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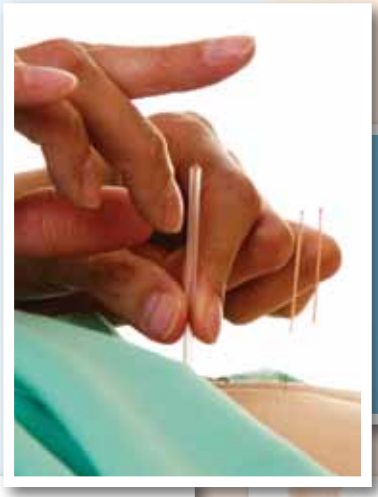
Chronic Pain



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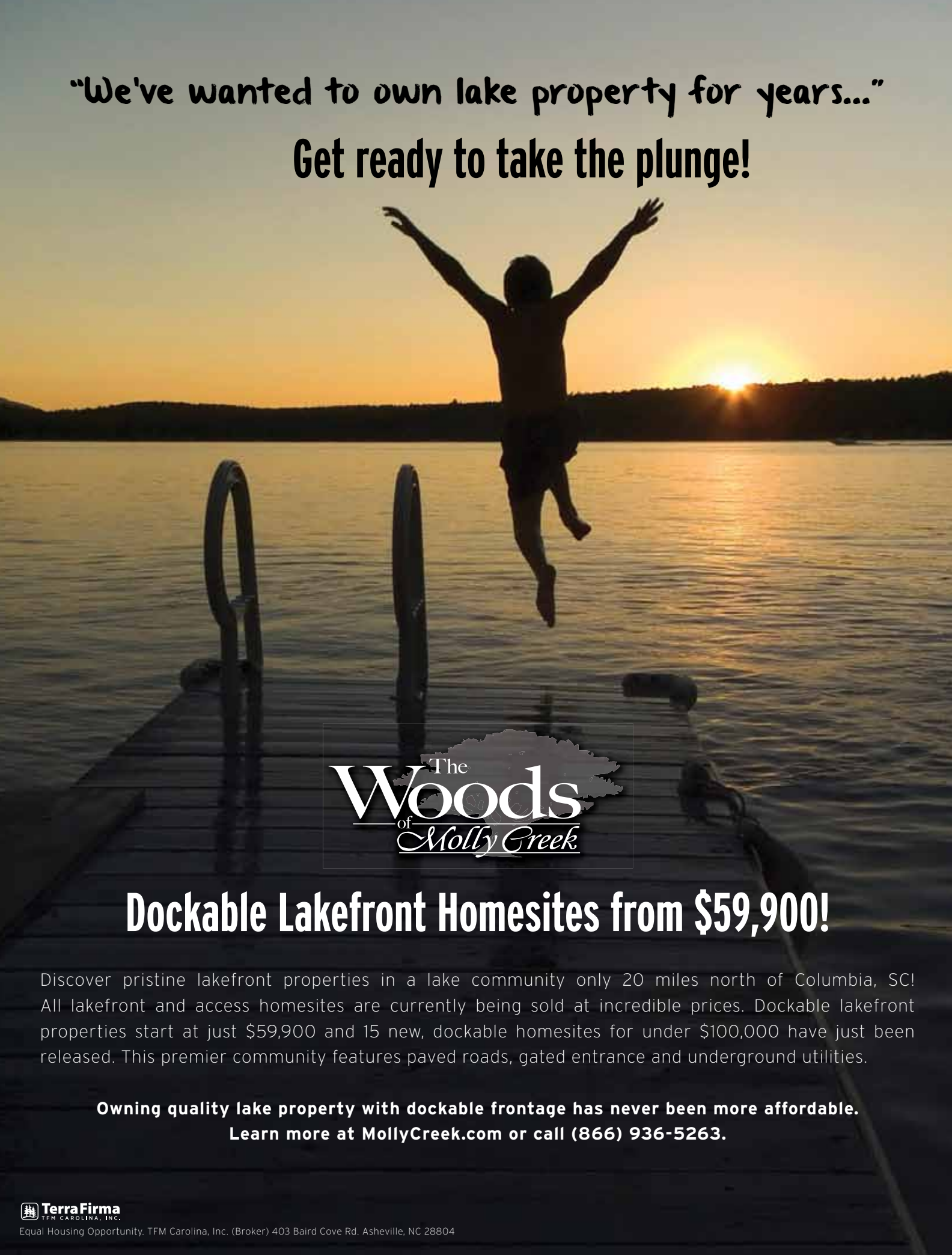
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Articles

Policy Forum
Chronic Pain

INTRODUCTION

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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

Troy Roberson

Corporal Troy Roberson works as a community police officer for the Pittsboro Police Department and serves as chair of Chatham Drug Free, a county-wide coalition to prevent and reduce underage drinking, tobacco use, and drug use. As chair of Chatham Drug Free, Roberson learned about the epidemic of prescription drug misuse and how law enforcement agencies elsewhere have been able to assist in the safe collection and disposal of over-the-counter and prescription medications. Thus, Roberson was enthusiastic when Safe Kids North Carolina organized the first Operation Medicine Drop event in March 2010. In addition to public events that educate residents about the potential for abuse or misuse of medications in the home and the environmental impact of trashing or flushing pills, Operation Medicine Drop also offers collection sites for safe disposal of unused or expired medications.

Believing this event would benefit the residents of Chatham County, Roberson encouraged the Pittsboro Police Department to participate in Operation Medicine Drop despite procedural barriers regarding the collection, holding, and disposal of medications. Commenting on Roberson's work, Kelly Ransdell, director of Safe Kids North Carolina, says, "[Roberson is] the epitome of what we love to find in our local partners. Rather than doing the bare minimum, he reached outside the box to engage valuable partnerships."

The Operation Medicine Drop events were very successful. From 2010 to 2012, Chatham County collected a total of 46,303 dosage units of medication. But Roberson also recognized the need for a permanent collection box so that residents did not need to hold onto medications between take-back events. With the support of Chatham Drug Free, Roberson raised funds and organized the effort to install a permanent collection box in the lobby of the Pittsboro Police Department building. Since the permanent collection box was put in place in June 2012, the Pittsboro Police Department has collected 128,000 dosage units of medication.

The drop boxes offered by the Pittsboro Police Department offer a safe means to remove unused or expired medications from the home and to prevent accidental poisoning or misuse, and they complement the ongoing efforts of Chatham Drug Free to educate parents and students about the dangers and legal consequences of illicit drug use. Beth Lamanna, a professor at the University of North Carolina School of Nursing, member of Chatham Drug Free, and a resident of Chatham County, says Roberson "truly understands the strong connection between community safety and the health of a community's residents. He embodies community policing at its best." NCMJ

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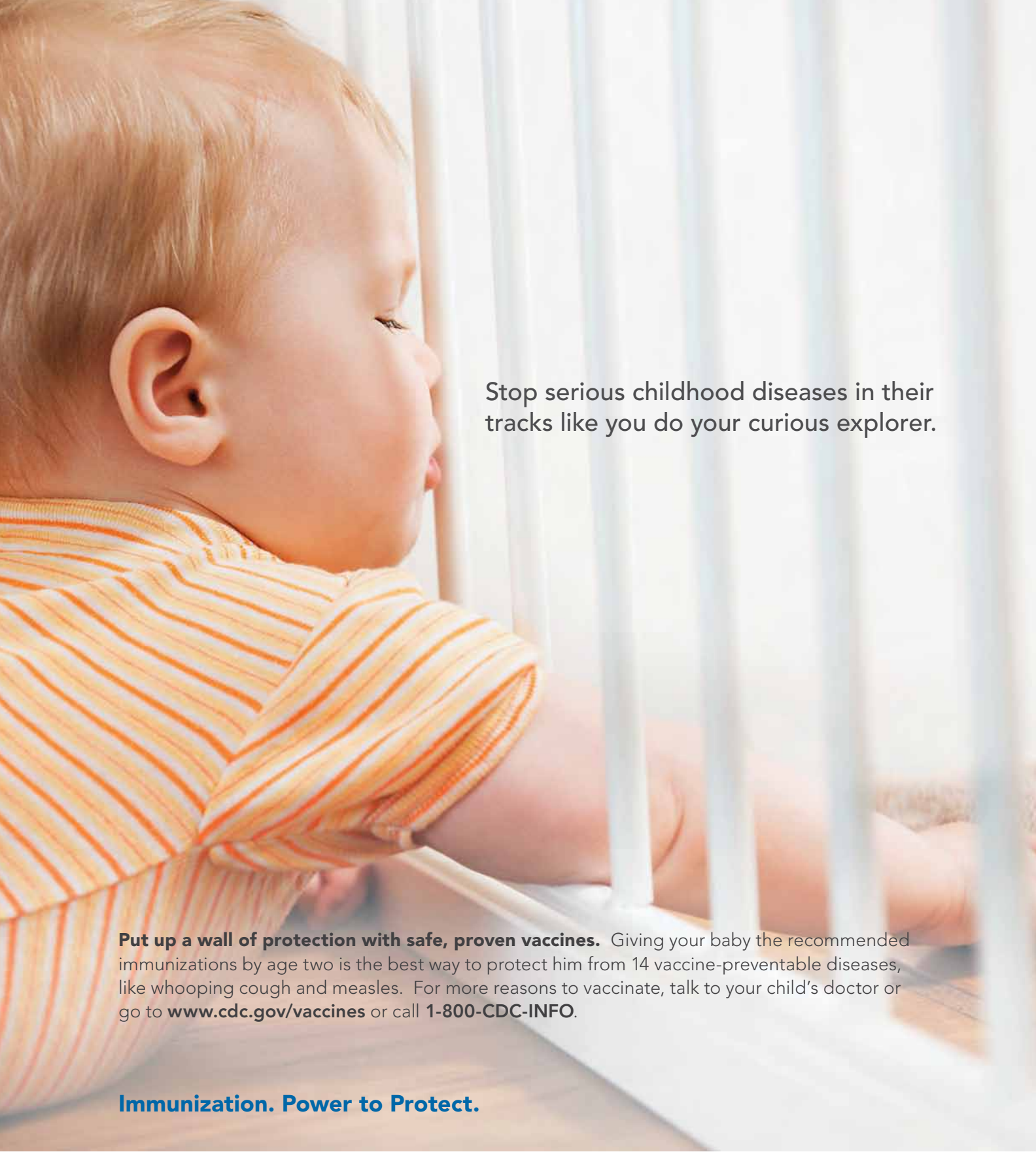

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ORIGINAL ARTICLE

Verifying Influenza and Pneumococcal Immunization Status of Children in 2009–2010 from Primary Care Practice Records and from the North Carolina Immunization Registry

Katherine A. Poehling, Lauren Vannoy, Timothy R. Peters

BACKGROUND The North Carolina Immunization Registry (NCIR) has been available since 2004. We sought to measure its utilization among practices that provide primary care for children who are enrolled in a prospective influenza surveillance study.

METHODS This study included children aged 0.5–17 years who presented with fever or acute respiratory symptoms to an emergency department or inpatient setting in Winston-Salem, North Carolina, from September 1, 2009, through May 19, 2010. Study team members verified influenza and pneumococcal immunization status by requesting records from each child's primary care practice and by independently reviewing the NCIR. We assessed agreement of nonregistry immunization medical records with NCIR data using the kappa statistic.

RESULTS Fifty-six practices confirmed the immunization status of 292 study-enrolled children. For most children (238/292, 82%), practices verified the child's immunizations by providing a copy of the NCIR record. For 54 children whose practices verified their immunizations by providing practice records alone, agreement with the NCIR by the kappa statistic was 0.6–0.7 for seasonal and monovalent H1N1 influenza vaccines and 0.8–0.9 for pneumococcal conjugate and polysaccharide vaccines. A total of 221 (98%) of 226 enrolled children younger than 6 years of age had 2 or more immunizations documented in the NCIR.

LIMITATIONS NCIR usage may vary in other regions of North Carolina.

CONCLUSION More than 95% of children younger than 6 years of age had 2 or more immunizations documented in the NCIR; thus, the Centers for Disease Control and Prevention 2010 goal for immunization information systems was met in this population. We found substantial agreement between practice records and the NCIR for influenza and pneumococcal immunizations in children.

Childhood immunization schedules have expanded over the past decade for children of all ages, including young children and adolescents [1, 2]. Children frequently obtain vaccines from multiple sources. Many children receive their first dose of hepatitis B vaccine during the birth hospitalization [3, 4], and some children receive immunizations from multiple providers [5]. To minimize the dispersal of immunization records, the Centers for Disease Control and Prevention (CDC) has recommended the use of state-based immunization registries [6]. North Carolina modified the Wisconsin Immunization Registry to develop the North Carolina Immunization Registry (NCIR), a secure, population-based, Web-based clinical tool that was implemented in 2004 [7]. This study measured both the extent to which providers used the NCIR in 2009–2010 and the agreement between practice-based records and registry data for influenza and pneumococcal immunizations among children.

Methods

An influenza surveillance study prospectively enrolled children who presented with acute respiratory illness or fever to an emergency department or inpatient setting in 1 of 2 hospitals in Winston-Salem, North Carolina—including the region's only children's hospital—from September 1, 2009, through May 19, 2010. Eligible children resided in Forsyth County or 1 of 7 contiguous counties in North Carolina. After informed consent was obtained from a parent or guardian (along with child assent, when appropriate), children were enrolled in the study and permission was obtained to verify their influenza and pneumococcal immunization history by contacting their primary care practice and by reviewing the NCIR. (This study is distinct from our 2012 study that compared parental reports for the 2009–2010 seasonal influenza vaccine and the H1N1 vaccine to confirmation of vaccination status using either the NCIR or practice reports [8].)

For the current study, a facsimile was sent to the parent-identified primary care practice in the spring and summer of 2010; this facsimile requested verification of the influenza and pneumococcal immunization status for each child enrolled in the study. Influenza and pneumococcal immunization status were independently verified in the NCIR.

Study population. The study population comprised all children who were prospectively enrolled, had immuniza-

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tions entered into the NCIR, and had their influenza and pneumocccal immunization status verified by a practice.

Influenza immunization status. In 2009–2010, influenza vaccine recommendations for the seasonal influenza vaccine differed from recommendations for the H1N1 monovalent influenza vaccine, particularly for children 9 years of age, for whom the recommendation was that they receive 2 doses of the latter but only 1 dose of the former [9-11]. The definitions of fully immunized, partially immunized, and not immunized for each vaccine are shown in Table 1.

Agreement between the practice-based records and registry-based records. Many practices responded to our request for immunization verification by providing a copy of the NCIR record. The expected agreement between the practice copy of the NCIR and our review of this registry should approximate 100%. Hence, we limited the assessment of agreement to children whose immunization status was verified using practice records alone. Because the influenza vaccine was recommended for children 6 months of age or older, the study population consisted of children 0.5–17 years of age. For these children, we extracted information from the practice-based record regarding doses of seasonal and H1N1 monovalent influenza vaccines in 2009–2010 and doses of pneumococcal conjugate vaccine (7-valent or 13-valent) or any pneumococcal polysaccharide vaccine, and we compared this information with the NCIR record. Because the 23-valent pneumococcal polysaccharide vaccine is recommended only for children 2 years of age or older who have medical conditions predisposing them to pneumococcal disease [12], we limited assessment of that vaccine to children 2–17 years of age. For each vaccine, we compared the number of doses listed in the practice-based records with the number of doses recorded in the NCIR to compute the percent agreement, expected percent agreement, and a simple (not weighted) kappa statistic (κ) with its P value. κ is a measure of inter-rater agreement that accounts for the likelihood that the observed agreement could occur by chance; this value can range from –1 (perfect disagreement beyond chance) to +1 (perfect agreement beyond chance). According to the categorization scheme of Landis and Koch [13], a κ value of 0.81–1.00 indicates almost perfect agreement, a κ value of 0.61–0.80 indicates substantial agreement, and a κ value of 0.41–0.60 indicates moderate agreement. For each vaccine, we also computed the sensitivity, specificity, positive predictive value, and negative predictive value for each child being classified as immunized or not immunized when the NCIR record was compared to practice-based records. Exact 95% confidence intervals were computed using the binomial distribution. All analyses were performed using the statistical package STATA 8.1 (College Station, Texas).

This study was approved by the Wake Forest School of Medicine Institutional Review Board with written parental consent and child assent when appropriate, and by an authorization agreement between the institutional review boards of Forsyth Medical Center and Wake Forest School of Medicine.

Results

Of the 334 children enrolled from September 1, 2009, through May 19, 2010, the study population consisted of the 292 children (87%) who had influenza and pneumococcal immunizations verified by both the NCIR and practice records (Figure 1). More than three-quarters of study children were younger than 9 years of age, approximately half were male, half were black, and three-quarters of them resided in Forsyth County (Table 2). More parents reported that their child obtained care from a pediatric practice (76%) than from a family medicine practice (19%) or a health department (6%).

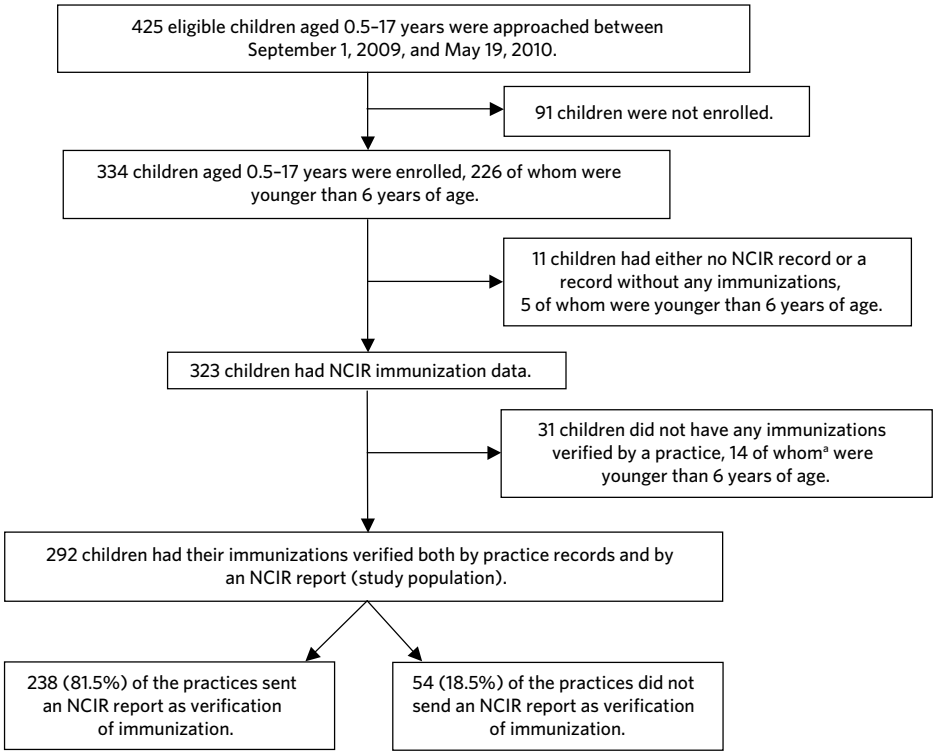
For 238 (82%) of the study children, the practice verified the child's immunizations by providing a copy of the NCIR record. Compared to this group, children whose immunizations were verified with practice-based records were younger, less likely to be non-Hispanic white, more likely to reside in a county surrounding Forsyth County, and more likely to obtain care at a family medicine practice (Table 2). Of the 226 chil-

TABLE 1.
Immunization Status Definitions for the 2009–2010 Seasonal and H1N1 Monovalent Influenza Vaccines

	Immunization status	Age group	Definition
2009–2010 seasonal influenza vaccine	Fully immunized	0.5–<9 years	2 doses if not fully immunized in a previous season
		0.5–<9 years	1 dose if fully immunized in a previous season
		≥9 years	1 dose
	Partially immunized	0.5–<9 years	1 dose if not fully immunized in a previous season
	Not immunized	0.5–18 years	0 doses
2009–2010 H1N1 monovalent influenza vaccine	Fully immunized	0.5–<10 years	2 doses
		≥10 years	1 dose
	Partially immunized	0.5–<10 years	1 dose
	Not immunized	0.5–18 years	0 doses

Note. Data are from the 2009 recommendations of the Advisory Committee on Immunization Practices [9], a 2009 update on H1N1 monovalent vaccines from the Centers for Disease Control and Prevention (CDC) [10], and the CDC Web site on the H1N1 vaccine [11].

FIGURE 1.
Derivation of the Study Population



Note. NCIR, North Carolina Immunization Registry.
[a]These 14 children had 2 or more immunizations recorded in the NCIR.

dren younger than 6 years of age, 221 of them (98%) had 2 or more immunizations documented in the NCIR.

Parents reported that the 292 children in the study received care from 1 of 56 health care facilities, of which 30 (54%) were pediatric practices, 21 (34%) were family medicine practices, and 5 (11%) were health departments. The mean number of enrolled children per health care facility was 8 for pediatric practices (range, 1–60), 3 for family medicine practices (range, 1–12), and 2 for health departments (range, 1–4).

In this study, primary care practices administered the majority of seasonal and monovalent H1N1 influenza vaccine doses in 2009–2010. Among 182 verified doses of seasonal influenza vaccine, 85% were administered in their primary care practice, 10% were administered in a health department, 3% were administered in a practice other than their primary practice, and 2% were administered in a school or wellness center. Among 118 verified doses of monovalent H1N1 influenza vaccine, 75% were administered in their primary care practice, 17% were administered in a health department, 6% were administered in a school or wellness center, and 3% were administered in a practice other than their primary practice. In 2009–2010 the NCIR confirmed 172 (94.5%) of 182 verified doses of seasonal influenza vaccine and 115 (97%) of 118 verified doses of monovalent H1N1 influenza vaccine.

For 54 children whose immunization status was verified with practice records, we ascertained the level of agreement between the practice records and the NCIR. The kappa statistics for the 2009–2010 seasonal influenza vaccine and the H1N1 influenza vaccine ($\kappa = 0.63$ and $\kappa = 0.71$, respectively; Table 3) were lower than those for pneumococcal conjugate and 23-valent pneumococcal polysaccharide vaccines ($\kappa = 0.92$ and $\kappa = 0.84$, respectively; Table 3).

There were different reasons for the discrepancy between the practice report and the NCIR. For influenza vaccines, 2 different practices reported 1 dose of seasonal influenza vaccine and 1 dose of H1N1 monovalent influenza vaccine in the practice records but not in the NCIR, which negatively impacted the sensitivity and negative predictive value of the influenza immunization status in the registry (Table 4). Conversely, for the pneumococcal vaccine, 1 child had a pneumococcal conjugate vaccine and another child had a pneumococcal polysaccharide vaccine reported by the practice to the NCIR (per our review of the NCIR), but those vaccines were not recorded in the practice-provided verification. This discrepancy negatively impacted the specificity and positive predictive value of the pneumococcal immunization status in the registry.

Discussion

This study demonstrates that the NCIR was commonly used in 2009–2010 by practices in Forsyth County and its

TABLE 2.
Demographic Characteristics and Vaccination Status of Children Enrolled in the Study

	NCIR record sent by practice		
	Yes N=238	No N=54	
Characteristic	N (column %)[a]	N (column %)[a]	**P-value**
Age			
0.5–<2 years	82 (34%)	15 (28%)	.04
2–5 years	95 (40%)	15 (28%)	
6–8 years	29 (12%)	15 (28%)	
9–17 years	32 (13%)	9 (17%)	
Gender			
Male	123 (52%)	24 (44%)	.34
Female	115 (48%)	30 (56%)	
Race			
White	56 (24%)	7 (13%)	.03
Black	132 (56%)	27 (50%)	
Other	50 (21%)	20 (37%)	
County of residence			
Forsyth County	196 (82%)	32 (59%)	.001
1 of 7 contiguous counties	42 (18%)	20 (41%)	
Type of health care facility			
Pediatric practice	200 (84%)	28 (52%)	<.001
Family practice	29 (12%)	24 (44%)	
Health department	9 (4%)	2 (4%)	
Seasonal influenza vaccination status			
Not immunized	123 (52%)	27 (50%)	.85
Partially immunized	40 (17%)	8 (15%)	
Fully immunized	75 (32%)	19 (35%)	
H1N1 influenza vaccination status			
Not immunized	168 (71%)	40 (74%)	.15
Partially immunized	40 (17%)	4 (7%)	
Fully immunized	30 (13%)	10 (19%)	
Pneumococcal conjugate vaccine(s)[b]			
None	25 (11%)	6 (11%)	.54
1 dose	7 (3%)	4 (7%)	
2 doses	12 (5%)	2 (4%)	
3 doses	48 (20%)	7 (13%)	
4 doses	145 (61%)	35 (65%)	
5 doses	1 (<1%)	0 (0%)	
Pneumococcal polysaccharide vaccine[c]			
None	150 (96%)	35 (90%)	.12
Any dose(s)	6 (2%)	4 (10%)	

Note. NCIR, North Carolina Immunization Registry.
[a]Sum of percentages may not equal 100% due to rounding error.
[b]7-valent and/or 13-valent pneumococcal conjugate vaccine. For children younger than 5 years who had received 4 doses of 7-valent pneumococcal conjugate vaccine, 1 dose of 13-valent pneumococcal conjugate vaccine was recommended.
[c]23-valent pneumococcal polysaccharide vaccine data is limited to children aged 2–17 years.

7 contiguous counties in North Carolina. Primary care practices provided immunization verification in the form of the NCIR record for most (82%) of the children enrolled in this study. Further, 221 (98%) of the 226 enrolled children younger than 6 years of age had 2 or more immunizations recorded in the NCIR. Thus, in this study population the NCIR achieved the 2010 CDC goal for immunization information systems, which specifies that at least 95% of children younger than 6 years of age should have 2 or more immunizations recorded in such a system [6].

For children whose immunization status was verified with practice records, we found substantial agreement between

TABLE 3.
Agreement Between the North Carolina Immunization Registry and Practice-Based Immunization Records

	Doses in registry record	Doses in practice records					Agreement	Expected agreement	Kappa statistic[a]
Seasonal influenza vaccine, N=54[b]		None		1 dose		2 doses			
	None	27		7		1			
	1 dose	2		11		1	80%	45%	0.63
	2 doses	0		0		5			
Monovalent H1N1 influenza vaccine, N=54[b]		None		1 dose		2 doses			
	None	40		1		0			
	1 dose	0		3		2	89%	62%	0.71
	2 doses	2		1		5			
Pneumococcal conjugate vaccine, N=54[b]		None	1 dose	2 doses	3 doses	4 doses			
	None	6	0	0	0	0	96%	54%	0.92
	1 dose	0	2	0	0	1			
	2 doses	0	0	2	0	0			
	3 doses	0	0	0	4	1			
	4 doses	0	0	0	0	38			
23-valent pneumococcal polysaccharide vaccine, N=39[c]		None		1 dose					
	None	35		0			97%	84%	0.84
	1 dose	1		3					

[a]For each of these kappa statistics, P<.001.
[b]Data are for children aged 0.5–17 years.
[c]Data are for children aged 2–17 years, because 23-valent pneumococcal vaccine is not recommended for children younger than 2 years.

the practice records and the NCIR for seasonal and monovalent H1N1 influenza vaccines ($\kappa \geq 0.63$) and almost perfect agreement for pneumococcal conjugate and polysaccharide vaccines ($\kappa \geq 0.84$), per the categorization scheme of Landis and Koch [13]. Hence there was high concordance for influenza and pneumococcal immunizations between the practice records and the NCIR.

We believe that the practices included in this study are representative of the practices serving Forsyth County and its 7 contiguous counties in North Carolina. Among enrolled children, 76% received primary care at a pediatric practice. An analysis of 2004–2007 data from the National Ambulatory Medical Care Survey reported similar findings, with general pediatricians performing 77% of all visits to primary care physicians among children 0–17 years of age [14].

Our results are comparable to those of previous reports for other immunization registries in the United States. We found that within 6 years of the North Carolina registry being implemented, 98% of children 0.5–5 years of age had 2 or more immunizations documented in the NCIR. In comparison, 92% of children aged 19–35 months were included in the KIDS Immunization Registry in Philadelphia, Pennsylvania [15], and 91% of children younger than 5 years of age were included in the Arizona State Immunization Information System [16]. We also found that 94.5% of verified doses of seasonal influenza vaccine and 97% of doses of monovalent H1N1 influenza vaccine were reported in the NCIR; similarly, a regional immunization registry in Wisconsin captured 95% of all influenza immunizations during 2 consecutive influenza seasons (2006–2008) [17].

In 2009–2010, the NCIR required direct data entry by medical practice personnel, such that information flow occurred in only one direction. The NCIR is working to develop bidirectional communication with electronic health records that achieve design principles of Health Level 7 Standards [7, 18], and this expansion is expected to increase the proportion of all North Carolina children whose information is entered into the registry. Financial incentives for adopting electronic health records and meeting standards for meaningful use of these systems should significantly enhance the adoption of electronic health records in primary care practices throughout North Carolina. Once bidirectional communication between electronic health records and the NCIR is well established, use of this registry may increase not only for children but also for adults. Use of the NCIR to document immunizations among adults is potentially important given the expansion of the adult immunization schedule since 2002 [19, 20].

This study has several limitations. It may not reflect immunization registry usage throughout the state, because all children in this study resided in Forsyth County or 1 of its 7 contiguous counties. However, these counties include urban, suburban, and rural populations, thus reflecting the metropolitan diversity within North Carolina. Another possible limitation is that the few children who did not have an entry in the NCIR or whose practice did not verify their immunization status could have systematically differed from children who had their immunizations verified by both sources. Similarly, children were enrolled in the emergency department and inpatient setting and thus may have

TABLE 4.
Characterization of Influenza and Pneumococcal Immunizations in 2009–2010 from the North Carolina Immunization Registry Compared to Practice-Based Records

	Registry record	Practice-based records		Sensitivity (95%CI)	Specificity (95%CI)	PPV (95%CI)	NPV (95%CI)
		Immunized	Not immunized				
Seasonal influenza vaccine, N=54[a]	Immunized	17	2	68%	93%	89%	77%
	Not immunized	8	27	(46–85%)	(77–99%)	(67–99%)	(60–90%)
H1N1 monovalent influenza vaccine, N=54[a]	Immunized	11	2	92%	95%	85%	98%
	Not immunized	1	40	(62–99.8%)	(84–99%)	(55–98%)	(87–99.9%)
Pneumococcal conjugate vaccine, N=54[a]	Immunized	48	0	100%	100%	100%	100%
	Not immunized	0	6	(93–100%)[b]	(54–100%)[b]	(54–100%)[b]	(93–100%)[b]
23-valent pneumococcal polysaccharide vaccine, N=39[c]	Immunized	3	1	100%	97%	75%	100%
	Not immunized	0	35	(29–100%)[b]	(85–99.9%)	(19–99%)	(90–100%)[b]

Note. CI, confidence interval; NPV, negative predictive value; PPV, positive predictive value.
[a]For each of these kappa statistics, P<.001.
[b]Data are for children aged 0.5–17 years.
[c]Data are for children aged 2–17 years, because 23-valent pneumococcal vaccine is not recommended for children younger than 2 years.

systematically differed from children who did not have an emergency department visit or hospitalization; however, being able to verify the immunization status of children who present to the emergency department or to an inpatient setting is important. Also, we may have underestimated the immunization status of children if they received an influenza or pneumococcal vaccine from a practice other than their primary care practice or from a location that did not enter the data into the NCIR. For example, pharmacists in North Carolina were granted temporary authorization to administer seasonal and monovalent influenza vaccines to children 14 years of age or older from October 9, 2009, through July 2010 [21]. Finally, this project focused on only influenza and pneumococcal vaccines, not all recommended pediatric vaccines, and results for up-to-date status for all recommended immunizations may vary.

In summary, the NCIR was widely used to document immunizations for children residing in Forsyth County, North Carolina, and its 7 contiguous counties. There was substantial agreement between practice-based records and registry records for influenza and pneumococcal vaccinations. The NCIR is a valuable resource in the effort to defend public health through control of vaccine-preventable diseases. NCMJ

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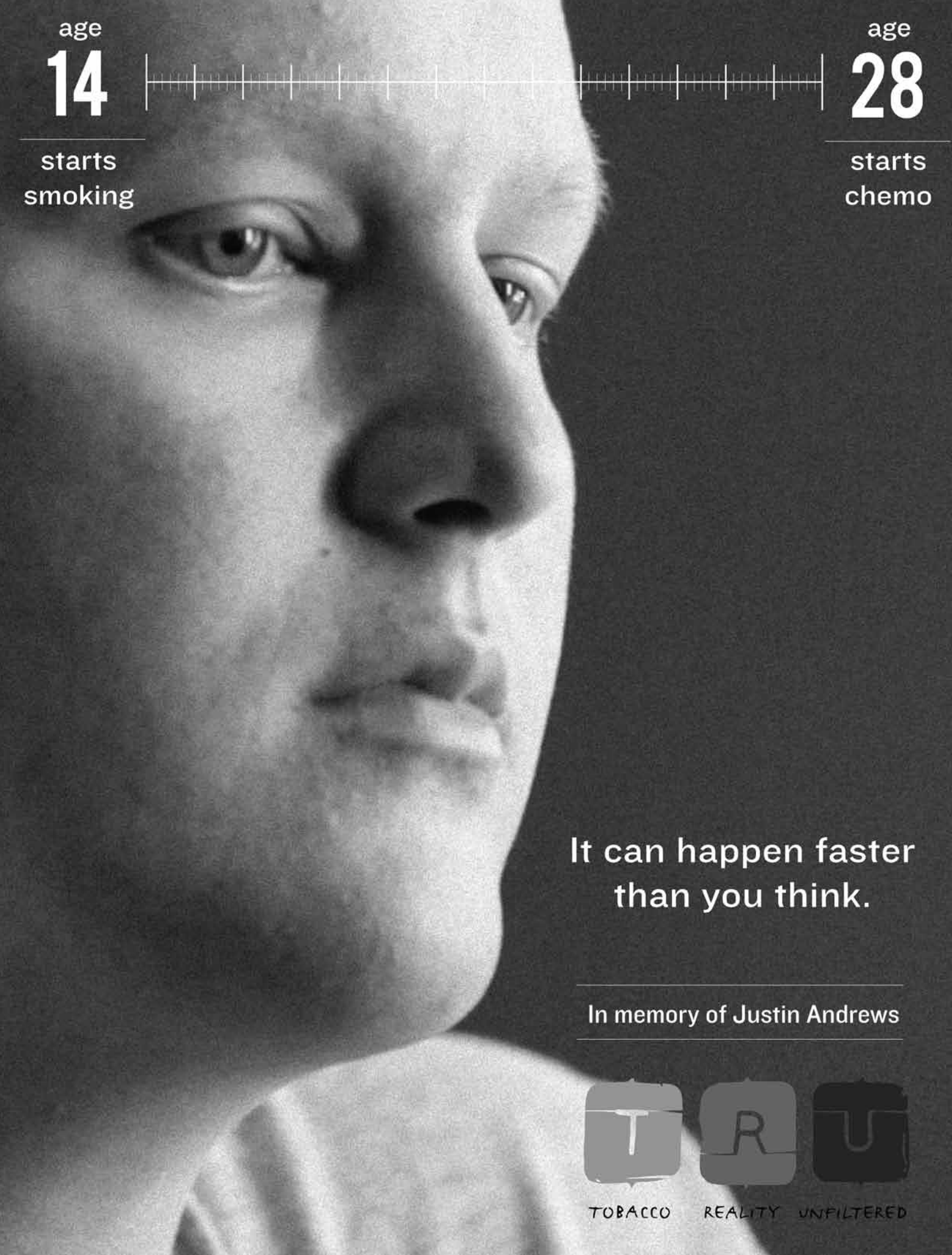
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ORIGINAL ARTICLE

North Carolina Health Professionals' Communication with Adolescents About Smoking

Kelly L. Kandra, Anna McCullough, Leah Ranney, Adam O. Goldstein

BACKGROUND The middle school and high school years are a time when adolescents are at high risk for initiation of smoking and progression to nicotine addiction. This research examines the prevalence with which North Carolina students receive smoking-related communication from health professionals and how such communication relates to smoking behaviors.

METHODS Data are from the 2009 North Carolina Youth Tobacco Survey (NCYTS), a biennial public and charter school–based survey of students in grades 6–12. The overall response rate was 78.2% (n = 3,301) for high school students and 79.2% (n = 3,805) for middle school students. Weighted multivariable logistic regression models were used to identify variables that are significantly related to health professionals' communication about smoking and/or advice against smoking.

RESULTS A majority of respondents reported that they had not been asked about or advised against smoking. Middle school and high school students who had tried to quit smoking in the past 12 months were significantly more likely to report having been asked about smoking (OR = 2.00 [95% CI, 1.23–3.28], OR = 1.96 [95% CI, 1.44–2.66], respectively) or advised against smoking (OR = 2.25 [95% CI, 1.13–4.50], OR = 2.02 [95% CI, 1.31–3.14], respectively) than were students who had not tried to quit.

LIMITATIONS This research is based on a cross-sectional survey and is subject to the honesty of the participants. Results may not generalize beyond public and charter school students in North Carolina.

CONCLUSIONS North Carolina health professionals need to increase communication with adolescents in order to sustain the historically low rates of smoking in this age group.

Every year in North Carolina, tobacco use results in 12,200 deaths [1], 181,566 years of potential life lost [2], and $3.5 billion in lost productivity [1]. Almost 80% of adult smokers report that they regularly smoked cigarettes during their teenage years [3], and longitudinal data indicate that initial experimentation with smoking typically happens between the ages of 11 and 13 years, when students are in middle school [4]. In 2009, every day more than 4,000 individuals under the age of 18 years experimented with cigarettes for the first time, and an additional 1,100 progressed from experimentation to daily smoking [5].

Given that the middle school and high school years are a time when adolescents are at high risk for the initiation and continuation of cigarette smoking, it is essential that they receive appropriate advice and guidance regarding smoking during these years. The Public Health Service's 2008 clinical practice guidelines for treating tobacco use and dependence [6] recommend that clinicians ask all adolescent patients about tobacco use and offer strong prevention and cessation messages; they also recommend providing counseling to adolescent patients who use tobacco, as such counseling can double rates of long-term abstinence. More recent research has shown that screening and advice from physicians is associated with improved attitudes and knowledge about tobacco use among all young individuals and with significantly higher intentions to quit among those who use tobacco [7]. However, most young individuals report that their physician or dentist has not advised them about tobacco use in the past year [8]. Our research examines data from a survey of North Carolina students to determine both the prevalence with which they report having received communication from a health professional regarding smoking and the relation between such communication and smoking behaviors, including quitting.

Methods

Data come from the 2009 North Carolina Youth Tobacco Survey (NCYTS), which was administered in the fall of 2009. The NCYTS, a biennial public and charter school–based survey of students in grades 6–12, is a surveillance effort of the Tobacco Prevention and Control Branch of the North Carolina Division of Public Health; this survey measures students' use of and attitudes toward various tobacco products, as well as their cessation attitudes and efforts. Participation in the NCYTS is voluntary and anonymous, and school parental permission procedures are followed. A total of 3,805 middle school students and 3,301 high school students completed

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the 2009 NCYTS (see Table 1). A multistage cluster design and corresponding sampling weights allow results to be generalized to all students in public and charter middle schools and high schools in North Carolina.

Two questions on the 2009 NCYTS addressed smoking-related communication from health professionals: "During the past 12 months, did any doctor, dentist, nurse, or other health professional ask you if you smoke?" and "During the past 12 months, did any doctor, dentist, nurse, or other health professional advise you not to smoke?" Response options for both questions were yes, no, and "don't know/not sure." Multivariable logistic regression models were used to identify variables that are significantly related to health professionals' asking students about smoking and advising students not to smoke. Independent variables included gender (dichotomized as female or male), age (treated as a continuous variable), race (dichotomized as minority [students who self-identify as American Indian or Alaskan Native, Asian, black or Africa American, Hispanic or Latino, or Native Hawaiian or other Pacific Islander] or nonminority [students who self-identify as white]), ever use of cigarettes (dichotomized as yes or no), use of cigarettes in the past 30 days (dichotomized as yes or no), ever use of cigars (dichotomized as yes or no), use of cigars in the past 30 days (dichotomized as yes or no), and quit attempt in the past 12 months (categorized as yes, no, or "did not smoke in past 12 months," with the reference group consisting of those who answered no; see Table 2). All independent variables were entered simultaneously in the logistic regression model. Separate logistic regression models were run for middle school students and for high school students, and only individuals with complete data across all relevant variables were included in the analyses.

Given the study's complex sampling design and corresponding sampling weights, all data were analyzed using SAS survey procedures. Results include weighted percentages, odds ratios (OR), and confidence intervals (CI) and may be generalized to all North Carolina middle and high school students attending public or charter schools. Statistical significance was set at $P<.05$.

Results

A majority of North Carolina students reported that they had not been asked about smoking or advised against smoking by a doctor, dentist, nurse, or other health professional during the past 12 months (see Table 3). Among North Carolina middle school students, only 16.27% reported that a health professional had asked them about smoking, and only 29.46% reported having been advised not to smoke by a health professional. Only 10.95% responded yes to both questions, and 47.71% responded no to both questions. Among high school students, slightly more than one-third (34.53%) reported that a health professional had asked them about smoking, and slightly less than one-third (30.17%) reported that a health professional had advised them not to smoke. Approximately 20.01% of North Carolina high school students responded yes to both questions, while 42.31% responded no to both questions.

Logistic regression results are shown in Table 4. As student age increased, students were significantly more likely to report having been asked about smoking by a health professional. The OR for middle school students was 1.40 (95% CI, 1.22–1.60), and the OR for high school students was 1.13 (95% CI, 1.01–1.26). However, age was not significantly related to middle school students' having been advised not to smoke (OR = 1.13 [95% CI, 0.97–1.32]). For high school students, increasing age actually decreased their odds of having been advised not to smoke, by 11% for each additional year of age (OR = 0.89 [95% CI, 0.83–0.95]).

Among both middle school and high school students who smoke, having attempted to quit was significantly related to having been asked about smoking and having been advised not to smoke. Middle school students who had tried to quit smoking in the past 12 months were significantly more likely to report having been asked about smoking (OR = 2.00 [95% CI, 1.23–3.28]) and were significantly more likely to report having been advised not to smoke (OR = 2.25 [95% CI, 1.13–4.50]) than were middle school students who had not tried to quit. The results for high school students were similar. Additionally, high school students who had not smoked in the past 12 months were significantly more likely to report having been asked about smoking (OR = 1.93 [95% CI, 1.20–3.09]) and were significantly more likely to report having been advised not to smoke (OR = 1.98 [95% CI, 1.26–3.11]) compared with high school students who had smoked in the past 12 months and had made no attempt to quit smoking.

For high school students, 2 other variables were significantly related to their having been asked about smoking by a health professional, and 1 other variable was significantly

TABLE 1.
Response Rates for the 2009 North Carolina Youth Tobacco Survey

School type	Number of schools sampled	Number of schools participating (%)	Number of students sampled	Number of students participating (%)	Overall response rate[a]
Middle school	99	94 (94.9%)	4,559	3,805 (83.5%)	79.2%
High school	101	95 (94.1%)	3,972	3,301 (83.1%)	78.2%

[a]The overall response rate is the product of the school response rate (the percentage of schools participating) and the student response rate (the percentage of students participating).

TABLE 2.
Weighted Percentages for Independent Variables Used in Logistic Regression Models

Variable	Middle school students Weighted %	High school students Weighted %
Gender		
Female	48.67	48.32
Male	51.32	51.68
Race		
Minority	44.99	42.4
Nonminority	55.01	57.6
Age		
11 years or younger	24.72	0.23
12 years	30.56	0.15
13 years	33.60	0.37
14 years	9.72	20.14
15 years	1.26	25.60
16 years	0.04	25.18
17 years	0.05	22.37
18 years or older	0.04	5.96
Ever use of cigarettes		
Yes	21.07	44.1
No	78.93	55.9
Use of cigarettes in the past 30 days		
Yes	4.31	16.7
No	95.69	83.3
Ever use of cigars		
Yes	14.38	30.7
No	85.62	69.3
Use of cigars in the past 30 days		
Yes	4.63	13.2
No	95.37	86.8
Attempted to quit smoking in the past 12 months		
Yes	5.81	12.03
No	4.37	11.44
Did not smoke during the past 12 months	89.82	76.53

Note. Age is treated as a continuous variable in the logistic regression model. Data are weighted to enable generalization to all students at public and charter middle schools and high schools in North Carolina.

related to their having been advised not to smoke by a health professional. Males were less likely than females to report having been asked about smoking (OR = 0.78 [95% CI, 0.62–0.99]), and high school students who had tried cigar smoking were more likely to report having been asked about smoking by a health professional than were those who had not tried cigar smoking (OR = 1.48 [95% CI, 1.02–2.14]). Finally, high school students who had smoked in the past 30 days were more likely to report having been advised not to smoke by a health professional compared with high school students who had not smoked in the past 30 days (OR = 1.75 [95% CI, 1.24–2.47]).

Discussion

The majority of respondents to the 2009 NCYTS reported that health professionals had not discussed smoking with them in the past 12 months. This finding is unfortunate, given that research suggests that health professionals such as dentists, nurses, and physicians can have a positive impact on smoking behaviors [7-9]. Physicians' advice to and discussions with teenagers about smoking have also been shown to be associated with changes in attitudes about the social desirability of smoking, teenagers' knowledge about the dangers of smoking, and their intentions to smoke in 5 years [7]. The findings reported here are alarming, because the 2000 National Youth Tobacco Survey showed similar results for adolescent reports regarding smoking-related communication from physicians and dentists [8]. It appears that physicians do not commonly discuss smoking when interacting with their younger patients. Research suggests that providers believe that asking adolescents about smoking can be a barrier to establishing rapport [10], but health professionals should strive to communicate the dangers of smoking and the deadliness of tobacco addiction to adoles-

TABLE 3.
Weighted Percentages and 95% Confidence Intervals for North Carolina Middle School and High School Students' Self-Reported Communication with Health Professionals

Asked about smoking by a health professional	Advised not to smoke by a health professional			
	Yes (95% CI)	No (95% CI)	Not sure (95% CI)	Total (95% CI)
Middle school students				
Yes	10.95% (9.02–12.88)	4.03% (3.08–4.99)	1.29% (0.68–1.90)	16.27% (14.09–18.45)
No	14.64% (13.23–16.05)	47.71% (45.23–50.18)	6.17% (4.98–7.36)	68.52% (65.95–71.08)
Not sure	3.87% (3.03–4.71)	2.74% (2.08–3.93)	8.60% (7.59–9.62)	15.21% (13.66–16.76)
Total	29.46% (27.32–31.59)	54.48% (52.13–56.82)	16.07% (14.45–17.68)	100%
High school students				
Yes	20.01% (18.23–21.79)	11.00% (9.61–12.38)	3.52% (2.02–5.01)	34.53% (31.99–37.06)
No	7.46% (6.13–8.80)	42.31% (39.60–45.02)	3.95% (2.99–4.91)	53.72% (51.28–56.18)
Not sure	2.70% (1.87–3.52)	2.61% (2.08–3.14)	6.44% (5.36–7.51)	11.75% (10.19–13.31)
Total	30.17% (28.17–32.17)	55.92% (53.74–58.11)	13.91% (12.16–15.65)	100%

Note. CI, confidence interval.
Data are weighted to enable generalization to all students at public and charter middle schools and high schools in North Carolina.

cents, given the positive impacts of such communication.

On a more encouraging note, some at-risk individuals are being reached. Of particular importance is the finding that middle school and high school students who had tried to quit smoking in the past 12 months were significantly more likely to report having received communication about smoking from a health professional. Furthermore, high school students who chose the answer "did not smoke in the past 12 months" in response to the question about whether they had attempted to quit smoking in the past 12 months were also significantly more likely to report having received communication about smoking from a health professional; thus, it is possible that messages from health care providers may have influenced some high school students who experimented with smoking in the past but had not smoked in the past 12 months.

Research has consistently shown that smoking behavior is related to age [11]; thus, it is not surprising that increasing age is associated with increasing odds that a middle school or high school student will report that a health professional had asked them about smoking. Among high school students, however, increasing age is associated with decreasing odds that a student will report having been advised not to smoke. Primary care providers and adolescent medicine specialists have indicated that insurance issues, time allotted for patient interaction, and more pressing concerns (eg, drunk driving) can limit opportunities to encourage adolescents to quit smoking [10]. Given the positive association between students' quit attempts and their receiving advice about smoking from health professionals, North Carolina health professionals should consider making cessation messages a priority, particularly since research suggests that many teenagers want to quit smoking [12].

Given the relatively low percentages of middle school students who report smoking cigarettes and cigars, it is not surprising that use of these products by students in this age group is not significantly related to whether they had received smoking-related communication from a health professional. However, the relatively low prevalence of tobacco use among middle school students does not detract from their need to hear clear messages about not smoking. For both middle school and high school students, strong prevention messages delivered early and often are critically important. Some evidence suggests that signs of nicotine dependence can develop even before a young person progresses to daily smoking [13]. Once young people are addicted to nicotine, cessation efforts are more difficult [12], highlighting the crucial role that health professionals can play by providing early interventions for these individuals.

It is possible that students who reported not having been asked or advised about smoking by a health professional had not interacted with a health professional during the past year. However, most North Carolina parents report that their children do have a primary care provider and a regular dentist. In the Child Health Assessment and Monitoring Program (CHAMP) survey [14], a 2009 statewide survey of North Carolina parents, a majority of parents—79.6% of parents of children aged 11–13 years and 76.4% of parents

TABLE 4.
Weighted Multivariable Logistic Regression Results for North Carolina Middle School and High School Students' Self-Reported Communication with Health Professionals

	Outcome variables			
	Middle school students		High school students	
Independent variables	**Asked about smoking** Odds ratio (95% CI)	**Advised not to smoke** Odds ratio (95% CI)	**Asked about smoking** Odds ratio (95% CI)	**Advised not to smoke** Odds ratio (95% CI)
Age	1.40** (1.22–1.60)	1.13 (0.97–1.32)	1.13* (1.01–1.26)	0.89** (0.83–0.95)
Gender				
Female	1.00	1.00	1.00	1.00
Male	0.90	1.00	0.78*	1.15
	(0.64–1.28)	(0.76–1.31)	(0.62–0.99)	(0.92–1.45)
Race				
Minority	1.00	1.00	1.00	1.00
Nonminority	0.82	0.96	0.91	1.06
	(0.62–1.09)	(0.78–1.19)	(0.73–1.14)	(0.84–1.32)
Ever use of cigarettes				
No	1.00	1.00	1.00	1.00
Yes	1.02	1.07	0.87	0.89
	(0.65–1.59)	(0.76–1.50)	(0.59–1.29)	(0.59–1.34)
Current use of cigarettes				
No	1.00	1.00	1.00	1.00
Yes	1.12	1.77	1.30	1.75**
	(0.61–2.04)	(0.78–3.98)	(0.89–1.90)	(1.24–2.47)
Ever use of cigars				
No	1.00	1.00	1.00	1.00
Yes	1.08	0.80	1.48*	1.05
	(0.77–1.52)	(0.59–1.08)	(1.02–2.14)	(0.71–1.55)
Current use of cigars				
No	1.00	1.00	1.00	1.00
Yes	1.19	1.02	1.38	1.12
	(0.70–2.04)	(0.62–1.68)	(0.90–2.10)	(0.70–1.80)
Attempt to quit smoking in the past 12 months				
No	1.00	1.00	1.00	1.00
Yes	2.00**	2.25*	1.96**	2.02**
	(1.23–3.28)	(1.13–4.50)	(1.44–2.66)	(1.31–3.14)
Did not smoke in the past 12 months	1.13	1.72	1.93**	1.98**
	(0.56–2.26)	(0.90–3.30)	(1.20–3.09)	(1.26–3.11)

Note. CI, confidence interval.
Age is treated as a continuous variable. Data are weighted to enable generalization to all students at public and charter middle schools and high schools in North Carolina.
*P<.05
**P<.01

of adolescents aged 14–17 years—reported that they had one person whom they thought of as their child's primary care provider. Also, 93.1% of parents of children aged 11–13 years and 89.3% of parents of adolescents aged 14–17 years reported that their child had a dentist or dental clinic where he or she regularly received care. Furthermore, 84.6% of parents of children aged 11–13 years and 79.3% of parents of adolescents aged 14–17 years reported that their child had had a preventive care visit in the past 12 months, and 94.6% of parents of children aged 11–13 years and 86.9% of parents of adolescents aged 14–17 years reported that their son or daughter had seen a dentist in the past 12 months [14].

There are limitations to this research. The 2009 NCYTS data are cross-sectional in nature. Therefore, significant relationships between variables should not be treated as causal. Also, directionality cannot be assumed. It is possible that middle school and high school students' attempts to quit smoking preceded communication with a health professional. It is recommended that future research specifically address when individuals attempt to quit smoking in relation to when they receive smoking-related communication from a health professional. Also, as results are specific to

middle school and high school students in North Carolina, they may not generalize to young people in other areas of the United States or those not enrolled in public or charter schools. Finally, these data are self-reported and are subject to the honesty of the participants. However, research indicates that school-based questionnaires do produce valid estimates of tobacco use [15], and it is likely that students were honest in their responses to the questions about health professionals' communications about smoking, particularly because "not sure" was included as a possible response for both questions.

Health professionals in North Carolina need to increase their communication with young patients regarding tobacco use, in particular advising them not to smoke or use other types of tobacco. This call to action among health professionals is now more important than ever, given that tobacco prevention in North Carolina has been severely limited in its funding. Since 2003, North Carolina has invested more than $94 million in tobacco initiatives through the Health and Wellness Trust Fund Commission (HWTFC), and rates of tobacco use among middle school and high school students in North Carolina are at historically low levels [16, 17]. However, the HWTFC was abolished as of June 30, 2011, with the North Carolina General Assembly's passage of the Appropriations Act of 2011 [18], which has resulted in substantially fewer prevention efforts for young people around the state. In order to sustain the low rates of smoking among young people in North Carolina, communication and support from a trusted source is critically important.

Now is the time for North Carolina health professionals to get involved with youth tobacco prevention and cessation. The good news is that a wealth of youth tobacco prevention and cessation information is available for North Carolina health professionals who need additional resources. One source is the American Academy of Pediatrics (AAP) Julius B. Richmond Center, whose mission is "to improve child health by eliminating children's exposure to tobacco and secondhand smoke" [19]. Any health professional can access a variety of tools and resources on the Richmond Center's Web site (http://www2.aap.org/richmondcenter/psotco/resources.html), including a slideshow presentation on how to ask and advise teens about tobacco and a webinar on best practices in adolescent smoking prevention and cessation. There also have been recent funding opportunities for training of health professionals related to the promotion of smoking cessation. In July 2012, the Smoking Cessation Leadership Center at the University of California in San Francisco and the Pfizer Medical Education Group made $2 million available for grants to institutions, health systems, professional associations, state agencies, or organizations offering projects, programs, or initiatives aimed at providing training for health care professionals that will improve the effectiveness of smoking cessation efforts [20]. Finally, with health care reform about to bring major changes to the US health care system, health professionals may now be able to successfully make the case that providing cessation support for young people should be automatically covered by insurance, because the costs associated with cessation support would be far less than the medical costs associated with smoking-related illnesses. The best way to have healthy adults in North Carolina is to start with healthy children and adolescents. Who better to lead the charge than North Carolina's health professionals? NCMJ

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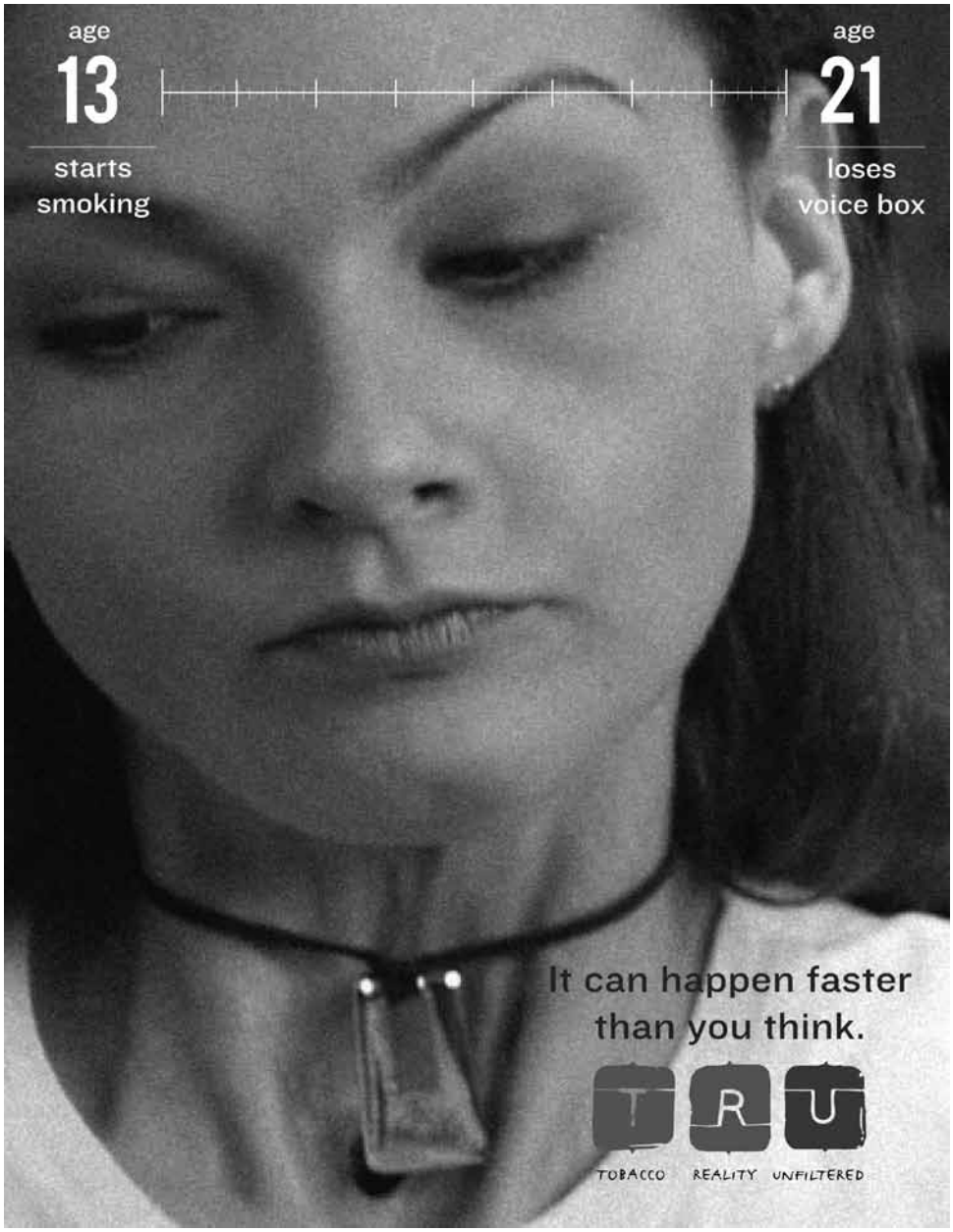

POLICY FORUM

Treating Chronic Pain

Introduction

Perhaps nothing is as debilitating as chronic pain, yet pain remains difficult to understand and categorize. Defining chronic pain as a clinical condition implies that it fits into neat categories with defined boundaries, therapeutic approaches, and predictable outcomes, but rarely does the reality of chronic pain obey such neat categorization.

Physicians are sometimes thought to be insensitive to pain and suffering, and many do prefer the thrill of diagnosis and definitive treatment to the long-term challenge of managing a patient and his or her pain. To understand the misery of the patient experience, however, the clinical view of chronic pain must be replaced with a broader definition of pain—one that acknowledges how unrelenting suffering saps the spirit at least as much as it haunts the body.

This issue of the NCMJ considers the troubling issue of chronic pain in order to better inform physicians of the full range of treatments that can offer relief. These articles remind us of the benefits and the increasing risks that are associated with the use of opioids. While effective for relieving pain, these potent drugs carry the threat of overdose both when used properly and, increasingly, when used improperly—whether due to theft, diversion, or overprescription. This issue also presents and discusses promising alternatives to opioids, including not only other pharmacologic options but also surgical and behavioral alternatives. Finally, there are several commentaries discussing the power of electronic records and how we can use searchable databases to identify overprescription by physicians and drug-seeking behavior by patients.

We have come a long way in understanding pain, and we now have an expanding array of options for more effective treatment and more thoughtful prevention of diversion and drug abuse, but we still need to go further. Once an opioid prescription has been written, patients can literally rest better, but prescribers cannot do the same; they must remain constantly vigilant in order to ensure that these drugs do no harm. Indeed, medical professionals and patients alike must be mutually accountable for the safe use of these drugs. Only then can we provide relief from the haunting specter of chronic pain while also protecting patients and the community from harm.

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

ISSUE BRIEF

Chronic Pain:
Challenges and Opportunities for Relieving Suffering

John Rowe, Anthony J. Caprio

This issue of the NCMJ addresses the problem of chronic pain in North Carolina; its diagnosis and management in primary and specialty care; and the need to balance efficacy and safety when prescribing opioid medications, as these drugs are associated with significant potential for misuse and abuse. The commentaries in this issue not only address the use of opioids for the management of chronic pain but also explore various alternatives, including medical marijuana, epidural and other injections, surgery, acupuncture, and other integrative therapies. Articles in this issue also describe the management of chronic pain in palliative care, the ways in which mental health affects pain, and the unintended consequences of chronic pain management. Finally, this issue describes several initiatives across the state that are addressing the epidemic of prescription drug abuse; these initiatives are effecting systematic changes in clinical practice to more effectively manage chronic pain, protect patients, and minimize the negative impact of prescription drug abuse on communities.

Chronic pain, which can persist for months or even years, negatively impacts a person's function and quality of life and can be difficult for clinicians to address. Although an ongoing inflammatory or degenerative process may initiate and/or perpetuate this condition, pain can persist long after an acute injury has healed or an inciting event has ended. Chronic pain is complex, may involve both central and peripheral neurological changes, and is influenced by the patient's psychosocial milieu, which can potentiate the persistent experience of pain [1]. One thing is certain: Patients with chronic pain are suffering. However, therapeutic approaches to alleviate that suffering may be poorly defined or only partially effective. Following the premise "first do no harm," a clinician often must weigh the risks of prescribing medications or performing an intervention, the utility of ordering diagnostic tests to evaluate something that is inherently subjective, and his or her duty to reduce suffering without being manipulated by patients.

Estimates regarding the prevalence of chronic pain in adults vary widely. Based in part on the work of Tsang and colleagues [2], an Institute of Medicine report titled *Relieving Pain in America* estimated that about 100 million adults in the United States experience chronic pain [1]. Extrapolating from that figure to the adult population of North Carolina suggests that as many as 3.1 million adult North Carolinians may be affected by this problem. The costs of managing chronic pain are immense. Estimates suggest that the national cost of health care and lost productivity combined total between $560 and $635 billion [1].

Common treatment modalities for chronic pain include pharmacotherapy, interventional techniques, physical therapy, cognitive and behavioral therapies, and integrative approaches such as acupuncture and meditation. Rarely is a single therapeutic modality entirely effective. The best therapeutic approaches often involve multiple components and a team approach to pain management. The components of comprehensive pain management include an ongoing therapeutic relationship, continuity of care, and careful monitoring and adjustment of the treatment plan over time [3].

This issue of the NCMJ discusses the management of chronic pain with opioid and nonopioid therapies, the mental health implications of chronic pain, and the societal consequences of chronic pain, especially when opioids are used in a manner that is not consistent with the prescribed use.

Opioid Use, Diversion, and Overdose Deaths

Opioids are frequently prescribed for the management of chronic noncancer pain, despite the lack of evidence supporting their use for that indication. In their commentaries in this issue, both Roux [4] and Fedoriw [5] emphasize careful patient selection for opioid therapy and careful selection of an opioid in order to both reduce pain and improve function. In another commentary, Finch [6] outlines a strategy for assessing risk, establishing treatment agreements, monitoring and adapting treatment when necessary, and intervening when high-risk behaviors are observed. Fedoriw [5] also reminds us of the important role the primary care practitioner plays in the ongoing assessment of opioid therapy for chronic noncancer pain.

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Opioid diversion poses a particular challenge for clinicians as they try to appropriately manage pain. The sidebar by Varnell [7] describes how the problem of diversion has increased over the past few years. Going beyond "doctor shopping," diversion now involves the outright theft of physicians' Drug Enforcement Administration numbers and the creation of fraudulent prescriptions. These activities result in more than $120,000 worth of controlled drugs being sold on the street each week [7].

Fortunately, prescribers have a powerful tool to assist them in the appropriate prescribing and monitoring of controlled substances. The North Carolina Controlled Substances Reporting System (NCCSRS) allows prescribers to query a database of outpatient prescriptions and use these data to inform treatment decisions. As Bronson explains in his commentary [8], the NCCSRS was established primarily as a clinical tool to help practitioners make more informed decisions regarding the prescription of controlled substances, but this database should also be used to identify individuals who abuse or misuse controlled substances, with the intention of referring them to appropriate treatment programs.

Unfortunately, deaths due to prescription opioids have reached epidemic levels over the past decade [9]. Medicaid patients represent a disproportionate number of overdose deaths in North Carolina [10]. Middle-aged white males who are receiving prescription opioids are at the highest risk of unintentional overdose [9, 11].

In a sidebar, Ford and Dulaney [12] share data from Carolinas Poison Center. Between 2011 and 2012, there were more than 6,000 calls to Carolinas Poison Center regarding prescription pain medications containing opioids. In the majority of cases, the patient underwent treatment in a health care facility; in 22% of those cases, treatment involved administration of naloxone, an opioid-receptor antagonist. Despite some limitations, naloxone continues to be an important life-saving intervention. Both the Centers for Disease Control and Prevention [13] and the American Medical Association [14] endorse community-based distribution of naloxone to be used in an emergency by anyone witnessing an overdose.

A number of important initiatives in North Carolina are addressing the epidemic of prescription opioid abuse and overdose. In their commentary in this issue, Lancaster and colleagues [15] describe the Chronic Pain Initiative (CPI) led by Community Care of North Carolina (CCNC). This statewide initiative is a comprehensive, community-based approach to addressing chronic pain and opioid misuse. The CPI grew from the Project Lazarus pilot program developed in Wilkes County, North Carolina [16]. Key elements of the Project Lazarus model include community activation and coalition building, monitoring and surveillance data, and the use of naloxone for high-risk patients [16].

The Wilkes County experience is impressive. In 2008 Wilkes County had the sixth-highest per-capita overdose rate in the country. After Project Lazarus was initiated in Wilkes County, overdose deaths decreased by 69% between 2009 and 2011. In 2011 there were no deaths due to a prescription opioid obtained from a prescriber within Wilkes County [15]. The CPI uses the community engagement aspects of the Project Lazarus model and the expansive CCNC network for care management to change opioid prescribing practices and to set patient expectations.

CCNC has acknowledged the need for both community and professional education, and the Governor's Institute on Substance Abuse has taken a leading role in educating medical practitioners about chronic pain management and safe opioid prescribing. In a sidebar, Finch and McEwen [17] describe the role the Governor's Institute has played in the CPI. On a national level, the US Food and Drug Administration (FDA) has issued a mandate to the pharmaceutical industry to develop educational materials and to sponsor continuing education activities about opioid prescribing. In July 2012, the FDA approved a risk evaluation and mitigation strategy for extended-release and long-acting opioid medications [18].

In response to the opioid overdose epidemic in North Carolina, the North Carolina Medical Society (NCMS) created an Opioid Death Reduction Task Force to examine this public health crisis and to develop strategies to address it. In October 2012, the NCMS sponsored a forum that highlighted the work of Project Lazarus and the CPI and promoted enrollment of prescribers in the NCCSRS. North Carolina Attorney General Roy A. Cooper spoke at this forum and emphasized prevention strategies, including medication take-back events such as Operation Medicine Drop [19]. Although avoidance of accidental poisoning may not be the primary motivation for citizens to bring controlled substances to these community take-back events, the events can still be effective in removing unused prescription medications from households [20].

Nonopioid Therapies

Opioids are not the only pharmacologic treatment for chronic pain. In his commentary in this issue, Laguerre [21] examines how nonopioid medications such as nonsteroidal anti-inflammatory drugs, antidepressants, and anticonvulsants may be more effective than opioids for the treatment of certain pain conditions. In other cases, such drugs may have opioid-sparing effects. Since higher doses of opioids are associated with a higher risk of overdose, dose-reduction strategies such as the use of adjunct medications are important to consider [9]. As Blau points out in another commentary [22], interventional techniques such as joint injections and nerve blocks are another way of reducing the need for long-term opioid therapy, and they can also reduce treatment costs and improve function.

Patient selection is critically important not only for successful opioid therapy but also for surgical interventions, where proper patient selection is linked to reduced pain and

better functional outcomes. A commentary by Del Gaizo [23] emphasizes that, although hip and knee replacement surgery can greatly benefit patients, those who are using opioid medications long term before surgery have higher risks for complications, persistent pain, and dissatisfaction after joint replacement.

The use of less conventional treatments for chronic pain is also gaining attention. Medical marijuana has been approved for treatment of chronic pain in some states, although not in North Carolina. In a sidebar, Kondrad [24] reviews the evidence for marijuana's analgesic properties and evaluates the potential risks and benefits of its use for pain relief. A commentary by Coeytaux and Garland [25] explores the safety and effectiveness of acupuncture for the management of chronic pain, as well as the potential contribution of the placebo effect. This commentary reviews multiple studies whose findings suggest that acupuncture can benefit some patients with back and neck pain, headaches, shoulder pain, and osteoarthritis [25].

To broaden our perspective on the experience of chronic pain and its management, a commentary by Langlois [26] addresses chronic pain in the palliative care setting. A common misconception is that palliative care is limited to end-of-life care, but palliative care can also be life-affirming, and pain management is a key component of the palliative care approach. Palliative care uses a holistic and team-based approach to address total pain, which includes psychological, emotional, existential, and social factors. In another commentary, Lima [27] embraces the biopsychosocial model for the management of chronic pain and reminds us that pain is dramatically affected by a person's thoughts and moods. She illustrates a step-by-step cognitive behavioral therapy approach to chronic pain that involves education about pain, relaxation skills, increasing levels of behavioral activation, time-based pacing to reduce fear of movement, and sleep modification.

Models of Care

The Mountain Area Health Education Center (MAHEC) is developing a nurse practitioner–led model of care that manages patients in a coordinated, standardized way and can be implemented in a primary care practice. In a large practice, and particularly in a residency training program, getting all physicians and providers to perform all of the elements spelled out in a guideline can be difficult. Because primary care is so broad, it is hard to do all of the things that must be done for each chronic disease. Through the support of an innovations grant from the Centers for Medicare & Medicaid Services (CMS) [28], MAHEC is developing a chronic pain program that will employ a nurse practitioner as the primary care manager for patients with chronic pain. The nurse practitioner will share responsibility for the patient's care with the patient's primary care physician. Nurse practitioners are ideally suited to provide such care, given the nursing profession's holistic approach to care. The nurse practitioner will ensure completion of all elements in the chronic pain program: conducting a pain-specific history and physical examination, screening for a history of substance abuse or risk factors for potential abuse, obtaining informed consent and a signed controlled-substance agreement, developing a self-management plan and goals for therapy, reviewing the NCCSRS database, and performing periodic urine drug screening. Patients will schedule appointments before they run out of medicine, which will allow for pill counts—something that has not generally been done in primary care. The goal is for patients to receive consistent care from their regular physician and avoid situations in which patients present to another provider with an urgent need for an opioid prescription, either because they have missed an appointment or because they have been taking too much medication.

In addition to employing nurse practitioners, MAHEC will expand the role of behavioral health specialists to help patients strengthen their coping strategies. Group visits will provide both education and support. Patients will learn the basic mechanisms of pain and therapeutic modalities during a mandatory introductory session. Patients will also learn how moods and mental state contribute to the pain experience. Pharmacotherapists will review the benefits and risks of medications, especially opioids. A series of educational sessions will incorporate the expertise of community providers and will illustrate how physical therapy, occupational therapy, relaxation, yoga, Pilates, and acupuncture can reduce pain. The goal is for patients to engage in the behavioral management of their pain.

Once this model is established, it will be disseminated across the region with support from the CMS innovations grant. The ultimate goal of the project is to prevent visits to the emergency department for inadequately treated pain or for drug abuse. Pill counts, drug screening, and review of the NCCSRS database will reduce diversion and abuse of medications. Further benefits will ideally include improved pain scores and heightened self-efficacy scores.

Conclusion

Successfully managing chronic pain is a challenge for providers, health care systems, and communities. Community engagement, provider education, and an interdisciplinary approach to care are key elements of successful chronic disease management programs, and they should be applied to the management of chronic pain. There are several initiatives in North Carolina that are not only educating patients and providers but also developing tools to facilitate implementation of practice changes that meet the needs of chronic pain patients while minimizing the risks of diversion, abuse, and overdose. NCMJ

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Long-Term Opioid Therapy for Chronic Pain:
Optimizing Management, Minimizing Risk

Jennifer L. Roux

Opioid analgesics are commonly used for the management of chronic noncancer pain. Although they can be beneficial for select patients, opioids are also at the heart of a nationwide epidemic of misuse and diversion.

The use of opioids for the management of chronic pain in the United States has increased dramatically over the past 2 decades. While opioids are widely considered to be the mainstay of therapy for cancer pain, their increasing use for chronic noncancer pain is controversial. This controversy is driven by the lack of high-quality evidence demonstrating the efficacy of long-term opioid therapy and by the myriad of potential adverse effects and risks associated with opioid use. This commentary offers a basic review of opioid medications and their use in chronic pain management, examines the nationwide epidemic of opioid misuse, and discusses strategies that health care providers can use to help curb this widespread problem.

Opioid Analgesics

Opioid medications produce analgesia by binding to opioid receptors throughout the central and peripheral nervous systems. Opioids can be divided into 2 classes based on their duration of action (Table 1).

Short-acting opioids (SAOs) are characterized by more rapid changes in the plasma concentration of the drug; they are thus best suited for treating pain that is acute or intermittent. Some of the most commonly prescribed SAOs are morphine, hydromorphone, oxymorphone, fentanyl, tramadol, tapentadol, buprenorphine, codeine, hydrocodone, and oxycodone. Tramadol, codeine, hydrocodone, and oxycodone are often formulated in combination with a nonopioid analgesic such as acetaminophen or a nonsteroidal anti-inflammatory drug. Because the latter drugs can potentially cause gastrointestinal or hepatic toxicity, their presence in the combination product limits the maximum daily dose of these formulations.

Long-acting opioids (LAOs) include drugs that are inherently long-lasting and formulations that have been pharmacologically modified to release drug into the bloodstream more gradually. LAOs are more appropriate for chronic and/or constant pain, since their analgesic effects can last approximately 8–72 hours. Available LAOs include methadone and the extended-release, sustained-release, or controlled-release formulations of morphine, hydromorphone, oxymorphone, fentanyl, tramadol, tapentadol, buprenorphine, and oxycodone.

Multiple studies comparing SAOs versus LAOs have failed to establish the superiority of one class over the other for management of chronic noncancer pain syndromes [1-3]. Providers should therefore tailor the choice of therapy to the individual patient. Patients with persistent unrelenting pain may benefit more from the consistent analgesia offered by an LAO, with the added potential advantages of less frequent dosing, less medication dispensed, and less preoccupation with medication use. On the other hand, some patients may prefer to use medication only when their pain is severe, rather than perpetually having the drug in their system. In these cases, an SAO may be a more logical choice. In my experience, a patient with constant pain and intermittent episodes of pain triggered by activity—known as breakthrough pain—may do well with combination therapy consisting of an LAO dosed regularly and an SAO taken only when needed.

TABLE 1.
Commonly Prescribed Opioids

Short-acting opioids	Long-acting opioids
Buprenorphine	Buprenorphine*
Codeine	Fentanyl*
Fentanyl	Hydromorphone*
Hydrocodone	Methadone
Hydromorphone	Morphine*
Morphine	Oxycodone*
Oxycodone	Oxymorphone*
Oxymorphone	Tapentadol*
Tapentadol	Tramadol*
Tramadol	

*Extended-release, sustained-release, or controlled-release formulation.

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Positive Outcomes

Manchikanti and colleagues [4] recently conducted a rigorous review of the literature regarding the effectiveness of opioids for the management of chronic noncancer pain. They concluded that short-term opioid therapy (defined as treatment for 3 months or less) may result in a moderate degree of pain relief, but the evidence to support this conclusion is weak. Likewise, there is a paucity of high-quality evidence to support the efficacy of long-term opioid therapy (therapy lasting longer than 3 months), and studies assessing the impact of long-term opioid therapy on quality of life show equivocal results [4].

Despite this dearth of evidence, some of the most influential pain medicine organizations recognize the potential benefits of long-term opioid therapy for select individuals with chronic noncancer pain. In 2009 the American Pain Society and the American Academy of Pain Medicine concluded that long-term opioid therapy "can be an effective therapy for carefully selected and monitored patients with chronic noncancer pain" [5]. In 2012 the American Society of Interventional Pain Physicians stated, "long-term opioid therapy for chronic non-cancer pain should be reserved for select patients with moderate or severe pain that significantly affects function or quality of life" [6]. The latter organization also recommended that opioid therapy be continued only if it leads to improvement in pain and function [6].

Negative Consequences

As with nearly all types of medications, opioids have several possible side effects. Some of the most common side effects include constipation, nausea, somnolence (drowsiness), dizziness, and pruritus (itching). Other side effects include cognitive and psychomotor impairment, myoclonus (muscle twitching), sleep disturbance, and exacerbation of sleep apnea [4]. Opioids can interfere with the production of sexual hormones, namely testosterone, leading to diminished libido, erectile dysfunction, fatigue, depression, decreased muscle mass, and osteoporosis [4]. Also, there is debate about a phenomenon known as opioid-induced hyperalgesia, which is characterized by a paradoxical increase in pain sensitivity in patients who are taking opioids to manage pain. Studies to determine whether opioid-induced hyperalgesia exists and/or how prevalent it might be have come to mixed conclusions [4].

Among the most feared risks of opioids are addiction, respiratory depression, and death. Although these risks are rare, they add further serious consequences to the nationwide problem of opioid misuse and diversion.

Scope of the Opioid Misuse Epidemic

The United States comprises 4.6% of the world's population but consumes 80% of the global supply of opioids [7]. Between 1997 and 2007, total retail sales of commonly used opioids jumped 149% [7]. Hydrocodone was the most commonly prescribed medication in the United States between 2006 and 2011; during this period, the US population consumed 27.4 million grams per year, compared to 3,237 grams per year in Britain, France, Germany, and Italy combined [4]. Without question, opioids are readily available to the public.

The National Survey on Drug Use and Health is a useful source for analyzing the prevalence of opioid misuse, as this survey furnishes statistical information on the use of illegal drugs, alcohol, and tobacco. In 2011 an estimated 22.5 million Americans aged 12 years or older reported having used illicit drugs in the month prior to being surveyed [8]. This survey found that nonmedical use of psychotherapeutic drugs (a category that includes opioid pain relievers) ranked second only to marijuana use [8]. Nonmedical use is defined as use by anyone other than the person for whom the prescription is written or use by anyone for the experience or feeling the drugs cause.

Among individuals who reported using opioids nonmedically, most had obtained these drugs through a legitimate prescription from a single provider or had acquired them at no cost from a friend or relative [8]; the latter practice is known as diversion. In 81.6% of these reported instances of diversion, the friend or relative had secured the medication through a legitimate prescription from a single provider [8]. These findings suggest that "doctor shopping" may no longer be necessary to acquire opioids for recreational use.

Recreational use of opioids often causes adverse events that require emergency medical attention, and emergency department visits for nonmedical use of opioid pain relievers increased 156% from 2004 to 2010 [9]. From 2003 to 2007, the number of unintentional overdose deaths due to opioid analgesics was greater than the combined total of deaths due to heroin plus deaths due to cocaine [10]. In 2009, unintentional poisoning caused more deaths among individuals aged 25–64 years than did motor vehicle crashes. The vast majority (91%) of unintentional poisoning deaths were caused by drugs, most commonly prescription opioids [11].

What Can Health Care Providers Do?

Having recognized the scope of the problem, the US Food and Drug Administration now has a risk evaluation and mitigation strategy (REMS) for LAOs. This requires all manufacturers of LAOs to provide education for prescribers regarding how to choose which patients should take these opioids and how to manage such patients, as well as education for patients regarding proper handling of opioids [12].

Given the alarming epidemic of opioid misuse, it is incumbent upon health care providers to rigorously screen, carefully select, and comprehensively manage patients who are receiving long-term opioid therapy. Each patient should first undergo a detailed evaluation in an attempt to diagnose the pain complaint. Long-term opioid therapy is rarely a first-line treatment; rather, it is typically considered following the failure of more conservative measures, such as nonopioid medications, physical therapy, behavior modification,

and basic interventional pain management procedures [6]. Examples of interventional pain management procedures include epidural steroid injections, joint injections, and various nerve blocks.

Even if conservative measures have failed, some patients are not appropriate candidates for long-term opioid therapy. The strongest predictor of opioid misuse is a personal or family history of alcohol abuse or illicit drug abuse. Other strong predictors for opioid misuse include a history of driving while intoxicated, drug conviction, childhood sexual abuse, lost or stolen prescriptions, or use of supplemental sources to obtain opioids [13]. For providers who desire an objective way of identifying patients who are at high risk for opioid abuse, numerous screening tools are available, including the revised Screener and Opioid Assessment for Patients with Pain (SOAPP), the Opioid Risk Tool, and the Diagnosis, Intractability, Risk, Efficacy (DIRE) risk assessment tool. Unfortunately, no single tool has enough evidence to support universal use [5].

If clinicians are considering long-term opioid therapy, it is important to obtain informed consent from the patient before initiating therapy. This discussion should focus on the potential benefits and risks of opioids, realistic goals, and expectations for treatment. Informed consent can be combined with an opioid treatment agreement, which often contains guidelines for responsible opioid use and grounds for discontinuation of opioid therapy. Evidence to support the use of informed consent and opioid treatment agreements is weak, but such documentation is consistently recommended by many pain medicine organizations [5, 6].

Once long-term opioid therapy has been initiated, clinicians can monitor compliance using one of several instruments, although evidence is lacking with regard to their effects on clinical outcomes. The Pain Medication Questionnaire and the Current Opioid Misuse Measure are patient-administered surveys that screen for potentially aberrant behaviors related to opioid use [14, 15].

Although evidence to support the use of urine drug screening is mixed, such testing is often utilized as part of a comprehensive monitoring approach. This testing may ensure treatment compliance and safer use of opioid medications. The frequency of drug screening should correlate with the provider's perception of the risk for aberrant medication-related behavior. Providers need to understand how to correctly interpret drug screening results, and these results should not be interpreted in isolation; decisions regarding patient care should be based on the entire clinical picture [5].

Prescription drug monitoring programs represent another element of an inclusive monitoring plan. As of December 2012, 44 states had operational prescription drug monitoring programs and an additional 5 states had passed legislation authorizing such programs, leaving Missouri as the only state without plans for a prescription drug monitoring program [16]. These programs differ in terms of how data are collected, but most programs gather information about the controlled substance prescriptions filled by a patient, the prescriber of each prescription, and the pharmacy that fills each prescription. Once again, the literature contains conflicting evidence about the impact of these programs on opioid use [6].

Throughout the course of a patient's opioid therapy, the provider should maintain the patient on the lowest effective dose, since higher doses of opioids are associated with higher risks of overdose and/or death [10]. The provider must frequently assess the patient's degree of analgesia and his or her level of activity. Adverse effects and aberrant medication-related behaviors need to be addressed immediately. Discontinuation of opioids should be considered if the patient is not meeting his or her treatment goals or is exhibiting patterns of irresponsible behavior that may jeopardize his or her safety on opioid medications [6]. Signs of true opioid addiction—characterized by impaired control over medication use, compulsive medication use, continued medication use despite harm, or cravings for the medication—should prompt referral to an addiction specialist [17].

In pain management settings across the United States, long-term opioid therapy will continue to be utilized for the treatment of chronic noncancer pain. For the safety of these patients and the general public, both health care providers and patients must be educated regarding the limitations and potential risks of opioids. Patients need instruction on responsible opioid use, and providers must be attentive and conscientious when considering and managing opioid therapy. NCMJ

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Alternatives and Adjuncts to Opioids for the Treatment of Chronic Pain

Patrick J. Laguerre

The use of opioids to treat chronic noncancer pain is controversial because of concerns about safety, efficacy, and the potential for addiction and abuse. Clinicians must therefore continue to seek out alternatives to opioids, such as nonsteroidal anti-inflammatory drugs, acetaminophen, muscle relaxants, benzodiazepines, and antidepressants.

The use of opioid analgesia has long been the standard of care for treatment of moderate to severe acute pain and chronic cancer pain [1]. In recent years, however, opioid medications are also being more commonly used to treat chronic noncancer pain. Although this paradigm shift has afforded many patients more complete pain control, physicians must maintain some degree of reservation when prescribing long-term opioid therapy. Diversion and abuse of narcotic pain medications are ever-growing problems; thus careful patient selection and monitoring throughout the course of therapy are required. Patients who have been on opioid therapy for months to years will develop tolerance and a physical dependence on their medications even in the absence of addictive behaviors [1]. In addition, side effects such as nausea, constipation, pruritus (itching), sedation, and respiratory depression can limit the potential for effective therapy, especially at escalating doses.

These issues make the careful consideration of nonopioid medications increasingly important. Whether they are used in lieu of opioid management or as adjuncts to opioid therapy in order to reduce opioid-related side effects, nonopioid therapy plays an integral role in the treatment of chronic pain.

There are currently many different classes of nonopioid medications that can be used in the treatment of chronic pain, including acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), antidepressants, anticonvulsants, benzodiazepines, antispasmodics, calcium channel blockers, corticosteroids, alpha-2 agonists, local anesthetics, N-methyl d-aspartate (NMDA) receptor antagonists, and topical agents [1]. Professionals involved in treating unresolved pain have a responsibility to utilize these medications in the best possible manner, either alone or in conjunction with opioid therapy, to lessen pain and to improve function and quality of life for their patients.

Acetaminophen

Acetaminophen and NSAIDs are by far the most commonly used nonopioid analgesics, but they are often significantly underrated and are often unnecessarily omitted from the treatment regimen for patients with moderate to severe chronic pain [2]. Acetaminophen is a widely serviceable analgesic, since it is effective either alone or in combination with opioids. It is a nonsalicylate that may have analgesic and antipyretic effects similar to those of aspirin, but it does not have aspirin's antiplatelet effects or its peripheral anti-inflammatory effects, and acetaminophen does not compromise the gastric mucosa. In 2009, the US Food and Drug Administration (FDA) recommended that the maximum daily dose of acetaminophen be lowered from 4,000 mg per day to 3,250 mg per day. Although the FDA did not require this change, the manufacturer of Tylenol voluntarily lowered the maximum recommended dose of its 500-mg tablets to 6 doses per day (for a total of 3,000 mg) [3]. Acetaminophen is well tolerated at these levels, but an overdose can cause potentially fatal hepatic necrosis [4]. Also, use of acetaminophen must be monitored in alcoholic patients and in patients with underlying liver disease, as they can develop severe hepatotoxicity even at standard doses. The risk of gastrointestinal irritation is lower with acetaminophen than with NSAIDs, and acetaminophen is rarely associated with renal toxicity.

NSAIDs

Like acetaminophen, NSAIDs are useful for treating chronic pain resulting from trauma, arthritis, surgery, or cancer. There is a ceiling effect to the dose-response curve of NSAIDs, meaning that after a therapeutic ceiling is achieved, increasing the dose increases the side effects but produces no additional analgesia [2]. NSAIDs do not produce physical or psychological dependence and are also antipyretic. Their mechanism of action involves inhibiting the enzyme cyclo-

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Medical Marijuana for Chronic Pain

Elin Kondrad

In 1970, the Controlled Substances Act classified cannabis as a Schedule I drug; this category is reserved for drugs that are defined as having "a high potential for abuse," "no currently accepted medical use in treatment in the United States," and "a lack of accepted safety for use of the drug or other substance under medical supervision" [1]. Interest in the medicinal potential of cannabis has persisted, however, fueled by the isolation of the active compounds in marijuana, starting with tetrahydrocannabinol (THC) in 1964. This research continued in the 1990s with the discovery of the endocannabinoid system, a network of receptors that bind both compounds in marijuana and endogenous ligands produced by the human body. There are 2 types of cannabinoid receptors: CB1 receptors and CB2 receptors. CB1 receptors are present in areas of the brain that modulate pain, in the nociceptive pathways of the spinal cord, and on peripheral nerves; these receptors may help modulate pain signals in multiple areas. CB2 receptors are found primarily in the cells of the immune system and may help to down-regulate inflammation [2].

The prevalence of cannabinoid receptors in pain pathways suggests that marijuana or its components may have significant pharmaceutical potential for analgesia. There are currently 2 synthetic analogs of THC: dronabinol and nabilone, both of which have been approved by the US Food and Drug Administration for treatment of chemotherapy-induced nausea and vomiting and for AIDS-related anorexia and wasting. A third cannabinoid, nabiximols, is available in Canada for treatment of cancer pain and for treatment of neuropathic pain in multiple sclerosis. A recent systematic review and meta-analysis concluded that cannabinoids have moderate efficacy for the treatment of chronic pain but that side effects limit their use [3].

The term *medical marijuana* refers, not to the purified and regulated compounds described above, but to botanical cannabis, which contains at least 60 active compounds and is usually smoked. Eighteen states and the District of Columbia have now passed legislation permitting the use of marijuana for medical purposes [4]; North Carolina is not currently among these states. In October 2009, the US Department of Justice issued a directive stating that people who follow state laws that allow them to possess and use marijuana for medical purposes would not face federal prosecution. However, those who use, sell, and grow medical marijuana are still doing so in violation of federal law, and there continue to be federal raids on dispensaries and on marijuana growing operations in states that permit the use of marijuana for medical purposes. In the absence of federal oversight, the clinical conditions for which use of marijuana is permitted, the way in which permission for medical use is granted, and the amount of marijuana that a person may possess for medical use vary widely from state to state [5]. Chronic pain is an approved indication for use of medical marijuana in 15 states [4].

There are few studies of smoked marijuana because its Schedule I status means that strict limitations curtail research regarding its medical effects [1]. However, 5 randomized, placebo-controlled trials have evaluated the benefits of smoked marijuana for pain; the placebo in these studies was a marijuana cigarette that contained no cannabinoids (0% THC) [6-10]. One study of neuropathic pain [6] and 2 studies of HIV-associated sensory neuropathy [7, 8] found that use of marijuana led to significantly more individuals achieving a 30% reduction in pain. However, another study of neuropathic pain [9] showed a mean reduction of only 0.7 points on a 10-point pain scale in patients with refractory pain. Finally, a study of experimentally induced neuropathic pain [10] showed significant improvement in analgesia among individuals who smoked marijuana cigarettes containing 4% THC. Interestingly, there was no pain reduction when the marijuana in the cigarette contained only 2% THC, and there was an increase in pain when it contained 8% THC, suggesting that marijuana may have an optimal dosing window. These

oxygenase (COX), which results in inhibition of prostaglandin synthesis.

Currently there are 3 classes of NSAIDs: aspirin, which irreversibly inhibits COX; drugs that reversibly inhibit COX, such as ibuprofen and naproxen; and drugs that selectively and reversibly inhibit COX-2, such as celecoxib [1].

Although NSAIDs are generally safe and have great efficacy, practitioners must be careful in prescribing these drugs because of their common and potentially serious side effects. Elderly patients and individuals with certain medical comorbidities are particularly at risk of side effects. Gastrointestinal symptoms—including anorexia, dyspepsia, nausea, abdominal pain, and diarrhea—are the most common side effects related to these drugs [2]. The risk of mucosal injury and ulceration is thought to increase when NSAIDs are used in the presence of the bacteria *Helicobacter pylori*, with concomitant use of glucocorticoids, or in patients who consume significant amounts of alcohol. COX-2 inhibitors have been found to have a lower incidence of gastric ulcers compared with nonselective NSAIDs taken in equally effective doses [2]. Adding misoprostol or a proton pump inhibitor to the treatment regimen can be effective in preventing duodenal and gastric ulceration [5].

Traditional NSAIDs and COX-2 inhibitors are generally well tolerated but have been shown to have detrimental effects on renal function and blood pressure in patients with congestive heart failure, chronic renal insufficiency, hypovolemia, or hepatic cirrhosis [2]. Long-term use of high doses of NSAIDs in patients with concomitant recurrent urinary tract infections poses a risk of slowly progressive renal

studies are difficult to generalize to patients with chronic pain because of the short duration of these studies, the small numbers of subjects enrolled (between 15 and 50), the varying THC content of the plant material smoked, and the difficulty of blinding participants regarding which treatment they have been selected to receive [11].

Marijuana does not pose a risk of fatal overdose, and the public health burden of marijuana is estimated to be less than that of alcohol, tobacco, or other illicit substances [12]. However, use of marijuana has significant adverse effects. Acutely, marijuana increases the risk of motor vehicle accidents and can cause anxiety and panic; at high doses, it can even cause psychotic symptoms. Long-term users have a 9% risk of dependence and show signs of subtle cognitive impairment [13]. Adolescent users have decreased educational attainment and are more than twice as likely to develop schizophrenia. Finally, smoking marijuana has the advantage of delivering THC and other active components to the bloodstream much more efficiently than oral administration, but smoking carries with it an increased risk of chronic bronchitis, an increased risk of impaired respiratory function, and possibly an increased risk of lung cancer [12].

There are physiologic reasons to believe that marijuana may have analgesic properties, and trials of purified cannabinoids and of smoked marijuana furnish some preliminary support for this idea, particularly in the case of neuropathic pain. However, the current evidence is based on small trials whose results are difficult to generalize to widespread use of medical marijuana. We need more high-quality studies to determine whether the benefits of medical marijuana outweigh its risks. NCMJ

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failure and decreased concentrating capacity at the renal tubule [2]. In comparison with other NSAIDs, COX-2 inhibitors have also been shown to increase the risk of myocardial infarction and stroke in patients who are at risk for thrombosis [6-10]. Topical application of NSAIDs results in lower systemic drug levels, however, and thus fewer side effects.

It should also be noted that hypersensitivity to NSAIDs is a known phenomenon that can result in angioedema, urticaria, exacerbation of asthma, laryngeal edema, and shock. Patients with hypersensitivity to aspirin should avoid all other NSAIDs, as cross-sensitivity can cause a life-threatening reaction [2].

Antidepressants

Tricyclic antidepressants (TCAs) have long been known to enhance analgesia when administered with opioids. Early studies of various opioids showed a reduction in the amount of drug used after cholecystectomy or cesarean section when the opioid was administered with intramuscular amitriptyline [11-15]. Today TCAs are more commonly used when neuropathic pain is suspected. Disease processes such as diabetic and nondiabetic peripheral neuropathy [16, 17], postherpetic neuralgia [18], and fibromyalgia [19, 20] have all shown significant pain reduction when treated with TCAs. The analgesic action of TCAs seems to be independent of the drugs' antidepressant properties, as analgesia has been established within 24 hours of use, whereas the antidepressant effects take more than 1 week to develop. The mechanism of action is thought to be related to blocking of serotonin reuptake, blocking of norepinephrine, and stabilizing of nerve membranes.

Different studies have examined the use of selective

serotonin reuptake inhibitors (SSRIs) for treatment of pain. Although SSRIs can produce some pain relief in conditions such as diabetic peripheral neuropathy, the degree of pain relief is believed to be considerably less than that produced by TCAs [21]. However, SSRIs have been found to have fewer side effects than TCAs [22, 23].

Serotonin-norepinephrine reuptake inhibitors (SNRIs) selectively block the reuptake of serotonin and norepinephrine. Duloxetine, an SNRI, is the first antidepressant to have been approved by the FDA with a specific indication for pain. The prescribing information for duloxetine [24] states that it is now indicated for the management of neuropathic pain (diabetic peripheral neuropathy) [25], fibromyalgia, and chronic musculoskeletal pain.

When prescribing antidepressants for the management of chronic pain, clinicians need to consider the potential side effects associated with these medications both when they are taken at normal doses and in the event of an overdose. TCAs are more likely to cause weight gain, cholinergic side effects, driving impairment, and falls than are SSRIs [21]. TCAs are also the class of antidepressants most commonly used in suicide attempts [26], which is an important consideration in this patient population.

Anticonvulsants

The main actions of anticonvulsants involve the modulation of voltage-gated calcium or sodium channels, antagonism of glutamate, enhancement of the gamma-aminobutyric acid (GABA) inhibitory system, or a combination of these effects [27]. These mechanisms, which are thought to reduce neuronal hyperexcitability, can be successful in treating pain when opioids have little efficacy, such as for cases of diabetic neuropathy and trigeminal neuralgia [27].

Gabapentin is probably the anticonvulsant most widely used for neuropathic pain in the United States. In 1998, a double-blind, placebo-controlled clinical trial showed gabapentin to be effective in the treatment of postherpetic neuralgia [28], and the drug is now approved by the FDA for this indication. In that same clinical trial, gabapentin was also found to have a synergistic relationship with morphine [28]. Unlike many of the older antiepileptic agents, gabapentin does not induce hepatic enzymes, and it is known for its lack of drug-drug interactions. The most common side effects are somnolence (drowsiness), dizziness, and fatigue; it can also cause weight gain. It is thought to be relatively safe even in the event of an overdose [27].

Pregabalin has a mechanism of action similar to that of gabapentin, and its properties are also very similar. Pregabalin has been shown to be effective in the treatment of postherpetic neuralgia, fibromyalgia, and generalized anxiety disorder [29-33].

Topiramate is yet another anticonvulsant with analgesic properties. It has multiple mechanisms of action and is a mild inducer of hepatic enzymes. Common side effects include paresthesias, drowsiness, fatigue, and cognitive complaints [27]. Kidney stones occurred in 1.5% of patients treated with topiramate in clinical trials [34], and mild weight loss is often noted (which may be a desirable side effect in overweight patients). Topiramate has received FDA approval for migraine prophylaxis. When topiramate was tested as a treatment for diabetic peripheral neuropathy, however, 3 placebo-controlled trials did not show significant analgesic effects [34].

Older anticonvulsants such as phenobarbital, phenytoin, valproic acid, and carbamazepine can be beneficial in the treatment of neuropathic pain but are now used less often because of side effects, drug-drug interactions, and the risk of toxicity. Newer agents continue to be introduced, and their utility in the treatment of neuropathic pain continues to be investigated.

Benzodiazepines

Benzodiazepines are most commonly prescribed for their antianxiety effects and for the emergent management of seizures and status epilepticus. However, evidence shows that benzodiazepines also have intrinsic analgesic properties. Benzodiazepines bind to the GABA-A receptor, which facilitates the actions of GABA in the central nervous system (CNS) [27]. An early study showed that alprazolam produced substantial analgesia in cancer patients who had malignancies and an associated causalgic pain syndrome [35]. Patients who received an oral narcotic and a benzodiazepine before undergoing a bone marrow biopsy had less pain than usual for this type of procedure [36]. Finally, clonazepam has been shown in small clinical trials to reduce chronic facial pain [37].

Patients who suffer from chronic pain may have concomitant anxiety and mood disorders, as well as some degree of sleep disturbance, so adding a benzodiazepine to their treatment regimen can be beneficial. These drugs also serve as clinically effective muscle relaxants, and there is evidence that they hasten recovery from acute back pain [38]. However, the side effects of drowsiness, ataxia, and tolerance can limit the utility of benzodiazepines for long-term use. Adding benzodiazepines to opioids can also potentiate respiratory depression, leading to serious consequences. The potential for misuse and addiction must also be considered during patient selection.

Skeletal Muscle Relaxants

Despite their common use, very little is known about the role of skeletal muscle relaxants in the treatment of chronic back pain. Although none of the regularly used muscle relaxants carries an indication for chronic back pain, at least 1 survey showed that they are commonly prescribed on a long-term basis for that indication [38]. In choosing a specific muscle relaxant, a prescriber must consider side effects, patient tolerability, and contraindications. For example, cli-

nicians often avoid carisoprodol because of its high potential for addiction; cyclobenzaprine is often avoided because its similarities to TCAs cause concern that it might produce arrhythmias, and it can potentiate seizures when administered with tramadol; and metaxalone is often selected over its counterparts because it is thought to be less sedating [38]. No current data show any of these agents to be more efficacious than the others [38]. Most muscle relaxants are CNS depressants, and this fact should be considered when prescribing these drugs for patients using alcohol, anxiolytics, opioids, or other sedatives.

Other Therapeutic Agents

Although it would be impossible to provide an exhaustive list of nonopioid analgesics in this commentary, there are several additional agents to consider.

Corticosteroids are very effective in their ability to reduce inflammation, edema, and neuronal excitability. They are often used to treat back pain, headaches, bone pain, and neuropathic pain [2]. However, serious side effects limit their long-term use.

Pentoxifylline increases blood flow and tissue oxygenation by decreasing blood viscosity and erythrocyte flexibility. It has been used to treat Peyronie's disease, neuropathic injury, and sickle cell disease [2].

The alpha-2 agonist clonidine has been widely used to improve postoperative analgesia. Due to its effects on the CNS when it is administered through transdermal, intrathecal, or oral routes, clonidine is also effective in the management of burn pain, cancer pain, and complex regional pain syndrome [2].

Topical local anesthetics, specifically lidocaine, have been effective in the treatment of postherpetic neuralgia and other neuropathic conditions. These agents have very minimal risk of systemic toxicity [2].

Finally, 2 NMDA receptor antagonists, dextromethorphan and ketamine, may have pain reduction and opioid-sparing effects [2].

Conclusion

Medication management continues to be the mainstay of chronic pain management. As the use of opioid medications becomes more widely accepted in the treatment of noncancer pain, it remains extremely important for clinicians to keep in mind the importance of nonopioid therapies. Not only can these medications synergistically reduce pain levels when administered in conjunction with opioids, but they also allow for opioid sparing, thus decreasing the overall side effect profile of opioid medications. Nonopioid medications can be utilized when opioids should be avoided—such as in cases of severe respiratory disease, ileus, or substance abuse—and in certain pain conditions nonopioid medications can be even more efficacious than their opioid counterparts. In order to best manage patients with chronic pain conditions, clinicians must understand not only the indications for these important alternatives to opioids but also their related side effects. NCMJ

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The Needle in a Haystack:
Appropriate Use of Interventional Techniques in the Management of Chronic Pain

William S. Blau

Management of chronic pain is often difficult. Interventional approaches, such as joint injections and nerve blocks, can reduce dependence on opioid therapy, polypharmacy, and long-term costs; they can also dramatically improve pain control and function. However, interventional techniques must be used ethically and judiciously as part of a comprehensive approach to patient-centered care.

Chronic pain is a complex disorder that manifests in a variety of ways. In extreme cases, some patients may perceive chronic pain to be worse than death. In addition to the direct suffering induced by unrelenting pain, which in many cases occurs in the absence of a specific diagnosable etiology, a patient with chronic pain may experience sleep disturbance, depression, anxiety, or impairment in physical, cognitive, and psychosocial functioning. Many cases present challenging ethical and medical issues regarding the management of controlled substances. Addressing the needs of these patients requires an interdisciplinary approach, along with considerable time, effort, and patience.

Chronic pain is best understood as a chronic disease, and the most appropriate approach to the care of patients with chronic pain draws from the model of chronic disease management [1]. However, comprehensive and integrated treatment—which includes functional rehabilitation, psychological approaches (such as cognitive behavioral therapies), and analgesic management—is expensive [2]. Such treatment requires a considerable amount of time and effort on the part of both patients and their providers, and it may not lead to long-term efficacy for many patients, especially those with comorbid psychological or psychiatric disorders. When all else fails, some patients can benefit from carefully managed and monitored opioid therapy. However, use of opioid therapy for chronic pain is increasingly controversial due to the relative lack of data on long-term efficacy; the preponderance of side effects; and the risks of drug abuse and diversion, which affect patients and society. Furthermore, management of long-term opioid therapy can be burdensome for the provider and is not very well compensated compared to interventional therapies.

Relatively few medical therapies for chronic pain have a strong base of supporting evidence. For even the best pharmacological therapies, the number needed to treat (NNT)—the number of people who need to be treated for 1 person to benefit—is typically in the range of 3–4. Most interventional therapies are supported by weak evidence, at best [3, 4]. Nonetheless, providers have an ethical mandate to control pain, and patients with chronic pain demand treatment more vigorously than do patients with most other problems. For example, these patients may say, "If I can't get rid of this pain, I don't know what I'll do," or "Somebody has to do something; I can't live like this." When was the last time a patient with essential hypertension threatened to commit suicide if his or her physician did not promptly offer an effective treatment? Patients with unrelenting pain can become desperate, and their providers often feel frustrated [5].

Benefits

Interventional pain management, which includes the use of invasive techniques such as joint injections and nerve blocks, may be an imperfect approach to the treatment of chronic pain, but it may still be preferable to more comprehensive methods in some cases. By definition, chronic pain has no cure, but therapies that hold the potential to dramatically reduce, if not cure, the biological source of the pain are tempting. Indeed, evidence shows that, in the relatively rare instances when pain can be eliminated, many of the patient's functional and psychosocial comorbidities also improve [6]. When interventional therapies work well, they can reduce polypharmacy, dependence on opioid therapy, and long-term costs, and they can dramatically improve pain control and function [7].

Unfortunately, there is a dearth of high-quality studies validating many interventional therapies. Empirically, individual patients appear to respond well to these treatments—bearing in mind that the outcome being sought is not a permanent cure, but rather improvements in pain, physical and emotional functionality, and overall quality of life that last for at least several weeks. For patients whose lives have been deci-

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mated by intractable pain and whose only other option may be lifelong dependence on opioid analgesics, even a modest chance of success from a procedural intervention may be acceptable to the patient and the provider.

Use of interventional therapies is limited by clinicians' inability to predict which patients will respond positively to these approaches. Currently, the only way to really know who will respond to an epidural or transforaminal steroid injection is to offer the procedure as a trial. Many patients will benefit from this treatment, even for generally unsupported indications such as axial lower back pain [8], but many other patients will not receive sufficient benefit and yet will incur the cost and risks of the procedure. For potentially effective interventions, such as medial branch neurotomy for treatment of facet or sacroiliac joint pain [9], patients can be screened with temporary anesthetic blocks; from a health care perspective, however, even this empirical approach may not be the most cost-effective course [10]. Another challenge is the temptation to repeat costly procedures that provide only limited benefit. Some patients find real value from an intervention that may provide only hours or days of relief, yet repetition of such procedures is not a viable strategy for long-term management.

Interventions that can be effective and that pose minimal risk include trigger-point injections, which are best used in support of physical therapy; epidural or transforaminal steroid injections; cervical or lumbar facet blocks; radiofrequency neurotomy of the facet joint; sacroiliac joint injections; radiofrequency neurotomy of the sacroiliac joint; bursa injections; neurolysis of the peripheral nerve, plexus, or ganglion (especially in the setting of terminal cancer-related pain); vertebroplasty or kyphoplasty; implantation of a spinal cord stimulator; and implantation of an intrathecal infusion pump. The most expensive therapies—those that involve implantation of a spinal cord stimulator or an intrathecal drug infusion pump—do have the potential to produce dramatic, enduring, and cost-effective improvement in pain and function over the long term, but they are not effective for all types of pain and are not appropriate for all patients [11, 12]. Nevertheless, with careful patient selection and appropriate psychological and therapeutic screening (via a temporary trial of the proposed therapy), interventional therapies can produce excellent long-term outcomes for patients in whom all other analgesic strategies have failed [13, 14].

Other procedures that may have value in some patients include peripheral nerve blocks and sympathetic nerve blocks. Procedures with questionable value include pulsed radiofrequency procedures (nondestructive), discography, intradiscal electrothermal therapy (IDET), epidural neurolysis (Racz procedure), and epiduroscopy [15-17].

Risks and Adverse Effects

Utilization of interventional approaches for the management of chronic pain carries risks of procedure-related complications. The most concerning complications generally involve uncontrolled bleeding or infection (eg, epidural abscess or hematoma), but these risks are acceptably small with proper patient selection and sterile technique [18]. Nevertheless, the consequences for individual patients who experience such complications can be devastating. For example, a recent outbreak of fungal meningitis associated with the use of tainted compounded steroid preparations has resulted in 741 cases of clinical infection, associated with 55 deaths, in 20 states [19]. Likewise, cervical transforaminal steroid injections were widely used to treat radicular symptoms until several years ago, when it became apparent that rare catastrophic complications were occurring, likely due to embolization of the cervical spinal cord by undetected intra-arterial injection of particulate steroid suspensions [20]. Although such occurrences are extremely rare, the decision to pursue any interventional procedure for the management of chronic pain must incorporate a realistic assessment of risk versus benefit.

Appropriate Use

Interventional approaches also carry disadvantages from a strategic standpoint. Although these therapies can yield significant long-term benefits, there are increased upfront costs, especially with regard to trials of therapy that may or may not ultimately prove to benefit the patient [11, 12]. The appeal of an approach that provides profound, if only short-term, pain relief may result in patients depending on medical procedures to control their pain, rather than learning skills to manage and cope with their pain. Similarly, physicians may be tempted to over-rely on interventions for various reasons. Administering interventions is more enjoyable than managing long-term opioid therapy, and providers are well reimbursed for interventional approaches under a fee-for-service health care system. This temptation may be reinforced when physicians feel the need to offer *something* for problems that otherwise seem to have no solution. Patients with chronic pain often hope for a cure that does not exist, and they are thus particularly vulnerable to practitioners who offer the semblance of a cure or a dramatic improvement through interventional means.

Of greater concern are providers who choose to limit their practice in order to avoid the challenge and responsibility of comprehensive pain care while emphasizing the use of interventional approaches. Financial incentives in medicine are not always aligned to reward the most patient-centered care, which has had unfortunate consequences for the treatment of chronic pain, as pharmacologic management is often inadequately reimbursed. In contrast, pain procedures are often well compensated, regardless of their ultimate efficacy. Some providers define themselves as "interventional pain physicians," but I would suggest that the real question is whether or not a physician is a *pain medicine* specialist, and I would hope that all pain medicine specialists would have the knowledge and skills to incorporate the benefits of interventional therapies into a comprehensive program of

patient-centered care [21].

Finally, the relative ineffectiveness of current treatments for chronic pain provides a strong motivation for adopting new approaches that hold the promise of better outcomes, even if many of them are interventional and untested. Curiously, many of these treatments first take hold in the realm of private practice before being subjected to more rigorous examination from an academic perspective. In 1997, a new form of internal disc disruption was introduced as a treatment for discogenic pain, which is one of the most common sources of chronic back pain. This procedure, IDET, involves threading a wire into the posterior annulus of the disc and heating the disc contents. This technique and others similar to it were readily incorporated into the interventional pain armamentarium. Fifteen years later, however, in the absence of convincing evidence of the procedure's safety and efficacy, IDET is now rarely if ever offered, and most third-party payers consider it to be experimental.

Conclusion

Chronic pain is a devastating disease. Despite increased clinical and experimental attention to this disorder over the past few decades, clinicians still lack reliably safe and effective medical treatments. Patients who suffer from chronic pain are best served by a comprehensive and integrated care model that not only provides the best pain relief possible but also offers treatments that optimize function and improve patients' ability to cope with pain. Interventional techniques do not take the place of, nor do they eliminate the need for, a comprehensive approach, but they can be valuable adjuncts when used judiciously as part of a patient-centered program [22]. NCMJ

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Total Hip or Knee Replacement in Patients with Chronic Pain

Daniel J. Del Gaizo

Patients with advanced degenerative joint disease of the hip or knee often experience chronic pain that can be effectively treated with joint replacement surgery. Joint replacement surgery remains beneficial even if patients have concurrent extrinsic pain or they are taking narcotics long term, although these groups are at higher risk for persistent pain and for dissatisfaction with their surgical results.

Advanced degenerative joint disease (DJD) of the hip or knee is most commonly associated with severe wear of the articular cartilage of the affected joint. Advanced DJD is also often accompanied by bone wear, bone loss, synovial and soft tissue inflammation, intra-articular effusion, capsular and ligament contractures, and altered joint mechanics. Pain in patients with advanced DJD has multiple causes, including nerve irritation of exposed subchondral bone, inflamed intra-articular pain receptors, the presence of an effusion creating elevated intra-articular pressure, and increased strain on muscles and ligaments.

Although some nonsurgical interventions may help to reduce the effusion and inflammation associated with advanced DJD of the hip or knee, the structural damage caused by the disease is permanent, and no nonsurgical intervention has been proven to reverse its course [1]. Because advanced DJD is almost always progressive, with increasing structural damage occurring over time, patients often experience chronic pain that progresses in severity.

Joint replacement surgery can reliably relieve pain by restoring more normal joint mechanics and by resurfacing the worn cartilage and bone with well-fixed prosthetic implants. In many large studies, more than 90% of patients report being satisfied with the results of hip or knee arthroplasty [2, 3]. Many patients who have recovered from a hip or knee replacement procedure report that they no longer experience any pain. Among those who do continue to have pain, most report that their symptoms have improved markedly compared with their preoperative status.

Many variables can affect how quickly patients recover from hip or knee replacement surgery. These include but are not limited to the severity of the preoperative disease, the patient's level of preoperative conditioning, and the surgical approach. In general, the recovery period appears to be slightly longer for a knee replacement than for a hip replacement. In my practice, we inform patients that most people who undergo a hip or knee replacement will be about 80% recovered by 6 weeks after surgery and that, in our experience, complete recovery can be expected by 1 year after surgery.

Postoperative Pain Control and Use of Narcotics

While the dose and duration of use will vary, many patients require narcotic pain medications for a period of time after hip or knee replacement surgery. These medications not only provide pain relief but also facilitate postoperative rehabilitation by allowing patients to work through discomfort and to meet their rehabilitation goals. In the setting of knee replacement surgery, in particular, it is crucial that patients obtain the desired range of motion before permanent arthrofibrosis is established. Although postoperative narcotics are often necessary, even appropriate use of these agents carries risks of adverse effects, which can include nausea, confusion, constipation, urinary retention, respiratory depression, and/or substance dependence.

My colleagues and I minimize the need for narcotics in several ways. First, we use less invasive surgical techniques in order to minimize soft tissue damage and to decrease the corresponding pain response. Second, we have developed a multimodal pain-control protocol. By targeting the pain pathway at multiple locations, we minimize both pain and potential medication-induced adverse effects. In addition to receiving narcotics, patients are often provided with some form of regional anesthesia for the first 2 nights after a knee replacement; for example, a femoral nerve block can be accomplished by continuously infusing ropivacaine through an indwelling catheter [4]. Nonsteroidal anti-inflammatory agents are also used to address inflammation and swelling, and acetaminophen is used for its central-acting modulation of pain. Finally, ice and compression dressings are used routinely, as they have been shown to significantly reduce postoperative pain after knee replacement surgery.

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Patients are encouraged to wean themselves from narcotics as soon as they can do so without compromising their ability to achieve rehabilitative milestones. The vast majority of our patients who undergo elective primary hip or knee replacement require no narcotic pain medication by 6 weeks after surgery. I counsel all of my patients before surgery that I will not prescribe narcotic pain medications for longer than 3 months unless there is an identified problem with the joint replacement.

If 3 months have passed since the hip or knee replacement surgery was performed and a patient continues to have pain that necessitates the use of narcotic pain medications, there is a significant chance that something is wrong with the joint replacement [5, 6]. Possible causes of such pain include infection, hematoma, loose components, malpositioned components, and fracture. It is imperative that an orthopedic surgeon rule out these possibilities. Once that has been done, the patient should be evaluated for extrinsic causes of pain, such as referred pain from another degenerative joint or the spine. If no extrinsic causes are found, then clinicians should entertain the possibility of myofascial etiologies, such as complex regional pain syndrome or exacerbation of fibromyalgia.

Hip or Knee Replacement in Patients with Concomitant Chronic Pain from Another Cause

Hip or knee replacement surgery can be beneficial even in patients who have concomitant chronic pain related to other etiologies, such as fibromyalgia or chronic back pain. However, such patients may be at increased risk for persistent pain after the surgery, and they are more likely to be dissatisfied with the surgical result. Bican and colleagues [7] compared the results of total knee replacement in patients with and without fibromyalgia. They found that patients with fibromyalgia were less satisfied with their knee replacement and had lower postoperative functional scores [7]. However, patients with fibromyalgia still experienced significant improvement compared to their preoperative status. Indeed, their degree of improvement was similar to that of the control group; they simply started at a lower level preoperatively. The authors concluded that fibromyalgia should not be considered a contraindication to joint replacement surgery, although patients with fibromyalgia should be counseled about their increased risk of being dissatisfied with the results of the surgery.

D'Appuzo and colleagues [8] evaluated the results of 110 patients with fibromyalgia who had undergone knee replacement surgery. After a mean follow-up period of 7 years, patients reported a high incidence of persistent knee pain (44%), and there was a relatively high revision rate (6%). Of patients who continued to have some degree of knee pain after surgery, 48% had mild pain, 29% had moderate pain, and less than 1% had severe pain; pain levels were unknown in the remaining patients. While pain was not totally alleviated in these cases, overall pain severity was markedly improved for 82% of patients, and 82% of patients were satisfied with the results of their surgery. Although most joint replacement surgeons would consider these outcomes to be inferior to those of standard total knee arthroplasty, these results are still acceptable.

Long-Term Use of Narcotics Before Hip or Knee Replacement Surgery

Long-term use of narcotic pain medications before hip or knee replacement surgery increases the risk that patients will have a more difficult recovery, a higher complication rate, and lower overall satisfaction with the results of the procedure. This was demonstrated in a recent study by Zywiel and colleagues [9], which looked at the outcomes of knee replacement surgery in a cohort of 49 patients with a history of long-term preoperative opioid use. In addition to having lower functional scores and lower satisfaction scores, these patients had a relatively high rate of revision (16%) for persistent stiffness or pain.

Franklin and colleagues [10] used a national database of prescriptions to evaluate the use of narcotic pain medications in patients who had undergone knee replacement for unilateral knee DJD. Only 3% of patients who had not been taking narcotics before surgery required these drugs 1 year after surgery, whereas 14% of patients who had been taking narcotics prior to surgery were still taking them 1 year afterward.

I believe that the majority of patients with advanced DJD of the hip or knee should not be treated with narcotic pain medications. The chronic and progressive nature of the disease places these patients at risk for dependency; as noted previously, use of narcotics prior to hip or knee replacement may also place patients at risk for complications or suboptimal outcomes. Patients with advanced DJD of the hip or knee with pain that necessitates the use of narcotic medications should be promptly referred to an orthopedic surgeon who can evaluate them for hip or knee replacement.

Conclusion

Advanced DJD of the hip or knee can result in chronic pain. In many patients this pain can be effectively treated with hip or knee replacement surgery. Although some patients may continue to have pain after the surgery, the majority of these patients are still significantly improved compared with their preoperative status. Patients with chronic pain and comorbid conditions such as fibromyalgia can also benefit from hip or knee replacement surgery, but they are at higher risk for persistent pain and/or dissatisfaction with their surgical result. Finally, patients who have been taking narcotic pain medications long term before undergoing surgery are at increased risk for complications, persistent pain, and dissatisfaction with the results of hip or knee replacement. NCMJ

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Acupuncture for the Treatment or Management of Chronic Pain

Remy R. Coeytaux, Eric Garland

Evidence supports the safety and efficacy of acupuncture compared with no treatment, but it is unclear what role the placebo effect plays in acupuncture's efficacy. In determining whether acupuncture is indicated for a given individual or patient population, clinicians should consider acupuncture's effectiveness compared with no acupuncture—as well as the effectiveness, safety, and cost of alternative types of treatment.

Pain is a complex biopsychosocial phenomenon that arises from the interaction of neuroanatomical and neurochemical systems with cognitive, affective, and physiological processes. In contrast to acute pain, which is most often evoked by noxious stimuli or damage to bodily tissues, chronic pain does not necessarily correlate with tissue damage. In patients with chronic pain, the magnitude of the reported pain may be out of proportion to the degree of tissue damage. Thus, clinical interventions that focus on repairing injured tissue may not adequately alleviate chronic pain, and multimodal treatment approaches may be warranted. In this paper, we summarize the evidence regarding the use of acupuncture for the treatment or management of chronic pain.

The published literature includes hundreds of randomized controlled trials (RCTs) designed to evaluate the efficacy and safety of acupuncture for a wide variety of clinical indications. Chronic or recurrent pain conditions are well represented in the acupuncture literature. Since 2000, there have been at least 14 systematic reviews of acupuncture for back or neck pain [1-14], 12 systematic reviews of acupuncture for peripheral joint pain [13, 15-26], and 8 systematic reviews of acupuncture for headache [13, 27-33] (Table 1).

The majority of RCTs of acupuncture that have been published to date have evaluated the effectiveness of an "active" or "true" acupuncture protocol compared either to a no-treatment group or to a "sham" acupuncture intervention. Most sham acupuncture protocols involve penetration of the skin by acupuncture needles, but these needles are applied to bodily locations that are not thought to correspond to therapeutic acupuncture points. Many recent, larger studies are 3-arm RCTs that compare true acupuncture both to a sham intervention and to a no-treatment, waitlist, or usual-care-only control group. A relatively small proportion of clinical trials have directly compared acupuncture with 1 or more other potentially active interventions.

There are enough published RCTs of acupuncture to conduct meta-analyses on individual patient-level data. Vickers and colleagues [13] recently published a meta-analysis of patient data from 29 high-quality RCTs (involving a total of 17,922 patients) that evaluated acupuncture for chronic pain. This analysis demonstrated that acupuncture was associated with significant alleviation of pain relative both to no treatment and to sham acupuncture for all 4 chronic pain conditions studied: back and neck pain, chronic headache, shoulder pain, and osteoarthritis.

Effectiveness, Safety, and Cost

Whether acupuncture is found to be effective for the treatment or management of chronic pain depends in large part on the comparison group used in clinical trials. The available evidence strongly suggests that acupuncture is effective for most of the pain conditions that have been studied to date when the alternative is not undergoing a course of acupuncture treatment. When compared with a sham intervention that is intended to serve as a placebo control, however, some trials demonstrate the superiority of true acupuncture, whereas others do not. The observation that true acupuncture is not always superior to sham acupuncture in the context of RCTs is consistent with 2 different—but not necessarily mutually exclusive—explanations: The first possible explanation is that acupuncture's clinical effects are attributable to the placebo effect. The second possibility is that sham acupuncture treatments are not physiologically inert and thus may influence clinical outcomes.

Our interpretation of the existing evidence is that the placebo effect probably accounts for a not-insignificant proportion of acupuncture's observed efficacy in the context of both clinical trials and clinical practice. Even if acupuncture is associated with a relatively strong placebo

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TABLE 1.
Systematic Reviews of Acupuncture for the Treatment of Chronic or Recurrent Pain

Location of pain	Lead author and year of publication	Number of trials (number of patients)	Evidence of efficacy?[a]
Spine			
Back	Henderson 2002 [1]	8 (573)	Inconclusive
Back	Cherkin 2003 [2]	20 (not reported)	Inconclusive
Back	Furlan 2005 [3]	35 (2,838)	Yes
Back	Manheimer 2005 [4]	33 (2,299)	Yes
Neck	Trinh 2006 [5]	10 (661)	Yes
Back	Yuan 2008 [6]	23 (6,359)	Yes
Neck	Fu 2009 [7]	14 (4,249)	Yes
Back	Rubinstein 2010 [8]	20 (5,590)	Yes
Back	Trigkilidas 2010 [9]	4 (2,339)	Yes
Spine	Lu 2011 [10]	8 (not reported)	Yes
Back	Standaert 2011 [11]	2 (1,214)	Inconclusive
Back	Hutchinson 2012 [12]	7 (13,874)	Yes
Back/neck	Vickers 2012 [13]	13 (7,478)	Yes
Back	Xu 2013 [14]	13 (2,678)	Yes
Extremities			
Knee	Ezzo 2001 [15]	7 (393)	Yes
Elbow	Trinh 2004 [16]	6 (282)	Yes
Shoulder	Green 2005 [17]	9 (525)	Inconclusive
Joint	Kwon 2006 [18]	18 (1,891)	Yes
Joint	Manheimer 2007 [19]	16 (3,498)	Yes
Knee	White 2007 [20]	13 (2,596)	Yes
Knee	Selfe 2008 [21]	10 (1,456)	Yes
Joint	Manheimer 2010 [22]	16 (3,498)	Yes
Wrist	Sim 2011 [23]	6 (442)	Inconclusive
Knee	Cao 2012 [24]	14 (3,835)	Yes
Heel	Clark 2012 [25]	8 (1,240)	Yes
Shoulder	Lee 2012 [26]	7 (502)	Yes
Shoulder	Vickers 2012 [13]	3 (564)	Yes
Head			
Mixed headache	Manias 2000 [27]	27 (1,088)	Yes
Idiopathic headache	Melchart 2001 [28]	26 (1,151)	Yes
Chronic headache	Sun 2008 [29]	31 (3,916)	Yes
Tension-type headache	Davis 2008 [30]	8 (928)	Yes
Tension-type headache	Linde 2009 [31]	11 (2,317)	Yes
Migraine headache	Linde 2009 [32]	22 (4,419)	Yes
Neurovascular headache	Zhao 2011 [33]	16 (1,535)	Yes
Chronic headache	Vickers 2012 [13]	7 (4,896)	Yes

[a]Evidence of efficacy ratings were determined based on the conclusions reported in each individual study. An "inconclusive" rating is listed when the individual report explicitly reported inconclusive findings or when evidence of efficacy was ambiguous.

effect, the clinical benefits associated with acupuncture—which have been demonstrated by findings from RCTs and have been reaffirmed by systematic reviews and meta-analyses—should not be discounted. Other factors should also be taken into consideration, including the safety and cost of acupuncture as a treatment option, as well as the comparative effectiveness and safety of alternative treatment options. Patient choice and preference should also be considered.

Acupuncture's safety profile is characterized by a low incidence of a variety of different adverse events, including transient pain associated with the needling, dizziness, feelings of disorientation, bruising, or exacerbation of the symptoms for which treatment was sought. A prospective survey of 574 acupuncturists in the United Kingdom revealed 43 adverse events identified by practitioners as being "significant" out of a total of 34,407 acupuncture treatments, which corresponds to a rate of 1.3 events per

1,000 treatments. None of the events was considered to be "major" or "serious." Of the 43 reported adverse events, 5 were severe nausea, 4 involved fainting, and 3 were local pain at the site of the needling. A variety of other adverse events were reported with an incidence of 1 or 2 events per 34,407 treatments [34].

Acupuncture's cost effectiveness has been studied in the United Kingdom, Germany, and Italy, but it has not been studied in the United States. Ambrosio and colleagues [35] included 7 cost-utility analyses and 1 cost effectiveness analysis in a systematic review of the literature evaluating acupuncture as a treatment for lower back pain, neck pain, dysmenorrhea, migraine, and osteoporosis. They found that, although acupuncture was clinically effective, it added to the overall cost of care. The cost per quality-adjusted life-year gained ranged from £2,527 to £14,976, which is below the typical willingness-to-pay threshold estimated by the UK National Institute for Health and Clinical Excellence. The authors concluded, "acupuncture appears to be a cost-effective intervention for some chronic pain conditions" [35]. However, cost effectiveness analyses and conclusions from European studies may not be readily applicable to the United States.

Currently, Medicare, Medicaid, and most private health insurance plans in North Carolina do not cover the costs of acupuncture services. Instead, acupuncture is typically rendered on a fee-for-service basis. The direct, out-of-pocket cost to the patient for each acupuncture treatment is typically in the range of $50 to $120. For most chronic pain conditions, multiple treatments may be needed, thereby resulting in direct costs of more than $700 for a course of treatment. In addition, there may be indirect costs associated with time lost from work and travel expenses, and there may be opportunity costs if the time and resources spent on a course of acupuncture treatment preclude the use of an alternative approach that might have resulted in lower costs or greater benefit.

Acupuncture as Adjunctive Therapy

Most of the studies cited above evaluated the efficacy or effectiveness of acupuncture as a stand-alone treatment for defined symptoms or clinical conditions. In addition, acupuncture could also play a role as an adjunct to other treatments for individuals with chronic pain. In the management of opioid withdrawal symptoms, for example, the use of acupuncture plus opioid agonists is associated with a lower reported incidence of side effects than when opioid agonists are used alone; the relapse rates of these 2 approaches do not differ after 6 months, however [36]. Acupuncture has also been shown to reduce the incidence of opioid-related side effects such as nausea, dizziness, sedation, pruritus, and urinary retention in the setting of postoperative pain management [37]. This evidence suggests that acupuncture might be useful in alleviating opioid-related side effects associated with medical management of chronic pain.

Licensing, Certification, and Availability of Acupuncturists

In North Carolina, 4 licensing boards play a role in overseeing the practice of acupuncture: First, the North Carolina Acupuncture Licensing Board is charged with issuing, denying, suspending, and revoking licenses of licensed acupuncturists who have successfully completed an approved, 3-year postgraduate acupuncture college or training program. Second, the American Board of Medical Acupuncture (ABMA) oversees board certification for medical acupuncture for physicians who are already licensed to practice medicine by the state's medical board. Board certification requirements for physician medical acupuncturists include graduation from an accredited medical school; possession of a valid, unrestricted license to practice medicine in a state or jurisdiction of the United States or Canada; and completion of a minimum of 300 hours of board-approved acupuncture training and education. Third, the North Carolina Medical Board is responsible for licensure of physicians, nurse practitioners, and physician assistants. The use of medical devices (including acupuncture needles) falls under the scope of care of these health care professionals. Licensed physicians and physician extenders may therefore administer acupuncture treatments without acupuncture-specific board certification. Finally, the North Carolina Board of Chiropractic Examiners (NCBE) is responsible for licensing individuals who are qualified to practice chiropractic in the state of North Carolina. The NCBE requires a licensed chiropractor to complete a minimum of 200 hours of board-approved acupuncture training and education in order to be eligible to provide acupuncture as part of his or her practice.

In February 2013, approximately 400 licensed acupuncturists, 6 board-certified physician acupuncturists, and 348 chiropractors were eligible to provide acupuncture in North Carolina. These figures do not include licensed physicians who include acupuncture as part of their medical practice but who have not sought board certification from the ABMA. Licensed acupuncturists, medical acupuncturists, and acupuncture-trained chiropractors practice in a variety of different clinical settings, including hospitals, clinics or centers within medical centers, private practices, community health centers, and free clinics. Third-party payer reimbursement issues and hospital credentialing requirements make it relatively difficult for hospitals to offer acupuncture to inpatients; consequently, most acupuncture services in North Carolina are provided in ambulatory care settings.

Future Research

The question of how much of acupuncture's clinical benefit is attributable to the placebo effect is likely to remain unanswered. Hundreds of RCTs—many of them with high-quality methodologies—and dozens of meta-analyses have already been published on this topic. In our opinion, more

research of the same type (in terms of study design and research questions) is not likely to be particularly illuminating. We believe that progress is more likely to be made by asking a different set of questions: How does acupuncture compare with alternative approaches, taking into account comparative effectiveness, safety, and cost? Which of the many acupuncture traditions or approaches is most effective for a particular clinical indication? Is there a role for acupuncture as an adjunct to other treatment modalities for chronic pain? If a course of acupuncture adds to the net cost of treatment (after factoring in possible savings from decreased health care resource utilization elsewhere), is the additional cost "worth it" from the perspective of patients, payers, and policymakers?

Conclusion

Strong evidence supports the safety and efficacy of acupuncture relative to no acupuncture treatment for a variety of chronic pain conditions. However, there is insufficient evidence to clarify the potential role of the placebo effect. In the absence of clear evidence that all of acupuncture's clinical benefits are solely attributable to the placebo effect, we conclude that factors such as acupuncture's effectiveness relative to no acupuncture for treatment of certain pain conditions—as well as the effectiveness, safety, and cost of alternative treatment options—should be considered when determining whether a course of acupuncture treatment is indicated for a given individual or patient population. NCMJ

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Pain Management:
Lessons from Palliative Care

John P. Langlois

Reducing suffering and helping patients to control their symptoms are key components of palliative care. This commentary will offer a comprehensive definition of palliative care and will present a case history to illustrate how palliative care can benefit patients with chronic pain.

Palliative care is a relatively new specialty. In the United States, the first hospital-based consultation services started in the 1980s, and the American Board of Medical Specialties recognized palliative medicine as a specialty in 2008.

There is a common misconception that palliative care is reserved for patients with terminal illness. Although palliative care arose from the hospice movement, hospice care is actually a subset of palliative care that focuses specifically on patients with severe illness who are approaching the end of life. In the United States, hospice care is usually offered only when a patient is expected to live less than 6 months. In contrast, palliative care may be appropriate for a wide range of patients. Aside from hospice's more narrow focus, both hospice care and palliative care share an emphasis on quality of life and on the prevention and relief of suffering.

To give a more concrete sense of what is involved in palliative care, consider the case of a young man, identified as G.T., who was diagnosed at 17 years of age with a rare hematologic condition that resulted in recurrent bouts of pain complicated by ileus and uncontrollable nausea and vomiting. These symptoms required prolonged hospitalizations with administration of parenteral opioids for pain control and provision of parenteral nutrition until the ileus resolved. G.T.'s additional symptoms included itching and depression. After each hospitalization, he would be discharged until the next pain crisis, resulting in recurrent hospitalizations over several years. When G.T. was 24 years old, the hospital's palliative care team was consulted to assist with pain and symptom management and to provide psychosocial support.

The World Health Organization (WHO) defines palliative care as

> an approach that improves the quality of life of patients and their families facing the problems associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual [1].

This definition has a number of corollaries. The first is that palliative care "provides relief from pain and other distressing symptoms" [1]. Indeed, one of the hallmarks of palliative care is its focus on symptoms. In most other specialties of medicine, the patient's problems are approached by first determining a diagnosis, which then drives a plan for managing care. In contrast, palliative care begins by first dissecting and analyzing each symptom. For example, pain can be broken down into 4 main types: nociceptive, neuropathic, inflammatory, and visceral. Complicated pain syndromes usually involve more than one type of pain.

In G.T.'s case, knowing the diagnosis was useful, but the diagnosis had been known for 7 years before the palliative care team was consulted, and G.T.'s symptoms had continued to severely affect his quality of life. Indeed, there was evidence of involvement of all 4 types of pain. After careful analysis and consideration, the palliative care team decided that G.T.'s pain crises were causing the ileus, nausea, and vomiting. We initiated therapy with methadone, a naturally long-acting opioid with broader receptor activity than other opioids [2]. G.T. needed higher doses of methadone than we had anticipated, but we were committed to doing what was required to control his symptoms and to improve his quality of life.

"Treat to goal" is a key precept of pain management in palliative care. Opioids are not the only medications that can be used to control pain syndromes; appropriate use of adjuvant medications is also essential. Anticonvulsants and tricyclic antidepressants are important for managing neuropathic symptoms, nonsteroidal anti-inflammatory agents (and sometimes corticosteroid medications) are valuable for treating pain that has an inflammatory component, and anticholinergic medications or nitrates may assist with visceral pain. [Editor's note: For more information on nonopioid pain medications, refer to the commentary by Laguerre on pages 209-214.] In G.T.'s case, antihistamines were vital in controlling the excessive histamine release that could trigger a pain crisis. These drugs also controlled his itching.

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Another corollary of the WHO definition of palliative care is that it "affirms life and regards dying as a normal process" [1]. Although it might seem that this issue would be irrelevant in G.T.'s case, the confusion about what palliative care is—and is not—must be addressed in nearly every case. Our palliative care team often must reassure staff members, family members, and patients that we are there not to provide end-of-life care but to improve quality of life.

A further corollary is that palliative care "intends neither to hasten or postpone death" [1]. Although I have been greeted at the nurses' station with the phrase, "Here comes the death squad," the truth is that all of palliative care—including hospice care—affirms life, and patients often will improve and "graduate" from hospice care [3]. There is increasing scientific evidence that patients may actually live longer with palliative care and hospice care [4]. Over time, G.T., his family, and members of the staff came to understand that we were not the death squad.

Palliative care also "integrates the psychological and spiritual aspects of patient care" [1]. Dame Cicely Saunders, the founder of the hospice and palliative care movement, developed the concept of *total pain*—the idea that pain is not just physical but includes psychological, emotional, existential, and social factors in its causes and expression, and that attention to all of these areas is required in order for treatment to be effective [5]. This was certainly true in G.T.'s case. His series of prolonged hospitalizations had taken its toll on the patient, his family, and the staff members who cared for him. There were issues related to depression, anxiety, and social and financial stresses, and there were concerns about addictive behavior. This case required prolonged efforts by the full palliative care team. Fortunately, as adequate pain control was achieved, G.T.'s drug-seeking behaviors vanished, indicating that the behaviors we had been seeing were pseudoaddiction, a condition in which inadequate control of pain causes drug-seeking behavior that mimics addiction [6].

Two additional corollaries of the WHO definition of palliative care are that it "offers a support system to help patients live as actively as possible until death" and that it "offers a support system to help the family cope during the patient's illness" [1]. In complex and demanding cases such as those of G.T. and most other palliative care and hospice patients, no single person can provide the depth and breadth of care required. For this reason, palliative care "uses a team approach to address the needs of patients and their families" [1]. Palliative care is always best practiced by a team of doctors, nurses, social workers, chaplains, and other health care providers. Although the physicians and nurse practitioners on our team provide important expertise in symptom management, the social worker and chaplain are vital in building trust, overcoming fears, and addressing the patient's psychological and spiritual pain and suffering, which go beyond the physiological pain.

Another important corollary is that palliative care "will enhance quality of life, and may also positively influence the course of illness" [1]. The mission of palliative care is to enhance the quality of life for all patients who receive such care. What that means for a specific individual is not always clear, so an essential task in palliative care is determining the goals of care, which involves understanding what is meant by quality of life for a particular patient and his or her family. For one patient, it may mean aggressive surgery and a prolonged stay in the hospital's intensive care unit. For another patient in a similar situation, it may mean a transition to comfort care and going home with hospice support. In G.T.'s case, our goals were to control his pain, to prevent ileus, to avoid hospitalizations, and to enable him to live as normal a life as possible. To achieve these goals, the palliative care team—in close collaboration with the referring physician—judiciously stabilized G.T.'s condition with methadone therapy and as-needed dosing of hydromorphone for breakthrough pain. At a recent follow-up visit in our palliative care clinic, G.T. reported that he had been able to successfully reduce his methadone dose (as he had requested) and that he had not had a pain crisis or hospitalization in more than 2 years. He was also engaged to be married.

The final corollary of the WHO definition of palliative care is that it "is applicable early in the course of illness, in conjunction with other therapies that are intended to prolong life, such as chemotherapy or radiation therapy, and includes those investigations needed to better understand and manage distressing clinical complications" [1]. Some people may not think of palliative care as being appropriate for a patient as young as G.T., but palliative care can be appropriate for anyone with severe illness. Our youngest patients are newborns in the neonatal intensive care unit, and our oldest patient is currently 106 years of age. Although palliative care consultations are typically thought of as occurring in the hospital setting, more and more frequently they also take place in clinic, long-term care, and home settings. In some cancer centers, palliative care consultations are automatically integrated into the care of patients with advanced-stage cancer, beginning with their first visit. Palliative care does not take the place of a primary care medical home and does not diminish the role of the referring physician. As with any other specialty consultation, the palliative care team works to enhance the care of the patient and to assist the attending physician in providing the best and most appropriate care for the patient.

Pain is a complex condition that is extremely common in patients with severe illness. Palliative care integrates all of the components and tools of good pain management—careful assessment, control of side effects and other symptoms, assessment of addiction risk, pain contracts, pill counts, lock boxes, database queries, quantitative urine drug screening, and close follow-up—with a comprehensive team-based approach to maximize the quality of life of the patient and his or her family. Palliative care providers can be valuable allies in caring for patients with pain and other symptoms of severe illness. NCMJ

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Chronic Pain and Mental Health:
Moving Beyond the Conceptualization of Pain as the Fifth Vital Sign

Elizabeth N. Lima

Current approaches to the assessment and treatment of chronic pain continue to rely predominantly on the medical model. However, the comorbidity of chronic pain with psychiatric conditions underscores the need for a biopsychosocial and interdisciplinary approach to pain that can bridge the gap between scientific understanding and medical practice.

We must never forget that we may also find meaning in life even when confronted with a hopeless situation, when facing a fate that cannot be changed. For what then matters is to bear witness to the uniquely human potential at its best, which is to transform a personal tragedy into a triumph, to turn one's predicament into human achievement. When we are no longer able to change a situation—just think of an incurable disease such as inoperable cancer—we are challenged to change ourselves.

— Viktor Frankl, *Man's Search for Meaning*

The costs of chronic pain have been estimated in terms of pain's financial, occupational, emotional, and social impacts, and all such calculations lead to the conclusion that societies and individuals continue to pay too high a price for the effects of chronic pain. The literature suggests that, despite advances in our understanding of pain, health care providers tend to rely heavily on the medical model when assessing and treating pain [1]. However, the evidence points toward the importance of taking an interdisciplinary, biopsychosocial approach to chronic pain. Patients therefore need to expand the set of tools they use to manage chronic pain, and health care providers need to evolve beyond the overly simplistic medical model toward a more comprehensive approach to assessment and treatment of pain.

Models of Pain from Descartes to the Neuromatrix Model

In *Traité de l'homme*, which had been written by 1633 but was not published under that title until 1664, René Descartes advanced a medical model of pain that theorized that pain is directly proportional to the amount of tissue damage in the body [2]. Although there is now good evidence to the contrary, the medical model continues to exert great influence on the assessment and treatment of chronic pain. Descartes's stance led to the assumption that any pain occurring in the absence of discernible and diagnosable tissue damage must be psychogenic. The ineffective distinction between "organic" and psychogenic pain has created a chasm between these 2 entities that is not only frustrating—both to patients and to health care providers—but that also negatively impacts the care provided and received. Patients feel they are being told that "the pain is all in their head," and providers struggle to balance the necessity of relieving pain against the known risks of available pharmacological interventions.

In 1965, Melzack and Wall advanced the gate control theory of pain, which called attention to the role of the central nervous system [3]. This theory accounted for the role that psychological and social factors play in either ameliorating or exacerbating the experience of pain. More recently, Melzack's conceptualization of pain evolved into the pain neuromatrix concept [4], which accounts for the fact that pain is an alarm that signals potential tissue damage. This model takes the position that these signals are a "false" alarm in patients with chronic pain. Melzack proposed the pain neuromatrix model because no other model could explain the phantom-limb pain experienced by paraplegic patients.

Chronic Pain and Comorbid Psychiatric Conditions

Anxiety and depressive disorders are quite prevalent in patients with chronic pain. The question of which comes first has been debated; however, prospective studies suggest a bidirectional relationship in which baseline anxiety or depression predicts susceptibility to chronic pain, and chronic pain prospectively predicts anxiety and depression [5-7]. Once both diagnoses are established, having anxiety

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or depression as a comorbidity in addition to chronic pain tends to produce reports of greater intensity of pain as well as greater disability [8, 9]. Patients with chronic pain have also been found to suffer from generalized anxiety symptoms. Finally, the role of trauma and posttraumatic stress disorder (PTSD) in chronic pain has been substantiated in the literature [10, 11].

The brain's role in pain may help to account for these common comorbidities. There is not one particular place in the brain that serves as a "pain center." Rather, pain neurophysiology is represented by the spinal cord and multiple regions of the brain that are not only involved in pain but also specialize in other functions. These structures include the premotor/motor cortex (organizes and prepares movement), the cingulate cortex (concentration and focusing), the prefrontal cortex (problem solving and memory), the amygdala (fear, fear conditioning, and addiction), the sensory cortex (sensory discrimination), the hypothalamus and thalamus (stress responses, autonomic regulation, and motivation), the cerebellum (movement and cognition), and the hippocampus (memory, spatial recognition, and fear conditioning) [12].

An Integrated Biopsychosocial Approach to the Assessment of Chronic Pain

Simply measuring pain using a Likert scale provides only a glimpse of the impact that pain has on an individual patient. Comorbid psychiatric conditions also deserve attention; if left untreated, they may serve as barriers to successful treatment. Rather than exploring only the biomedical causes of pain, a biopsychosocial approach also examines how psychological and social influences affect pain. Thus, an informative pain assessment goes beyond the measurement of pain severity. For example, the West Haven–Yale Multidimensional Pain Inventory [13] assesses the extent to which pain interferes with marital, social, occupational, and recreational aspects of life. It further considers the current presence of support, life control over pain, affective distress, the patient's ability to perform common activities, and the responses of the patient's significant other. It is relevant to assess how the patient's significant other responds to the patient's pain because the reactions of a solicitous spouse—someone who is overly vigilant about the patient's pain and who responds in ways that reinforce pain-related behaviors (for example, by doing household chores for the patient)—have been shown to lead to increases in pain experience [14].

The presence of comorbid anxiety symptoms can be assessed using instruments such as the State-Trait Anxiety Inventory [15]. Similarly, symptoms of depression in patients with chronic pain have been investigated using the Beck Depression Inventory [16]. For assessing symptoms of PTSD, the PTSD Checklist has been used in primary care settings [17]. Given the intractable nature of chronic pain, evidence suggests that the patient's level of functioning—as assessed by a shortened version of the World Health Organization Quality of Life instrument (WHOQOL-BREF), for example [18]—may be more responsive to treatment than is the reported pain severity. Finally, substance use disorders represent an increasingly problematic challenge during treatment and assessment of chronic pain, with opioid addiction and misuse warranting national attention. Miotto and colleagues provide a guide to assessing and managing chronic pain conditions in patients with comorbid substance use [19].

In addition to evaluating pain and comorbid conditions, it is also important to consider predictors of treatment outcomes. Among the strongest predictors of treatment outcomes are patients' perceptions, beliefs, and attitudes about chronic pain and their ability to influence it. These beliefs and attitudes can respond to treatment. The Pain Catastrophizing Scale measures patients' attitudes and beliefs by having the patient rate items in 3 different categories: rumination about pain, magnification of pain, and sense of helplessness about pain [20].

An Interdisciplinary Biopsychosocial Approach to Treatment

The pain literature demonstrates that single-modality approaches to chronic pain result in poor outcomes or have only small effect sizes [21]. Response to medications, for example, may be bimodal, with only a minority of individuals responding very well [22]. Complicating matters is a lack of predictive power. Specifically, it is not possible to prospectively identify which patients will respond optimally to which treatments, although there has been promising work using the West Haven–Yale Multidimensional Pain Inventory to categorize patients and assign them to specific treatments [23]. An interdisciplinary approach in which psychosocial approaches are used in conjunction with pharmacological or physiological interventions therefore remains a better choice for treating patients with chronic pain. Psychological therapies that can be beneficial include cognitive behavioral therapy (CBT), acceptance and commitment therapy, and dialectical and behavioral therapy. Of these 3 types of therapy, CBT has been the subject of the most research, and no other psychological therapy has shown incrementally superior results in patients with chronic pain.

CBT for chronic pain focuses on replacing maladaptive patterns of thought and behavior—those that contribute to the experience of pain—with more beneficial patterns. John Otis [24] has developed a CBT approach for treating chronic pain that involves specific steps. These steps include providing information about pain (eg, an explanation of gate control theory), teaching relaxation skills (eg, progressive muscle relaxation, visual imagery, diaphragmatic breathing), increasing levels of behavioral activation by scheduling pleasant activities, reducing fear of movement with time-based pacing, and encouraging sleep modification [24]. CBT programs can be successfully delivered in either individual therapy or group therapy settings. CBT for chronic pain has

been shown to have positive effects on patients' attitudes and beliefs about pain and mood.

Most patients with chronic pain experience some fear of movement (ie, kinesiophobia), which contributes to avoidance of physical activity. This results in further deconditioning through disuse, increased levels of pain, and negative social and emotional impacts. Combining patient education and therapies with an active movement or walking program has positive effects not only on physical functioning but also on mood. However, patients with chronic pain should be guided through this lifestyle change; otherwise, they will typically engage in periods of overactivity that cause soreness and discomfort, resulting in physical inactivity for days afterward. To help the patient to establish a baseline for physical activity, clinicians can ask: "How many minutes can you walk without stopping, without causing a pain flare-up or without having to take a pill right before or after walking?" However, keep in mind that patients tend to overestimate how much they can do without triggering a pain flare-up. Encourage the patient to consistently maintain their baseline level of activity and to increase it slowly over an extended period of time. Patients with chronic pain are also increasingly using other therapies with a specific focus (eg, mindfulness, biofeedback), as well as complementary and alternative medicine approaches.

For patients who have psychiatric comorbidities, treatments targeting these comorbidities should be recommended. Psychological therapies, such as cognitive processing therapy and prolonged exposure, have been validated in patients with PTSD. CBT therapies for anxiety and depression are also well validated. Individuals with comorbid substance use disorders should be encouraged to undergo treatment for addiction (eg, Alcoholics Anonymous, Narcotics Anonymous, detoxification).

Overall, the nature of chronic pain underscores the need to bridge the gap between scientific knowledge and clinical practice. A biopsychosocial approach to the assessment and treatment of chronic pain is consistent with scientific developments that point to the essential role of the brain in the experience of pain. Adopting a biopsychosocial approach will require changes in beliefs and attitudes, not just on the part of patients, who need to be willing to try nonpharmacological interventions for chronic pain, but also on the part of health care providers, who must move beyond the medical model of chronic pain. NCMJ

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Safe and Practical:
A Guide for Reducing the Risks of Opioids in the Treatment of Chronic Pain

Kelly Bossenbroek Fedoriw

Health care providers often face the challenge of deciding when and how to prescribe opioids for patients with chronic noncancer pain. In patients for whom opioid treatment is appropriate, the risks can be mitigated by an initial risk assessment, informed consent, regular monitoring, and treatment within a medical home.

Health care providers often care for patients who are in pain, and choosing the correct therapeutic option can be daunting. Acute pain is less challenging, as it tends to have an easily identifiable cause and typically resolves when the inciting injury heals. Treating acute pain quickly is appropriate, and when nonsteroidal anti-inflammatory drugs (NSAIDs) and/or other over-the-counter regimens are insufficient to provide adequate analgesia, opioid therapy is often effective [1]. In this context, it is of paramount importance that clinicians set expectations for healing time and duration of therapy and consider adjuvant therapeutic options (such as referral for physical therapy). Unfortunately, it is not uncommon for pain to persist long after the acute illness or injury has healed, and deciding when to prescribe opioids for chronic pain is a difficult question.

Over the past 15 years, an overwhelming increase in the prescription of opioids for chronic noncancer pain has coincided with equally alarming increases in deaths due to opioid overdoses, emergency department visits related to nonmedical use of opioids, and substance abuse treatment for opioid addiction [1, 2]. Not surprisingly, these increases have occurred in parallel with the development of long-acting opioids, the aggressive marketing of opioids by the pharmaceutical industry, and leniency in the regulation of opioid prescribing on the part of state medical boards [1, 2].

Despite the abundance of opioids prescribed in the United States, many patients are still in pain. The Institute of Medicine's 2011 report *Relieving Pain in America* urges transformation of "prevention, care, education, and research, with the goal of providing relief for people with pain in America" [3]. However, the report also acknowledges the dangers and limitations of opioids in the setting of chronic pain [3]. Indeed, the consequences related to the misuse of opioids for the treatment of chronic noncancer pain are frightening: The number of deaths from opioid overdoses is increasing, medication misuse and opioid addiction are soaring, and drug diversion remains alarming. Clearly these are challenging problems.

There is little published evidence to support the use of opioids for the treatment of chronic noncancer pain. According to the American Society of Interventional Pain Physicians (ASIPP), "the explosive use of therapeutic opioids ... is complicated by a lack of evidence regarding their effectiveness, long-term efficacy, and safety data in the treatment of chronic non-cancer pain, but there is irrefutable evidence of adverse consequences" [2]. A recent Cochrane review found only weak evidence to suggest that long-term opioid treatment yields clinically significant relief from chronic noncancer pain in appropriately selected patients [4].

In contrast, the risks of opioids are well established. The risk of opioid-related death is nearly 3 times higher in a patient who is taking a daily morphine-equivalent dose (MED) of 200 mg or more compared to someone taking a daily MED of less than 20 mg [5]. Adverse effects are common with opioid treatment. In addition, a condition known as opioid-induced hyperalgesia is gaining recognition; this condition is characterized by "persistent or increasing pain with increasing dose, pain worse on opioids than before, decreasing duration of analgesic effect and pain becoming increasingly diffuse or poorly localized with ongoing opioid use" [6].

Physicians are largely aware of the risks of long-term opioid therapy and therefore try to find other treatment options, both for patients who are newly diagnosed with chronic noncancer pain and for those who are already taking opioid medications. Alternatives and first-line medications often include NSAIDs, antidepressants, anticonvulsants, and topical agents. In addition, physical therapy, rehabilitation, cognitive behavioral therapy, and complementary medicine techniques may be helpful. For some patients, however, a trial of opioid therapy is a reasonable next step.

Patients must be carefully selected for an opioid trial

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Educating Medical Practitioners About Safe Opioid Prescribing:
Training from the Governor's Institute on Substance Abuse

James W. Finch, Sara McEwen

There has been a great deal of speculation about what is causing the current epidemic of prescription medication abuse, with possible factors including sociocultural, economic, and medical issues [1]. One concern relates to the prescribing patterns of some clinicians—both primary care providers and specialists—particularly with regard to prescription of opioid analgesics. To address this concern, a number of national and state-level initiatives have aimed to promote safer opioid prescribing practices. In North Carolina, the Governor's Institute on Substance Abuse has played a lead role in these efforts, with the support of the North Carolina Division of Mental Health, Developmental Disabilities, and Substance Abuse Services (DMHDD-SAS); the Substance Abuse and Mental Health Services Administration (SAMHSA); and other funders.

As far back as 1994, the Governor's Institute, along with Duke University and the *Journal of Law, Medicine and Ethics*, cosponsored a conference devoted to prescription drug abuse and published 2 articles on the need for medical education to address this issue [1, 2]. In 2008, the Governor's Institute collaborated with SAMHSA to provide a series of workshops on safe opioid prescribing as part of a national training initiative. These workshops resulted in increased use of opioid risk screening tools and increased use of the North Carolina Controlled Substances Reporting System, and the success of these workshops demonstrated that prescribers were eager for training in this area. The Governor's Institute then began receiving requests for similar training, which resulted in additional trainings over the next 4 years.

In collaboration with the North Carolina Society of Addiction Medicine and other specialty groups, the Governor's Institute has provided or facilitated a number of initiatives targeted at a broad range of North Carolina's medical practitioners. These trainings have focused on teaching core skills that will help practitioners balance the need for adequate pain management—including access to opioid medications, when needed—versus the need to minimize the risk of abuse. Topics that have been covered in these trainings include: the role and limitations of opioids in managing chronic pain; risk stratification as an element of treatment planning before initiation of a therapeutic trial; elements of adequate monitoring; and appropriate responses to aberrant medication behaviors, including when to discontinue opioids and when to refer patients for specialty care.

In 2009, with funding from the Kate B. Reynolds Charitable Trust, the Governor's Institute implemented a program for 10 counties in Eastern North Carolina. This initiative developed grassroots awareness of prescription drug abuse and included community awareness campaigns, medication turn-in days, and evening seminars for clinicians. Outreach within the medical community resulted in widespread attendance by primary care physicians, emergency medicine specialists, and pain management clinicians. Over the course of 2 years, 7 trainings were attended by a total of 260 health care providers. This training initiative also included the provision of onsite technical assistance in addressing systems barriers, which include organizational culture, workflow, and reimbursement issues.

The Governor's Institute has also hosted a series of highly successful, practice-oriented conferences every year for the past 4 years. These conferences are formatted to attract both addiction medicine specialists and primary care clinicians. Each conference has focused attention on

(Table 1). A thorough history and a physical examination are essential in determining whether opioids are a reasonable option. If the diagnosis is fibromyalgia, for example, opioids are not indicated [6]. Moreover, patients who have poorly defined pain, those with a somatoform disorder, and those who are receiving compensation (eg, workers' compensation or Social Security Disability) will likely have a poorer response to opioid therapy [7].

TABLE 1.
Steps in the Initial Assessment of Patients Who Are Being Evaluated for Long-Term Opioid Therapy

1. Take the patient's history and perform a physical examination.
2. Assess the risk that the patient will misuse the drug, perhaps by using a screening tool such as the Addiction Behaviors Checklist.
3. Check the North Carolina Controlled Substances Reporting System to see any controlled substance prescriptions the patient may have previously filled in North Carolina.
4. Perform baseline urine drug screening.
5. Have the patient sign a treatment agreement or a pain contract.

In addition to establishing a diagnosis, physicians should stratify patients according to their risk of addiction and opioid misuse. Risk stratification is key to mitigating these hazards, and it should be an ongoing process in patients with chronic noncancer pain (Table 2). Multiple patient screening tools are available, but these methods have not been compared directly, so it is unclear which is best [8]. Highly rated tools include the Diagnosis, Intractability, Risk, Efficacy (DIRE) Score; the Addiction Behaviors Checklist; and the Screener and Opioid Assessment for Patients with Pain (SOAPP) [1]. These screening tools and others, as well as treatment algorithms, can easily be found online. Community Care of North Carolina (CCNC) also provides online resources for providers who treat chronic pain (https://www.communitycarenc.org/population-management/chronic-pain-project/). Such tools can help physicians stratify patients into categories of

abuse of controlled medications, giving particular attention to abuse of opioids and benzodiazepines. Lectures have provided reviews of the literature and standards of treatment, and seminars have focused on in-depth discussions and on how standards of treatment can be implemented in real-world practice settings.

As an important part of responding to the current opioid epidemic, treatment needs to be provided for individuals who have moved beyond opioid misuse to opioid addiction. However, clinicians often receive little support in dealing with this problem. To address this need, the Governor's Institute, working with DMHDDSAS, has for the past 4 years facilitated an ongoing mentoring network for those working in opioid treatment programs (methadone clinics). This mentoring has included monthly conference calls that include case discussion, literature review, and emerging standards of care.

For physicians who provide in-office treatment with buprenorphine or naloxone (agonist and antagonist therapies for opioid addiction), the Governor's Institute has sponsored training updates at yearly addiction medicine conferences. These workshops have attracted a majority of the physicians in North Carolina who are treating opioid addiction with buprenorphine or naloxone.

The leaders of Community Care of North Carolina (CCNC) have long been aware of the public health impact of prescription drug abuse. Building on the impressive success of Project Lazarus in Wilkes County [3], CCNC recently initiated the statewide Project Lazarus: Chronic Pain Initiative. As part of this initiative, the Governor's Institute has been asked to develop and implement training for clinicians. This 2-year project, funded by the Kate B. Reynolds Charitable Trust and the North Carolina Office of Rural Health and Community Care, will be the largest training initiative ever implemented in this clinical area in North Carolina. In collaboration with the North Carolina Academy of Family Physicians, 40 training sessions will be provided for approximately 2,500–3,000 clinicians, and ongoing site-specific case-discussion conferences will be facilitated. The trainings will cover the multidimensional character of chronic pain; the role of opioids in safe and effective management of chronic pain; screening and risk stratification to minimize misuse or abuse; intervening if or when misuse occurs; and networking with local pain management and behavioral health experts.

Ancillary materials for this project will be posted on a Governor's Institute–sponsored Web page that is devoted to providing substance abuse resources for health care providers (http://www.sa4docs.org/). This Web page provides training updates and links to other clinical resources, and last year it was visited by 12,805 unique visitors—not only from North Carolina but also from 49 other states and 17 countries. NCMJ

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high, moderate, or low risk, which can help to guide management. High-risk patients and those who have significant psychiatric comorbidities or a history of drug abuse should be managed only by providers who have experience treating this population, and comanagement with a psychiatrist or an addiction specialist is strongly recommended [7].

Patients should give informed consent before opioid treatment is initiated. Adverse effects of opioids are common, and providers should develop a plan for dealing with these issues before starting opioid treatment. Nausea can affect up to 25% of patients but typically resolves with time; if treatment of nausea proves necessary, antihistamines or metoclopramide can often provide relief [9]. Constipation should be prevented with stool softeners and a stimulant laxative. Cognitive impairment and sedation are major risks when starting treatment with opioids, when the dosage is being increased, or when opioids are being taken with other sedating substances (such as alcohol). Patients should be instructed not to drive when they are feeling impaired [7]. The risk of respiratory depression is much higher when a patient's dosage is increased or when an opioid is combined with another drug, such as a benzodiazepine. Patients also need to be aware of the risks of physical dependence and withdrawal before starting opioid therapy.

Expectations should be clearly agreed upon at the start of opioid therapy, and patients need to understand that total pain relief with opioids is not a realistic goal. The average benefit with opioid therapy is a reduction of 2 or 3 points on a 10-point pain scale [7]. A reasonable expectation is that a successful opioid trial will result in a 30% reduction in pain or a 30% improvement in function [8].

Treatment agreements or pain contracts can be used to document informed consent and expectations. There is fair evidence that treatment agreements may improve compliance [8]. These agreements also set expectations for random urine drug screening, pill counts, and avoidance of excessive

TABLE 2.
Guidelines for Monitoring Patients Who Are Receiving Long-Term Therapy for Chronic Noncancer Pain

■ For patients at low risk of misusing opioids:
● Urine drug screening should be performed every 1–2 years.
● The NCCSRS should be checked twice per year.
● A daily MED of 50 mg or more can be used if necessary.
■ For patients at medium risk of misusing opioids:
● Urine drug screening should be performed every 6–12 months.
● The NCCSRS should be checked 3 times per year.
● A daily MED of 50 mg or more can be used occasionally.
■ For patients at high risk of misusing opioids:
● Comanagement of care with a psychiatrist or an addiction specialist is highly recommended and is likely to be necessary.
● Urine drug screening should be performed every 3–6 months.
● The NCCSRS should be checked 4 times per year.
● Opioids should be avoided if possible, or used at a daily MED of 10 mg or less.
● Dose escalations should be avoided.
Any patient receiving long-term opioid therapy who displays aberrant behaviors should be counseled, and opioid therapy should be reconsidered.

Note. MED, morphine-equivalent dose; NCCSRS, North Carolina Controlled Substances Reporting System.
Source: Guidelines are from [1].

alcohol consumption, and they establish the consequences if a prescription is lost or stolen. Examples of such agreements can be found on the CCNC Web page cited previously and on the Web site of the Washington State Department of Labor & Industries (http://www.lni.wa.gov/ClaimsIns/Files/OMD/agreement.pdf).

The North Carolina Controlled Substances Reporting System (NCCSRS) is a superb resource, and it should be accessed prior to prescribing opioids for any patient. [Editor's note: For more information on the NCCSRS, please refer to the commentary by Bronson on pages 249-253.] Using the NCCSRS, providers can learn where in North Carolina and when patients have filled prescriptions for a controlled substance. Currently 43 other states also have prescription monitoring programs, and work is progressing to link these systems. Prescription monitoring programs can reduce doctor shopping and prescription drug abuse [8]. More information on accessing the NCCSRS can be found at http://www.ncdhhs.gov/mhddsas/controlledsubstance/implementation-guide2-11.pdf. Unfortunately, prescription monitoring programs are grossly underutilized [1].

Urine drug screening should be conducted for every patient who is receiving long-term opioid therapy [8]. However, the results of such screening should be interpreted in the context of the patient's behavior and overall compliance [7]. Unexpected positive results should be confirmed by more specific means such as gas chromatography–mass spectrometry. False-negative results are also possible. If an opioid is present at a concentration lower than the laboratory's threshold value, then a negative result will be reported. In addition, some assays do not detect oxycodone, fentanyl, or methadone; these tests may need to be requested specifically. The numerous available assays each have variable test characteristics that are not equivalent across all drug classes. For example, pseudoephedrine not infrequently results in a false-positive result on an amphetamine screening test, whereas a positive result when testing for cocaine is much more specific. Consultation with the laboratory can be helpful in these cases.

Opioid selection is primarily based on cost, side effects, and patient comorbidities. There is no evidence to suggest that one opioid is better than another, nor is there evidence that long-acting opioids are any better or any worse than short-acting opioids for relieving chronic noncancer pain [7]. In particular, there is no compelling evidence to support prescribing both a long-acting opioid plus a short-acting opioid for "breakthrough pain" [7]. If a patient's pain is well controlled by a short-acting medication that is taken 4 times a day, then there is no reason to change that regimen [10].

The use of methadone to treat chronic noncancer pain has been increasing, perhaps because of the low cost of such therapy [11]. This trend is a cause for concern given the specific risks associated with methadone therapy. The long and variable half-life of methadone makes titration difficult, and methadone therapy is associated with a significant risk that the patient's corrected Q-T (QTc) interval will be prolonged. Thus, I feel methadone should be a medication of last resort. Patients who require a trial of methadone can start therapy at a dosage of 2.5 mg orally every 8 hours. Dosage increases should occur no more frequently than once per week [7]. Even if a patient has been taking high doses of other opioids, the starting dose of methadone should be no higher than 30–40 mg per day [7]. An electrocardiogram should be performed to monitor the QTc interval prior to starting methadone therapy, again after 1 month of therapy, and then yearly while therapy continues. Providers should avoid prescribing other medications that prolong the QTc interval and should increase electrocardiogram monitoring if necessary. Methadone should not be used to treat breakthrough pain, nor should it be used on an as-needed basis [7].

Given the well-established risks of opioids, use of high-dose opioid therapy should be reconsidered. Good evidence shows that dose limits are associated with a reduction in the total daily dosage of opioids and with a reduction in the number of deaths due to opioid overdose [8]. Multiple guidelines support opioid dosage limits, but they do not necessarily agree on what the upper limit should be [8]. According to guidelines from the ASIPP, patients who do not experience a response to low-dose opioid therapy (a daily MED up to 40 mg) or moderate-dose therapy (a daily MED of 40–90 mg) are unlikely to respond to higher doses of opioids [8]. Patients who require high doses of opioids (a daily MED of 100 mg or more) should be re-evaluated to determine the cause of their pain, and providers should evaluate adherence to the treatment plan, consider the use of more frequent

monitoring, and possibly refer the patient to a pain specialist [7, 8]. Several studies have shown that some patients who experience severe pain despite receiving high doses of opioids actually achieve improvement of pain and mood with a decrease in dosage [8].

A patient's opioid dose should be tapered off if the patient experiences intolerable adverse effects, fails to progress toward treatment goals, and/or shows signs of repeated aberrant behavior [7]. According to the ASIPP, "minimal requirements for continued opioid therapy are analgesia of at least 30%, and/or activity improvement of 30% without misuse/abuse, or major adverse effects" [8].

Opioid withdrawal is very unpleasant but is not life threatening. To decrease the symptoms of withdrawal, the total opioid dose can be decreased by 10% of the original dose weekly [8]. However, some patients can tolerate more rapid tapering. Importantly, therapy does not need to be tapered if patients have not been taking opioids for more than 3 months nor if they have been diverting medications. Symptoms of withdrawal (abstinence syndrome) can be managed with clonidine: 0.1–0.2 mg can be taken orally every 6 hours, or a 0.1-mg transdermal patch can be applied weekly. Patients should be monitored for hypotension while they are taking clonidine [8]. If patients develop withdrawal symptoms during tapering, treatment with clonidine, sedating antidepressants such as trazodone, and nonsteroidal anti-inflammatory medications is preferable to using benzodiazepines [8]. The speed of tapering can be adjusted for the individual patient, but patients who do not comply with the tapering regimen or who abuse their medication should be referred for detoxification [8].

Addiction resources should be offered to all patients who exhibit aberrant behavior such as using unprescribed opioids, using cocaine, altering prescriptions, harassing members of the physician's staff, requesting multiple early refills, or losing prescriptions [7]. Patients with dependency can be offered office-based treatment with buprenorphine/naloxone (Suboxone, Reckitt Benckiser Pharmaceuticals Inc.), which is a reasonable alternative to methadone maintenance therapy for some patients. Primary care providers can offer this treatment if they have obtained special training and have been granted a waiver by the Drug Enforcement Administration. More information can be found at http://www.pcssb.org/.

Treatment of chronic noncancer pain is complex and involves numerous aspects of the patient's life; in these respects chronic pain resembles other chronic diseases that are treated by primary care physicians. The Institute of Medicine of the National Academies notes that all patients who are being treated for pain, including those who are being seen by a pain specialist, can benefit from having a primary care practitioner (or a medical home) to help coordinate care from various providers [3]. Coordination of care is essential, because a simple medical model in which a physician attempts to cure the disease does not work for chronic noncancer pain. A chronic disease model—including risk assessment, a team approach, patient self-management, and care coordination across specialties—will benefit all patients with chronic noncancer pain, whether or not they are being treated with opioids. NCMJ

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The Chronic Pain Initiative and Community Care of North Carolina

Michael Lancaster, Jerry McKee, Amelia Mahan

The rate of unintentional deaths from opioid poisoning has reached epidemic proportions. One model of successful intervention is Project Lazarus, an integrated-care pilot program in Wilkes County, North Carolina. Community Care of North Carolina, supported by a grant of $1.3 million from the Kate B. Reynolds Charitable Trust and matching funds of $1.3 million from the North Carolina Office of Rural Health and Community Care, is now expanding the Project Lazarus approach statewide.

The number of filled prescriptions for opioid analgesics has increased dramatically in the United States. From 1997 to 2007, for example, per-capita sales of opioids increased 402% [1]. With 10.12 deaths per 100,000 residents in 2010, North Carolina ranked 26th among all the states in the country in terms of deaths by unintentional poisoning (a category that includes but is not limited to deaths due to drug overdose) [2]. The Centers for Disease Control and Prevention (CDC) and the White House's Office of National Drug Control Policy have declared prescription drug overdose deaths to be an "epidemic" [3, 4]. This problem is reflected in North Carolina's emergency departments, which are increasingly seeing patients seeking prescriptions for opioids; in primary care practices, where both the number of prescriptions being written for opioids and the dosages of those prescriptions are increasing; and in communities, where the problems associated with misuse of opioids affect all socioeconomic strata [5, 6].

Emerging evidence suggests that many chronic pain conditions—such as degenerative joint disease, bulging discs, and other chronic lower back or musculoskeletal problems—may often be addressed more effectively and more safely with nonopioid pharmacotherapy. [Editor's note: For more information on nonopioid medications, please see the commentary by Laguerre on pages 209-214.] When indicated, reasonable alternatives or adjuncts to medication include physical therapy, occupational therapy, chiropractic care, acupuncture, weight reduction, meditative practices, cognitive reframing, and cognitive behavioral therapy. In addition, treating underlying mental illness, teaching coping strategies, and encouraging proper nutrition, exercise, and improved sleep hygiene have all been shown to improve chronic pain management.

The Project Lazarus: Chronic Pain Initiative (CPI), led by Community Care of North Carolina (CCNC), is a statewide program that is patterned after a successful pilot project conducted in Wilkes County, which in 2007 had the third-highest per-capita overdose rate in the nation [7]. This single-county pilot initiative was launched in 2008 and involved the combined efforts of Northwest Community Care (the local CCNC network in Wilkes County), the initial Project Lazarus (a community-based overdose prevention program), local hospitals, health care providers, and professionals from the fields of education, law enforcement, and public health. Thanks to the work of this coalition, the number of overdose deaths in Wilkes Country (defined as the death of a county resident due to overdose of a opioid obtained from a provider within the county) decreased 69% between 2009 and 2011 [8]. In 2011, there were no such overdose deaths reported for Wilkes County.

Like the Wilkes County model, the statewide CPI has 3 components. The first is community engagement, under the guidance of Project Lazarus. The second component consists of specific clinical elements: those described in the CPI tool kits developed for emergency department personnel and primary care clinicians, which align these providers with the pharmacist community; the physician mentoring and opioid prescription training that is being provided by the Governor's Institute on Substance Abuse; and the care management that the CCNC networks provide for patients. The third component consists of outcome measures determined and measured by the Injury Prevention Research Center at the University of North Carolina at Chapel Hill.

The CPI, which began in early 2012, is unique in that its 3 components address not only complex clinical issues involved in the prescription of opioid medications but also the need for the community to be actively engaged in what is both a clinical problem and a community-based public health problem. The CPI recently received a grant of $1.3 million from the Kate B. Reynolds Charitable Trust,

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which is being matched by funding from the North Carolina Office of Rural Health and Community Care. This funding will facilitate the expansion of the initiative throughout the state by underwriting training in evidence-based approaches to pain management and the development of clinical and community coalitions.

Community Coalition Building

The Project Lazarus experience in Wilkes County demonstrated the power and impact of local community coalitions, particularly those that are led by a motivated leader or champion [8]. In general, such coalitions are made up of community partners including clinicians, parents, health officials, faith community representatives, school officials, and law enforcement professionals. Local coalitions are involved in developing the specifics of the overdose prevention interventions for their area. Project Lazarus provides support to allow the coalitions to design and implement these interventions; this support may involve strategic planning, securing funding, allocating resources, carrying out community awareness campaigns, and/or choosing a specific set of interventions that are appropriate for the community.

Broad engagement of community stakeholders, which is essential to helping individual communities take responsibility for their own health, sets the Project Lazarus model apart from other such efforts. This comprehensive approach sets the stage for societal and cultural change. Experience has shown that lasting change entails repetitive reinforcement within one generation in order to have a positive effect on subsequent generations [9].

CCNC Infrastructure and CPI Coordinators

CCNC has a statewide infrastructure consisting of 14 networks with more than 600 care managers and more than 5,000 primary care providers. This infrastructure has supported the chronic disease management programs for asthma, diabetes, congestive heart failure, and chronic obstructive pulmonary disease that have been a successful part of CCNC for many years. Over the past 2 years, an integrated care model has been added, which includes full-time behavioral health coordinators and part-time psychiatrists located in each network. Each of the 14 networks has designated a CPI coordinator to serve as the CPI champion, to act as a facilitator, and to train participating sites on ways to increase awareness of the problem, on the status of the CPI, and on the availability of various resources. The actual clinical training is delivered by clinical resource experts from the Governor's Institute on Substance Abuse. Other tasks of the CPI coordinator include working with emergency departments to accomplish policy changes and to encourage the use of the CCNC Provider Portal (to access information about Medicaid-enrolled patients) and the North Carolina Controlled Substances Reporting System; visiting primary care practices to discuss specific chronic pain cases, using the tool kit for primary care physicians as a starting point; and serving as a community liaison by developing county resource lists for pain management and substance abuse services and, in some instances, by providing care management for patients who are identified through the initiative.

CPI tool kits are available for care managers, emergency department physicians, and primary care physicians (these can be downloaded at http://www.p4communitycare.org/media/related-downloads/cpi-toolkit-care-manager.pdf, http://www.p4communitycare.org/media/related-downloads/cpi-toolkit-eds.pdf, and http://www.p4communitycare.org/media/related-downloads/cpi-toolkit-pcps.pdf, respectively). The tool kits contain the basic training guidelines for all of CCNC's CPI efforts across the state. The CCNC networks have edited and enhanced the tool kits as their local needs and resources have required.

An enhancement has also been made to CCNC's Provider Portal, which now allows pain agreements to be uploaded. A goal of the CPI is to have a signed pain agreement for every Medicaid patient who receives treatment with opioids and who has been clinically evaluated and determined to benefit from such an agreement; once that agreement has been uploaded into the Provider Portal, it will be available to all providers working with the patient, allowing for consistency of treatment and an immediate response to the patient's needs.

Another use of technology is the development of a Chronic Pain Indicator, which is based on an algorithm that uses Medicaid claims data; this indicator can be used to identify patients who are at risk of becoming (or already are) high utilizers of chronic pain management services. This allows for proactive management of the care of these individuals to ensure that they are linked to appropriate assessments (either pain assessments or substance abuse assessments). Referrals for care management can come from other sources as well.

With the introduction of grant funding, CCNC is adding a statewide project coordinator and facilitator to oversee all aspects of the CPI. This individual will be responsible for conducting regular meetings with the leaders of stakeholder organizations, overseeing and supporting the network CPI coordinators, conducting regular reviews of scheduled trainings and coalition meetings, and tracking the progress of the initiative. The project coordinator will be in a position to oversee activities relating to all 3 components of the initiative—community engagement, clinical training, and outcomes assessment—and thus to assure effective coordination across the initiative and across the state.

A CPI Stakeholder Advisory Board, consisting of representatives from clinical and professional associations across the state, was created so that members could coordinate efforts within their respective groups to support the CPI and to advise CCNC regarding specific interventions or directions for the initiative to explore. Meetings of this active

group have been well attended, and subgroups have already formed to address specific tasks (such as evaluating guidelines for pain clinics and developing the best models of pain management for specific types of pain).

The strength of CCNC lies in its statewide infrastructure, which allows programs such as the CPI to be consistently implemented and supported, while preserving the sensitivity to local needs and variations that makes each program successful. While the CPI has certain overarching goals and offers central office support, there is local autonomy in how these goals are achieved. Each CCNC network has developed its own plan for implementing the CPI, based on existing resources and funding. Although most CCNC networks include multiple counties, the CPI is a county-based initiative, because local and community resources—such as health departments, sheriff departments, school systems, and hospitals—are primarily county-based. Given this county-focused implementation, particular attention and support (both financial support and human resources) will need to be devoted to addressing the needs of underserved counties. The Kate B. Reynolds Charitable Trust grant and the matching funds from the North Carolina Office of Rural Health and Community Care will make it possible for support to be available for every county in the state. The workforce available to support this implementation consists of the CCNC central office behavioral health team, CCNC network resources (behavioral health coordinators, CPI coordinators, network psychiatrists, and network pharmacists), and the CCNC care managers who have regular contact with each practice. The ability to take this initiative statewide and to inculcate it as part of CCNC health care practices is a truly unique opportunity facilitated by the CCNC infrastructure.

The Impact of Clinician Training on the Current Model of Care

The Governor's Institute on Substance Abuse is partnering with CCNC to provide local trainings for clinical staff in order to teach strategies for safe and effective management of chronic pain. [Editor's note: For more information on this training, please refer to the sidebar by Finch and McEwen on pages 233-234.] These trainings will include a Continuing Medical Education–accredited launch event that will be widely promoted through professional and community groups and will aim to reach a range of health care providers, including emergency department physicians, primary care physicians, community pharmacists, and dentists. The curriculum will facilitate the acquisition, application, and maintenance of rational, low-risk prescribing practices for the treatment of chronic pain in order to reduce the risks of medication misuse, addiction, diversion, and death. CCNC Behavioral Health Program Director Michael Lancaster is collaborating with Jim Finch (a nationally recognized expert on addiction medicine, physician education, and curriculum development) to develop a training curriculum that will be presented in conjunction with CPI tool kits to physicians and other health care providers throughout the state. Finch, who is also Director of Physician Education at the Governor's Institute on Substance Abuse, will identify and work with approximately 6–8 physicians who will serve as regional experts, lead the training events, and deliver the follow-up coaching and mentoring.

There is evidence that positive changes in physician behavior can be achieved by providing coaching and mentoring within a "systems approach," central elements of which are teaching, follow up, and ongoing support; there is also evidence that an academic detailing approach (which involves face-to-face noncommercial education by trained health care professionals) works well in the practice setting [9, 10]. Recent studies have looked at the core competencies that primary care physicians need in order to effectively screen patients for needed interventions (or appropriate referrals) for mental health support, substance abuse treatment, or pain specialist support, and data regarding these core competencies will be used in the development of the training curriculum [11]. A recent study specifically looking at opioid prescribing [12] showed better outcomes for approaches that pair didactic methods of knowledge acquisition with access to pain management and behavioral health consultation.

Practitioners will be provided with ongoing physician-to-physician support from regional experts who will assist with skills acquisition and will provide mentoring and support during clinical implementation. This mentoring may include case conferencing, assistance in using the suggested tools (such as the CPI tool kits, the Opioid Risk Tool, and the North Carolina Controlled Substances Reporting System), or help in locating a physician who can prescribe buprenorphine. Clinical concerns will be addressed as they arise. Chronic pain management, opioid prescribing, and opioid safety are currently issues of state and national significance, and numerous clinicians, pharmacists, and health department officials are actively seeking help with these issues. The demand for such assistance grows daily.

This comprehensive approach will reduce confusion and increase synergy. Presently, physicians are understandably confused as a result of the multitude of competing initiatives, coalitions, and freestanding training programs that aim to address safer opioid prescribing and chronic pain management. The CPI will seek to solve this problem by developing a highly visible, comprehensive, statewide infrastructure and by adopting an inclusive approach so that individual groups and communities can benefit from the experience of existing programs and available resources. As the project rolls out across the state, previously unmotivated communities are expected to welcome assistance, either because they see how outcomes have improved in counties where the CPI has already been implemented, or because their community's opioid problems are exacerbated when neighboring counties begin to get on board with the CPI.

TABLE 1.
Outcome Measures That Will Be Used to Assess the Effectiveness of the Chronic Pain Initiative

Outcome measure	Source of data
Implementation of intervention components and strategies by participating community-based drug prevention coalitions	Logs submitted by leaders of community coalitions and CPI regional leaders; annual survey of health directors
Prescriber registration with and utilization of the NCCSRS[a]	NCCSRS
Access to substance abuse treatment	NCCSRS
Prescriptions of high-level opioids[b]	NCCSRS and CCNC patient records
Prescriptions of low-level or medium-level opioids to Medicaid patients diagnosed with chronic pain[b]	CCNC patient records
Emergency department visits attributable to opioid overdoses	NC DETECT[c]
Opioid-related unintentional poisoning mortality rates	OCME, NCSCHS[d]
Patient satisfaction with care for chronic noncancer pain	Longitudinal sample of CCNC patients with chronic noncancer pain

Note. CCNC, Community Care of North Carolina; CPI, Chronic Pain Initiative; NC DETECT, North Carolina Disease Event Tracking and Epidemiologic Collection Tool; NCCSRS, North Carolina Controlled Substances Reporting System; NCSCHS, North Carolina State Center for Health Statistics; OCME, Office of the Chief Medical Examiner.
[a]The NCCSRS is a statewide electronic program that monitors all controlled substance prescriptions dispensed across the state, irrespective of payment source or provider.
[b]The categorization of opioids as low-level, medium-level, or high-level is based on the particular medication or prescription, the dosage (measured in morphine equivalents per day), and the level of abuse risk.
[c]NC DETECT was created by the North Carolina Division of Public Health to address the need for early event detection and surveillance using timely electronic data from a variety of sources. It includes electronic data from the state's 114 hospital-affiliated acute care emergency departments. De-identified data become available for research 3 months after the close of the month. Data elements used will include date and time of visit and patient's county of residence, age, sex, final diagnosis codes, and discharge disposition. Drug-related ED visits are defined using ICD-9-CM final diagnosis codes.
[d]Each poisoning death in North Carolina triggers a medical examiner death certificate, which lists the cause(s) of death and is submitted by the OCME to the NCSCHS. Annual data from the NCSCHS are typically unavailable for research and monitoring purposes for at least 9 months following their submission. However, CCNC is in the process of training medical examiners to notify the health department's statistician immediately upon the occurrence of an overdose event. These events will then be provided directly to CCNC, which will in turn provide them to the Chronic Pain Initiative.

Evaluation and Outcomes

Ongoing assessment and evaluation of the CPI process, assimilation of feedback, and dissemination of outcomes to stakeholders are critical to the success of the initiative. Each participating community-based coalition will receive periodic data for the county or counties in its catchment area relating to the particular objectives on which the coalition is focused, as well as benchmark data that can be used to measure progress. A brief explanation of the sources of these data can be found in the footnotes for Table 1.

Conclusion

CCNC believes that making enduring changes in clinical practice is challenging but possible. Physicians' opioid-prescribing practices and patients' expectations regarding what constitutes appropriate management of chronic pain can be successfully modified. To be successful, the initiative will need to make necessary adaptations in practice settings and health care systems, to gather and follow process and outcomes measures, and to provide ongoing support so that new behaviors can be sustained. CCNC and its CPI partners believe that this challenge must be met for the sake of the health of North Carolina's citizens. NCMJ

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Challenges of Chronic Pain Management:
Public Health Consequences and Considered Responses

James W. Finch

This article reviews the public health consequences of current approaches to chronic pain management, particularly those related to prescription of opioid analgesics and other controlled medications. This article also reviews factors contributing to these negative trends and discusses potential strategies for reversing them.

Prescribing rates for opioid medications have risen dramatically over the past 15 years, doubling or even quadrupling depending on the particular analgesic. The total amount of opioids prescribed in the United States measured in morphine-equivalent doses (MEDs) increased more than 600% between 1997 and 2007 [1], and more than 200 million opioid prescriptions are now written every year. With the increased availability of opioids, diversion of these medications to nonmedical use has also increased. In 2010 more than 12 million individuals in the United States were estimated to have used opioid analgesics nonmedically during the previous year, and approximately 1.8 million people had abused or had been dependent on these drugs [2]. As a consequence of this trend, health care providers in clinical practice are more commonly observing medical and traumatic complications of opioid use. Between 2004 and 2010, the number of emergency department visits for hydrocodone misuse or abuse more than doubled, and the number of visits related to oxycodone tripled [3].

Accidental overdose deaths underscore the seriousness of this problem. Nationally, the rate of unintentional deaths due to prescription drug overdoses has nearly tripled over the past 10 years [1]. In 2010 approximately 16,000 overdose deaths were attributed to prescription opioids, while only 2,000 were related to heroin [2]. While opioids are the primary cause for concern, other controlled medications also have potentially serious overdose risks. In 2010 there were almost 400,000 emergency department visits and approximately 6,000 overdose deaths involving benzodiazepines [2]. Nationally, deaths due to drug poisoning are now the primary cause of accidental deaths, exceeding traffic fatalities [2, 4]. The North Carolina Office of the Chief Medical Examiner reports that deaths due to overdoses of controlled medications—primarily opioid analgesics—have more than doubled over the past 10 years in North Carolina, with almost 900 such deaths reported in 2011 (William Bronson, written communication).

These numbers provide only a broad outline of the more obvious public health consequences of opioid misuse. Mean annual direct health care costs are nearly 8.7 times higher for individuals who abuse these medications than for those who do not [5]. Along with these economic effects on individuals, there are also incalculable emotional consequences for families and communities. Prescription medications, primarily opioid analgesics and benzodiazepines, have surpassed marijuana to become the new gateway drugs—the first illicit drugs used by teenagers [6]—which hints at their broad impact and foreshadows the continuation of this societal and clinical problem for many years to come.

An Evolving Standard of Care

Each year, a large majority of the global supply of opioid analgesics is consumed in the United States, including more than 80% of the global opioid supply and 99% of the global supply of hydrocodone [7]. This imbalance reflects sociocultural and economic factors as well as clinical standards. Therapeutic decisions, including the decision to prescribe opioids, are based not only on the clinician's knowledge base but also on patient preference, availability of nonmedical treatment modalities, complexities and biases in third-party reimbursement, aggressive pharmaceutical marketing, and medicolegal concerns. These and other factors have tended to skew the standard of care in the United States toward an overreliance on opioids for long-term management of chronic pain.

Viewed in a historical context, the standard of care for the management of chronic noncancer pain has changed dramatically over the past 20 years. The United States has long had high rates of chronic pain and associated suffering, disability, and impaired quality of life. Approximately 15–20 years ago, physicians were seen as being unresponsive to this pressing clinical need, and they were accused of ignoring pain or treating it inadequately [8]. At that time a concerted effort was made to respond to this unmet need with educational and regulatory initiatives, such as

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Prescription Drug Overdose and Misuse:
Data from Carolinas Poison Center

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Carolinas Poison Center is a telephone resource center that provides confidential triage, information, and management advice to a wide spectrum of callers in North Carolina. As a result of these calls, Carolinas Poison Center has a dataset of self-reported information from the public and medical information from health care providers about the substances involved in poisonings, their clinical effects, and the management of these cases. The calls can relate to anything that causes toxicity—including medications, illicit drugs, chemicals, gases, venoms, and plants.

A widely held perception is that Carolinas Poison Center receives calls mainly from parents of small children who are exposed to toxic substances in the home. Although children younger than 6 years of age do account for just under half of calls related to human exposures, the most complicated poisoning cases involve adults who have been exposed to multiple drugs, and opioids are increasingly involved in these latter cases.

In calendar years 2011 and 2012, Carolinas Poison Center handled 98,115 calls involving humans who were exposed to prescription or nonprescription pharmaceutical substances. The top 5 categories of such agents were analgesics; sedatives, hypnotics, and antipsychotics; cardiovascular drugs; antidepressants; and antihistamines. Prescription pain medications containing opioids, either alone or in combination with acetaminophen or salicylates, accounted for 6,137 of these calls, representing 29.8% of all calls regarding human exposure to analgesic medications. The top 3 opioids implicated in these cases were (in rank order) hydrocodone, oxycodone, and tramadol.

In the majority of the prescription pain medication cases reported to Carolinas Poison Center, the involved individual underwent treatment in a health care facility; naloxone was administered in 22.0% of these cases. Of the cases managed in a health care facility that involved opioids only (without acetaminophen or aspirin), 7.6% had an outcome of death and/or major effects, such as respiratory depression, and/or moderate effects that responded rapidly to therapy, such as hypotension. Only 32.5% of prescription pain medication cases were managed at the site of the caller, outside a health care facility.

The increased use of extended-release products, long-acting substances such as methadone, and partial agonist/antagonists such as buprenorphine can make management of opioid-related poisonings difficult. Even when naloxone is administered, the duration of action of the opioid is often much longer than that of naloxone, which necessitates longer observation times and possibly additional doses or continuous infusions of naloxone. Health care providers must also monitor for nonopioid effects of these agents. Carolinas Poison Center staff members assist health care providers with management recommendations and monitoring advice.

In addition to providing services to the general public, health care providers, law enforcement professionals, schools, and other agencies, Carolinas Poison Center also engages in research and awareness campaigns to help prevent poisoning injuries. For example, Carolinas Poison Center is currently working with the Injury Prevention Research Center at the University of North Carolina at Chapel Hill to study the effectiveness of a care coordination program to prevent prescription drug overdoses. This randomized controlled trial will evaluate the efficacy of a care coordination plan for patients who have made numerous visits to 13 emergency departments for treatment of chronic, subjective pain that is not associated with cancer or sickle-cell disease. This study is being conducted in conjunction with the Centers for Disease Control and Prevention.

Finally, Carolinas Poison Center is also conducting a campaign aimed at reducing the misuse and abuse of prescription medications by teenagers. This campaign, which debuted in April 2013, was created with the assistance of teen focus groups. It primarily targets middle school students, who are deemed to be most open to awareness outreach, but it will also be used in high schools. NCMJ

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the "pain as the fifth vital sign" campaign. In addition, the Model Policy for the Use of Controlled Substances for the Treatment of Pain was developed by the Federation of State Medical Boards in an attempt to alleviate physicians' concerns about regulatory oversight [8].

Clinical practice subsequently shifted to include more widespread use of opioid analgesics. Previously opioids had typically been used only for acute, time-limited pain. Successful use of opioids for chronic cancer-related pain led to increasing use of these drugs to treat chronic noncancer pain as well. Although well intended, this expansion in the use of opioids was made without adequate attention to

potential risks and despite the paucity of clinical research supporting such a change [9].

There is now a need for a more balanced, evidence-based standard of care for management of chronic pain—one that assures access to needed treatment while minimizing the potential for overuse and abuse of medications. This effort will require paying attention to 2 parallel, overlapping imperatives. First, there is a need for training in effective, multidimensional pain management strategies with a more proscribed role for opioids, particularly high-dose opioids. Second, new standards of care will need to define and apply safer prescribing practices through adequate risk stratification, appropriate treatment planning, and conscientious monitoring.

Training Needs

US medical schools report devoting an average of only 9 hours of curricular time to pain, and a majority of primary care physicians report that they do not feel confident about managing chronic pain [10]. There is thus a clear need for more education on topics such as how to differentiate categories of pain (such as nociceptive, inflammatory, and neuropathic pain), how to identify which treatment modalities are likely to be effective for these types of pain, and how to determine when pain is likely to be responsive to opioids. Currently, most clinical protocols list opioids as indicated for moderate to severe pain, and they state that these drugs are to be used only after other modalities have proven inadequate [11]. Yet primary care clinicians and specialists at times use opioids as first-line treatment for a broad range of chronic pain syndromes.

Dosing is another important area in which training is needed. Specific topics that should be addressed include safe and effective dose initiation and titration; when and how to use different opioids, including short-acting and long-acting formulations; how to establish when an adequate dose has been reached; and when and how to stop prescribing opioids. Achieving the optimal dose for each patient is particularly important because there is an escalation in risk with increasing dosages of opioids. In a study of opioid overdoses among patients with chronic noncancer pain [12], the hazard ratio for serious overdose events was 1.0 at a daily MED up to 20 mg, 3.11 at a daily MED of 50–99 mg, and 11.18 at a daily MED of 100 mg or greater. Clinicians also need to know what constitutes an adequate trial of opioid therapy. When faced with complaints of inadequate pain management or requests for higher doses, the clinician may decide—rather than increasing the dose—to discontinue opioid therapy, rotate among opioids, or use these drugs with greater attention to other pharmacologic or behavioral interventions.

More broadly, a recent Institute of Medicine report, *Relieving Pain in America* [13], reinforced the importance of framing chronic pain as a unique chronic disease state with complex neurophysiological, emotional, and social components—all of which make its management quite distinct from that of acute pain. The "suffering" aspects of chronic pain require a different level of attention and intervention than that available through medications alone. Traumatic experiences, depression, changes in self-image, disruptions in employment and other social roles, stresses on family caregivers, and a host of other subtle aspects of chronic pain clearly point to the need for a biopsychosocial treatment model. Cognitive behavioral therapies and the development of coping skills have demonstrated effectiveness in pain management, and patients' motivation and engagement are important in establishing realistic goals for the management of their pain. A collaborative model of care is thus critically important to a successful outcome [13].

Implementing a Safer and More Balanced Approach to Prescribing

Many of the current proposals for adapting prescribing practices to minimize the potential for misuse and addiction are not really new. Rather, they reapply guidelines for conscientious medical practice to this particular clinical area [8, 14]. The emphasis is now on the need to apply these guidelines universally and to routinely use newer tools such as the North Carolina Controlled Substances Reporting System (NCCSRS) as part of ongoing risk assessment and monitoring [15]. Applying these strategies to all patients, regardless of age or other demographic characteristics, is crucial, as overdoses are not just occurring among young, naïve street addicts. One review [4] found that overdose rates in 2008 were actually highest among those 45–54 years of age, while those 15–24 years of age had some of the lowest reported overdose rates (25 deaths per 100,000 and 5 deaths per 100,000, respectively). Some guidelines also recommend wider use of abuse-resistant formulations of pain medications. Whether such formulations will have a significant impact on misuse and abuse is not yet clear; while they may indeed provide some added safety, they are no substitute for conscientious clinical care.

Most of the evolving protocols for safer prescribing share certain features, even if specific applications or tools vary [11, 16]. One important feature of these protocols is risk stratification. Specifically, deciding whether or how to use opioids should be dictated by risk assessment that is based not only on the patient's self-report but also on information obtained from prior clinicians or medical records, from the NCCSRS, and from the results of preliminary drug screening.

Treatment agreements are another common feature of prescribing protocols. These are written, signed agreements that educate the patient about risks, set realistic collaborative goals, and define the parameters for safe use that must be maintained in order for patients to have continued access to their medication [11, 17].

Ongoing monitoring is also commonly imposed. Treatment effectiveness should be determined by improvement in functionality and adequate pain management, not by pain eradication [18]. Safety is gauged through the absence

Prescription Drug Diversion:
A Law Enforcement Perspective

Donnie R. Varnell

The Diversion and Environmental Crimes Unit (DECU) of the North Carolina State Bureau of Investigation (SBI) is the only statewide law enforcement group that is dedicated to investigating all criminal violations involving prescription drugs and controlled substances, including the diversion of these substances. (Readers can learn more about the North Carolina SBI at http://www.ncdoj.gov/SBI.aspx.) This role gives DECU a unique perspective on the growing epidemic of prescription drug diversion, which affects not only the criminal justice system but also health care professionals and citizens.

For many years, hydrocodone was the most commonly diverted drug, and it continues to be one of the most popular medications among individuals who commit these violations. Over the past 2 years, however, oxycodone (in a 30-mg dose) has far surpassed all other prescription narcotics as the drug of choice among drug seekers and those who abuse prescription drugs. DECU has also witnessed a disturbing increase in the number of young people in the high school and college populations who buy, sell, and trade amphetamine/dextroamphetamine (a stimulant that is indicated for the treatment of attention deficit hyperactivity disorder). Finally, benzodiazepines such as alprazolam are frequently diverted by a wide range of individuals.

From 2004 to 2009, DECU saw a 400% increase in the total number of investigations of diversion; additionally, from 2010 to 2012, the number of investigations that involved health care professionals increased 35%. DECU's resources were nearly overwhelmed by the number of organized drug rings that used forged computer-generated prescriptions to obtain large amounts of controlled substances, and these drugs then quickly found their way onto the streets and into the hands of citizens. These highly profitable criminal groups, which operate in multiple jurisdictions, no longer need to "doctor shop" to obtain these powerful and addictive drugs; they only need to steal a prescriber's Drug Enforcement Administration (DEA) number and use it to produce fraudulent prescriptions. These groups normally consist of 10–30 members and fraudulently obtain more than 4,000 dosage units per week; this amount is easily worth more than $120,000 when sold on the street.

The consequences of diversion and subsequent investigations are often severe and can extend far beyond the individual who has committed the violation. A person who is found guilty of diverting a Schedule II drug will often be charged with and convicted of trafficking opium-based substances, and he or she may face several years of mandatory prison time. In addition to criminal penalties, having vast amounts of powerful and potentially deadly narcotics available for sale on the streets poses considerable dangers. DECU is now dealing with a 300% jump in the number of overdose deaths that are being investigated as homicides and manslaughter cases. Furthermore, my colleagues and I recently gave a presentation at a local high school that is suspending or charging 3 students per week due to violations involving the possession of prescription drugs at school.

DECU has often stated that arrests alone are not the solution to this problem. We know that we must use a multidisciplinary partnership to combat these trends. We are therefore working closely with regulatory groups such as the North Carolina Medical Board, the North Carolina Board of Nursing, and the North Carolina Board of Pharmacy in an effort to curtail this growing problem. DECU has given awareness training to more than 4,000 individuals over the past year and will continue to provide this service in the future.

We also advise citizens to take full advantage of medicine take-back programs, such as Operation Medicine Drop, in order to remove unused medications from their homes. Most young people who use prescription controlled substances obtain these drugs in their own home or in the home of a friend. Over the past 3 years, DECU, the DEA, and Safe Kids North Carolina have collected and destroyed more than 20 million dosage units of medication. In addition, we strongly suggest that health care professionals check their own prescription profiles in the North Carolina Controlled Substances Reporting System (NCCSRS). We have had several physicians check the NCCSRS and learn that someone had fraudulently written hundreds of controlled substance prescriptions using their DEA number.

Diversion of prescription drugs is undoubtedly the fastest growing and most severe drug problem in America today. Only by working together will we be able to combat these trends and better protect the citizens of North Carolina. NCMJ

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of impairment or aberrant behaviors, use of recurrent drug screening, and review of NCCSRS data.

Most protocols also call for adapting the treatment plan when necessary. Inadequate pain relief calls for reevaluation of multimodal treatment options and for active engagement with the patient, rather than simply an increase in dosage. Referrals for evaluation or additional treatment may also be indicated, particularly if higher doses are to be considered.

In addition, most safe-prescribing protocols recommend intervening when the patient's behaviors appear to be risky or aberrant. Further assessment is often required to determine what type of intervention is needed, after which clinicians may choose to increase their frequency of contact with the patient, discontinue refills, refer the patient for mental health or substance abuse evaluation, or discontinue the use of controlled substances.

Implementation of these recommendations will depend on how they are adapted to various primary care, specialty, or emergency settings. Methodologies must be time-efficient, take advantage of electronic medical records and other information system technologies, make use of personnel in team-based models, and link patients with available mental health and substance abuse services in the community.

Clinical Conundrums: Functional Addiction and Functional Dependency

One looming challenge is how to deal with the large number of individuals who are currently dependent on prescribed opioids, many of whom have been taking these drugs for long periods of time, sometimes at high dosages. This is generally a poorly delineated group: Some patients may still have severe pain that requires opioids at some dose. Others may be continuing opioid therapy primarily to avoid rebound pain or withdrawal. Many may be using opioids not to treat physical pain but to ameliorate emotional or situational distress, which is called "chemical coping." Finally, since many patients have not been monitored adequately for functionality, impairment, or aberrant behaviors, some patients may be "functional addicts"—people who are addicted but have not yet been identified as such—while other patients who show no evidence of impairment or aberrant behaviors could be referred to as "functionally dependent" rather than addicted. Patients in different categories will clearly require very different clinical approaches.

One obvious approach would be to try to decrease opioid doses to safer levels while attempting or reattempting a more multidimensional treatment approach. However, successfully transitioning these patients from opioid therapy to an alternative therapy—or even significantly lowering the dosage they are receiving—will likely be challenging. Long-term maintenance therapy with opioids induces a complex set of neuroadaptations, often making the opioid necessary for the individual to feel normal or at ease; thus it is difficult to decrease the patient's dosage or to discontinue therapy. Studies have shown that attempts to discontinue methadone after long-term maintenance therapy for opioid addiction have generally been unsuccessful. Even after prolonged periods of stability, up to 80% of these individuals return to opioid use after stopping methadone therapy [19]. Patients who are taking methadone for opioid addiction could be said to represent a very different clinical and demographic cohort than most other patients with chronic pain. However, studies of buprenorphine for the treatment of opioid dependence, which have been conducted in cohorts that overlap significantly with the population of chronic pain patients, show the same high tendency for relapse after discontinuation of buprenorphine therapy, even when the drug is tapered over a period of several months [20].

If chemical coping is involved, then decreasing or discontinuing opioid use is likely to be especially difficult, making the utilization of mental health services essential. Distress management and alternative coping skills are necessary for those who have become emotionally as well as physically dependent on opioids. Likewise, access to addiction services is critically important for patients who are at high risk for aberrant use, such as those with current or prior substance abuse problems or those who have demonstrated an inability to use opioids safely. In particular, access to buprenorphine or to a combination of buprenorphine and naloxone will likely improve addiction-related treatment outcomes, provide some analgesia if needed, and reduce addiction-related mortality [21]. In France, widespread use of medication-assisted therapy, primarily buprenorphine treatment, was found to be associated with an 80% decrease in overdose deaths from heroin or cocaine [22].

Ongoing Initiatives

Many medical practitioners, health care systems, regulatory boards, and medical societies are showing a great deal of initiative in responding to this public health challenge. The Federation of State Medical Boards is currently revising its guidelines for chronic pain management to balance access to care with safeguards to avoid misuse. Specialty societies and other organizations are also developing educational resources related to safe opioid prescribing. The American Academy of Family Practice and the American Society of Addiction Medicine have both been awarded grants to support the nationwide availability of free training regarding risk mitigation strategies, and physicians who attend this training can earn Continuing Medical Education credit. In North Carolina, the Governor's Institute on Substance Abuse has taken a lead role in making similar training available within the state. [Editor's note: For more information on the work of the Governor's Institute on Substance Abuse, please see the sidebar by Finch and McEwen on pages 233-234.]

An example of an innovative health systems approach to chronic pain management is the Chronic Pain Initiative of Community Care of North Carolina (CCNC). [Editor's note: Lancaster and colleagues discuss this initiative in more detail on pages 237-241.] Building on the successful com-

munitywide approach taken by Project Lazarus [23], CCNC is using its patient-centered medical homes and systems of care pathways to implement many of the recommendations outlined above. Using clinical training provided through the Governor's Institute, CCNC is working in collaboration with local pain, mental health, and substance abuse practitioners to change the standard of care for chronic pain management among its several thousand prescribers across the state.

Implementing more training in medical schools and residency programs will be essential for long-term change. Chronic pain management will continue to be a major clinical need, as a large cohort of patients are already dependent on these medications. Primary care specialists must continue to provide the majority of chronic pain management, but they will need the help of a broad range of specialists. There are not enough pain management or addiction medicine specialists to meet this need, so clinicians in all areas of medicine need to be informed and involved if the pendulum of care is to be pushed toward the common goal of available, effective, and safe management of chronic pain. NCMJ

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The North Carolina Controlled Substances Reporting System:
A Valuable Tool for Combating Prescription Drug Misuse

William D. Bronson

Prescription drug misuse is a growing problem that is resulting in increased morbidity and mortality throughout the United States. The North Carolina Controlled Substances Reporting System has proven to be an effective tool that allows health care providers to make more informed decisions when they prescribe or dispense controlled substances.

North Carolina, like the rest of the nation, has been experiencing significant problems related to the misuse and abuse of prescription controlled substances. These problems include what the Centers for Disease Control and Prevention (CDC) has termed an "epidemic" of deaths due to unintentional poisoning. In many states, unintentional poisoning deaths—the vast majority of which are caused by prescription controlled substances—have surpassed motor vehicle deaths as the state's leading cause of accidental death [1]. Although North Carolina has not reached this milestone, the state has experienced a 308% increase in unintentional poisoning deaths over the past 12 years; there were 1,140 such deaths in the state in 2011 [2]. Following a pattern seen in many mid-Atlantic and Northeastern states, such deaths first occurred in rural and mountainous areas of North Carolina but then gradually spread throughout the state (see Figure 1). Correspondingly, the number of unintentional deaths with a mention of a specific controlled substance as a contributing factor increased from approximately 240 deaths in 1999 (personal communication, Kay Sanford, MPH) to 888 deaths in 2011 (unpublished data)—a 270% increase.

According to the 2010 National Household Survey of Drug Use and Health (NSDUH), nonmedical use of pain relievers and prescription psychotherapeutic drugs has remained relatively constant since 2002 [3]. This would seem to imply that at least some of the observed deaths are due to licit rather than illicit drug use, meaning that persons with legal prescriptions for controlled substances are unintentionally dying from their use. Some of these deaths may be the result of ignoring instructions and overusing the medication; some may be the result of seeking relief from pain and/or anxiety through improper medication use; and many of these cases involve the concomitant use of alcohol or additional drugs of which prescribers were unaware.

Unintentional deaths appear to be only the tip of the iceberg. According to North Carolina's statewide syndromic surveillance system—the North Carolina Disease Event Tracking and Epidemiologic Detection Tool (NC DETECT)—benzodiazepine medications, followed by opioid analgesics, make up the largest percentage of drugs mentioned in emergency department admissions due to overdoses [4]. Four of the top 10 drugs mentioned in these emergency admissions are controlled substances [4]. According to CDC medical epidemiologist Leonard J. Paulozzi, the public health impact of this epidemic is such that, for each overdose death, there are at least 9 hospital admissions for substance abuse treatment, 35 emergency department admissions, 161 persons diagnosed with a substance use disorder, and 461 persons who are using a controlled substance nonmedically [5].

In response to this rising problem, the state implemented the North Carolina Controlled Substances Reporting System (NCCSRS) in 2007. This database is operated by the Division of Mental Health, Developmental Disabilities, and Substance Abuse Services (DMHDDSAS) of the North Carolina Department of Health and Human Services (DHHS). North Carolina law requires that all outpatient prescriptions for controlled substances be entered into this database within 7 days of being dispensed by a pharmacy. Persons who are authorized by federal law to prescribe a controlled substance can request 24-hour online access to the system, which allows them to see what other prescriptions a patient has received and thus make a more informed decision about the medication, dosage, and quantity to be prescribed. Dispensers can query the system to determine the safety and appropriateness of a prescription, and they can contact the prescribing practitioner to obtain confirmation, clarification, and/or consultation when questions arise. Prescribers and practitioners who are authorized to use the database can communicate with each other and document

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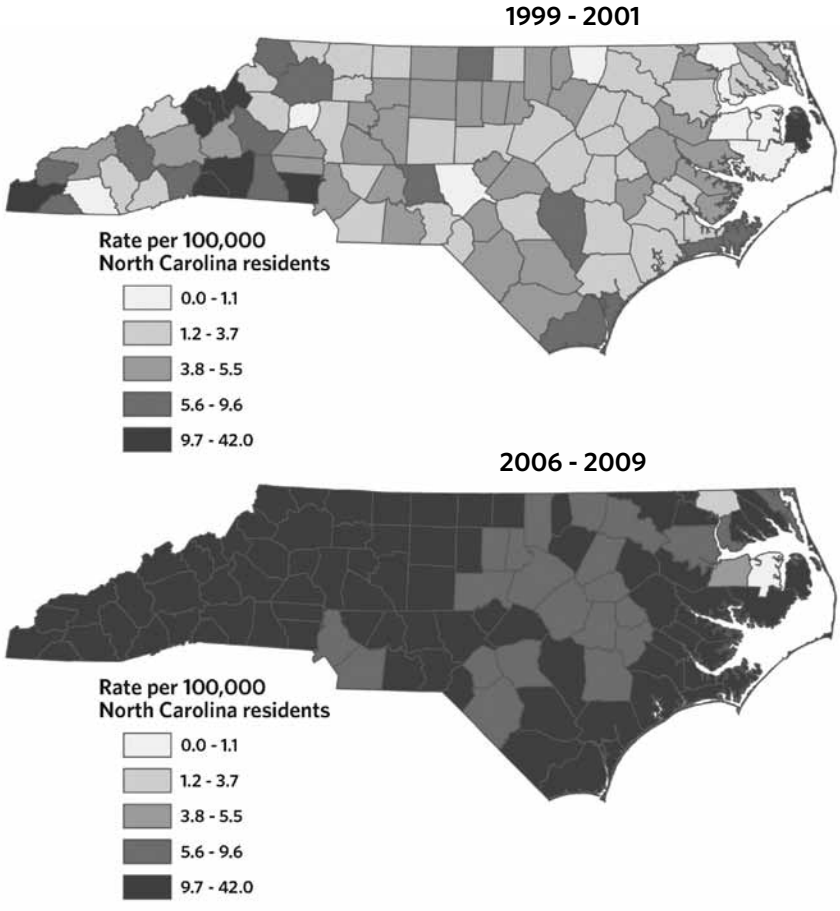
FIGURE 1.
Unintentional Deaths Due to Poisoning Across North Carolina Between 1999 and 2009



Note. Darker shading indicates a higher death rate per 100,000 persons.
Source: North Carolina State Center for Health Statistics, Vital Statistics-Deaths, 1999–2008. Analysis by the Injury Epidemiology and Surveillance Unit.

the results of their queries in a patient's medical record. Both can gain secure online access by sending a notarized application to the Drug Control Unit of DMHDDSAS.

The NCCSRS was established primarily as a clinical tool for practitioners. As of March 2013, approximately 13,000 prescribers (representing about 30% of all prescribers in the state) and about 2,500 dispensers (representing about 25% of all dispensers in the state) were registered to use the online system. Most states operate similar systems, although they may differ in their purpose, location, and rules for access. Some of these prescription drug monitoring programs were originally started for use by law enforcement or narcotics control professionals and only recently opened up their data to prescribers. Other systems are located within the state's board of pharmacy, and still others use a public health approach.

North Carolina's approach is unique in that its program is located within the state's substance abuse authority. According to the North Carolina Controlled Substances Reporting System Act [6], the intent of the law is

> to improve the State's ability to identify controlled substance abusers or misusers and refer them for treatment, and to identify and stop diversion of prescription drugs in an efficient and cost-effective manner that will not impede the appropriate medical utilization of licit controlled substances.

DHHS may disclose information from NCCSRS not only to prescribers and dispensers, but also to licensing boards with jurisdiction over health care professionals pursuant to an ongoing investigation of a specific individual licensed by that board. In addition, DHHS may provide information to the Diversion and Environmental Crimes Unit of the North Carolina State Bureau of Investigation (SBI) pursuant to a bona fide investigation, to the North Carolina Division of Medical Assistance for the purpose of administering the North Carolina State Plan of Medical Assistance, and to the primary monitoring authorities of other states. Medical examiners may access the NCCSRS to assist in determining an individual's cause of death. Finally, DHHS reports unusual patterns of prescribing to the Attorney General of North Carolina, who reviews these cases and may order a criminal

investigation by the SBI. DMHDDSAS has convened a multidisciplinary advisory committee to make recommendations regarding implementation of the program and to help establish criteria for what constitutes an unusual pattern of prescribing. Substantial changes to the NCCSRS are possible in the future, as legislation regarding this system is currently being considered by the North Carolina General Assembly.

At present, more than 100 million prescription records are in the system, with approximately 18 million new prescriptions being added each year. More than 4 million queries have been made of the system since its inception—on average, 2,900 queries are made each day. In any 6-month period, 26% of the population of North Carolina receives a prescription for a controlled substance, which together amounts to more than 400 million doses (unpublished data).

DMHDDSAS recently asked the Injury Prevention Research Center at the University of North Carolina (UNC) at Chapel Hill to conduct an evaluation of the NCCSRS, results of which were released in January 2013. The first part of the evaluation was a survey of prescribers and dispensers. Those who used the system were asked what they like and do not like about the system, why and how they use it, and how they thought the NCCSRS could be improved. Those who were not using the system were asked to explain why not. The second part of the evaluation then analyzed the impact of the NCCSRS to determine whether the legislative intent, as previously cited, was being met.

Those prescribers who were using the NCCSRS were asked how it affected their clinical practice. Prescribers reported that they were more often able to identify persons with drug seeking behaviors (91% of prescribers) and to identify drug abusers (85% of prescribers). Ninety-two percent of prescribers reported higher confidence in denying patient prescriptions, and 66% reported higher confidence in prescribing a controlled substance. Sixty-two percent of users reported no change in asking patients to leave their practice, and 72% reported no change in their accepting more complex patients into their practice. Eighty-two percent of users of the NCCSRS reported they had no concerns with the system [7].

Many of the prescribers who reported using the NCCSRS were selective about when they used the system, citing reasons such as when a patient's behavior suggested a possible problem (82%), when a patient requested early refills (80%), when a patient asked for a specific drug (77%), or when seeing a new patient (48%). The majority of all prescribers (both registered and not registered) reported that they had been contacted by a pharmacist or another practitioner with information from the NCCSRS, and 97% of these individuals found the information to be useful or helpful. Prescribers who were not using the NCCSRS said they did not know about the system (27%), would never use the system (23%), or were too busy to use the system (10%) [7].

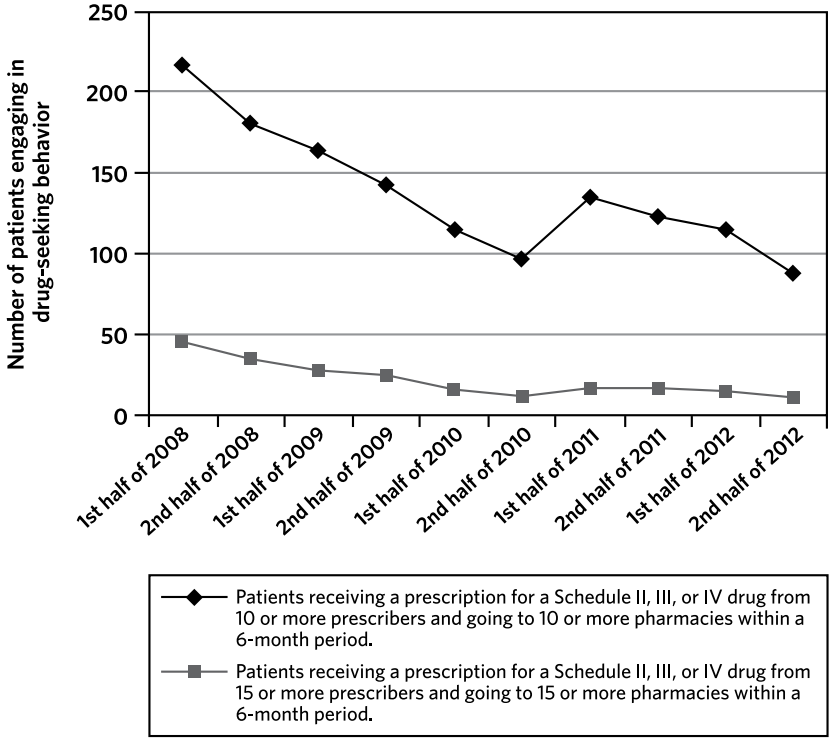
Pharmacists (dispensers) reported that they used the system primarily when dispensing prescriptions for new patients or for patients whose history suggested the need for a query. While pharmacies are required to enter reports into the system, pharmacists' use of the system is voluntary. When the survey was administered in 2012, the percentage of pharmacists who had signed up to use the NCCSRS was much lower than the percentage of prescribers who had signed up. This may be partly because major pharmacy chains did not permit their pharmacists to use the system until 2 years ago, and they have not promoted its use. At the time of the survey, the largest North Carolina pharmacy chain was still blocking access for their pharmacists. (This pharmacy chain began granting access on January 1, 2013.) Of those pharmacists who were using the NCCSRS, most said the system was easy to use and reported no problems with it; 84% of the pharmacists who had registered to use the system said that they used information from the NCCSRS when calling a prescriber to discuss the prescription, and 82% said that the physician was very likely to change the prescription in these cases.

The second part of the evaluation examined whether the NCCSRS was achieving its legislative intent; these finding were very positive. Over the past 3 years, there has been a steady increase in the number of providers who have registered for and are using the NCCSRS, even though the percentage of prescribers who are using the system remains low. The NCCSRS does not seem to have decreased legitimate prescribing, but it may have helped to reduce the number of persons meeting the strictest definitions of drug-seeking behavior [8]. In addition, the NCCSRS may help providers to distinguish between patients who are at high risk for overdose death and those who are not; it may therefore help to reduce the average number of prescriptions filled by high-risk patients. Finally, consistent use of the NCCSRS by providers is strongly associated with the likelihood that their high-risk patients will receive treatment for opioid dependence [8].

Figure 2 demonstrates that between January 2008 and December 2012 there was a decline in the number of persons meeting a strict definition of drug-seeking behavior—that is, receiving a Schedule II, III, or IV prescription from 10 or more prescribers and going to 10 or more pharmacies within a 6-month period. It also shows a slight decrease in the number of patients going to 15 prescribers and 15 pharmacies. Data for the 6-month intervals from January 2008 through the first half of 2012 are from a report of the NCCSRS evaluation [8], and data for the second half of 2012 are unpublished data obtained in March 2013 as part of a regular metrics report.

The evaluation completed by the UNC Injury Prevention Research Center contained a number of recommendations for improving the NCCSRS. These recommendations were based on the feedback received during the survey, a review of best practices around the United States, and a review of the limited available research on the efficacy of prescription

FIGURE 2.
Changes in Drug-Seeking Behavior in North Carolina between January 2008 and December 2012



drug monitoring programs. Some of these recommendations would necessitate changes in the law, but others are already being contemplated. Specific recommendations include allowing a prescriber to delegate a query to a nurse or other staff member; requiring that medications dispensed from a physician's office or a dentist's office be entered into the system; allowing the system to send alerts to prescribers regarding patients who may be at risk of drug misuse or abuse; being able to link the NCCSRS to similar databases in other states to get a more complete picture of prescription drug use, especially in border communities; requiring that data be entered into the system more frequently, such as every 24 hours; and increasing outreach efforts to increase usage of the system.

Misuse and abuse of prescription controlled substances and diversion of controlled substances have been problems for decades. Powerful and effective but potentially dangerous new drugs have helped to contribute to the growth of this multidimensional, complex, and interrelated set of problems. The NCCSRS is an effective tool that can assist clinicians with appropriate prescribing and can help them to identify problems that may be developing. It can provide valuable information that confirms or alters what a practitioner knows about a patient; however, it should never be the sole basis for making a treatment decision. Overdose deaths may involve both licit as well as illicit drug use, so there is clearly a need for education for the public and for the medical community to counteract the disturbing trends that are unfolding. NCMJ

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Running the Numbers

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

Emergency Department and Hospital Utilization for Treatment of Chronic Pain in North Carolina

Pain is one of the most common reasons people seek medical attention. The articles in this issue of the NCMJ describe some of the most common causes of chronic pain, options for treatment, and some of the unintended consequences of treatment. One possible way to get a handle on chronic pain is through prevention, which requires understanding the causes of chronic pain. In addition, it is important to determine the most efficacious and cost-effective methods of treating chronic pain (eg, medication, surgery, or acupuncture), as well as optimal treatment locations (eg, the emergency department [ED], inpatient hospital setting, or ambulatory care setting).

The burdens and costs of chronic pain are enormous. The Institute of Medicine of the National Academies estimates that 100 million people in the United States live with chronic pain at a total economic cost of $560 billion–$630 billion annually. Only about half of that amount is spent on medical care; the other half represents indirect costs from lost productivity [1]. Among civilian, noninstitutionalized individuals of all ages, the percentage of sampled individuals who reported having received a prescription for pain medication within the past 30 days increased 25% between 1988–1994 and 2005–2008, from 7.2% to 9%, respectively [2]. Although most pain complaints are managed in a primary care setting or other ambulatory care setting (eg, orthopedic, neurology, or rheumatology practices), utilization of hospitals and EDs for treatment of pain is much more costly and may be associated with more severe pain.

In this paper we report the number of people who received treatment for pain in EDs and hospitals in North Carolina in 2010, as well as the number of ED visits and hospital admissions for pain, by indication. We also provide information on the sociodemographic characteristics of patients who were hospitalized for a pain-related indication. Finally, we report 5-year trends in knee and hip replacement surgery; from those trends, we project how many such surgeries will be needed in North Carolina in 2030.

We obtained the data for this study from the utilization databases for inpatient discharges and emergency departments. The Cecil G. Sheps Center for Health Services Research at the University of North Carolina at Chapel Hill is under contract with the North Carolina Division of Health Service Regulation to maintain these databases for use in research and state health planning. The databases are updated yearly by Truven Health Analytics.

Based on his clinical experience and a review of the literature, the lead author of this study compiled a list of common pain diagnoses related to inpatient hospitalizations or ED visits and determined the corresponding ICD-9 codes (found in the *International Classification of Diseases*, Ninth Edition). This list of ICD-9 codes was reviewed by 2 physician colleagues with expertise in pain management. The list of ICD-9 codes used for this analysis included codes for common chronic pain complaints (eg, limb pain, back pain, headache, dental pain) and codes for certain surgical procedures, but it did not include ICD-9 codes for pain complaints that would likely be the result of an acute primary medical process (eg, abdominal pain, pelvic pain). Using SAS software, the hospital discharge and ED databases were queried to determine the frequency of utilization of hospitals and EDs for each ICD-9 code. Fourth and fifth digits of the codes were included in the queries, and

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then categories were collapsed for simplicity. We chose to focus on ED and inpatient hospital utilization because of the high cost of services in these 2 clinical settings and the readily available aggregate data. For inpatients, we also calculated frequencies for aggregate pain complaints by race, ethnicity, age, and payer.

The inpatient database was queried to obtain counts of hip and knee replacement surgeries by year for the 5-year period 2006–2010. Rates of hip and knee replacement surgeries (the number of surgeries per 10,000 population) were then calculated for predefined age groups using US Census Bureau intercensal estimates [3]. Using estimates from the North Carolina Office of State Budget and Management [4], the rates of hip and knee replacement surgeries calculated for 2010 were applied to population estimates for 2030. A linear trend analysis (Microsoft Excel) was used to estimate projected rates of hip and knee replacement surgeries for 2030, and those rates were applied to population estimates for 2030.

Table 1 highlights the large volume of people with pain diagnoses who presented in the state's EDs and hospitals in 2010. A total of 254,060 hospitalizations involving 178,662 unique patients were related to pain complaints in 2010. The most common pain diagnoses for inpatient hospitalization were pain in limb (38.3%), back pain (12.8%), chronic pain (12.8%), lower-extremity joint replacement (12.8%), and headache (10.1%). In addition, a total of 873,828 ED visits by 764,656 unique patients involved at least 1 of the pain diagnoses included in our search. The most common pain diagnoses for ED visits were headaches (29.8%), back pain (28.8%), pain in limb (24.4%), dental pain (9.3%), and chronic pain (7.6%).

Characteristics of patients who were hospitalized for pain-related diagnoses are shown in Table 2. Interestingly, female patients outnumbered male patients nearly 2 to 1. The largest numbers of inpatient hospitalizations related to chronic pain were for patients aged 45–64 years and those aged 65–84 years. The majority of patients were white and non-Hispanic; however, information about ethnicity was missing for a large number of patients. Most patients who were admitted to the hospital had some type of insurance: Medicare (55.2%), private insurance (20.7%), Medicaid (10.8%), or VA/CHAMPUS (1.4%); only 4.5% of patients paid for services out of pocket.

Figures 1 and 2 show the yearly rates of hip and knee replacement surgery, respectively, in North Carolina for 2006 through 2010, by age group. It is especially noteworthy that the rates of hip and knee replacement surgery among individuals 45–64 years of age increased by 24% and 17%, respectively, between 2006 and 2010. Overall rates of hip and knee replacement surgeries rose, as did rates in each age group—with the exception

TABLE 1.
Common Pain-Related Diagnoses for Inpatients and Emergency Department Patients in North Carolina in 2010

Diagnosis	Treated as inpatient Number of diagnoses (%)	Treated in ED Number of diagnoses (%)
Back pain	32,626 (12.8)	251,307 (28.8)
Chronic pain	32,519 (12.8)	66,600 (7.6)
Dental pain	1,301 (0.5)	81,464 (9.3)
Headaches	25,745 (10.1)	260,782 (29.8)
Pain in limb	97,236 (38.3)	213,858 (24.4)
Joint replacement of the shoulder or elbow	2,302 (0.9)	NA
Lower-extremity joint replacement	32,534 (12.8)	NA
Spinal fusion	14,044 (5.5)	NA
Other spinal procedure	14,290 (5.6)	NA
Total unique patients	178,662	764,656
Total visits	254,060	873,828

Note. ED, emergency department.
Some patients presented as inpatients or to the emergency department on more than 1 occasion; thus, the number of visits was higher than the number of unique patients. Also, the following diagnoses are not listed separately because they involved such small numbers of patients, but they were included in our search of the databases and are included in the total number of unique patients and total number of visits: arthroplasty and repair of hand, fingers, or wrist; arthrodesis of foot or ankle; arthrodesis of other joint; and refusion of spine.

TABLE 2.
Characteristics of Hospitalized Patients with Pain Complaints in North Carolina in 2010

Characteristic	Number of patients (%)
Gender[a]	
Male	63,139 (35.34)
Female	115,522 (64.66)
Age (years)	
<1	58 (0.03)
1–17	2,031 (1.1)
18–44	30,215 (16.9)
45–64	67,151 (37.6)
65–84	65,183 (36.5)
≥85	14,024 (7.9)
Race	
White	116,287 (65.1)
Black	27,333 (15.3)
Asian/Pacific Islander	943 (0.5)
Native American/Alaskan Native	3,024 (1.7)
Other	2,000 (1.12)
Unknown/information missing	29,075 (16.3)
Ethnicity	
Hispanic	1,523 (0.9)
Non-Hispanic	126,968 (71.1)
Unknown/information missing	50,171 (28.1)
Insurance	
Medicare	98,626 (55.2)
VA/CHAMPUS	2,469 (1.4)
Medicaid	19,238 (10.8)
Private insurance	36,976 (20.7)
No insurance (self-pay)	8,087 (4.5)

Note. CHAMPUS, Civilian Health and Medical Program of the Uniformed Services; VA, Veterans Affairs.
Percentages may total more than 100% due to rounding.
[a]One observation is not included due to gender being reported as unknown.

of hip replacement surgeries among those 85 years of age or older.

Table 3 compares the numbers and rates of hip and knee replacement surgeries in 2010 with the numbers and rates that we projected for 2030. Using age-specific population estimates and projected changes in the rates of hip and knee replacement surgeries, we found that the total number of hip replacement surgeries performed annually in North Carolina is likely to have increased by about 33% by 2030, and the number of knee replacement surgeries is likely to have increased by 52%.

Our findings will not surprise physicians who treat or study adults with pain conditions. ED utilization for pain-related conditions is exceedingly common, with nearly 1 in 10 North Carolinians seeking such care in 2010. It is also not surprising that certain conditions are more common among hospital inpatients than among ED patients. Most hospitalizations for pain-related complaints are for conditions that require surgical treatment (such as spinal or joint surgery). The frequency of ED utilization for pain-related complaints suggests a need for alternative sources of care, extended physician office hours, primary care medical homes, and education of patients regarding self-management.

Perhaps the most noteworthy finding from this analysis is the rate of joint replacement surgeries, particularly the increase in that rate between 2006 and 2010. Nationally, the volume of knee replacement surgeries among Medicare beneficiaries increased 161.5% between 2001 and 2010, and per-capita utilization increased 99.2% [5]. In 2010 the median cost of hip replacement surgery in the

FIGURE 1.
Yearly Rates of Hip Replacement Surgery in North Carolina by Age Group, 2006–2010

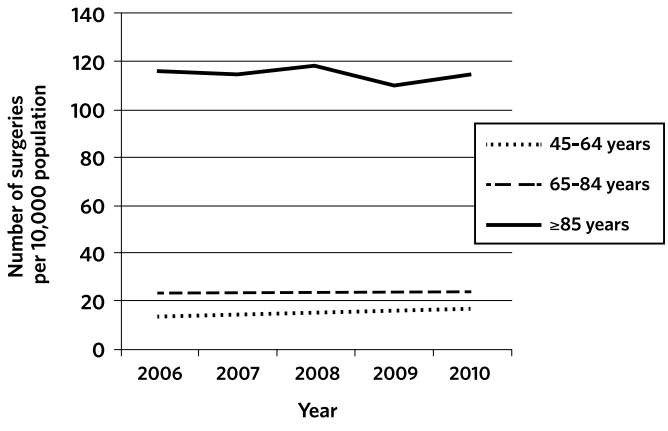
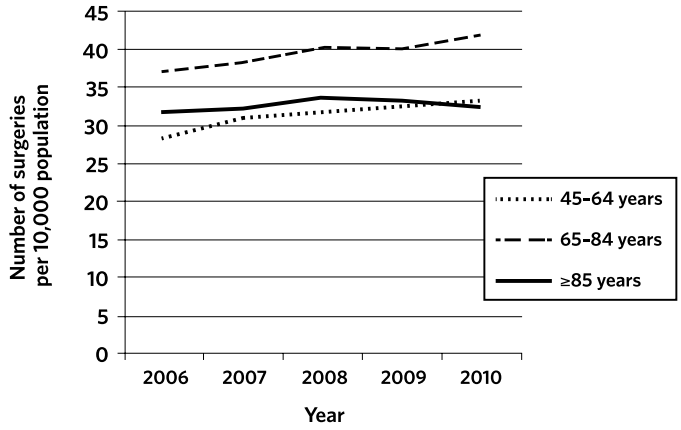


FIGURE 2.
Yearly Rates of Knee Replacement Surgery in North Carolina by Age Group, 2006–2010



Southern United States, using hospital discharge data on charges and a standardized ratio of cost to charges, was $16,458; for knee replacement surgery it was $15,822 [6]. We estimate that the total cost of knee and hip replacement surgeries in North Carolina in 2010 was $500 million, and we project that this cost will increase to $700 million in 2030 (assuming no increase in the costs per procedure). This represents a major future health care cost. It should be noted that these figures do not include the cost of treatment prior to surgery, which can include outpatient visits, radiology services, procedures (eg, joint injections), consultations, and prescription medications. Rehabilitation costs and losses in productivity are also not included.

The prevention and treatment of obesity will be an important factor in mitigating this trend [7]. In addition, there is regional variability in rates of joint replacement among Medicare patients [8], which points to another source of consideration for con-

TABLE 3.
Numbers and Rates of Hip and Knee Replacement Surgeries in North Carolina in 2010, with Projections for 2030, by Age Group

	Hip replacement		Knee replacement	
Age group (years)	Number of surgeries	Number of surgeries per 10,000 population	Number of surgeries	Number of surgeries per 10,000 population
2010				
45–64	4,172	16.7	8,332	33.2
65–84	5,972	23.7	10,576	41.9
≥85	1,692	114.7	477	32.3
Projection 1 for 2030[a]				
45–64	4,532	16.7	9,064	33.2
65–84	4,776	23.7	8,444	41.9
≥85	2,941	114.7	828	32.3
Projection 2 for 2030[b]				
45–64	8,218	30.1	15,343	56.2
65–84	5,481	27.2	13,059	64.8
≥85	2,567	100.1	969	37.8

[a]Projection 1 for 2030 assumes that the rates of joint replacement surgery will remain constant from 2010 to 2030 and applies those rates to population estimates for 2030.
[b]Projection 2 for 2030 calculates new rates for 2030 based on linear trends and applies those rates to population estimates for 2030.

trolling costs. Some of this variability may be driven by provider preference and community norms. However, another major factor is patient preference and the degree of patient engagement in decision making related to arthritis treatment and joint replacement surgery. One study of a shared decision-making model for hip and knee replacement showed that use of decision aids was associated with drastically lower numbers of hip and knee replacement surgeries (decreases of 26% and 38%, respectively) [9].

Chronic pain is a common and costly problem resulting in frequent and expensive ED visits and hospitalizations. Optimal treatment, delivery of care in the most appropriate locations, prevention, and cost containment will require broad stakeholder engagement and investment on the part of consumers, providers, payers, and public health professionals. NCMJ

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Spotlight on the Safety Net

A Community Collaboration

Project Lazarus:
An Innovative Community Response to Prescription Drug Overdose

Nestled in the foothills of North Carolina near the Blue Ridge Parkway, Wilkes County is a rural area full of rich traditions that have been upheld by many generations of families. These families have learned to make the low-mountain country their home by trusting in one another and being willing to share their belongings with family members and friends. Unfortunately, when close-knit families and friends share prescription opioid medications, the entire community can suffer.

Wilkes County has a population of fewer than 70,000 people, but in 2007 it had an unintentional drug-poisoning mortality rate of 28.3 deaths per 100,000 population—the third-highest county death rate from drug overdose in the country [1]. Almost all of these Wilkes County deaths were from overdoses of prescription opioid pain relievers [2]. In 2005, members of the community, including myself, began to take notice of the county's high unintentional drug-poisoning mortality rate. I was director and chaplain of hospice for Wilkes Regional Medical Center at the time, and I became concerned when prescribers began notifying me that they could no longer safely prescribe opioids to their hospice patients, due to medications being shared, stolen, or sold within patients' households.

I began by investigating the relationship between doctors and patients, focusing primarily on how doctors were prescribing prescription opioid medications and how patients were using these medications. Realizing that the epidemic of overdoses was getting out of hand, I turned to the local health department, to law enforcement officials, and to hospital emergency departments for answers, but no one I contacted was able to offer a solution to the problem. I then became the chair of the Wilkes Healthy Carolinians Substance Abuse Task Force. After contacting state and federal authorities, who were also unable to provide a solution to the problem, I decided that it was time for Wilkes County to take action as a community.

The first step was to make the community aware of the problem. I began by gathering real-time data and engaging community stakeholders. Doctors, heads of school systems, law enforcement officials, medical directors, and others began helping to build public awareness of the problem. This initial step of increasing public awareness was crucial in building a coalition that would continue to serve Wilkes County in our fight against overdoses. In 2007, as the community was beginning to accept and work towards finding a solution to the problems associated with prescription opioids, our efforts were noticed by Northwest Community Care Network (NWCCN), the local network of health professionals that provides primary care for Medicaid enrollees. In 2008 NWCCN began the Chronic Pain Initiative for Wilkes County, and I was appointed to be the project director.

As other communities saw Wilkes County endeavoring to solve its prescription opioid problem, they began to ask how they could implement a similar plan. It became apparent that we needed a name for the drug overdose prevention project that the NWCCN Project Advisory Committee and I had undertaken in 2008; we chose the name Project Lazarus. Soon afterward, a public hearing was held at the North Carolina Medical Board, which resulted in the board approving and encouraging the practice of co-prescribing the opioid antidote naloxone together with opioid medications when a patient is judged to be at risk of overdosing. After this approval was obtained, Project Lazarus began to expand into other counties, and it is now operating statewide with the help of funding from

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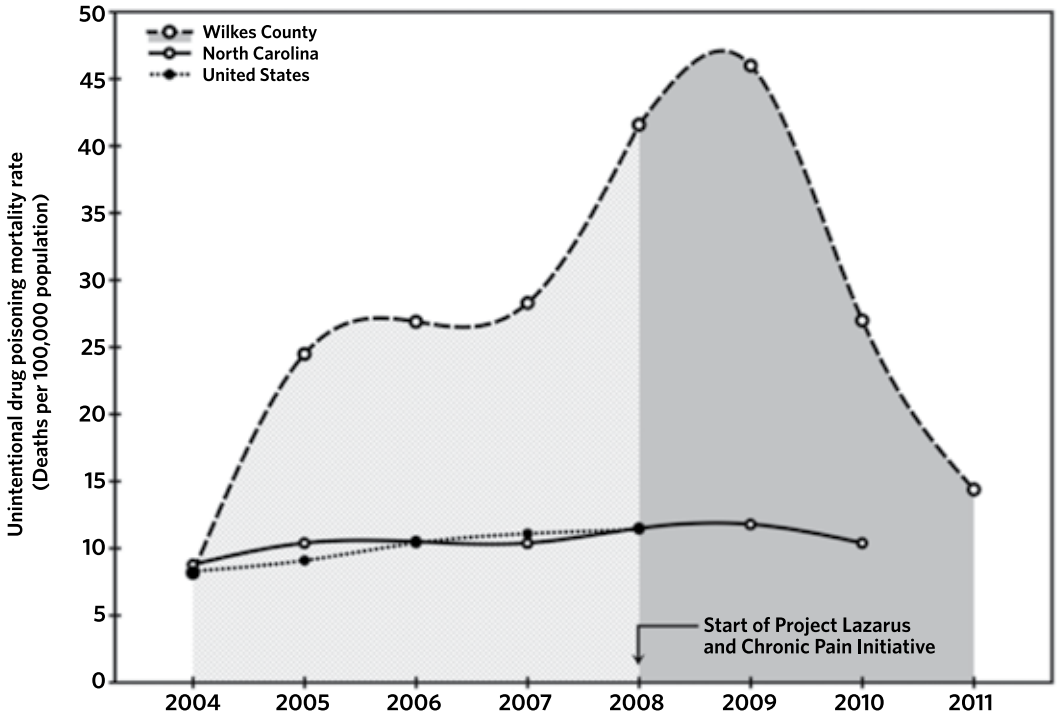
FIGURE 1.
Number of Deaths per 100,000 Population from Unintentional Drug Poisoning in Wilkes County, the State of North Carolina, and the United States, 2004-2011



the Kate B. Reynolds Charitable Trust, the North Carolina Office of Rural Health and Community Care, the Mountain Area Health Education Center, Purdue Pharma L.P., and other sources.

With help from the community, I devised a model for addressing the problems associated with prescription opioids. The model is based on 2 premises: that drug overdose deaths are preventable, and that communities are responsible for the health of their members. The model was developed in response to some of the highest drug-overdose death rates in the country; Wilkes County's rate of drug-overdose deaths was 46.6 deaths per 100,000 population in 2009 [2]. Fortunately, implementation of the model's 10 components has had an appreciable impact on unintentional overdose deaths, which dropped to 29.0 deaths per 100,000 population in 2010 [2] and to 14.4 deaths per 100,000 population by 2011 (unpublished report, Wilkes County Health Department).

The Project Lazarus model can be conceptualized as a wheel, with 3 core components serving as the hub of the wheel and another 7 components serving as the spokes. The components comprising the hub of the wheel are public awareness, coalition action, and data and evaluation. Once those components are in place, communities can begin adding the components that make up the spokes: community education, prescriber education, changes in hospital emergency department policies, diversion control, support for patients with chronic pain, harm reduction, and access to addiction treatment.

Building on its success in Wilkes County, Project Lazarus was subsequently implemented in other North Carolina counties, at the US Army installation at Fort Bragg, and in the Qualla Boundary (a land trust in Western North Carolina that is home to members of the Eastern Band of Cherokee Indians). During 2011 and 2012, Project Lazarus then partnered with Community Care of North Carolina, which spread the Project Lazarus model further, eventually implementing it in all 100 North Carolina counties. The Project Lazarus model has

also spread to other states, including New Mexico, Ohio, Virginia, and Maine. Project Lazarus has had a large impact on the areas where it has been established, and these results have caught the attention of Director of National Drug Control Policy R. Gil Kerlikowske.

As Figure 1 shows, Wilkes County has a history of exceptionally high mortality rates from unintentional drug poisoning, chiefly from prescription opioid overdoses. However, since the implementation of Project Lazarus, unintentional drug-poisoning mortality rates have drastically decreased in Wilkes County, emergency department visits related to substance abuse have decreased, and treatment for overdose has become more accessible [3]. To provide safe access to care for patients with chronic pain, the public needs to be educated about prescription drugs, with emphasis on the fact that these drugs must be taken correctly, stored securely, disposed of properly, and never shared. In addition, prescribers should institute best-practice methods of patient assessment, teach safety education, and provide ongoing monitoring by utilizing the North Carolina Controlled Substances Reporting System along with other measures. Together, these efforts can help chronic pain patients find relief. NCMJ

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Philanthropy Profile

Foundation Investments in Palliative Care

Palliative care is a medical specialty that focuses on preventing and relieving the suffering of patients with life-limiting and life-threatening illnesses. It is an interdisciplinary practice that utilizes the complementary knowledge and skills of a deep bench of health care providers, including physicians, nurses, social workers, pastors, and other professionals. Palliative care focuses on the whole person, rather than viewing the patient as a disparate set of individual body systems, and the preferences of the patient and his or her family guide decision making. Palliative care programs may be hospital-based or community-based.

The need for palliative care services will likely be even greater in the future, due to the growing proportion of elderly individuals in the population and the increasing incidence of chronic diseases. Nationally, the number of individuals 65 years of age or older is expected to increase considerably over the next couple of decades. According to the US Census Bureau, approximately 39 million US residents were 65 years of age or older in 2011 [1]. By 2030, this segment of the population is expected to grow to 72 million people [2]. In North Carolina, 13% of the state's population was 65 years of age or older in 2011 [3], and 18% of the state's population will belong to this age group by 2030 [4]. Because health care resources are finite, we will need to make significant changes in the way that medicine is practiced and how care is provided to individuals and families.

Chronic diseases such as heart disease, diabetes, cancer, and stroke are affecting increasing numbers of individuals. These patients require extended periods of treatment and highly coordinated care. According to data from the Centers for Disease Control and Prevention, nearly half of all adults had at least 1 chronic disease in 2005 [5]. Among those 65 years of age or older, nearly 90% suffer from at least 1 chronic condition, and many patients have multiple chronic illnesses [6]. The incidence of multiple chronic illnesses increases with age.

Fortunately, the number of palliative care programs also continues to increase. According to the Center to Advance Palliative Care (CAPC), there were more than 1,500 hospital-based palliative care teams in the United States in 2009. In North Carolina, 75% of hospitals with 50 or more beds offer palliative care services. The number of community-based palliative care programs also continues to increase [7].

Between 2002 and 2012, the trustees of The Duke Endowment, a private foundation founded by James B. Duke in 1924, awarded grants of almost $3.9 million to support programs relating to palliative care. These grants have helped organizations to establish interdisciplinary palliative care teams, to improve the quality of palliative care, and to increase the palliative care workforce. Since the first grant was awarded, there has been much progress in this field, and many lessons have been learned.

The first of these lessons is that palliative care plays an important role in the full spectrum of health care services. Palliative care complements traditional specialty care by providing comprehensive services to support the patient and his or her family members. While other specialists focus on the patient's specific illnesses, the palliative care team can provide additional support to manage symptoms and side effects of treatment. This concept and philosophy will become increasingly important as health care reform seeks to manage care comprehensively and accountably by aligning services.

Much has also been learned about the benefits of palliative care. Patients who receive palliative care services report better management of their pain and symptoms, and they and their family members are more engaged in making medical decisions [8].

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Palliative care also focuses on meeting the patient's psychosocial and spiritual needs and on helping individuals to establish advanced directives, when appropriate. Studies have shown that providing highly coordinated care and proactively meeting the patient's needs can improve quality and reduce costs. A study published in *The New England Journal of Medicine* in 2010 showed that patients with advanced lung cancer who received early palliative care reported lower rates of depression and better quality of life compared with patients who did not receive such services. Patients who received palliative care also had a 2.7-month longer median duration of survival [9].

Finally, we have learned that more palliative care professionals are needed. Given the nascent nature of palliative care, there are limited numbers of physicians who are certified in this specialty. CAPC reported that 2,887 physicians were board-certified in palliative care in the United States in 2011; in North Carolina, 89 physicians were board-certified in palliative care, and 477 registered nurses were certified in palliative care [7].

Given the increased incidence of chronic diseases and changing demographics—in the United States as a whole and in the Carolinas—there will be a greater need for programs that provide holistic care for individuals and families. Investments by The Duke Endowment have been timely and have helped to increase capacity for palliative care services in the Carolinas. Organizations and professionals continue to learn more as this specialty becomes more integrated into the health care system. NCMJ

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Acknowledgment

Potential conflicts of interest. M.T.M. is an employee of The Duke Endowment.

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