsibility. **NCMJ**

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Acknowledgment

Potential conflicts of interest. C.A.D. has no relevant conflicts of interest.

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Leadership in Medicine

The Role of the Quality Improvement Organization

Jill McArdle

Quality Improvement Organizations (QIOs) are an unbiased source of quality improvement support and expertise for health care professionals and institutions across the nation. The Carolinas Center for Medical Excellence, the QIO in North Carolina and South Carolina, is supporting the advancement of the National Quality Strategy.

Medicare's Quality Improvement Organization (QIO) Program—formerly known as the Utilization and Quality Control Peer Review Organization Program—is the largest federal program dedicated to improving the quality of health care at the community level. Each state, as well as the District of Columbia, Puerto Rico, and the US Virgin Islands, has an assigned QIO contractor. QIOs contract with the US Centers for Medicare & Medicaid Services (CMS) to improve the effectiveness, efficiency, economy, and quality of services delivered to Medicare beneficiaries in that state or territory.

The Carolinas Center for Medical Excellence (CCME) is the federally designated QIO for both North Carolina and South Carolina. CCME has held its QIO contract with CMS for nearly 30 years. During that time, CCME has worked with health care practitioners and providers across the health care continuum to focus on topics of great importance to the Medicare population—areas of care that are in need of improvement and for which there is good evidence that improvement is possible.

QIOs across the nation work under performance-based, 3-year contracts with CMS and are required to meet contract-specific process and outcome metrics. QIO contractors nationwide are all working to meet the same performance goals, such as reducing hospital admissions and readmissions, meeting recruitment targets for participating providers, and reducing the use of physical restraints in nursing homes. Thus they have a rich opportunity for learning and sharing methods of advancing and transforming the quality of health care in an efficient manner. QIOs are able to share best-practice information with one another in several ways: via an electronic information intranet; at national meetings sponsored by CMS; and in other learning forums that are sponsored by national coordinating center CMS contractors who support QIOs throughout the contract period.

The health care communities in North Carolina and South Carolina have come to trust CCME as a credible, collabora-

tive, committed, patient-centered, and knowledgeable partner in health care quality improvement. CCME fulfills its statutory and contractual requirements by functioning as a convener, organizer, motivator, and change agent. CCME's goal is to achieve measurable quality improvement results through data collection, analysis, education, and monitoring for improvement. Its role is to facilitate information exchange within the health care system and to disseminate and spread best practices to ensure that the care provided to the more than 1.5 million Medicare beneficiaries in North Carolina and the more than 800,000 beneficiaries in South Carolina meets the highest quality standards.

During the 3-year period from August 1, 2012, through July 31, 2014, CCME and other QIOs have been asked to partner with CMS to improve the nation's health care through the National Quality Strategy. That strategy has 3 broad aims: better health care, better health for people and communities, and affordable care (through lowering costs by making improvements). QIOs have recruited health care providers, practitioners, Medicare beneficiaries, and other committed partners to work on 4 priorities to meet these broad aims. The first of these priorities is to make beneficiaries and their families the center of care by teaching them how to be better informed and more engaged consumers of health care. The second is to improve individual patient care by improving medication safety and by reducing health care-acquired conditions (such as infections or other health problems that occur in a health care setting). The third is to integrate care for populations and communities by bringing together communities of providers to improve care transitions and to reduce unnecessary hospital readmissions. And the fourth is to improve health for populations and communities by helping physicians use electronic health record (EHR) systems to improve preventive and cardiovascular care for the population of patients they serve.

CCME and other QIOs are an unbiased source of quality improvement support and expertise for health care pro-

Electronically published April 16, 2013.

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N C Med J. 2013;74(2):148-150. ©2013 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2013/74212

professionals and institutions. Their services are offered to the health care community without fees. They are directed by CMS to reach out to the providers who are most in need of assistance with quality improvement—those who are not meeting performance expectations or benchmarks. QIOs provide assistance at a local level, in communities where people live, work, and receive health care.

The team of professionals at CCME is vast and varied. It includes doctors, nurses, social workers, occupational and physical therapists, other allied health professionals, quality improvement experts, health policy analysts, and health data analysts. CCME's quality improvement support and expertise are not limited to a single type of provider setting or to a particular clinical topic, and although CCME's mandate is directed at improving care for the Medicare population, its health care quality improvement initiatives are aimed at improving health care processes and systems in ways that will benefit all patients, regardless of age or insurance coverage.

One of the important obligations of QIOs is to protect the rights of Medicare beneficiaries by reviewing complaints about the quality of care and appeals regarding the denial or discontinuation of health care services. These reviews require CCME to determine whether care meets professional standards. The review findings are communicated to beneficiaries; in addition, CCME is able to work directly with providers in the areas that have been identified as needing improvement.

The estimated cost of the QIO program in fiscal year 2006 was approximately 0.1% of the total Medicare budget, and the cost per beneficiary that year was approximately \$9 for each of the more than 43 million Medicare beneficiaries [1]. A 2000 Institute of Medicine (IOM) report titled *To Err is Human* estimated that some 44,000 to 98,000 Americans die each year as a result of medical errors [2]. The Dartmouth Atlas Project has consistently reported large variations in medical resource distribution and use, but the project has not found any positive correlation between resource expenditure and improved outcomes [3, 4]. Further variations in health care were confirmed in a 2001 IOM report titled *Crossing the Quality Chasm* [5], which identified large gaps in the quality of care provided. The Committee on the Quality of Health Care in America, which authored the report, suggested that the cause of those gaps was the inability of our health care system to keep up with the rapid achievements in scientific knowledge and technology. The committee further recommended the systematic application of scientific evidence to clinical practice, with the goal of reducing what is believed to be a 17-year gap between the knowledge gained via randomized controlled research to the adoption of that knowledge into routine clinical practice [5].

QIOs are perfectly positioned to provide the technical support necessary to help health care providers apply scientific evidence to health care delivery at the community level by making that evidence more useful and more accessible to

clinicians and patients. A 2006 IOM report titled *Medicare's Quality Improvement Organization Program: Maximizing Potential* described the QIO program as a "unique national resource," and recommended that the program remain a key player in quality improvement because of its ability to "foster and coordinate change across the country ... [providing] greater consistency and the national alignment of improvement efforts" [6].

Health care providers and practitioners are committed to monitoring, providing, and implementing the safest, most effective care possible. However, change requires support and persistence. This, in part, is why the health care community in North Carolina has been eager to accept CCME's offer of assistance to participate in quality improvement initiatives, such as those aimed at optimizing care transitions to prevent hospital readmission, improving indicators of quality nursing home care, and decreasing adverse drug events in ambulatory care.

One of CCME's current initiatives targets 12 health care communities in North Carolina—which together contain 42 hospitals, more than 70 nursing homes, and more than 60 home health agencies—that are working with CCME to improve care transitions. The goal is for patients being discharged from hospitals to understand their medications, to know what to do if their condition worsens, and to know when to seek assistance. With that information, patients are well prepared to avoid unnecessary returns to the hospital. This effort requires that hospitals work with other providers, such as home health agencies, nursing homes, physician offices, and community support services that provide transportation, meals, and other resources; it takes the proverbial village to keep a community well.

CCME has facilitated interactions at the community level. The work includes analyzing root causes; conducting focus groups for physicians, patients, families, and community service providers; and providing detailed analyses of readmissions, noting where the hospital discharged the patient to and where the patient was readmitted from. In addition, with assistance provided by CCME, 3 North Carolina communities will receive direct funding via the Community-Based Care Transitions Program; this funding was made available under section 3026 of the Patient Protection and Affordable Care Act of 2010 [7, 8].

Forty-four nursing homes in North Carolina with the highest rates of pressure ulcers and use of physical restraints have accepted CCME's invitation to improve care by reducing those rates. CCME has offered on-site technical assistance to these nursing homes to help develop action plans to improve the care they deliver to their residents in the targeted areas. CCME has sponsored in-person learning sessions, periodic group educational webinars, and direct coaching to nursing homes to ensure ongoing improvement.

The old adage in quality improvement is that "you can't manage what you aren't monitoring or measuring." CCME has helped nursing homes to measure the results of the changes

they implement to determine whether they are achieving the desired improvements. In aggregate, the nursing homes participating with CCME saw a reduction in the proportion of patients on whom physical restraints were used, from 7% in the period from the fourth quarter of 2010 through the first quarter of 2011, to 3% in the period from the second quarter of 2012 through the third quarter of 2012; this is a relative improvement rate of 60%. In this same period, measureable improvement was seen in the rate of pressure ulcers among patients in the nursing homes participating with CCME; this rate was reduced from 13% to 10%, for a relative improvement rate of 25% (CMS, unpublished data, November 2012).

Adverse drug events disproportionately affect patients who are 65 years of age or older. Improving medication safety in the Medicare population will not only save Medicare costs but will also have a direct positive impact on the quality of life of Medicare beneficiaries. CCME is working with 10 community-based health care centers to improve medication safety and to reduce the incidence of adverse drug events. CCME partners with these clinics in their participation in the national Patient Safety and Pharmacy Services Collaborative, which is designed to integrate evidence-based clinical pharmacy services into the care and management of patients with high-risk, high-cost, complex health conditions. For some of these clinics, this has been their first experience participating in a structured quality improvement initiative.

Unlike hospitals and some other providers, physician offices typically do not have formal quality improvement programs as part of their organizational structure. In an effort to improve health care through the use of EHR systems, the 2009 American Recovery and Reinvestment Act included the Health Information Technology for Economic and Clinical Health Act, also known as HITECH [9]. HITECH allocated \$19 billion to hospitals and physicians in support of their use of certified EHR systems. CCME is able to help physicians better utilize their EHR systems to manage their patient population by providing EHR technical expertise and quality improvement expertise. More than 240 physicians and practitioners have benefited from the opportunity to work with CCME to improve the recommended preventive care provided to their patients, including cancer screening and adult immunizations, and the recommended care provided to their patients with cardiovascular disease through better use of their EHR systems.

QIOs are well suited to assist providers and improve health care quality as required by the Affordable Care Act. The landmark health care reform legislation, signed into law in March 2010 [8] and upheld by the US Supreme Court in June 2012, requires sweeping changes to our health care system. Numerous provisions will be implemented over the next several years. QIOs can help providers to establish accountable care organizations and medical homes and to execute other systematic changes. QIOs are a national resource, and they are well positioned and well prepared to play an integral part in our nation's quality improvement strategies.

CCME takes very seriously its role as the federally designated QIO for North Carolina and South Carolina. We consider this designation an honor and a privilege, and we look forward to continued opportunities to fulfill our organizational mission as an independent nonprofit corporation: "to provide leadership, education, and services to promote improvement in the quality and cost effectiveness of health care" [10]. NCMJ

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Acknowledgement

Financial support. The analyses on which this publication is based were performed under contract number 500-2011-NC10C, titled "Utilization and Quality Control Peer Review Organization for the State of North Carolina," funded by the US Centers for Medicare & Medicaid Services, an agency of the US Department of Health and Human Services (USDHHS). The content of this publication does not necessarily reflect the views or policies of USDHHS, nor does any mention in this publication of trade names, commercial products, or organizations imply endorsement by the US Government. The author assumes full responsibility for the accuracy and completeness of the ideas presented.

Potential conflicts of interest. J.M. has no relevant conflicts of interest.

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Quality Improvement in the Age of Electronic Health Records: The North Carolina Improving Performance in Practice Program

Sonali Batish

The Improving Performance in Practice program of the South East Area Health Education Center aims to assist primary care practices in using electronic health records to improve outcomes for patients with chronic diseases. This commentary describes the challenges and successes of practices that have participated in this program.

The Improving Performance in Practice (IPIP) program of the South East Area Health Education Center (SEAHEC) serves the North Carolina counties of New Hanover, Pender, Brunswick, Bladen, Onslow, and Columbus. This program began in early 2008 with 12 participating primary care practices, and the program expanded in 2010 when it began working in tandem with a Regional Extension Center (REC) grant.

Organized by the primary care certifying boards and physician specialty societies, the IPIP program was initially funded by the Robert Wood Johnson Foundation and receives direction and technical assistance from Group Health Research Institute's MacColl Institute for Health Care Innovation. IPIP is founded on principles outlined in the program's change package, which is a blueprint for improving care delivery. The IPIP change package entails high-leverage changes within a practice, including implementation of a registry to track and benchmark care, use of templates for planned care, use of protocols to guide decision making, and adoption of self-management support strategies to engage patients in managing their disease. These changes are not necessarily sequential, but they can be a natural progression towards improvement in a practice. The goal of the change package is to promote care that is evidence-based, standardized, consistent, and measurable across disease states. The first step is to implement an electronic database to readily identify and manage patients with chronic diseases.

Initially, most practices in the SEAHEC region used an external database with paper flow sheets to manage the care of patients with diabetes or asthma. Flow sheets printed from this external registry highlighted aspects of care that were due to take place, based on information about what type of care had already been provided during previous visits. SEAHEC's quality improvement coaches (QICs)

encouraged the use of flow sheets for previsit planning as a regular part of the care routine. As a follow-up to the use of flow sheets, QICs met with practices and extracted trending data from their registry. Based on these data, coaches worked with practice teams to perform plan-do-study-act (PDSA) cycles that led to improvement across measures throughout a practice. For example, one multilocation practice emphasized their diabetes medication protocol during staff meetings by regularly discussing data related to statin therapy, combination therapy with angiotensin-converting enzyme inhibitors and angiotensin receptor blockers (ACE/ARB therapy), and aspirin usage. The medication protocol was discussed as a standardized treatment for diabetes across practice locations. Providers were often reminded of the agreed-upon protocol during data discussions, particularly when related measures seemed to be lagging. When the practice adopted and implemented an electronic health record (EHR) system, the providers and staff members were able to incorporate these protocols and their application process into order sets, electronic templates, and point-of-care reminders for diabetes care.

Although the flow sheets were useful, practices often reported that the time and effort required for staff members to maintain the registry were barriers to sustainability. For many practices, this limitation helped motivate them to adopt an EHR system. During quarterly IPIP meetings, collaborative participants presented how their EHR system would allow data to be collected for every patient during the visit itself, without duplication of effort in printing paper flow sheets or performing manual data entry after each visit.

Having experience with an electronic registry helped shape practitioners' expectations of clinical functionality as they chose and implemented their new EHR system. Staff members at practices that had consistently used paper-based tools such as asthma action plans, patient educa-

Electronically published April 16, 2013.

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N C Med J. 2013;74(2):151-154. ©2013 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2013/74213

tion materials, and clinical protocols worked with IPIP/REC staff and EHR vendors to build these features into their EHR system, often before the system went into use. These tools were also shared with other practices during quarterly collaborative meetings involving all of the practices that were working with the SEAHEC IPIP/REC team. Some of these meetings were attended by more than 100 practitioners and staff members, with everyone sharing the pearls of wisdom they had gleaned while selecting and implementing their EHR systems. The peer-to-peer education that took place at these collaborative meetings provided valuable insights for practices regarding EHR implementation, meaningful use requirements, and patient-centered medical home activities. Hearing from colleagues about barriers as well as successes enhanced the credibility of the advice and developed providers' ability to advocate for improved systems of care. Also, these interactions accelerated progress by eliminating much of the trial and error that occurs when a practice works entirely in isolation.

Since the introduction of the REC grant in 2010, additional practices have been recruited to join the SEAHEC IPIP program. These practices approached the IPIP/REC team with an initial goal of selecting an EHR system, implementing it, and working toward meeting the meaningful use requirements of the EHR incentive programs of the Centers for Medicare & Medicaid Services. However, as these practices began the implementation process, received education on how to use the EHR system to manage patient care, and heard about the successes of their peers, many of them also began monitoring and improving their care of patients with chronic diseases. Practices in the collaborative that have already implemented an EHR system and are using quality data continue to provide motivation for those practices that have not yet reached the stage of routinely pulling data from their EHR system. For example, a pediatric practice presented their asthma data and screenshots of their asthma template, and they described the process of developing the custom template to eventually pull data. This presentation reminded other practices that there are exciting payoffs to be gained after a practice struggles through the difficult EHR implementation phase. It also reinforced the possibility of using the EHR system to demonstrate improvement. As these data are automatically produced over a period of time, they can be placed into annotated run charts. Such charts not only show trending data over time but also contain short notes to indicate PDSA cycles that were implemented during particular time frames, so that a practice can see if the implementation of a particular quality initiative resulted in data improvement. These charts add excitement to improvement work, as each PDSA cycle is correlated with tangible advances in care.

In addition to attending collaborative meetings, QICs also perform on-site practice visits, during which they provide feedback regarding EHR support, technical issues, and functionality. A great strength of the IPIP program is that IPIP/REC

staff members are able to gather pertinent information from multiple sources, including area providers, multiple partner agencies, and REC staff members across the state with whom they attend meetings and webinars. In many cases, QICs are able to obtain advice not just from this network of connections but also from local practices that are willing to network and provide in-person assistance to other collaborative participants in their region or in more distant areas of the state. This sharing among staff members and practitioners can range from receiving advice over the telephone to shadowing in a practice to see an EHR system in use.

IPIP/REC staff members also observe aspects of work flow in order to help practices prepare for EHR implementation. For example, in one practice that utilized paper charts, telephone prescription refill requests were automatically transferred to the nurses' line. Nurses would pull the paper chart, message the provider via sticky note, and then either call in the refill request or ask the front office staff to make an appointment for the patient to return to the clinic. As the practice was preparing to implement an EHR system, the QICs explained to the practice's staff members that many practices in the region train front office staff members to gather key data and message the provider electronically, thus executing refill requests more efficiently. The QICs worked with the practitioners, nurses, and front office staff members to create a telephone template—a series of questions to ask the patient when gathering refill information. By eliminating the sticky note and extra intermediary work by the nurses, staff members streamlined the process, and nurses were able to dedicate additional time to clinical rather than clerical work. As a result of such efforts, 46 practitioners reported on surveys administered following collaborative meetings that IPIP/REC support had been worthwhile in their efforts to use their EHRs for patient management.

The second step in the IPIP change package is to implement clinical decision support tools to guide patient visits. In practices that want to improve rates of participation in smoking cessation therapy or to improve management of diabetes, asthma, hypertension, or hyperlipidemia, practitioners work with QICs to choose evidence-based guidelines that suit the needs of their practices. A common issue is how to track whether patients have received preventive care consistently and in a timely manner. Setting up clinical decision support rules within the EHR system helps practitioners to prioritize challenging aspects of care, to develop a protocol that can serve as a benchmark, to identify staff members who are responsible for care activities, and to use the EHR system to alert staff members when care is due for a particular patient.

In one practice, practitioners wished to know when influenza vaccination was due for patients with asthma. IPIP/REC staff members worked with the practice and their vendor to create a rule that would flag the practice when vaccination was due. The flag would initially alert the front office staff members upon patient check-in. Patients who wished

to receive the vaccine were given information about their chronic disease and an explanation of why vaccination is important. A standing order protocol was created during practice staff meetings that empowered the nurse or medical assistant to administer the vaccine if the flag signaled that the patient was overdue to receive it. Soon after documenting the patient's vital signs and social history, nurses in the practice would administer the vaccine, before the provider entered the exam room. This change resulted in a significant improvement in influenza vaccination rates and more efficient use of provider time for other aspects of care. Similar results were obtained for practices working on providing foot exams, smoking cessation interventions, instructions in patient self-management, and asthma action plans.

The third step in the IPIP change package is to standardize care throughout the practice. SEAHEC's IPIP program, in collaboration with Community Care of the Lower Cape Fear (CCLCF), is participating in the Agency for Healthcare Research and Quality's Infrastructure for Maintaining Primary Care Transformation (IMPACT) project. As part of this initiative, both organizations' quality improvement teams are working with practices on previsit planning. Practices receive joint coaching and tools from SEAHEC/CCLCF to assist in the development of a previsit planning curriculum. This includes instructions on how to develop a standing order set for various chronic diseases, education about how huddles can improve team-based care, and assistance in improving practice-wide communication and staff satisfaction. Prior to participating in this initiative, practices are given a staff satisfaction survey that measures communication, culture, and teamwork within the practice. Once the results have been reviewed with the practice, staff members work together to decide which previsit planning tools would assist them in improving. The study is ongoing; however, staff satisfaction at these practices will be surveyed again in 12 months to see whether the interventions have improved staff satisfaction, increased standardization, and improved clinical outcomes. One participating practice has already begun to use huddles and previsit planning protocols, and preliminary data show improvement on various process measures such as documentation of glycosylated hemoglobin levels, smoking cessation counseling, and foot exam rates.

The last step in the IPIP change package is frequent data monitoring. Practices are assigned a QIC, a practice support coordinator, and a technical assistance specialist who work as a team to provide vendor-neutral guidance to practices throughout their improvement journeys. The team is trained to use a PDSA approach to guide improvement during regular on-site visits. Data are pulled from the EHR system and used to determine high-priority areas for improvement work. Practices not only see their own trending data but also receive comparative graphs benchmarked to state averages, regional averages, and national goals. Goals and small tests of change are set each month. By involving practice teams

that span the breadth of office operations, practices can examine work flow from the waiting room to the exam room in working toward solutions.

Some practices also work with IPIP/REC staff as part of their goal to become recognized by the National Committee for Quality Assurance as a patient-centered medical home (PCMH) [1]. Primary care practices have long been called upon to provide care for a multitude of patient issues during the practice visit and to coordinate care across multiple care settings. Practices need processes for following patients across the continuum of health care. Without an EHR, providers must fax patient records from one health care facility to another in order to coordinate care. In contrast, practices that are part of a health information exchange (HIE) can have patients identify their primary care team, and the HIE can then inform these individuals when the patient receives care from other providers. Processes for coordination of care can be measured and standardized as practices work toward PCMH recognition. IPIP/REC staff members assist practices in the development of tools that improve the coordination of care such as referral logs, practice policies, and forms that allow specialists to more easily report results to the primary care provider.

Ultimately, to achieve full coordination and the best possible care and cost outcomes, medical home practices will need to be able to seamlessly exchange medical information with hospitals and with specialty practices. In response to this need, SEAHEC became a founding member of Coastal Connect Health Information Exchange (CCHIE) [2]. The organization has selected an electronic platform to serve as an EHR translator, which can be used to securely exchange important clinical information across various settings of care. As part of the ongoing improvement work in the IPIP/REC collaborative, practices are being educated about CCHIE. IPIP/REC staff members have also coordinated on-site demonstrations for interested practices that show the exchange of clinical information between the practice and area specialty practices and hospitals. In addition, CCHIE staff members have given presentations at several collaborative meetings. Grant funds from The Duke Endowment have supported practices in the Community Care of North Carolina network in connecting to CCHIE by covering connection costs and subscription fees.

In recent months, CCHIE has made significant progress in connecting practices to area hospitals and specialist practices, resulting in a network that is already robust. To date, 5 area hospitals and 174 area primary care and specialty practices (551 providers) can exchange real-time data electronically. In addition, CCHIE has put a new portal in place that allows practitioners to receive notifications alerting them to a hospital admission. The eventual goal of this portal is to provide discharge summaries in real time for hospitalized patients. As part of this work, IPIP/REC staff members emphasize that the EHR system, in conjunction with CCHIE, can allow for seamless clinical exchanges across various

care settings. This connectivity will contribute to better care coordination and improved outcomes, as well as allowing primary care practices to function as full-fledged medical homes.

Practice-level and system changes that foster improved and efficient care continue to be a goal in the SEAHEC region. The trust earned and the relationships formed by IPIP/REC staff members foster improvement work even among busy practices with limited quality improvement resources. Given a changing reimbursement system that is heavily influenced by outcomes and data, the IPIP program is likely to continue to evolve and to assist practices into the foreseeable future. NCMJ

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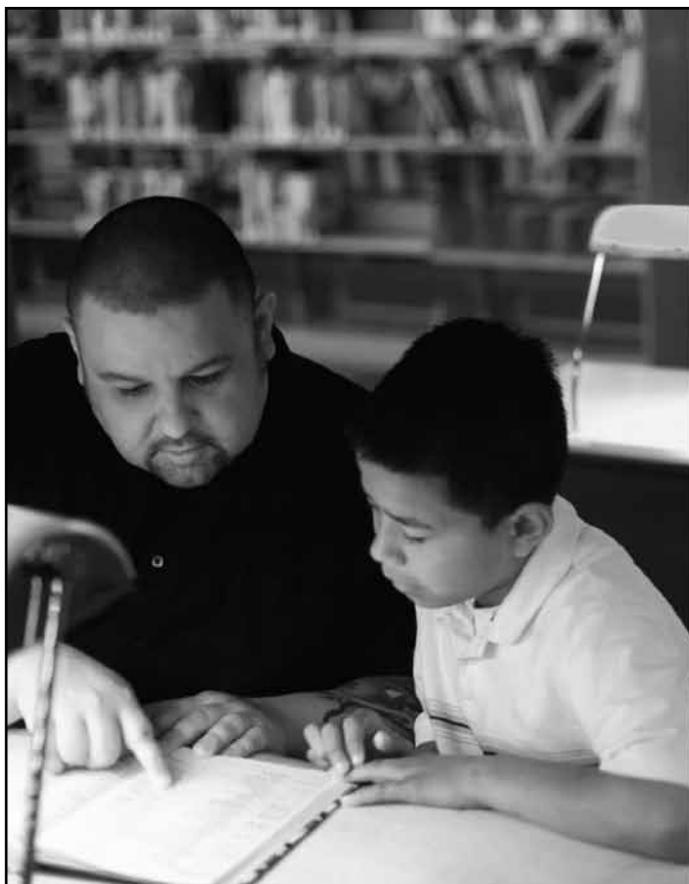
Acknowledgment

The author thanks Sam Cykert, MD, for reviewing this manuscript and suggesting several improvements. The author also thanks Albert Meyer, MD, and Ashley Adams for assistance in editing this manuscript.

Potential conflicts of interest. S.B. has no relevant conflicts of interest.

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The Perils of Quality Improvement Activities: A Physician's Perspective

W. James Stackhouse

Clinical quality measurement remains an elusive goal, and it has the potential to result in adverse outcomes and unexpected consequences. Practicing physicians are wary of current efforts but should remain professionally committed to the development of effective, evidence-based quality measures.

In 34 years of practicing medicine, I have yet to be paid based on any measured quality outcome. Instead, my sense of professionalism, my interest in evidence-based decision making and clinical outcomes, and my respect for my patients have driven my interest in quality improvement activities. I have no reason to think that the experiences of my physician colleagues have been any different.

The role of quality measurement may change in the near future, however, when programs such as the Physician Quality Reporting System (PQRS) of the Centers for Medicare & Medicaid Services (CMS) move from merely requiring the reporting of processes and numbers to providing rewards when targets are met or imposing financial punishments when targets are missed [1]. Other payers and insurers in North Carolina and nationwide are gradually moving from "reward for reporting" programs to true pay-for-performance activities. The development of accountable care organizations in North Carolina, which are being created by commercial insurance companies, Medicare, and Medicaid, will certainly engage many more practices in quality improvement efforts.

From the perspective of a practicing physician, the rewards have been relatively small so far compared to the effort involved in process reporting. Although I care for many Medicare patients, my "reward" for PQRS reporting in 2011 was less than \$1,200, and it was half that amount in 2012, when the incentive rate fell from 1% of claims to 0.5%.

Of course, reporting also has a cost. Using data from 8 diverse primary care practices in North Carolina, Halladay and colleagues [2] examined the costs of gathering and reporting data on quality care indicators to 4 major quality programs. Costs of reporting data included implementation expenses, ranging from less than \$1,000 to \$11,100 per clinician, and annual maintenance costs, ranging from less than \$100 to \$4,300 per clinician. The article states that practices with fewer care providers "appeared to be especially

hard hit" by reporting requirements [2].

Many physicians are not convinced that reporting of quality measures has a major impact on quality. A survey of 4,934 physicians in 2009 revealed that only 38% were participating in the Physicians Quality Reporting Initiative (PQRI), which has since been renamed the PQRS. More than half of medical specialists and surgeons participating in the PQRI believed that it had no impact on quality; this opinion was shared by 40% of primary care physicians [3]. Overall participation rates in PQRS may soon increase, as failure to participate will result in a 1.5% reduction in allowable Medicare fees beginning in 2015.

Payers in North Carolina have offered some practices financial incentives for participation in quality improvement work through recognition programs such as Bridges to Excellence (BTE), Improving Performance In Practice, and the National Committee for Quality Assurance (NCQA). Blue Cross and Blue Shield of North Carolina has offered financial incentives for quality improvement to selected practices since 2006. In 2009, Blue Cross and Blue Shield of North Carolina expanded these incentives with its Blue Quality Physician Program (BQPP). Focusing on independent practices and offering improvements in fee-for-service schedules for completion of the program, BQPP provides a significant financial incentive for practices to participate in selected quality improvement programs. The measured elements include components of care and quality, which use entities such as BTE and NCQA to assess disease management; education of administrative and clinical staff members on issues such as cultural competence and end-of-life decision making; and practice organization elements, including continuous quality improvement, maintenance of certification, cost-saving practice efforts and policies, office hours and access, motivational interviewing, and practice efficiency. The flexibility of different pathways for recognition may well improve the overall value, participation, and applicability of the process to different practices.

Electronically published April 16, 2013.

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NC Med J. 2013;74(2):155-158. ©2013 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2013/74214

Efforts to measure clinical quality and outcomes accelerated after a 2001 report from the Institute of Medicine of the National Academies (IOM) highlighted quality gaps in medical care [4]. This finding in turn accelerated the proliferation of clinical guidelines. Although guidelines are not quality measures, they are often used as a quality yardstick.

More than 2,500 disease-specific guidelines are now available through the Agency for Healthcare Research and Quality's National Guideline Clearinghouse [5]. Many of these guidelines are consensus statements from panels of recognized experts, drawn from various levels of evidence combined with the experts' experiences and current practice. Best practices are evidence-based, but sometimes limited evidence is available. Further research to validate both guidelines and best practices occasionally results in significant revisions due to evidence of unintended harm. Ignoring the complex needs of patients with multiple medical issues, programs have often used guidelines for individual disease management as measures of physician performance, despite disclaimers from the developing organizations that the guidelines are not to be considered standards of care.

Although such guidelines are often used for payer authorization decisions, the evidence base supporting these guidelines is often limited, with many guidelines relying on expert consensus alone. Recently, 6 professional organizations, including the American College of Physicians and the American College of Cardiology Foundation, outlined 48 specific practice guidelines for management of ischemic heart disease, 18 of which were, in the authors' own judgment, based on low-quality evidence [6]. In addition, guidelines may conflict when applied to patients with multiple significant disease processes, and authoritative panels often disagree about the efficacy of screening measures such as mammograms, prostate-specific antigen testing, and chest radiographs.

In 2012, Kung and colleagues screened 130 randomly selected guidelines from the National Guideline Clearinghouse Web site and concluded that fewer than half met at least 50% of the guideline standards set by the IOM in 2011. The authors used what they termed a "liberal" interpretation of the guidelines, meaning that they did not include 7 of the 18 IOM guidelines, which they deemed "too vague and subjective to be analyzed." Information on conflicts of interest (COI) was provided in fewer than half of subspecialty society-developed guidelines. In guidelines that contained this information, 71.4% of committee chairpersons and 90.5% of cochairpersons had disclosed COIs [7]. A 2011 IOM report recommended that persons with COIs not fill those roles, whether or not the COIs were disclosed [8].

Connecting compensation to guidelines and/or quality measurements elicits new behaviors from organizations and individuals. Data on the effects of measuring and rewarding performance are available from the British National Health Service (NHS). In 2004, the NHS used tracking information from the NHS-funded electronic health record (EHR)

to assess performance on 80 clinical indicators, 43 organizational indicators, 4 patient-experience indicators, and 8 other service indicators. General practices could earn up to 1,050 points by meeting these criteria, and financial awards were tied to performance. The average practice achieved 91% of the available 1,050 points, representing a bonus of \$75,000 USD per physician. "Cherry picking," or excluding certain patients from the scoring, did not occur to any significant extent. The NHS had only budgeted for about two-thirds of this performance level [9].

As far back as 2003, studies had begun to uncover the unintended consequences of pay-for-performance initiatives. Shen demonstrated that incentives offered to a non-profit substance abuse treatment center affected which patients were selected for treatment. Among those patients whose care was included in the incentive program, the implementation of incentives resulted in a significant decrease in the percentage of patients selected for treatment who were designated "most severe." During the same period, the percentage of patients selected for treatment who were categorized as "most severe" increased among Medicaid patients, whose treatment was not included in the incentive program [10]. In an excellent recent commentary, Woolhandler and colleagues discussed the role of behavioral economics and warned that pay-for-performance may be incompatible with quality improvement efforts. They point to several potential shortcomings including issues with outcome measurement, risk adjustment, claims in excess of the level of needed or provided services, inappropriate consequences of quality measurement, and patient socioeconomic factors [11].

In 2011, a Cochrane review of 2,933 potentially relevant studies of pay-for-performance programs found only 7 studies that met the criteria for outcomes measurement [12]. An analysis of those 7 studies found that 6 of them "showed positive but modest effects on a minority of the measures of quality of care included in the study." However, the studies suffered from a risk of selection bias. The authors concluded that "there is insufficient evidence to support or not support the use of financial incentives to improve the quality of primary health care," and they urged caution in using incentive schemes [12].

My personal experience with recognition programs has been mixed. I conservatively estimate that completing the steps in the BQPP program has required more than 80 hours of my time, outside of patient care, over a period of 6 months. My office staff has spent just as much time participating in education activities and performing data extraction related to the program. While time consuming, I believe our participation in the BQPP program improved the quality of our patient care.

I am also well aware of the statistical shortcomings of reporting data from a small sample size. Since 1990, my practice has used Microsoft Excel software to track clinical details of the care of more than 225 patients with diabetes, aged 32-86 years. Reporting of data is limited to a smaller

subset. PQRS requires me to report data on only my 30 most recently seen Medicare patients who are under the age of 75 years. Similarly, BTE and NCQA recognition programs for quality diabetes care require data from 36 sequential patients who are selected retroactively from a certain date. Although the average glycosylated hemoglobin level of my patients with diabetes is 7.1%, the frequency of visits for these patients varies. Patients whose blood glucose levels are well controlled may be seen only every 6 months, whereas patients whose levels are poorly controlled are seen much more frequently. The need for short-term follow-up visits after medication changes or acute illnesses means that those patients with the worst glycosylated hemoglobin levels may be included much more frequently in my list of recently seen patients.

Practices with more economically disadvantaged or uninsured patients, or simply older individuals, are also similarly penalized by such selection criteria. Some practices may attract or specialize in the care of patients with more difficult or complex conditions. For example, it is discouraging when a patient is taking 4 drugs for hypertension, has experienced a reduction in systolic blood pressure from 240 mm Hg to 140 mm Hg, and has a stable blood pressure maintained by medications that he can afford, yet he fails to meet the target criterion of "systolic pressure less than 140 mm Hg."

Variations in performance standards are also important. Analysis of the same 36 patients might allow a physician to meet the recognition requirements for one agency but not the requirements of another agency. Differences in the date chosen to start measurement reporting can affect scoring not only due to sample size and more frequent visits by poorly controlled patients but also because there are significant seasonal variations in measurements such as glycosylated hemoglobin [13]. I schedule my poorly controlled patients for more frequent visits. Seasonal diet and activity changes also affect my patients' level of control.

Self-insured health programs follow quality measures in practices, and scores from these reports and NCQA's Healthcare Effectiveness Data and Information Set are returned to practices as a measure of "quality." Because they are usually based on data about charges—not on medical record reviews—these reports are often incomplete. They frequently fail to capture specific blood tests performed in panels, for instance. Even more vexing, some of the measured parameters may extend over a period of 2-10 years and may include years during which data on charges are not available to the current payer. Submission of accurate chart data raised our practice's rate for repeated colon cancer screening within 10 years from 37% to 65%, our rate of annual low-density lipoprotein (LDL) cholesterol screening in patients with ischemic heart disease from 30% to 89%, and our rate of annual LDL screening in diabetic patients from 63% to 93%. Given current limitations, data based on charges alone does not seem well suited for quality assessment.

For many payers, an individual practice does not have

enough covered lives to make any data statistically sound, even if the data are properly collected. One of the goals of the North Carolina Health Quality Alliance is to interest major payers in sharing such data in a protected environment that is trusted by physicians, with the goal of gathering more accurate overall practice-specific information.

Almost inevitably, practices in the future will receive some payment or bonus that is based on performance measures, if not on quality outcomes. Many, but not all, practices are already engaged in activities such as installation of EHR systems to meet CMS's standards of meaningful use. Adoption of EHR systems is a necessary step for these practices. It remains to be seen whether the cost of installation, subsequent inefficiencies, and painful changes to work flow will be balanced by the financial rewards of using the EHR, much less improved quality outcomes. Whether electronic practice data can be extracted and reported in a format that meets different agencies' requirements, and at what cost, also remains to be seen.

Like many primary care physicians in North Carolina who are nearing retirement, I expect to retire not too long after Medicare begins levying financial penalties on practices that are not using an EHR system. I also do not expect to find that anyone interested in taking over my practice would want to use an EHR system that I chose now. Thus, I do not plan to implement an EHR system, as I personally have little incentive to invest in another source of office overhead and continuing costs, and I already have sufficient internal and external reporting measures to verify my belief that I am providing quality care.

For me, and for most physicians I know, quality measurement and performance improvement are not new concepts. Still, I am doubtful that most current activities can substantially change outcomes of care. However, we remain professionally committed to working toward a future in which quality of care can be accurately measured and then improved. NCMJ

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Acknowledgment

Potential conflicts of interest. W.J.S. has no relevant conflicts of interest.

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The Role of Health Plans in Improving Quality of Care

Dan Barco, Peter Chauncey

Regulations and accrediting bodies have charged health plans with assuring and improving the quality of care delivered to plan members. Now, health plans also have an opportunity to promote payment reform designed to align incentives so that plans, providers, employers, and patients can all focus on achieving high-quality care.

The Institute of Medicine of the National Academies (IOM) defined quality in health care as “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge” [1]. The activities that have traditionally been included in health plans’ quality improvement programs were largely in place by the early 1990s. These activities became the measures of performance recommended by the National Committee for Quality Assurance (NCQA), which is an accrediting body for health plans. State and federal regulators therefore expect that these quality improvement activities will be in place for all health plans.

In addition to developing service standards for the actions of health plan personnel, such as telephone answering and claim turnaround, health plans also use the advice of practicing community physicians to develop and distribute guidelines regarding the care that is provided to members. These guidelines include a set of recommended and expected preventive services, which generally conform to the recommendations of an external organization such as the US Preventive Services Task Force. Guidelines also cover evidence-based treatments for chronic illnesses, such as use of beta blockers after myocardial infarction; these recommendations are generally adopted from the guidelines of specialty societies. Because health plan guidelines often overlap with those of other organizations, physicians may view health plan guidelines as redundant and not particularly helpful.

A health plan is expected to demonstrate that its activities directly impact the health of its members. Examples of such activities include sending out reminder letters for preventive services, such as mammograms and retinal exams; offering disease management programs; providing information about palliative services and end-of-life care; and offering wellness programs, such as smoking cessation or exercise programs.

The quality program of a health plan requires that performance data be generated and reported regarding various outcomes measures. When Paul M. Ellwood, Jr., spoke of such measures during his 1988 presentation of the annual Shattuck Lecture at the Massachusetts Medical Society, he called for “a national data base containing information and analysis on clinical, financial, and health outcomes that estimates as best we can the relation between medical interventions and health outcomes, as well as the relation between health outcomes and money” [2]. Health plans and business coalitions began to develop a standard set of measures. NCQA published the second version of this work in 1993 as the Health Plan Employer Data and Information Set, and these measures were subsequently renamed the Healthcare Effectiveness Data and Information Set (HEDIS) [3]. State regulators and the federal government now widely require annual reporting of HEDIS measures. These measures evaluate processes of care provided for certain sets of health plan members (for example, immunizations for children, and measurement of blood glucose levels and eye exams for patients with diabetes).

Meanwhile, the professionals who deliver medical services have continued their own efforts to ensure that they provide high-quality care as required by their accreditation agencies, licensing bodies, and professional standards. Not surprisingly, the organized emphasis on quality has varied substantially. Quality-of-care activities within provider organizations are usually devised and conducted independently of health plans, rather than in collaboration with them, and the role health plans play is seldom sufficiently acknowledged.

Evidence and Recent Developments

We propose that, for the first time, health plans now have an imperative to change their payment paradigm. Passively paying for services based on volume without reference to quality of care is no longer acceptable. Health plans have the

Electronically published April 16, 2013.

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NC Med J. 2013;74(2):159-162. ©2013 by the North Carolina Institute of Medicine and The Duke Endowment. All rights reserved. 0029-2559/2013/74215

opportunity to promote payment reform that might finally align incentives so that plans, providers, employers, and patients can all focus on rewarding providers of high-quality care while giving other providers incentives to improve. Let us consider how the stage has been set for this new health plan role.

Reports from the IOM titled *To Err Is Human* [4] and *Crossing the Quality Chasm* [5], published in 1999 and 2001, respectively, called attention to major problems in patient safety, citing evidence that medical practice errors in the United States were causing at least 44,000 and perhaps as many as 98,000 patient deaths each year. These 2 reports prompted discussion, evaluation, and action. Patient safety is now a major concern, and efforts to ensure patient safety are ongoing in all domains of the health care system. *Crossing the Quality Chasm* includes recommendations that “private and public purchasers should . . . build in stronger incentives for quality enhancement” and that there should be a “research agenda to identify, pilot test, and evaluate various options for better aligning current payment methods with quality improvement goals” [5].

The Institute for Healthcare Improvement (IHI) provided a model for quality improvement that facilitates the evaluation of new ideas and the rapid implementation of proven interventions. In December of 2004, IHI launched the 100,000 Lives Campaign, an initiative to reduce morbidity and mortality in American health care. This campaign was based on 6 interventions demonstrated to be effective in improving patient safety. According to IHI, 100,000 lives would be saved within 18 months and every year thereafter if hospitals implemented these interventions. IHI President Donald M. Berwick called for immediate and significant action in a speech titled “Some Is Not a Number. Soon Is Not a Time.” Eventually more than 3,000 hospitals participated in the program, and IHI subsequently announced the program’s success, with 122,300 lives saved. Although the campaign was criticized for its promotion of rapid response teams and for some of its methodology [6], it demonstrated that incentives can accelerate the implementation of evidence-based interventions [7].

There is growing recognition that quality is associated with cost effectiveness, while poor outcomes lead to further interventions and higher costs. This association may partly explain why the United States has a relatively poor health profile, despite spending more on health care than do other developed countries. David A. Squires, writing for the Commonwealth Fund in 2012, noted that US health care spending is roughly twice the average amount spent by 13 developed countries, whether measured by per-capita expenditure or as a percentage of gross domestic product. Squires observed that

the quality of health care in the U.S. appears to be variable, with better-than-average cancer survival rates, middling in-hospital mortality rates for heart attacks and stroke, and the

worst rates of presumably preventable deaths due to asthma and amputations due to diabetes compared with the other study countries.

He also showed that, although a higher rate of obesity explains some poor health statistics for the US population, a combination of high prices and high utilization of “high technology” services seems to drive the overall excess in cost of health care [8]. Much emphasis has been placed on the fact that in 2010 the United States ranked 40th in overall life expectancy on a list compiled by the United Nations, trailing nearly all European countries [9].

Public payer initiatives have advanced the concept that services associated with demonstrably poor care should not be reimbursed. An example of such an initiative is the list of “never events”—particularly shocking medical errors that should never occur—that was published by the National Quality Forum in 2002 [10]. The Centers for Medicare & Medicaid Services (CMS) announced in 2008 that they would not compensate providers when these “never events” occurred [11]. Gradually private payers followed suit in their own payment policies.

The Leapfrog Group is a coalition of large employers that focuses on the role of hospitals in ensuring patient safety. In 2001 the group set standards for health plans and directly contracting hospitals, requiring them to meet expectations for quality processes in order to win contracts with the companies in the group. In 2006 the group added the expectation that hospitals would pledge to never bill the patient or any insurer for a hospitalization during which a “never event” occurred [12].

An important development is that, under the provisions of the Patient Protection and Affordable Care Act, CMS initiated additional premium payments to Medicare Advantage health plans that achieve a quality rating of 3 or more stars for their performance during the previous year on a set of quality measures [13].

In an article published in the Perspective section of *The New England Journal of Medicine* in 2010 [14], Howard Brody, a family physician and ethicist, argued that physicians have an ethical responsibility and a public relations opportunity to find opportunities for cost savings. He pointed to concessions made by hospitals and pharmaceutical companies during the development of the health reform proposal put forth by President Obama. Brody suggested that each specialty and primary care discipline should identify the top 5 services that could be substantially reduced without depriving any patient of meaningful benefit [14]. The disciplines of family medicine, internal medicine, pediatrics, and hematology/oncology have each responded by publicly announcing a set of 5 cost-saving measures that will not harm patients.

A Modified Approach

Based on the evidence, all components of the health care system should focus on supporting improvements in the

quality of care. Public discussions and initial programs have changed the environment such that public and private health plans can now begin to explicitly link payment for services with quality-of-care measures. We can now acknowledge that improved quality of care and reduced costs are related, not conflicting, goals. We can develop and implement business models that provide incentives to support established quality measures.

Many health plans and providers are creating and testing such programs. At Coventry Health Care of the Carolinas and Coventry Health Care of Virginia, we are beginning to employ a quality improvement approach that involves collaborations between medical groups and health systems. Our goals are: to support models of care that improve the health of the patient, improve access to and appropriateness of care, and emphasize care coordination; to use measures and indicators that correlate with improvements in quality, patient safety, and cost effectiveness; to share data openly and monitor progress toward goals; and to align incentives for the patient, the provider, and the health plan so that they reward value rather than volume of services. Funding to support care coordination should be separated from claims activity. When savings in claims do occur, they can be used to reward activities that improve efficiency of care, performance on quality measures, and members' health.

Our quality improvement program is based on agreed-upon measures selected from within 5 categories. The first category is avoiding unnecessary hospital admissions, and the goal is to reduce the rate of acute inpatient admissions within selected diagnostic categories that have been determined to be sensitive to optimal delivery of primary care. Measures in this category should reward physicians' efforts to manage chronic illnesses in such a way that inpatient care is not needed. One example of such an effort would be facilitating patients' access to early outpatient interventions when a chronic condition worsens. For the second category, inpatient readmissions, the goal is to reduce the proportion of patients who are readmitted within 30 days of discharge by providing effective transition-of-care programs. The third category is avoidable emergency services, and the goal is to reduce the number of emergency department visits made for conditions that could be managed in a less intense and less costly setting. The fourth category is member access to primary care within 120 days of enrollment. Finally, the fifth category is evidence-based guideline compliance, and the goal is to meet a certain performance rate for selected HEDIS measures. Measures with a high likelihood of impacting admissions or readmissions should be emphasized.

Plan representatives and members of the provider group discuss the measures and weights selected, the goals to be achieved, and the incentive payments that can be earned for each quality measure. As a consequence, physician leaders in the health systems are evaluating their processes and working with their colleagues to achieve the desired targets for these quality goals. The provider organizations

are making substantial investments in the meaningful use of their data to support these programs. They are investing in personnel, with the goal of improving patient education, adherence to prescribed regimens, and support for patient self-management. Focusing on quality provides a renewable basis for collaboration. Physicians are now aware of the cost of referred care and how it can vary depending on their decisions. Plan representatives and physicians are able to talk about issues of cost effectiveness, the ways in which cost affects outcomes, and how cost can be considered as a dimension of quality. Plan representatives and physicians now have a reason to meet regularly, talk about care, and find improvements. The context has changed as we work toward shared goals.

Conclusion

Our health system clearly needs more effective approaches to improve the quality and effectiveness of care. Health plans are ready to move from passively paying claims to collaborating in a more meaningful way with provider systems to reward performance related to important measures. While this type of approach is largely untested, it may represent a path for progressive improvement. **NCMJ**

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Acknowledgment

Potential conflicts of interest. D.B. and P.W.C. have no relevant conflicts of interest.

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Running the Numbers

*A Periodic Feature to Inform North Carolina Health Care Professionals
About Current Topics in Health Statistics*

Regional Variation in Quality of Health Care Across North Carolina's 100 Counties

In this issue of the NCMJ, various authors discuss the quality of health care in North Carolina, but only a few of these authors (eg, DuBard) look at geographic variations in quality of care [1]. To fill this gap, this column examines regional variations in the quality of care provided to Medicare beneficiaries across North Carolina's 100 counties.

There are many reasons to expect that quality of care may vary across North Carolina. Variations in quality of care are commonly observed in national data, although debate is ongoing about what causes these variations. One view, often associated with the Dartmouth Institute for Health Policy and Clinical Practice, is that this geographic variation is produced by physician practice patterns—that it results from learned behavior. Other theories focus on the characteristics of the health professionals providing the care (eg, variations in the training they received, the specialty they chose, or their experience) or on the socioeconomic characteristics of the population receiving care (eg, areas with higher poverty rates may have poorer medication adherence and thus poorer outcomes).

For this analysis, I used 2010 data from the Dartmouth Institute for Health Policy and Clinical Practice. Specifically, I looked at 3 county-level, quality-of-care measures for the Medicare population: the percentage of female Medicare enrollees aged 67-69 years who received at least 1 mammogram over a 2-year period, the average annual percentage of Medicare enrollees with diabetes aged 65-75 years who have had their glycosylated hemoglobin (HbA_{1c}) level checked, and the rate of preventable hospital admissions (the rate of hospital discharges for ambulatory care-sensitive conditions per 1,000 Medicare enrollees). (The rates for these measures are available in a spreadsheet that can be downloaded by clicking on the county-level 2010 link found at <http://www.dartmouthatlas.org/tools/downloads.aspx#primary>.) These measures

capture 3 distinct elements of quality of care in the ambulatory setting: secondary prevention, chronic disease management, and outcomes. My goal was to determine whether these measures are correlated—whether there are regions of the state with generally high (or low) values for all 3 measures.

The maps in Figure 1 show the data for each of the 3 quality-of-care measures. On each map, every county is colored in 1 of 4 different shades, with darker shades representing poorer quality of care. In certain parts of the state—the Research Triangle, Moore County, and the Kinston–New Bern region—quality of care is high for all 3 measures. In contrast, the southeastern part of the state generally has lower quality of care on all 3 measures.

Visual inspection suggests that most of the state's other counties perform well on some measures and poorly on others. However, statistical analysis shows that the measures are highly correlated. Despite the fact that 3 different elements of health care quality are being measured, counties with a rate indicative of high quality on 1 measure also tend to have rates indicating high quality on the other 2 measures. Indeed, Spearman correlation coefficients show that the correlations between the 3 quality measures are statistically significant (Table 1). When reviewing these correlations, note that higher levels of preventable admissions are a signal of poorer quality, in contrast to the other 2 measures (for which higher levels are a signal of better quality).

One possible explanation for this correlation is that these quality measures are simply a marker for

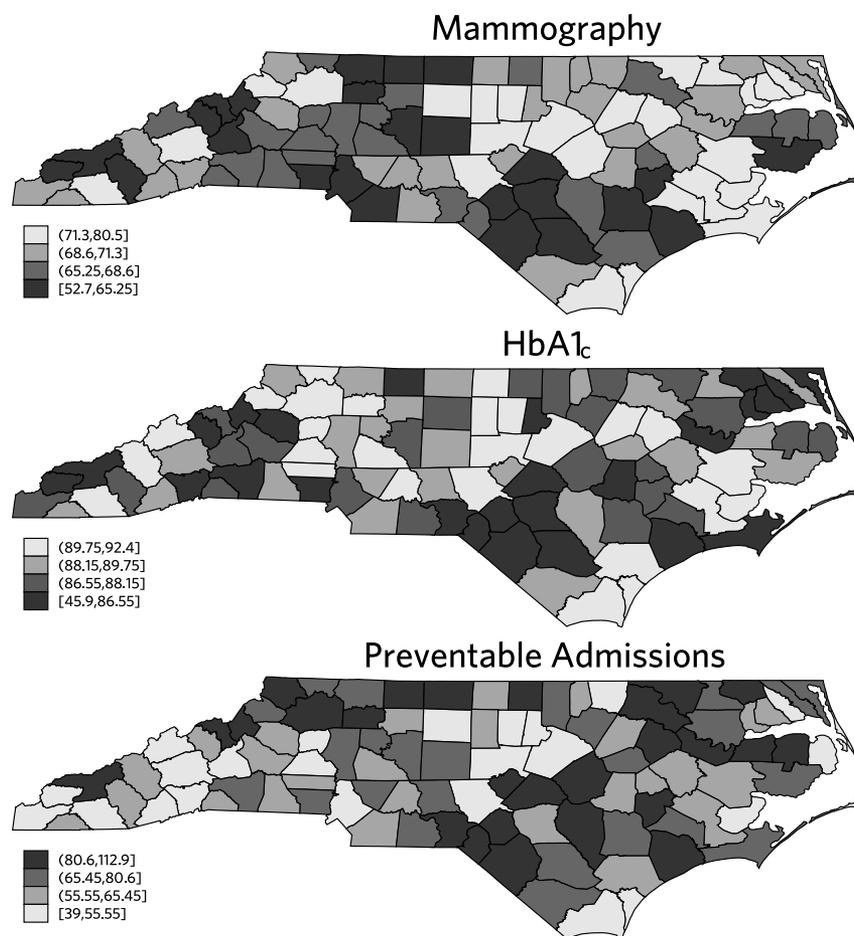
Electronically published April 16, 2013.

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0029-2559/2013/74221

FIGURE 1.
Quality of Health Care Provided to Medicare Enrollees in North Carolina's 100 Counties



Note. The top map depicts the percentage of female Medicare enrollees aged 67-69 years who received at least 1 mammogram over a 2-year period, the center map depicts the county's average annual percentage of Medicare enrollees with diabetes aged 65-75 years who had their glycosylated hemoglobin (HbA1c) level checked, and the bottom map depicts the county's rate of hospital discharges for ambulatory care-sensitive conditions per 1,000 Medicare enrollees. The keys show the rates for which each shade was used. Darker shading represents lower quality of care, and use of a parenthesis rather than a bracket before or after a number indicates an endpoint that is excluded from the set. Source of data: Dartmouth Institute for Health Policy and Clinical Practice.

some other factor. For example, perhaps Medicare beneficiaries with low socioeconomic status are less likely to receive high-quality care because they experience difficulties in accessing the health care system (eg, an inadequate physician supply or difficulty in obtaining transportation to a location that offers mammography), because they do not comply with provider recommendations (because of cost or failure to understand the recommendations), or because they encounter other barriers.

Additionally, the health care system may be overburdened in areas with a high proportion of residents of low socioeconomic status, in which case the health care system may not have the capacity to deliver the recommended care. For example, a shortage of practitioners offering mammography services may directly lead to low values for that measure.

To explore the possibility that mammography, HbA1c testing, and preventable admissions are

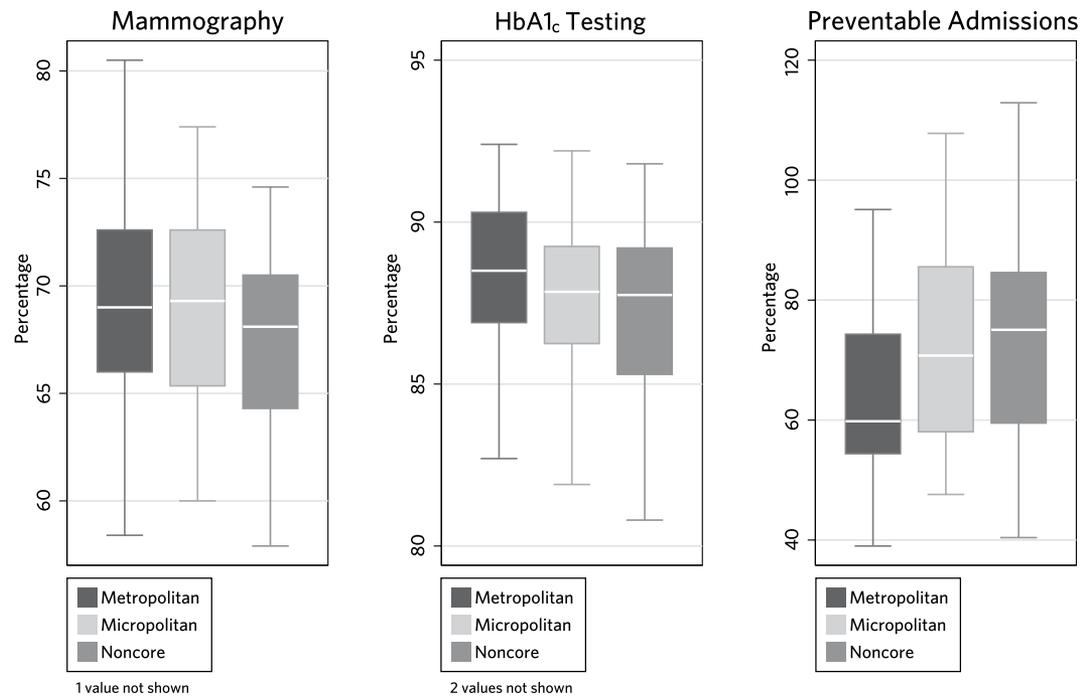
markers for low socioeconomic status, I included the estimated percentage of county residents whose household income is below the federal poverty level as an additional covariate. Previous studies have shown that communities with higher poverty rates have higher rates of hospital admission for preventable conditions, and the data for North Carolina counties confirm this observation. However, the data did not show an association between poverty rates and either mammography rates or rates of HbA_{1c} testing (Table 1). While poverty rates may be insufficient to capture the relationship between local circumstances and quality of care, this analysis suggests that variations in quality-of-care measures may be due to factors other than poverty.

If these data reflect genuine regional varia-

tions in quality of care, how might this variation be explained? One interpretation of these data is that state-based efforts to improve health care quality may be more effective if they are regional in nature. Indeed, this is one of the core tenets of the local stakeholder-driven approach taken by Community Care of North Carolina. The clustering of counties with lower measures of health care quality suggests that regional-based interventions and quality-improvement strategies may channel resources more effectively.

Further analysis of the data shows that quality-of-care measures are associated with the rurality of the county. For this analysis, counties were categorized using 2013 Office of Management and Budget data as metropolitan (having an urban core with a population of 50,000 or more), micropoli-

FIGURE 2.
Associations Between 3 Measures of Quality of Health Care and Rurality



Note. Mammography indicates the percentage of female Medicare enrollees aged 67-69 years who received at least 1 mammogram over a 2-year period, HbA_{1c} testing indicates the average annual percentage of Medicare enrollees with diabetes aged 65-75 years who had their glycosylated hemoglobin (HbA_{1c}) level checked, and preventable admissions indicates the rate of discharges for ambulatory care-sensitive conditions per 1,000 Medicare enrollees. Note that the y axes for these measures differ. The horizontal line in the middle of each box indicates the median rate, the top and bottom borders of the box mark the 75th and 25th percentiles, and the whiskers represent the range of the bulk of the remaining data. Metropolitan, having an urban core with a population of 50,000 or more; micropolitan, having an urban core with a population of at least 10,000 but less than 50,000; noncore, rural (having no urban core). Source of data on rurality of counties: Office of Management and Budget. Source of data on quality of care: Dartmouth Institute for Health Policy and Clinical Practice.

TABLE 1.
Spearman Correlation Coefficients for Poverty and for 3 Measures of Health Care Quality in 100 North Carolina Counties in 2010

	Mammography ^a	HbA1c testing ^b	Preventable admissions ^c	Poverty ^d
Mammography ^a	1			
HbA1c testing ^b	0.4179*	1		
Preventable admissions ^c	-0.3782*	-0.3226*	1	
Poverty ^d	-0.0503	-0.1324	0.3308*	1

^aPercentage of female Medicare enrollees aged 67-69 years who received at least 1 mammogram over a 2-year period.

^bAverage annual percentage of Medicare enrollees with diabetes aged 65-75 years who had their glycosylated hemoglobin (HbA1c) level checked.

^cRate of hospital discharges for ambulatory care-sensitive conditions per 1,000 Medicare enrollees.

^dPercentage of county residents in 2011 with incomes below the federal poverty level. Data are from the Small Area Income and Poverty Estimates of the US Census Bureau.

*P<0.05.

Source of data on health care quality: Dartmouth Institute for Health Policy and Clinical Practice.

tan (having an urban core with a population of at least 10,000 but less than 50,000), or noncore (having no urban core; rural). Figure 2 shows that metropolitan counties in North Carolina had higher rates of mammography and HbA1c testing in 2010 than did rural counties, and metropolitan counties had lower rates of preventable admissions than did either micropolitan or non-core counties. Thus Medicare beneficiaries in rural counties in North Carolina tended to have lower values for these quality-of-care measures. Understanding the reason for these lower values will be important if we want to ensure that peo-

ple across North Carolina have access to—and are receiving—high-quality health care. **NCMJ**

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Acknowledgment

Potential conflicts of interest. M.H. has no relevant conflicts of interest.

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Spotlight on the Safety Net

A Community Collaboration

Rural Health Group

Rural Health Group (RHG) is a nonprofit, federally qualified health center that seeks to provide high-quality primary care, dental care, behavioral health care, case management, and pharmacy services to residents of rural communities in Northeastern North Carolina, with a special emphasis on underserved individuals. RHG community health centers serve all patients, regardless of their ability to pay, and use a sliding-scale fee schedule based on household income and family size to assess and assign discounted health care fees for uninsured and underinsured patients. RHG health centers also provide care to patients who have health insurance through Medicaid, Medicare, or a private insurance plan. Currently, RHG provides care in 11 locations: Enfield, Jackson, Littleton (Lake Gaston), Henderson, Hollister (Twin County), Norlina, Rich Square, Roanoke Rapids, Scotland Neck, Whitakers, and Weldon Elementary School [1].

RHG has adopted a medical home model that aims to enhance patient care by improving continuity and coordination of care using a patient-centered approach to care delivery. In this model, patients partner with a primary care provider (PCP) and a multidisciplinary care team to develop a treatment plan tailored to the patient's specific biopsychosocial needs. The care team ensures that patients are engaged and supported throughout the health care process. This partnership between the patient, the PCP, and the care team allows for better management of health conditions and better health outcomes, especially if the patient transitions between a primary care setting and a specialty or hospital setting. When specialty or hospital care is needed, the entire care team is available to support the patient, coordinate care, and work with the PCP to address the patient's needs [1].

Since its inception, RHG has been driven by its mission to positively impact the health and well-being of the vulnerable populations it serves. Improving quality of care and reducing barriers to

care have always been the central focus of this mission. RHG is continually working to achieve these goals through the development of community partnerships—with organizations such as the NC Office of Rural Health and Community Care, HealthNet, Halifax Regional Medical Center, Community Care Plan of Eastern Carolina, and the Kate B. Reynolds Charitable Trust—and through the creation of targeted quality improvement initiatives.

One example of community collaboration is the partnership between RHG, HealthNet, and Halifax Regional Medical Center. In an effort to divert uninsured patients who may be utilizing emergency departments for primary care needs and to assist patients through transitions in care, RHG (with financial support from HealthNet) now employs a hospital case manager who is stationed at Halifax Regional Medical Center. This case manager helps to link uninsured patients to a PCP in one of RHG's community health centers. The case manager ensures that the patient has an appointment with a PCP prior to discharge; addresses any barriers to care; and coordinates services between the patient, the health center, and any community agencies involved in the transition. This collaboration has expanded the safety net for vulnerable patients and demonstrates RHG's commitment to reaching underserved patients who are most in need of support.

RHG understands the importance of managing the health of individual patients but also recognizes the need to monitor health outcomes in populations. To achieve this goal, RHG has designated clinical support staff to serve as "panel managers" at each of their locations. Each "panel" is

Electronically published April 16, 2013.

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0029-2559/2013/74222

comprised of a PCP's designated group of patients. The panel managers become knowledgeable about these patients and orchestrate patient care activity. Their primary responsibility is to assign patients to PCPs and to monitor population health outcomes. This ensures the provision of appropriate, evidence-based preventive health and chronic disease services.

Through the utilization of RHG's electronic medical record (EMR) system and data reporting software, panel managers can get an overall picture of the group's population health before drilling down to determine the needs of an individual patient. Once panel managers have identified relevant care standards and patient care needs (for behavioral health services, case management, transportation, medication assistance, etc.), they can then communicate with care teams that address the identified needs and barriers to care. RHG also employs a quality coach who supports and mentors the panel managers as they work on quality improvement projects. The coach's focus is on supporting process improvement efforts using rapid cycle changes in daily work flow.

Finally, RHG's school-based health center—which is housed at Weldon Elementary School—serves elementary school, middle school, high school, and early college students within the district. The school-based health center's primary focus is on prevention and wellness, since many risk factors can be identified in children and youth that impact the development of chronic diseases such as diabetes, obesity, and asthma. A pediatric nurse practitioner and a registered nurse at RHG's school-based health center complete a

health assessment for every student who comes to the center. The health assessment helps to identify high-risk students and assists the provider in establishing a treatment plan. Multidisciplinary care teams then work with the student and his or her family to manage current conditions and hopefully prevent the onset of chronic diseases.

To evaluate the impact of these quality improvement initiatives, RHG continually establishes and tracks metrics through its EMR system. RHG has made a concerted effort to build structured data into this system, which allows the overall impact of its initiatives to be assessed by aggregating outcome data across patients and over time.

Although physicians' time with patients is limited, RHG strives to affect patient lives beyond the point of care. Utilizing the medical home model, establishing strong relationships with numerous community partners, and employing quality improvement techniques have allowed RHG to make progress towards this goal. Ultimately, the goal of RHG is to improve health outcomes for patients and the community and to help patients in rural Northeastern North Carolina to achieve the best possible quality of life. **NCMJ**

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Acknowledgment

The author would like to thank Keshia Rooks, RN, BSN, CCM, director of case management for Rural Health Group, Inc., for providing information for this article.

Potential conflicts of interest. L.B. has no relevant conflicts of interest.

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Philanthropy Profile

Health Care Quality and Patient Safety: Funding a Movement

Quality initiatives have been in existence for years. However, the publication of the Institute of Medicine's landmark report *To Err is Human: Building a Safer Health System* [1] in November 1999 marked a significant shift in the health care landscape—one that placed quality and safety at the forefront of pressing industry issues. The confluence of various political, social, and technological changes, along with the availability of public and private funding to establish effective programs, has helped hospitals and other health care organizations to become leaders in providing quality health care in the Carolinas.

The trustees of The Duke Endowment, a private foundation established in 1924 by James Buchanan Duke, approved the topic of patient safety as a priority funding area in 2000. The overall objective was to help reduce the incidence of medical errors that have the potential to result in patient harm. The original goals were to encourage and assist health care organizations in the following areas: to create opportunities for experts in the industry to openly discuss medical errors and patient safety; to change the health care culture by fostering a non-punitive environment that allows staff members to learn from their mistakes and to create improved systems of care; and to identify and assess strategies for error reduction and best-practice models for monitoring and reporting systems.

In 2001, The Duke Endowment gave 4 North Carolina hospitals grant funds totaling \$2,272,520 to purchase and implement new technologies aimed at reducing medical errors. The 4 hospitals—Duke Medical Center in Durham, Northeast Medical Center in Concord, Iredell Memorial Hospital in Statesville, and Wayne Memorial Hospital in Goldsboro—implemented technologies such as bar coding systems, physician order entry systems, and electronic medical records, which proved to be effective in reducing medical errors. After evaluating these hospitals' results and recognizing the value of these technologies, the trustees of The Duke Endowment approved a Health Information Technology Special Grant Program.

The funding provided by this program expanded the utilization of health care technology that supports hospitals' ability to improve patient safety and quality, coordination of care, and provider efficiency and productivity. Through this program, The Duke Endowment provided funding for 26 health care technology projects in small and rural hospitals in the Carolinas.

In 2003, The Duke Endowment was invited to engage in discussions with leaders in South Carolina about an opportunity to partner with their leading health care systems and universities. In April 2004, Health Sciences South Carolina (<http://www.healthsciencessc.org/>) was founded as an inclusive, public-private, statewide biomedical collaborative committed to the vision of using health science education and research to drive economic growth and health care improvement. In 2006, a multiyear grant of \$21 million from The Duke Endowment provided resources that helped Health Sciences South Carolina establish the necessary infrastructure and technology to become a leader in health care education, research, and delivery of quality health care.

In 2004, The Duke Endowment began working with leaders of both the North Carolina Hospital Association and the South Carolina Hospital Association (SCHA) on ways to improve health care quality and patient safety. Conversations centered around ways to address issues related to quality improvement and patient safety, with a vision for the future in which every hospital in the Carolinas would have the necessary support and tools to provide the highest quality of care possible. This planning led to the North Carolina Hospital Association receiving a multiyear grant of \$5 million to help establish the North Carolina Center for

Electronically published April 16, 2013.

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0029-2559/2013/74223

Hospital Quality and Patient Safety—now known as the NC Quality Center (NCQC; <http://www.ncqualitycenter.org/>)—which has helped position North Carolina as a national leader in quality improvement and patient safety. The NCQC has been highly effective in working with hospitals to provide educational events; data collection, analysis, and comparison of quality and patient safety indicators; and strong leadership, all of which have had a significant impact on advancing a culture of safety and improving patient care outcomes. [Editor's note: For more information about the NCQC, see the article by Koeble and Campione on pages 126-132.]

Also in 2004, the SCHA convened a statewide committee on patient safety to review issues and to facilitate collective learning and activities. A multi-year grant of \$3 million from The Duke Endowment in 2006 helped to formalize and centralize the SCHA's statewide patient safety efforts through a program known as Every Patient Counts (<http://www.scha.org/improving-patient-experience>). The SCHA was nationally recognized in 2012, when the American Hospital Association awarded the SCHA with the Dick Davidson Quality Milestone Award for its leadership and its work to improve patient safety and quality of care.

Over the past decade, The Duke Endowment has continued to provide funding to improve health care quality and patient safety, approving grants totaling more than \$60 million. The emphasis has shifted from funding individual organizations in the Carolinas to funding concentrated, strategic statewide efforts aimed at improving systems of care and patient outcomes while reducing health care costs.

In addition to the funding mentioned above, several other organizations have received grants from The Duke Endowment to advance quality and safety efforts beyond hospitals: The North Carolina Public Health Foundation was given a grant to help establish the North Carolina Center for Public Health Quality (<http://www.ncpublichealthquality.org/ctr/>). [Editor's note: Randolph and colleagues provide details about the Center for Public Health Quality in their commentary on pages 137-141.] The North Carolina Office of Emergency Medical Services (EMS; <http://www.ncdhhs.gov/dhsr/EMS/ems.htm>) received funding to help the EMS Performance Improvement Center at the University of North Carolina at Chapel Hill (UNC-CH) use data to reduce disparities and to improve response times and patient outcomes in North Carolina

and South Carolina. Future Care of North Carolina (<http://futurecarenc.org/>) was given funding to enhance the clinical skills of nurses in long-term care facilities through patient simulation training. UNC-CH received funds to expand the North Carolina Area Health Education Center's Improving Performance in Practice program (<http://www.ncnip.org/>), which helps primary care practices use data to improve patient care outcomes. Finally, the North Carolina Department of Health and Human Services was given funding to implement the Just Culture initiative, which promotes patient safety in North Carolina's state-operated health care facilities (<http://www.ncdhhs.gov/dsohf/>).

The Duke Endowment has been proud to work with leaders of health care organizations who have effectively engaged their board members and staff members and committed to stimulating change in health care culture, improving clinical practice, and enhancing patient outcomes. The Carolinas have made significant gains in working toward their goal of gathering data about quality of care and making that data available to the public. Although there is still much to do, the Carolinas have experienced a noticeable shift in health care culture, from one of denial and blame to one of learning and improvement. Both states have also brought about documented improvements in health care quality and patient safety outcomes.

As we look to the future, The Duke Endowment anticipates opportunities to work even more collaboratively across health care organizations, to maximize the benefits of electronic health records and data, to develop formal programs that more closely involve patients and families in decisions about their care, and to continue to improve health care quality and patient safety.

On behalf of The Duke Endowment, I would like to take this opportunity to recognize and thank every health care organization, physician, staff member, and provider who works every day to improve health care quality and patient care outcomes. NCMJ

Mary L. Piepenbring vice president, The Duke Endowment, Charlotte, North Carolina.

Acknowledgment

Potential conflicts of interest. M.L.P. has no relevant conflicts of interest.

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Pretty But Imperfect

James Stewart Campbell

To the Editor—The pretty blue-and-red graphic on the cover of the November/December 2012 issue of the NCMJ may look great to the untrained eye, but whoever drew the courses of the arteries should have their artistic license revoked! Since when do webs of arteries cross the cerebral midline? And does the innominate artery really come off the right atrium??? There are other anatomical errors that are too numerous to count.

If we are going to have a serious medical journal in North Carolina, let us get serious about anatomy! **NCMJ**

James Stewart Campbell, MD owner, MEDesign, Pfafftown, North Carolina.

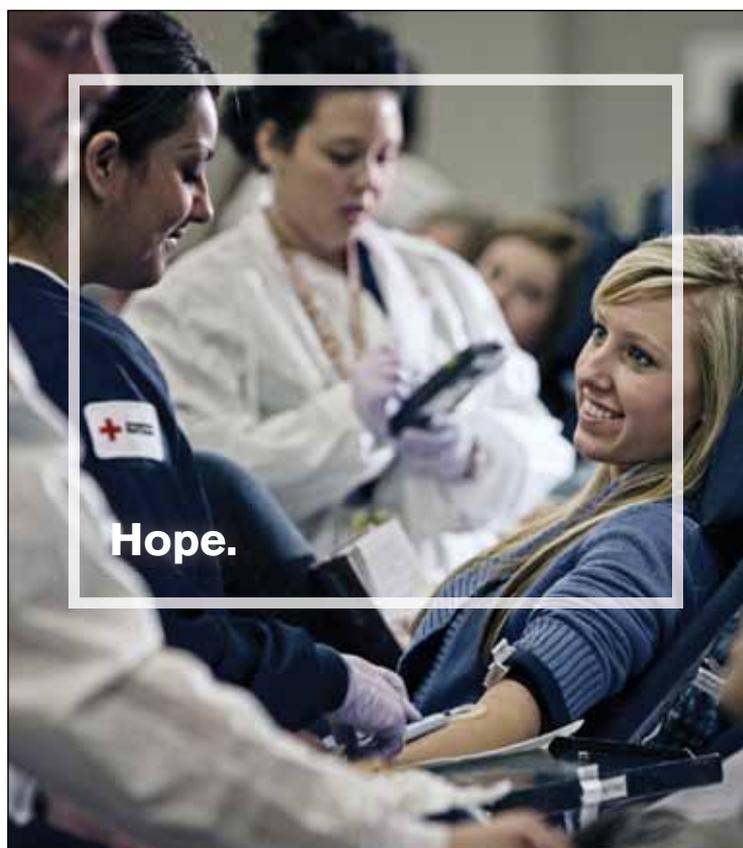
Acknowledgment

Potential conflicts of interest. J.S.C. has no relevant conflicts of interest.

Electronically published April 16, 2013.

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An Alternative to Emergency Department Care for Dental Pain and Infection

Douglas F. DeGroot

To the Editor—Oral health and the perceived inability of communities in our state to treat acute/chronic dental pain and infection gained some attention in the March/April 2012 issue of the NCMJ. The St. Mary Health Center in Wilmington is a successful model for addressing this problem. Our center focuses on caring for individuals whose incomes are below 200% of the federal poverty guidelines, who are uninsured, and who are not enrolled in Medicaid. Since our founding in 2008, many of our nearly 7,000 patient encounters have been referrals from the emergency department of the New Hanover Regional Medical Center.

St. Mary Dental Clinic treats only those patients with pain or infection due to dental disease. Practitioners remove only nonrestorable teeth affected by severe dental caries or periodontitis. Because our mission is to alleviate acute and chronic pain, we do not restore teeth. Patients who express an interest in restoring carious teeth are referred to the New Hanover County Community Health Center or Cape Fear Dental Clinic in Wilmington. This operating model not only provides high-volume emergency dental and oral surgery care for lower-income and uninsured citizens in Southeastern North Carolina but also relieves local hospitals of the need to address these issues, facilitates their use of more productive resources, and reduces their overall costs.

We presently operate as an independent stand-alone clinic. Patients are asked to donate \$20 for an extraction and \$50 for a more complex procedure. Patients who cannot afford this donation are treated at no cost. In addition to patient donations, we rely on support from community foundations, local organizations, and individuals.

As an independent clinic, however, we have been frustrated by the trend in health care to view greater organization, structure, and participation in collaborative networks as the path to improved efficiency and effectiveness. Foundations and grantors that fund health care in the state often express an interest in attacking the problem of dental patients visiting local emergency departments. However, these entities frequently either refuse to support stand-alone clinics that have a proven ability to deal with this problem, or they choose to channel their funding through network organizations, mistakenly thinking that this approach offers a way to allocate resources more efficiently by not duplicating services.

There is a big difference between theory and practice. Unlike medical clinics, the number of emergency dental clinics in the state is limited, and these clinics tend to have unique operating issues. In this environment, the addition of another organizational layer for emergency dental care does little to improve efficiency. Rather, it adds administrative costs and burdens to typically small and highly volunteer-oriented staffs, reduces interaction with community supporters, and sends a message to professional and support volunteers that paperwork and structure are more important than patient care.

The network focus on community-wide efficiency also tends to reduce organizational innovation. For example, rather than encouraging dental clinics to support small, on-site medical facilities to treat dental patients who present with systemic medical problems such as hypertension, uncontrolled diabetes, and/or asthma, the networks tend to encourage referrals to local medical clinics, which usually delays urgently needed dental care for an extended period. This increases staff workloads, creates burdensome follow-up among one or more agencies, and results in additional patient visits to emergency departments for medical management of their dental problems.

In summary, we believe that the St. Mary Health Center provides an excellent model for addressing the problem of acute dental pain and infection and for reducing the volume of dental visits to the emergency department. The issue is not whether the dental health problems of low-income and uninsured patients can be addressed efficiently and effectively but how to improve the allocation of funding necessary to achieve greater progress. **NCMJ**

Douglas F. DeGroot, DDS dental director, St. Mary Health Center, Wilmington, North Carolina.

Acknowledgment

Potential conflicts of interest. D.F.D. has no relevant conflicts of interest.

Electronically published April 16, 2013.

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North Carolina's Oral Health Strategies

Kathy Higgins

To the Editor—Oral health is a critical part of the overall health and well-being of North Carolinians, and safety-net clinics such as St. Mary Health Center play an increasingly important role in helping low-income and uninsured North Carolinians access free or low-cost emergency dental services that are in high demand and short supply. As emergency dental care has risen to the top of the priority list in many communities, charitable organizations and foundations across the state have invested in improving access to dental health providers and oral health programs in North Carolina.

While individual clinics are vital to helping individuals who are in pain and/or immediate danger from oral infection at a local level, it is important not to overlook collaborative networks as a proven strategy to address the health issues of vulnerable populations across the entire state and at critical points where disease can be prevented or treated [1, 2]. The Blue Cross and Blue Shield of North Carolina (BCBSNC) Foundation is largely focused on the disparity in dental care from a broader systematic perspective. Like many philanthropic entities across the country, the BCBSNC Foundation employs outcomes-based funding that supports both collaborative systems of care and individual grantee organizations as they work together to improve the efficiency and effectiveness of their initiatives. For example, this strategy is at the core of our grant investments in the North Carolina Association of Free Clinics, where increased support and technical assistance at the network level has had a profound impact on the ability of individual clinics to improve and document their outcomes, to standardize their measurements, and to receive additional funding from both local and state-wide funders.

Rather than focusing our grants solely on the local level or solely on the network level, we believe issues that impact communities across the entire state benefit from robust community funding *and* a strong collaborative network to identify and support best practices, to assist clinics in need, and to reach communities that are not being served by established health centers. Indeed, this approach appears to be the best way to ensure that the care available to our most vulnerable populations mirrors the care available to other North Carolinians. We applaud the efforts of all safety-net providers and are proud to work alongside them in improving North Carolina's dental health. **NCMJ**

Kathy Higgins, MS president, Blue Cross and Blue Shield of North Carolina Foundation, Durham, North Carolina.

Acknowledgment

Potential conflicts of interest. K. H. has no relevant conflicts of interest.

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Electronically published April 16, 2013.

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74(3) Chronic pain

74(4) Health reform

74(5) Respiratory diseases

Advertiser Index

Agency for Healthcare Research and Quality	100, IBC	Food and Drug Administration	132
American Academy of Dermatology	104	MagMutual.....	102
American Heart Association/American Stroke Association.....	158	North Carolina Medical Society	147
American Lung Association	IFC	SAMHSA.gov	176
American Red Cross.....	172	The Doctors Company.....	98
Big Brothers Big Sisters.....	154	UNC Health Care	97
Centers for Disease Control and Prevention	162, 167	Walker, Allen, Grice, Ammons & Foy, LLP	BC
		Watch For Me NC.....	125



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