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OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

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*Pediatrics* 2008;122:e383-e387

DOI: 10.1542/peds.2007-3761

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://www.pediatrics.org/cgi/content/full/122/2/e383>

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American Academy of Pediatrics

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# A Medical Home for Children With Insulin-Dependent Diabetes: Comanagement by Primary and Subspecialty Physicians—Convergence and Divergence of Opinions

Steven E. Wegner, MD, JD<sup>a</sup>, Christine R. Lathren, MD, MSPH<sup>b,c</sup>, Charles G. Humble, MSPH, PhD<sup>a</sup>, Michelle L. Mayer, PhD, MPH<sup>d,e</sup>, John Feaganes, MA, DrPH<sup>a</sup>, Alan D. Stiles, MD<sup>c</sup>

<sup>a</sup>AccessCare, Morrisville, North Carolina; <sup>b</sup>North Carolina Department of Medical Assistance, Office of Rural Health, Raleigh, North Carolina; <sup>c</sup>Department of Pediatrics, North Carolina Children's Hospital, Chapel Hill, North Carolina; <sup>d</sup>Department of Health Policy and Administration, University of North Carolina-Chapel Hill School of Public Health, Chapel Hill, North Carolina; <sup>e</sup>Cecil G. Sheps Center for Health Services Research, Chapel Hill, North Carolina

The authors have indicated they have no financial relationships relevant to this article to disclose.

## What's Known on This Subject

Past research has supported the benefits of collaboration between PCPs and specialists. The American Academy of Pediatrics has described how comanagement should vary with the degree of severity of underlying conditions. However, little is known about the actual extent of comanagement.

## What This Study Adds

We show where pediatricians and endocrinologists agree and disagree regarding who should lead and when there should be comanagement for 23 specific aspects of care for children receiving insulin for diabetes.

## ABSTRACT

**OBJECTIVE.** The purpose of this work was to examine pediatricians' and endocrinologists' views about management for routine preventive and acute care, diabetes-specific care, and family education and care coordination for children with insulin-dependent diabetes.

**METHODS.** We conducted a mixed-mode survey of all of the pediatricians in 1 medicaid managed care network and all of the pediatric and adult endocrinologists who treat children with diabetes in North Carolina.

**RESULTS.** Of the 201 pediatricians surveyed, 132 responded (65%). Among the 61 endocrinologists who treat children, 59% replied. Nearly all of the respondents agreed that primary care physicians should have responsibility for routine primary care (eg, well-child checkups, treating minor illnesses or injuries, and immunizations). Likewise, large majorities favored endocrinologists as leads for diabetes-specific care (eg, 94% for training in use of an insulin pump and 82% for training in use of a glucometer). Many generalists and subspecialists reported that specific aspects of diabetes care should be comanaged (eg, 31% for tracking of hemoglobin A1c). However, large proportions of pediatricians and endocrinologists expressed differing opinions about the primary responsibility for family education and care coordination and for specific diabetes services. For example, 80% of endocrinologists saw subspecialists as leads for monitoring blood sugar levels, whereas 52% of pediatricians favored comanagement.

**CONCLUSIONS.** An effective medical home model of care depends on establishing clear lines of responsibility between the primary care physician and subspecialist. Our findings suggest that primary care physicians and subspecialists agree on who should lead most aspects of care for patients with insulin-dependent diabetes and that some aspects of care should be comanaged. However, primary care physicians and subspecialists did not agree either between or within disciplines on who should be more responsible for the basic aspect of monitoring of blood sugar levels. Approaches that recognize the appropriate division of care between primary care physicians and subspecialists, facilitate comanagement when it is needed, and reward the collaboration required to provide medical homes for patients should be investigated as models of care. *Pediatrics* 2008;122:e383–e387

[www.pediatrics.org/cgi/doi/10.1542/peds.2007-3761](http://www.pediatrics.org/cgi/doi/10.1542/peds.2007-3761)

doi:10.1542/peds.2007-3761

### Key Words

children with special health care needs, insulin-dependent diabetes, medical home, primary care, specialty care, comanagement

### Abbreviations

PCP—primary care physician  
IDDM—insulin-dependent diabetes mellitus

Accepted for publication Mar 11, 2008

Address correspondence to Steven E. Wegner, MD, JD, AccessCare, 3500 Gateway Centre Blvd, Suite 130, Morrisville, NC 27560. E-mail: [swegner@ncaccesscare.org](mailto:swegner@ncaccesscare.org)

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**T**HIS STUDY EXPLORES primary care physicians' (PCPs') and endocrinologists' perceptions of how collaboration within the medical home model of care occurs for children with insulin-dependent diabetes mellitus (IDDM). This critical element of the medical home has long been recognized by the American Academy of Pediatrics (which first developed the medical home concept in 1967<sup>1</sup>) and also by the federal government's Healthy People 2010 goals<sup>2</sup>

and by the New Freedom Initiative core outcomes.<sup>3,4</sup> Recently, with the American Academy of Pediatrics, adult medical specialties have adopted a joint statement on medical home policy priorities.<sup>5</sup>

The benefits of collaboration between PCPs and subspecialists can include improvements in access, reduced frequency and inappropriateness of referrals, better communication, improved outcomes and satisfaction, and lower costs.<sup>6–8</sup> It has been suggested that there could be 3 models of collaboration: (1) generalist as the manager model, such as for a child with moderately severe asthma; (2) subspecialist as the manager model, such as for a child with particularly rare or complex condition; and (3) comanagement model, such as for a child with type 1 diabetes and attention-deficit/hyperactivity disorder.<sup>7</sup> Understanding how this comanagement model works in the collaboration between PCPs and endocrinologists is important for building a more efficient medical home.

IDDM affects an estimated 1.54 per 1000 children nationwide, 1 of the most common chronic conditions of childhood.<sup>9</sup> Children with IDDM were selected because they require ongoing contact with primary care and endocrinologist involvement for improving short- and long-term outcomes.<sup>10</sup> Specifically, we examine physicians' views on the distinct and complementary roles of general and subspecialty physicians in providing routine care, diabetes-specific care, family education, and care coordination.

## METHODS

We conducted a survey of North Carolina PCPs and endocrinologists in February and March 2007. The University of North Carolina Institutional Review Board approved this research. The PCP sample was a convenience sample of all of the 201 active pediatricians participating in AccessCare. AccessCare is a provider-owned, not-for-profit medical home managed care organization serving >200 000 Medicaid child and adult enrollees statewide. Family practitioners make up a much smaller proportion of physician members of AccessCare and as a group tend to see far fewer pediatric patients than do pediatricians. Therefore, we felt that we would have been less able to rigorously describe their preferences for division of care of patients with diabetes and did not include them in the survey.

Because AccessCare providers refer patients to all of the medical centers throughout the state, the subspecialist sample targeted all of the endocrinologists practicing in North Carolina. A list of registered endocrinologists was obtained from the 2005 North Carolina Medical Board enrollment file. The presence of an active North Carolina license was verified through North Carolina Medical Board online databases. After dropping candidates with out-of-state practice addresses, volunteer status, or inactive licenses, 153 endocrinologists remained.

The survey instrument, available on request from the authors, contained 32 closed-ended questions. It was hand delivered to PCPs by AccessCare case managers and returned via mail. For endocrinologists, a cover letter, survey, and return envelope were mailed directly

to the office address or home address, if no office address was listed. Physicians were asked to return incomplete surveys if they met the exclusion criteria described below. Repeat surveys were mailed to nonrespondents ~3 and 6 weeks after the initial delivery attempt. After the third delivery attempt, the offices of nonrespondents were called, and a knowledgeable member of the office staff, usually a nurse, was asked to confirm whether the physician currently serves any children <18 years old. Those who did not were considered to be ineligible.

Physicians were asked to choose which physician type is primarily responsible for providing various services to children <18 years of age with IDDM: the PCP, subspecialist, or both (a category labeled "comanaged" that was not defined). Three types of care were examined: routine preventive and acute care, diabetes-specific care, and family education and care coordination. The remainder of the survey focused on demographics and practice characteristics. We use the term "insulin-dependent diabetes mellitus" in this report as opposed to "type 1 diabetes" because we were studying preferred sites of care for patients receiving insulin for their diabetes, irrespective of which type of diabetes they have. Survey responses suggest that ~13% of patients with IDDM cared for by responding physicians have type 2 diabetes.

Frequency and regression analyses of survey responses were performed using SAS 9.1 statistical software (SAS Institute, Inc, Cary, NC). PCP and endocrinologists responses were compared by using Fisher's exact test. Statistically significant differences in preferences were defined as those with a *P* value of <.01 because of the large number of comparisons made. Effects of practice characteristics on the reported preferences by practice type were assessed using logistic models. Rural Urban Commuting Area scores were used to estimate the remoteness of practices from urban centers.<sup>11</sup>

## RESULTS

Of the 201 PCPs given a survey, 132 responded, and none returned surveys indicating that they met exclusion criteria (65% response rate). Of the 153 endocrinologists mailed a survey, 62 returned surveys indicating that they met exclusion criteria; another 28 had office staff confirm by telephone that no children are served; and 2 surveys were returned because of wrong address. Reasons given by endocrinologists for exclusion from the survey were as follows: not currently treating children (85%), not involved in patient care (9%), retired status (5%), and working in an acute care setting (1%). Of the 61 remaining physicians, 36 surveys were completed (59% overall response rate). This included 17 of 21 pediatric endocrinologists (81%) and 19 of 41 adult endocrinologists (46%). Respondents and nonrespondents did not differ on age, gender, and rurality of practice location for both PCPs and endocrinologists (data not shown). Among endocrinologist respondents, the majority of pediatric endocrinologists practiced in academic centers, whereas all of the adult endocrinologists practiced in community-based settings. Few differences in practice preferences were found between pediatric and

**TABLE 1 Preferred Treatment Leads for Routine and Preventive Care of Subjects With IDDM Reported by PCPs and Subspecialist Physicians**

Respondent Type	PCP Primarily Responsible, %		Subspecialist Primarily Responsible, %		Comanaged, %	
	PCPs	Endocrinologists	PCPs	Endocrinologists	PCPs	Endocrinologists
Treating minor illnesses (eg, URI)	100	94	—	—	—	6
Treating minor injuries (eg, sprains)	100	94	—	3	—	3
Performing well-child check-ups	99	97	—	—	1	3
Administering/tracking immunizations	97	97	—	—	3	3
Completing required school/camp/sports forms <sup>a</sup>	95	44	—	9	5	47
Providing routine anticipatory guidance <sup>a</sup>	93	59	—	6	7	35
Monitoring growth and development <sup>a</sup>	73	34	—	17	27	49

— indicates no physician of this type favored this model of primary responsibility for the specified aspect of care; URI, urinary tract infection.

<sup>a</sup> Responses differed between 132 PCPs and 36 endocrinologists with a *P* value of <.01 using Fisher's exact test.

adult endocrinologists, leading us to report their findings together.

A majority of all of the respondents, as a group, saw clear preferences in lead responsibility for many aspects of care for children with IDDM (Table 1). There was near unanimity of preference for PCPs for 4 routine and preventive care issues, but the endocrinologists were split between PCPs as leads and a preference for comanagement for the completion of required forms, routine anticipatory guidance, and the monitoring of growth and development (Table 1). For diabetes-specific care there was a clear favoring of subspecialist leadership for the training of patients in the use of insulin pumps and glucometers (Table 2). However, whereas large majorities of endocrinologists saw themselves as leads for 7 of the remaining 8 aspects of diabetes-specific care, substantially fewer PCPs preferred subspecialist leadership for these roles (Table 2). Where these responses were significantly different (eg, monitoring of blood sugar), it was because a higher proportion of PCPs preferred comanagement or saw themselves as leads. Preferences for leadership in family education and care coordination were fairly evenly split between comanagement and lead by subspecialists (Table 3). Comanagement was favored for referrals for mental health by both physician groups, but there were significant differences as to who should lead communication with school or day care

personnel regarding medicines and referrals to ophthalmologists and nutritionists (Table 3).

Logistic regressions designed to test the effect of practice characteristics on reported preferences revealed significant associations (*P* < .01) for only 3 of 276 possible pairings. Increasing Rural Urban Commuting Area scores (for rurality of practice setting) among PCPs were associated with an increased preference for subspecialist leads for tracking hemoglobin A1c, screening for thyroid disorders, and prescribing diabetes medicines and supplies. Board certification in pediatrics, internal medicine, or in adult or pediatric endocrinology was not associated with physician preferences. There also were no significant associations of preferences with involvement of case managers, registered nurses, nutritionists, or health educators in the care of patients with IDDM. Finally, size of patient panel was not associated with reported preferences for who should lead any aspect of patient care.

## DISCUSSION

This study reveals widespread agreement among PCPs and endocrinologists regarding responsibilities for many aspects of care for children with IDDM. This is particularly true for the aspects of routine, preventative, and acute care. It also reveals the extent to which both generalists and subspecialists prefer that certain aspects of preventive and acute care, diabetes care, and espe-

**TABLE 2 Preferred Treatment Leads for Diabetes-Specific Care of IDDM Reported by PCPs and Subspecialist Physicians**

Respondent Type	PCP Primarily Responsible, %		Subspecialist Primarily Responsible, %		Comanaged, %	
	PCPs	Endocrinologists	PCPs	Endocrinologists	PCPs	Endocrinologists
Training patient in use of insulin pump	—	3	94	97	6	—
Training patients in use of glucometer	5	6	79	92	16	3
Prescribing diabetes medicines and supplies <sup>a</sup>	11	3	58	86	31	11
Screening for thyroid disorders <sup>a</sup>	14	3	54	86	32	11
Screening for microalbuminuria	15	3	61	86	24	11
Tracking hemoglobin A1c	8	3	57	83	35	14
Adjusting insulin doses	3	3	69	83	27	14
Screening for dyslipidemia <sup>a</sup>	17	3	49	83	34	14
Monitoring blood sugar <sup>a</sup>	11	—	38	80	52	20
Facilitating access to medical supply distributors	6	3	52	61	42	36

— indicates no physician of this type favored this model of primary responsibility for the specified aspect of care.

<sup>a</sup> Responses differed between 132 PCPs and 36 endocrinologists with a *P* value of <.01 using Fisher's exact test.

**TABLE 3 Preferred Treatment Leads for Family Education and Care Coordination of Subjects With IDDM Reported by PCPs and Subspecialist Physicians**

Respondent Type	PCP Primarily Responsible, %		Subspecialist Primarily Responsible, %		Comanaged, %	
	PCPs	Endocrinologists	PCPs	Endocrinologists	PCPs	Endocrinologists
Making referrals to mental health	30	17	8	14	63	69
Communicating with school/day care personnel regarding medicines <sup>a</sup>	23	8	20	56	57	36
Making referrals to ophthalmology <sup>a</sup>	23	—	20	61	56	39
Making referrals to nutritionist <sup>a</sup>	12	6	33	61	55	33
Providing family with a plan to transition to adult care, including diabetes care	5	3	45	58	51	39
Providing anticipatory guidance specific to diabetes (eg, alcohol use)	11	8	42	50	46	42

<sup>a</sup> Responses differed between 132 PCPs and 36 endocrinologists with a *P* value of <.01 using Fisher's exact test.

— indicates no endocrinologist favored primary responsibility for PCPs for referrals to ophthalmologists.

cially family education and care coordination should be comanaged. This high level of agreement regarding the division and sharing of responsibilities is encouraging for several reasons. It builds the foundation for the medical home model of care. It also establishes the significance of coordination and comanagement. In addition, it begins to clarify the services that are best handled by the PCP and those best handled by the subspecialist.

There are, however, notable exceptions. PCPs consistently assigned themselves lead responsibility for all of the aspects of preventive and routine care, whereas a large proportion of endocrinologist preferred to share responsibility for some of these aspects of care (Table 1). These findings are similar to the PCP preferences for comanagement of many aspects of care reported previously by Forrest et al<sup>12</sup> and Stille et al<sup>13</sup> for broader ranges of illnesses. Stille et al<sup>13</sup> also reported disagreements between PCPs and 5 types of subspecialists over 3 of 5 more general aspects of care, disagreements similar to those that we found between PCPs and endocrinologists over who should lead for 10 of 23 detailed aspects of care for pediatric patients with IDDM.

For most diabetes-specific aspects of care, endocrinologists assigned themselves primary responsibility, whereas a sizeable proportion of PCPs preferred shared management for at least some diabetes-specific care (Table 2). This response among subspecialists may reflect the complexity of dosing regimens, as well as the small number of children with IDDM that any 1 pediatrician follows. Among PCPs, this response may reflect their recognition of the frequency of insulin adjustments and the convenience to families of receiving at least some diabetes-specific care at the PCP office.

The greatest differences in preferences for who should lead physician responsibility were found for family education and care coordination (Table 3). This may be because of the fact that endocrinologists often have on-site support staff for family education and care coordination and are, therefore, logical partners in comanagement in these areas.

Given the high response rate among our pediatrician PCPs, the wide dispersion of AccessCare practices, and the efforts to standardize IDDM care for Medicaid pa-

tients in medical homes across the state, our results may be generalizable to the more rural group of pediatricians. The size of the pediatric patient panel with IDDM was not associated with reported preferences for any aspect of patient care, but the extent to which differences in physicians' views depend on the severity or complexity of these panels or the expertise of the PCP in the care of this condition is unclear from this study.

It is unclear whether any observed differences are because of limited access of families in rural areas to endocrinologists, family preferences for specialty or primary care, varying community practice standards, shortages of endocrinologists with pediatric expertise, or specific organizational and financing policies. Mayer<sup>14</sup> has raised the issue of geographic proximity as a key component of access to subspecialty care. Rural Urban Commuting Area scores were significantly associated with 3 of 10 aspects of diabetes-related care. Because the responding endocrinologists almost all practiced in urban settings, we regard the Rural Urban Commuting Areas as surrogates for the distance of PCPs (and, by extension, patients) from endocrinology care. However, because we did not ask physicians whether or how the distance to subspecialty care influenced their ideas of who should lead various aspects of care, we can only infer a causal connection for these 3 associations. Whatever the reasons for differing views on lead responsibility for various aspects of care, it is clear that there is no "1-size-fits-all" model of collaboration within the medical home for children with IDDM.

## CONCLUSIONS

The findings of this statewide study of medical homes are an important foundation for defining and developing a new partnership with increased interaction between PCPs and endocrinologists. The data also suggest several areas in which additional efforts are needed, specifically pertaining to education and consultation, communication and information mechanisms, quality and payment, and research. For PCPs to assume an increasing role in chronic care management, their needs for ongoing education and convenient specialty consultation need to be more formally established. The American Board of Pediatrics intends to address this issue in its Maintenance of Certifica-

tion Program (James Stockman, III, MD, written communication, 2007). It is possible that certain technical aspects relating to diabetic-specific care may be delegated to the subspecialist, with the PCP not requiring detailed training. In addition, preferred communication processes need to be worked out between the PCP and the subspecialist, as well as with the family, to establish a better understanding of the core services to be provided by each or both and the most efficient processes for doing so. An electronic medical chart with shared access for all of the providers should be part of this new system of care.

A mix of quality improvement strategies is also critical to the success of collaboration in medical homes. These include, for example, referral pathways developed in colleague with both PCPs and subspecialists with indicators for specialty care for initial diagnosis and management, for ongoing management, and for return to primary care. Quality measures that specifically assess communication, coordination, and comanagement are needed. These indicators may be split between the PCPs and subspecialists; patients who are comanaged would be assigned to both. In addition, payment that encourages PCPs to assume more responsibility for chronic care and that supports subspecialists in providing education and consultation support to PCPs would go a long way to implementing needed medical home reforms. Such payment incentives could come in the form of reimbursement for nonface-to-face communications, care plan oversight services, and other consultation-related codes that are seldom recognized by public and private payers. In addition, payment incentives could be offered as practice or quality add-on bonuses for specific collaborative functions. Finally, new investments are needed to support practice-based pediatric research pertaining to actual processes and results of coordination and comanagement as part of the medical home model of care.

#### ACKNOWLEDGMENTS

We thank Peggy McManus, codirector of the Maternal and Child Health Policy Research Center and president of In-center Strategies, for numerous suggestions and help in preparing the article. We also thank the case managers from AccessCare who distributed surveys to pediatricians in their respective counties across North Carolina.

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