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A New Triadic Paradigm for Osteopathic Research in Real-World Settings

John C. Licciardone, DO, MS, MBA
Cathleen M. Kearns, BA

Clinical research is increasingly conducted in real-world settings. Osteopathic practices represent natural laboratories for studying the distinctiveness of osteopathic medicine. The Osteopathic Research Center (ORC) recently developed a triadic paradigm for research consisting of the Consortium for Collaborative Osteopathic Research Development (CONCORD), its affiliated practice-based research network (PBRN), and the patient-centered research (PCR) fellowship program. The CONCORD-PBRN was certified by the Agency for Healthcare Research and Quality in 2011. The inaugural PCR fellowship class completed didactic training that year. Fellows increased their knowledge of research design and biostatistics following participation in the curriculum. In 2012, a card study of osteopathic palpatory findings and manual techniques will be conducted within the CONCORD-PBRN. The ORC plans to use a hub-and-spoke model to grow the CONCORD-PBRN. Further expansion of this triadic paradigm is dependent on funding streams to support the needed research infrastructure.

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There has been a long-standing need for evidence to support osteopathic medical practice, particularly the use of osteopathic manual treatment (OMT).[1] The osteopathic medical profession is making important strides in establishing an evidence base to support the efficacy of OMT, particularly in the management of low back pain. For example, a systematic review and meta-analysis that pooled the results of relatively small clinical trials[2-7] found that OMT significantly reduced low back pain.[8] These findings were integral to the development and publication of the first and only clinical practice guideline established by the American Osteopathic Association.[9] This guideline has been accepted by the Agency for Healthcare Research and Quality, and has been posted on its National Guideline Clearinghouse.[10] The OSTEOPAThic Health outcomes In Chronic low back pain (OSTEOPATHIC) Trial,[11] funded in part by the National Institutes of Health's National Center for Complementary and Alternative Medicine and the Osteopathic Heritage Foundation, was recently completed. The highly anticipated results of this OMT trial involving 455 subjects, the largest to date, are slated for release in 2012. The purpose of the present article is to describe progress now made by The Osteopathic Research Center (ORC) in establishing a new paradigm for osteopathic medical research.

A New Paradigm for Responding to Emerging Research Needs

An emerging theme in research on health care delivery involves evaluating the effectiveness of treatments in real-world settings. Many stakeholders, including those who purchase and deliver health care, now embrace this concept. The National Center for Complementary and Alternative Medicine strategic plan advocates using the methods and tools of clinical outcomes and effectiveness research to develop evidence that is based on real-world clinical practices,[12] such as OMT. These methods may also be used to acquire data needed to design maximally informative clinical trials.[12]

A new research paradigm is needed if the osteopathic medical profession is to be successful in responding to these emerging research needs. In 2007, the ORC initiated a process for developing this paradigm. The resultant triadic

From The Osteopathic Research Center at the University of North Texas Health Science Center (Dr Licciardone and Ms Kearns) and the Department of Medical Education at the University of North Texas Health Science Center Texas College of Osteopathic Medicine (Dr Licciardone) in Fort Worth. Dr Licciardone holds a master's degree in preventive medicine.

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Address correspondence to John C. Licciardone, DO, MS, MBA, Professor and Executive Director, The Osteopathic Research Center, 3500 Camp Bowie Blvd, Fort Worth, TX 76107-2644.
E-mail: john.licciardone@unthsc.edu

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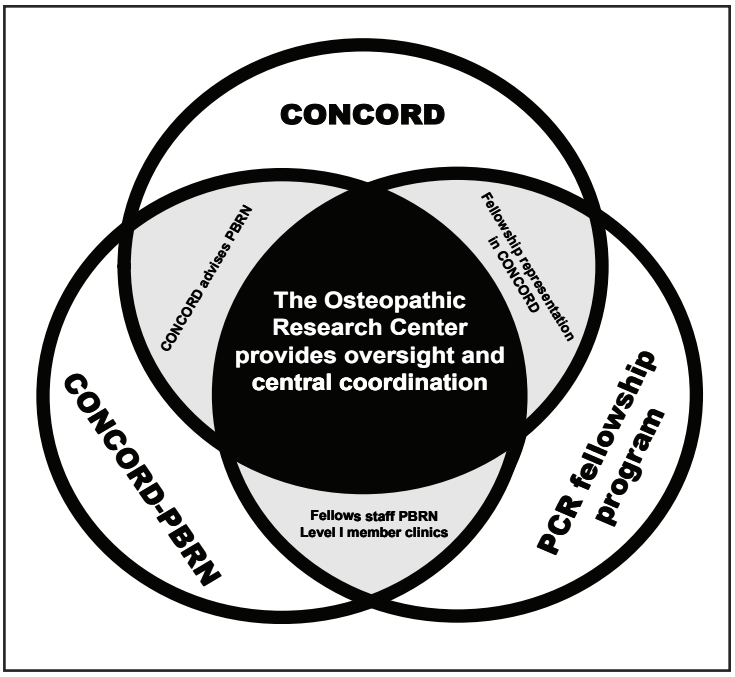

Figure 1. *Triad representing the interrelationships among The Osteopathic Research Center, the Consortium for Collaborative Osteopathic Research Development (CONCORD), the Consortium for Collaborative Osteopathic Research Development–Practice-Based Research Network (CONCORD-PBRN), and the patient-centered research (PCR) fellowship program.*

framework, depicted in *Figure 1*, consists of the Consortium for Collaborative Osteopathic Research Development (CONCORD), its affiliated practice-based research network (PBRN), and the patient-centered research (PCR) fellowship program.[13] The ORC's mission statement for the triad reflects the synergy within this approach: "to provide the evidence base for osteopathic medicine by conducting patient-centered research today and training the investigators of tomorrow." The triad provides the foundation for planning and implementing rigorous studies, including nested case-control studies, longitudinal studies, and clinical trials, which may be used to assess OMT benefits.[13] However, research need not be limited to studies assessing OMT efficacy or effectiveness. For example, studies could address the natural history and epidemiology of somatic dysfunction, thereby representing the "Osteopathic Framingham Study."[14] Other studies might explore the distinctive practice patterns of osteopathic primary care physicians.

The Consortium for Collaborative Osteopathic Research Development

The CONCORD provides the triad's advisory core, which consists of ORC representation (executive director and administrative director), a national advisory board (members selected from the deans of the colleges of osteopathic medicine, osteopathic research directors at colleges of osteopathic medicine and osteopathic postdoctoral training institutions, and osteopathic research-supportive foundations), CONCORD-PBRN representation (associate and regional directors), and PCR fellowship representation (1 member from each fellowship class). The CONCORD meets 3 times annually: at the ORC in the spring, via teleconference in the summer, and at the Osteopathic Medical Conference & Exposition in the fall.

The CONCORD-PBRN: A Primary Care Research Network

Osteopathic physicians are widely recognized for contributions to primary care, particularly in the specialty of family medicine. Data from the National Ambulatory Medical Care Survey indicate that osteopathic physicians provide primary care during an estimated 217 million patient visits annually, representing about 10% of the nation's primary care services.[15] Further, osteopathic physicians are much more likely than allopathic physicians to provide primary care in the specialty area of family medicine.[15] For example, in the northeastern United States, more than one-third of ambulatory patient visits in family medicine are provided by osteopathic physicians.[16] About 70% of osteopathic physicians in family medicine report using OMT in their practices.[17] Research indicates that the practice patterns of osteopathic physicians may also be distinct in other ways from those of their allopathic counterparts.[18,19]

The CONCORD-PBRN was established in 2010 as a primary care research network with a focus on osteopathic principles and practice. The member clinics of the CONCORD-PBRN are geographically dispersed throughout the United States, as shown in *Figure 2*. These sites represent academic medical centers, university-affiliated health care facilities, and group practices. Research is currently being implemented to determine the demographic and clinical characteristics of these member clinics. A long-term objective of the ORC is to establish the CONCORD-PBRN as demographically representative of the United States general population at the aggregate level. This will be achieved by strategically adding member clinics to meet the desired network composition. In January 2011, the Agency for Healthcare Research and Quality issued a certificate to the CONCORD-PBRN, recognizing it as a primary care research network. This certification was reissued in 2012 (http://www.hsc.unt.edu/orc/CONCORD%20PBRN%20Certificate.pdf).

The use of OMT in family medicine facilitates conducting a range of osteopathic studies within the frame-

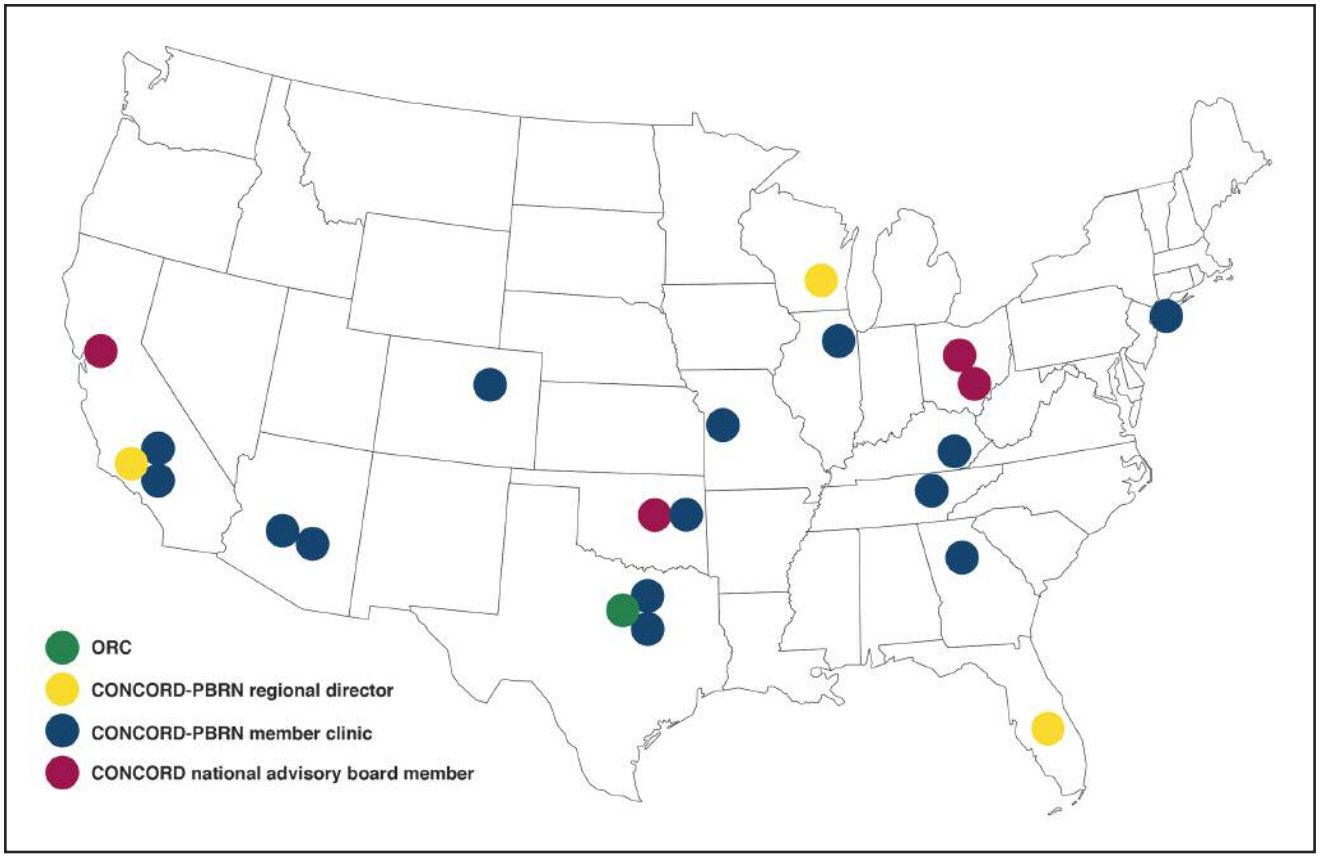

Figure 2. *National scope and distribution of the Consortium for Collaborative Osteopathic Research Development–Practice-Based Research Network (CONCORD-PBRN).* ***Abbreviation:*** *ORC, The Osteopathic Research Center.*

work of a primary care research network, such as the CONCORD-PBRN. However, the success of this approach depends on having a cadre of well trained clinician-investigators participating in the network. Thus, the PCR fellowship program is an integral component of the ORC's triad for establishing evidence relating to osteopathic medicine in the real world.

Hub-and-Spoke Model for Growth of the CONCORD-PBRN

The CONCORD-PBRN will implement a hub-and-spoke model to increase the number of member clinics and their geographic span, in conjunction with the growth of its affiliated PCR fellowship program. A schematic representation of this model is presented in *Figure 3*. The ORC serves as the primary hub of the CONCORD-PBRN by providing oversight and central coordination, including the administrative and research cores, laboratory resources, research design and biostatistical support, and guidance on human subjects issues. The PCR fellows represent the spokes, connecting the ORC to member clinics at their respective institutions or practice sites. These member clinics are given the designation "Level I" because they are directly overseen by PCR fellows trained at the ORC.

As PCR fellows gain experience over time, and with the infusion of additional funding and resources, their Level 1 member clinics may become secondary hubs within the CONCORD-PBRN. Secondary hubs will likely have established relationships (ie, spokes) with other clinician-investigators within their spheres, thereby providing local oversight and coordination for these "Level II" member clinics. Level II member clinics will likely be located on, or within close proximity to, the campuses of colleges of osteopathic medicine that house CONCORD-PBRN secondary hubs. In theory, a cluster of geographically remote clinics (eg, rural health clinics) could be served by a CONCORD-PBRN secondary or tertiary hub. In the latter example, the clustered rural health clinics would represent "Level III" member clinics.

This hub-and-spoke model enables the CONCORD-PBRN to grow in 2 ways. First, and most immediately, it provides for future PCR fellows to add more spokes,

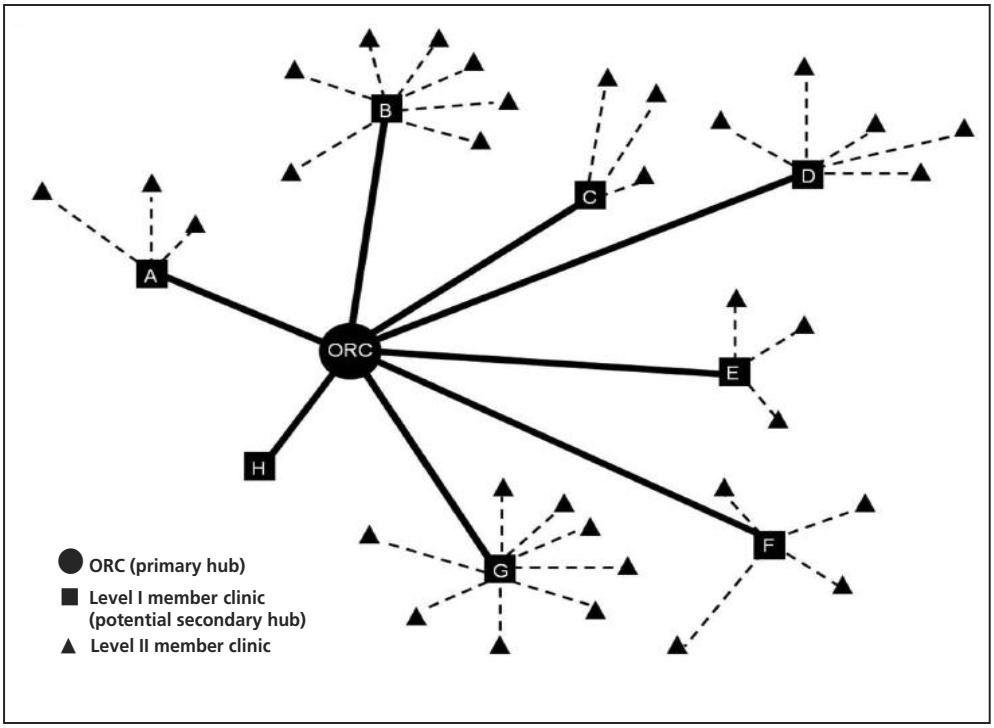

Figure 3. *Schematic representation of the hub-and-spoke model for growth of the Consortium for Collaborative Osteopathic Research Development–Practice-Based Research Network (CONCORD-PBRN). The Osteopathic Research Center (ORC) represents the primary hub, and its patient-centered research (PCR) fellows represent spokes that connect the ORC to its member clinics. Level I member clinics may become secondary hubs (eg, clinics A through G) by recruiting and training additional clinician-investigators for Level II member clinics within their spheres, as indicated by the broken lines. Clinic H represents a Level I member clinic that has not become a secondary hub. The training of PCR fellows at the ORC will further enhance network growth by creating additional spokes and Level I member clinics over time. See* Figure 2 *for actual geographic locations of CONCORD-PBRN Level I member clinics. Level II member clinics have not been established at present.*

thereby broadly increasing the CONCORD-PBRN geographic span and facilitating more collaborative research with the ORC. Second, and perhaps more importantly, it grows the osteopathic research enterprise in both urban and rural areas through secondary and tertiary hubs. The keys to successful implementation of the hub-and-spoke model will be training a critical mass of clinician-investigators in PCR methodology and providing adequate oversight of member clinic operations to ensure confidence in the research process. The latter includes, at a minimum, protection of human subjects, validity and reliability of data capture, and confidentiality of data transmission.

The Patient-Centered Research Fellowship Program

There are 2 essential phases of the PCR fellowship program. First, in the didactic phase, 162 contact hours of instruction in PCR are delivered during 6 bimonthly, extended weekend seminar (EWS) sessions at the ORC. Second, in the practicum phase, a 2-year practical experience in conducting PCR within a clinical practice occurs in conjunction with the ORC. Fourteen fellows were selected for the inaugural class, which extends from January 2011 through December 2013. The ORC recruited these fellows during 2010 by directly corresponding with each of the deans at the colleges of osteopathic medicine throughout the United States and by promoting the new program at osteopathic continuing medical education conferences, including the Osteopathic Medical Conference & Exposition in San Francisco, California. The program was primarily developed for osteopathic physicians to acquire PCR knowledge and practical skills, while maintaining their positions in colleges of osteopathic medicine, osteopathic postdoctoral training institutions, other medical facilities, or clinical practices.

Each PCR fellow was provided with funding to support the cost of travel, lodging, and meals to attend the 6 EWS sessions at the ORC during 2011. Additionally, required textbooks, supplies, and access to information technology services were provided at no cost to fellows. The ORC incurred an estimated cost of $8000 per fellow to support attendance and participation in the didactic phase of the program, exclusive of in-kind contributions to develop and deliver the PCR curriculum. No stipends are provided to fellows, as they continue to be employed in their usual positions.

Curriculum Delivered During the Didactic Phase of the PCR Fellowship Program

The PCR instruction included basic principles and concepts in the areas of clinical research design[20] (24 contact hours), epidemiology[21,22] (19 contact hours), biostatistics[23] (27 contact hours), human subjects research[24] (10 contact hours), critical analysis of the biomedical literature[5,8,9,25-33] (20 contact hours), and other miscellaneous topics (46 contact hours). Addi-

Table 1.
Overview of Patient-Centered Research Curriculum Delivered During the Didactic Phase of the Fellowship Program[a]

Subject Area	EWS Session	Contact Hours
Clinical Research Design		
Overview of basic research designs	1	1
Developing a research question	1	2
Acquiring research subjects	1	2
Sample size computations	2	1
Case-control studies	2	2
Cohort studies	2	2
Clinical trials	3	4
Studies of screening and diagnostic tests	4	2
Designing survey questionnaires and interviews	5	2
Secondary analysis of existing databases	5	2
Data management	6	3
Causal inference in observational studies	6	1
Subtotal no. of contact hours		24
Epidemiology		
Overview of epidemiology	1	2
Dynamics of disease transmission	1	1
Morbidity	2	1
Case-control studies	2	1
Cohort studies	2	1
Clinical trials	3	2
Prognosis and survival	4	2
Evaluating screening programs	4	2
Evaluating diagnostic tests	4	2
Systematic reviews	4	2
Epidemiology and public policy	4	1
Epidemiologic assessment of health services	5	1
Confounding bias	6	1
Subtotal no. of contact hours		19
Biostatistics		
Overview of biostatistics	1	1
Overview of statistical software packages	1	1
Descriptive statistics	1	1
Probability concepts	1	2
Probability distributions	2	1
Sampling distributions	2	1
χ^2 distribution	2	2
Logistic regression (interpretation of research outcomes)	2	1
Using IBM-SPSS software for descriptive statistics	2	2
Estimation	3	2
Hypothesis testing	3	2
Using IBM-SPSS software for inferential statistics	3	2

(continued)

[a] Similar curricular content was covered from multiple perspectives in the respective subject areas.

Abbreviations: AOA, American Osteopathic Association; EWS, extended weekend seminar; HIPAA, Health Insurance Portability and Accountability Act; IRB, institutional review board; NIH, National Institutes of Health; OMT, osteopathic manual treatment; ORC, The Osteopathic Research Center; PBRN, practice-based research network.

Table 1 (continued).
Overview of Patient-Centered Research Curriculum Delivered During the Didactic Phase of the Fellowship Program[a]

Subject Area	EWS Session	Contact Hours
Biostatistics (continued)		
Analysis of variance	4	3
Survival analysis (interpretation of research outcomes)	4	2
Correlation	5	1
Linear regression	5	3
Subtotal no. of contact hours		27
Human Subjects Research		
Historical perspective on human subjects research	2	1
Federal regulations relating to human subjects research	2	1
Roles and responsibilities in human subjects research	2	1
Ethical issues in clinical trials	3	1
Subject recruitment and retention in clinical trials	3	1
IRB considerations in PBRN research	5	2
Ethical issues in genetic research	5	1
Implementing the HIPAA Privacy Rule in research	5	1
Conflicts of interest in research	6	1
Subtotal no. of contact hours		10
Critical Analysis of the Biomedical Literature		
Relationship between auscultation of third heart sound and experience[25]	1	2
Case-control study of osteopathic palpatory findings in type 2 diabetes mellitus[26]	2	1
Cohort study of manipulative care for low back pain[27]	2	1
Randomized controlled trial of OMT for low back pain[5]	3	2
Randomized controlled trial of OMT during third trimester of pregnancy[28]	3	2
Card studies for observational research in practice[29]	3	2
Systematic review and meta-analysis of OMT for low back pain[8]	4	2
AOA guidelines for OMT in patients with low back pain[9]	4	2
Results of the Second Osteopathic Survey of Health Care in America[30]	5	2
Epidemiology and management of low back pain in the United States[31]	5	1
Primary care research on low back pain[32]	5	1
Efficacy and safety of tanezumab in treating chronic low back pain[33]	6	2
Subtotal no. of contact hours		20

(continued)

[a] Similar curricular content was covered from multiple perspectives in the respective subject areas.

Abbreviations: AOA, American Osteopathic Association; EWS, extended weekend seminar; HIPAA, Health Insurance Portability and Accountability Act; IRB, institutional review board; NIH, National Institutes of Health; OMT, osteopathic manual treatment; ORC, The Osteopathic Research Center; PBRN, practice-based research network.

Table 1 (continued).
Overview of Patient-Centered Research Curriculum Delivered During the Didactic Phase of the Fellowship Program[a]

Subject Area	EWS Session	Contact Hours
Miscellaneous Topics		
Fellowship program orientation	1	4
Pretest of clinical research design and biostatistics knowledge	1	1
The Osteopathic Research Center	1	1
Overview of PBRN research	1	1
State of osteopathic research	1	1
Scope of osteopathic research	1	1
Bioinformatics	1	2
Becoming a successful clinician-investigator	1	1
Biopsychosocial issues in research	2	1
Cognitive behavioral therapy	2	1
Review and response to an NIH program announcement	2	2
Fellow mock research projects	2	3
Writing and funding a research proposal	3	2
Research lessons in clinical trial implementation learned at the ORC	3	2
Basic mechanistic research at the ORC	3	2
Biopsychosocial aspects of pain research	4	2
Collaborative research with the ORC	4	2
OMT research protocols	5	2
Cost-effectiveness studies	5	2
Genetic and environmental factors in disease causation	5	2
Preparing reports for publication	6	3
Dealing with the media	6	2
Posttest of clinical research design and biostatistics knowledge	6	1
Fellowship program evaluation	6	5
Subtotal no. of contact hours		46
Practicum Research Planning	3, 4, 5, 6	16
Total No. of Contact Hours		162

[a] Similar curricular content was covered from multiple perspectives in the respective subject areas.

Abbreviations: AOA, American Osteopathic Association; EWS, extended weekend seminar; HIPAA, Health Insurance Portability and Accountability Act; IRB, institutional review board; NIH, National Institutes of Health; OMT, osteopathic manual treatment; ORC, The Osteopathic Research Center; PBRN, practice-based research network.

tionally, 16 contact hours were devoted to practicum research planning. The PCR curriculum is summarized in *Table 1*, according to subject area, EWS session, and number of contact hours.

The Practicum Phase of the PCR Fellowship Program

The fellows will progress to applying PCR principles and concepts in the practicum phase of the program by implementing a group research project within their clinical practices using the CONCORD-PBRN framework. Fellows will take a hands-on approach to PCR by acquiring approval from their local institutional review boards, collecting and transmitting practice-based research data, and participating in data analysis and reporting. A critical objective of this phase of the program is that each fellow earn authorship on a peer-reviewed journal article. This PCR fellowship class began planning a card study,[29] described in the following section, as a group project for implementation in 2012.

The CONCORD-PBRN Card Study

The card study is often considered to be the hallmark of practice-based research.[29] The name derives from pocket-sized cards used by clinicians to acquire practice-based data at the point of care. Ease of administration and low costs are major advantages of the card study. The clinician often completes the card immediately following a clinic visit, without direct input from the patient or assistance from office staff. In such cases, card studies are generally exempt from full institutional review board consideration because no data are collected directly from patients, no personally identifiable information is recorded on the card, and no card study-specific treatment or intervention is introduced into the patient encounter.

The CONCORD-PBRN card study will be conducted in 2012 to assess the demographic characteristics of network patients, common diagnostic codes for patient encounters, and prevalence of osteopathic palpatory findings (tissue texture abnormality, asymmetry, restriction of motion, and tenderness) and use of 14 specific OMT techniques according to anatomic region. A maximum of 100 patient encounter cards, without personal identifiers, will be acquired from each participating site (member clinics or clinics affiliated with CONCORD-PBRN regional directors) over a period of up to 4 weeks. The target sample size of 1500 patient encounters is expected to yield adequate statistical power to measure study variables with a margin of error no greater than ±5% at the 95% confidence level in the presence of mild clustering effects. Contingency table analyses will be used to initially assess the relationships among the variables of interest, including the presence of potential confounders. Multiple logistic regression will be used, as needed, to compute adjusted odds ratios and 95% confidence intervals.

Performance on the Clinical Research Design and Biostatistics Knowledge Test

Evaluation of the didactic phase of the program included unannounced administrations of a validated knowledge test[34] at the first and final EWS sessions. The 20-question test assessed understanding of clinical research design and statistical methods, and interpretation of study results commonly presented in general medical journals (*American Journal of Medicine*, *Annals of Internal Medicine*, *BMJ*, *JAMA*,

Table 2.
Program Evaluation Based on Pretests and Posttests of Clinical Research Design and Biostatistics Knowledge[a]

Question No.	Objective of Test Question	Reference Population,[b] % Correct (95% CI)	Program Evaluation,[c] % Correct	
			Pretest	Posttest
1a	Identify continuous variable	43.7 (37.8-49.5)	31	67
1b	Identify ordinal variable	41.5 (35.7-47.3)	31	53
1c	Identify nominal variable	32.9 (27.3-38.4)	31	47
2	Recognize a case-control study	39.4 (33.6-45.1)	31	7
3	Recognize purpose of double-blind studies	87.4 (83.5-91.3)	81	93
4a	Identify analysis of variance	47.3 (41.4-53.2)	63	60
4b	Identify χ^2 analysis	25.6 (20.5-30.8)	25	20
4c	Identify *t* test	58.1 (52.3-63.9)	63	67
5	Recognize definition of bias	46.6 (40.7-52.4)	44	27
6	Interpret the meaning of $P>.05$	58.8 (53.0-64.6)	69	73
7	Identify Cox proportional hazard regression	13.0 (9.0-17.0)	0	0
8	Interpret standard deviation	50.2 (42.3-56.1)	38	73
9	Interpret 95% CI and statistical significance	11.9 (8.0-15.7)	13	20
10	Recognize power, sample size, and significance-level relationship	30.3 (24.9-35.7)	25	60
11	Determine which test has more specificity	56.7 (50.8-62.5)	50	33
12	Interpret an unadjusted odds ratio	39.0 (33.3-44.7)	25	27
13	Interpret odds ratio in multivariate regression analysis	37.4 (31.9-43.3)	13	33
14	Interpret relative risk	81.6 (77.0-86.2)	81	100
15	Determine strength of evidence for risk factors	17.0 (12.6-21.4)	19	13
16	Interpret Kaplan-Meier analysis results	10.5 (6.9-14.1)	0	13

[a] Test questions are presented in Windish et al.[34]

[b] Reference population consisted of 277 internal medicine residents at 11 training programs in Connecticut.

[c] Program evaluation results are based on 14 participants (12 PCR fellows and 2 CONCORD-PBRN regional directors) who completed both pretests and posttests. One participant (fellow) was unavailable for the pretest, and 2 participants (1 fellow and 1 CONCORD-PBRN regional director) were unavailable for the posttest. There was a statistically significant increase in pretest to postpost test scores among fellows (P=.02).

Abbreviation: CI, confidence interval; CONCORD-PBRN, Consortium for Collaborative Osteopathic Research Development–Practice-Based Research Network; PCR, patient-centered research.

The Lancet, and *New England Journal of Medicine*). Each question was based on a clinically oriented vignette and included multiple-choice response options that did not require calculations. Slightly more than one-third of the questions were adapted from materials used in statistics courses at the Johns Hopkins Bloomberg School of Public Health. A reference population of 277 internal medicine residents in Connecticut completed the test, which had high internal consistency (Cronbach α=.81) and good validity in discriminating between faculty/fellows and residents.[34]

Table 2 presents the objective of each numbered question on the original test,[34] the performance of the reference population,[34] and the pretest to posttest performance of 14 PCR curriculum participants (12 fellows and 2 CONCORD-PBRN regional directors). On the pretest, participants scored lower than referents on 10 questions, comparably on 8 questions, and higher on 2 questions. On the posttest, participants scored lower than referents on 6 questions, comparably on 3 questions, and higher on 11 questions. Certain objectives of the knowledge test (eg, Cox proportional hazard regression) were not included as objectives of the PCR curriculum, thereby explaining the poor performance of fellows on these test questions. Nevertheless, the PCR fellows achieved a statistically significant improvement in the mean posttest score as compared with the mean pretest score (P=.02).

Additional Evaluation of the Didactic Phase of the PCR Fellowship Program

We also conducted an exit survey of 17 participants in the PCR curriculum (all 14 fellows and 3 CONCORD-PBRN

Table 3.
Program Evaluation Based on Participant Responses to Items Relating to the Patient-Centered Research Curriculum[a]

Evaluation Item	Response, %					Scale Score,[b] Mean (95% CI)
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	
The program improved my overall understanding of PCR.	88	12	0	0	0	4.9 (4.7-5.0)
The program improved my understanding of clinical research design.	65	35	0	0	0	4.6 (4.4-4.9)
The program improved my understanding of epidemiology.	47	35	18	0	0	4.3 (3.9-4.7)
The program improved my understanding of biostatistics.	35	53	6	6	0	4.2 (3.8-4.6)
The program improved my understanding of statistical software.[c,d]	38	44	13	6	0	4.1 (3.7-4.6)
The program improved my understanding of human subjects research ethics.	53	35	12	0	0	4.4 (4.0-4.8)
The program improved my understanding of the biomedical literature.	35	47	18	0	0	4.2 (3.8-4.6)
The 162 hours of instruction was just about right.	35	41	18	6	0	4.1 (3.6-4.5)
The number of instructors in the course was just about right.	47	47	6	0	0	4.4 (4.1-4.7)
The pace of material presented was just about right.[c]	56	38	6	0	0	4.5 (4.2-4.8)
The balance between conceptual and practical issues was just about right.	47	29	12	12	0	4.1 (3.6-4.7)
The assigned readings reinforced concepts covered in the sessions.	59	35	6	0	0	4.5 (4.2-4.9)
The handout materials helped identify important concepts.	59	35	6	0	0	4.5 (4.2-4.9)
Overall, the textbooks contributed to my understanding of PCR.	65	29	6	0	0	4.6 (4.3-4.9)
Specifically, the Hulley textbook[20] contributed to my understanding of PCR.	53	47	0	0	0	4.5 (4.3-4.8)
Specifically, the Gordis textbook[21] contributed to my understanding of PCR.	35	59	6	0	0	4.3 (4.0-4.6)
Specifically, the Haynes textbook[22] contributed to my understanding of PCR.	35	47	18	0	0	4.2 (3.8-4.6)
Specifically, the Daniel textbook[23] contributed to my understanding of PCR.[d]	24	47	18	12	0	3.8 (3.3-4.3)
Specifically, the Dunn textbook[24] contributed to my understanding of PCR.	35	47	12	6	0	4.1 (3.7-4.6)
I am more likely to undertake my own independent research.	47	41	6	6	0	4.2 (3.7-4.8)
I am more likely to collaborate with researchers at my institution.[d]	71	24	6	0	0	4.6 (4.3-5.0)
I am more likely to mentor researchers at my institution.	53	35	6	6	0	4.4 (3.9-4.8)
I am more likely to collaborate with researchers at other institutions.	65	35	0	0	0	4.6 (4.4-4.9)
I am more likely to mentor researchers at other institutions.[c,d]	38	19	31	13	0	3.8 (3.2-4.4)
I am more likely to collaborate with the ORC (beyond my practicum requirement).	71	29	0	0	0	4.7 (4.5-4.9)
I would recommend this program to my colleagues.	71	29	0	0	0	4.7 (4.5-4.9)

[a] Based on anonymous evaluations from 14 PCR fellows and 3 CONCORD-PBRN regional directors.

[b] Scale score for each item was computed as the mean of participant responses with higher scores reflecting stronger agreement with the statement (strongly agree, 5; agree, 4; neutral, 3; disagree, 2; strongly disagree, 1).

[c] There was 1 missing response on this item.

[d] Total of response percentages exceeds 100% because of rounding.

Abbreviations: CI, confidence interval; CONCORD-PBRN, Consortium for Collaborative Osteopathic Research Development–Practice-Based Research Network; ORC, The Osteopathic Research Center; PCR, patient-centered research.

regional directors) using a series of 26 items with 5 Likert-scale responses ranging from strongly agree (5 points) to strongly disagree (1 point). A mean scale score and 95% confidence interval was computed for each item, such that higher scores reflected more positive impressions of the curriculum or PCR fellowship program. The survey included 3 sentinel items on overall understanding of PCR research, likelihood of collaborating on future research, and recommending the program to colleagues. The survey results are presented in *Table 3*. The highest scores and, correspondingly, the best impressions were reported on the 3 sentinel items. The lowest scores related to the utility of the biostatistics textbook and to the likelihood of mentoring researchers at institutions other than the participant's home campus.

Another aspect of the exit survey involved the logistics and facilities used during the delivery of the didactic phase of the program. Ten items were used to evaluate the program, each having 4 response options ranging from excellent (4 points) to poor (1 point). A mean scale score and 95% confidence interval was computed for each item, such that higher scores reflected more positive impressions of the logistics or facilities. These survey results are presented in *Table 4*. The highest scores were reported for accessibility to Dallas-Fort Worth airports, ground transportation in Fort Worth, and meals throughout the EWS sessions. The lowest score was attributed to the hotel accommodations.

Future Directions and Challenges

The ORC plans further growth and expansion of its triadic

Table 4.
Program Evaluation Based on Participant Responses to Items Relating to Logistics and Facilities[a]

Evaluation Item	Response, %				Scale Score[b] Mean (95% CI)
	Excellent	Good	Fair	Poor	
Accessibility to DFW-area airports from your home institution[c]	81	13	6	0	3.8 (3.4-4.0)
Ground transportation in Fort Worth[c]	80	20	0	0	3.8 (3.6-4.0)
Hotel accommodations at Downtown Hilton[c]	36	43	14	7	3.1 (2.5-3.6)
Lunch and breakfast meals provided during sessions[c]	75	25	0	0	3.8 (3.5-4.0)
Evening meals provided by ORC	82	18	0	0	3.8 (3.6-4.0)
UNTHSC campus meeting facilities	53	41	6	0	3.5 (3.1-3.8)
Access to library services at UNTHSC	65	35	0	0	3.6 (3.4-3.9)
Access to Blackboard at UNTHSC	59	41	0	0	3.6 (3.3-3.8)
Access to IBM-SPSS software at UNTHSC	47	41	12	0	3.4 (3.0-3.7)
Access to other information technology services at UNTHSC	47	47	6	0	3.4 (3.1-3.7)

[a] Based on anonymous evaluations from 14 PCR fellows and 3 CONCORD-PBRN regional directors.

[b] Scale score for each item was computed as the mean of participant responses with higher scores reflecting greater satisfaction with the evaluated item (excellent, 4; good, 3; fair, 2; poor, 1).

[c] There were missing responses on this item.

Abbreviations: CI, confidence interval; CONCORD-PBRN, Consortium for Collaborative Osteopathic Research Development–Practice-Based Research Network; DFW, Dallas-Fort Worth; ORC, The Osteopathic Research Center; PCR, patient-centered research; UNTHSC, University of North Texas Health Science Center.

approach to conducting osteopathic research in real-world settings. The most immediate and tangible steps include implementing and publishing the results of the CONCORD-PBRN card study and evaluating the practicum phase of the PCR fellowship program by 2013. The latter will help guide planning for subsequent fellowship classes. Unlike our inaugural fellowship class, which followed a calendar-year timetable for their didactic and practicum phases, we anticipate aligning future fellowship classes and their EWS sessions with a traditional academic-year timetable. Thus, the next fellowship class is tentatively scheduled to begin in the fall of 2013.

We also need to build additional ORC infrastructure and capacity to support research designs that are more complex than the card study described herein. This goal will primarily require ORC personnel to conduct site visits and to train additional clinician-investigators and staff at the CONCORD-PBRN Level I member clinics, thereby enhancing their research capabilities and facilitating their transitions to secondary hubs. These secondary hubs will, in turn, require their own research personnel to sustain and grow the research enterprise.

Substantial additional funding will be required to fully implement this new research paradigm along the lines described herein. The ORC has invested considerable time and effort thus far to bring the CONCORD-PBRN and PCR fellowship program to their present states. This has been made possible through funding from external and institutional sponsors. However, more funding will be needed to sustain and expand these initial efforts. The funding priorities of major research agencies, such as the National Institutes of Health, appear to lag behind their stated needs for real-world research. Understandably, such agencies often focus on cutting-edge basic research, rather than on "low-tech" PCR. Thus, the osteopathic profession may need to look inward to identify sources of support for such research until the extra-professional funding environment improves.

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Editor's Note: In this article, the authors use the term *osteopathic manual treatment* to describe the techniques used to treat patients with somatic dysfunction. The style guidelines of *JAOA—The Journal of the American Osteopathic Association* and AOA policy prefer the term *osteopathic manipulative treatment*. Given the context of this article, the authors believe that the term *osteopathic manual treatment* is more appropriate because it is more encompassing than *osteopathic manipulative treatment*.