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Research During Pediatric Residency Training: Outcome of a Senior Resident Block Rotation

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Research During Pediatric Residency Training: Outcome of a Senior Resident Block Rotation

WHAT'S KNOWN ON THIS SUBJECT: Pediatric residency programs are required to provide a curriculum that advances residents' knowledge of the basic principles of research. Previous research has identified many barriers to conducting research during pediatric residency training.

WHAT THIS STUDY ADDS: A successful training model for enhancing research and academic skill development of pediatric residents can lead to productive research accomplishments by pediatric residents. Key elements of the program include protected time, senior faculty leadership and mentorship, and program funding.

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KEY WORDS
education, residency training, research

ABBREVIATIONS
CDB— career-development block
OR— odds ratio
CI— confidence interval

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abstract

BACKGROUND: The Pediatric Residency Review Committee requires programs to provide a curriculum that advances residents' knowledge of the basic principles of research. In July 2002, the Boston Combined Residency Program instituted a 3-month career-development block (CDB) rotation. During the rotation residents pursue an academic or clinical project under mentorship by a faculty member.

OBJECTIVE: Our objective for this study was to evaluate the outcome of the CDB rotation since it was implemented.

METHODS: A survey was administered to 165 residents who completed the CDB rotation.

RESULTS: Of 165 residents, 136 (82%) responded to the survey. Of 122 residents who reported the type of project they conducted, 59 (48%) completed a clinical/health services project, 24 (20%) completed a project in education or curriculum development, and 7 (6%) worked in basic science. Thirty-five residents (27%) received funding to support their work. Thirty-five residents (26%) presented at national meetings such as the Pediatric Academic Societies Meeting. Fifteen (11%) residents have had manuscripts accepted for publication, and 22 (16%) additional residents have submitted manuscripts for publication. Factors associated with successful publication included having received funding (odds ratio: 3.37 [95% confidence interval: 1.34–8.42]) and the nature of the research project (odds ratio: 3.55 [95% confidence interval: 1.40–9.04]). The majority of residents (84%) stated that the CDB rotation enhanced residency training.

CONCLUSIONS: A dedicated academic rotation that includes protected time, senior faculty mentorship, and program funding, can lead to productive research accomplishments by pediatric residents. Support of academic work during residency training may encourage engagement in a variety of academically oriented activities. *Pediatrics* 2009;124:1126–1134

Accomplishing research during residency training is a goal of many pediatric training programs, and yet, there are few descriptions of how best to accomplish this challenge.[1–5] Efforts to develop research skills during residency training have been described in many medical and surgical specialties.[6–15] The barriers to developing research during residency training include work hour limits, the balance between clinical and service needs of the program, and the competing educational needs of trainees. In addition, the varied previous experiences and future career paths of residents require flexibility in program development and implementation.

The Accreditation Council of Graduate Medical Education requires accredited pediatric residency programs to provide a curriculum that advances residents' knowledge of the basic principles of research while assuring participation in scholarly activities by allocating resources to support such activities.[16] The American Academy of Pediatrics Committee on Pediatric Research recommended that education in research methodology be provided to all pediatricians-in-training. The committee proposed integrating a research curriculum into existing educational sessions, promoting research electives, and encouraging resident participation in research projects.[17]

The importance of teaching research has been emphasized by Cull et al[2] who linked the shortage of pediatric researchers over the past decade to a lack of research exposure during residency training. Stockman[18] believed that although a research requirement during residency training may not alter the career path of an individual trainee, proper research mentoring may be of value to all physicians. Encouraging efforts to develop research during residency training has been discussed as an approach to promoting academic pediatric careers.[19,20]

The challenges in accomplishing research during residency training must also be noted. In a 2001 survey of 500 post graduate year (PGY-3)-3 residents, residents assessed their own research knowledge as inadequate. Although many residents participated in journal clubs, fewer residents reported any formal research training (13%) or had conducted a research project during their residency (8%).[2] Perceived barriers to conducting research include inadequate protected time, lack of previous research training, insufficient financial support, vague curricular requirements, and minimal contact with ongoing research projects.[2] Other barriers such as scheduling challenges, insufficient faculty support, and lack of personal interest have been identified by other investigators.[3,21–25] The lack of available mentors has been identified as a key element in preventing residents from accomplishing research during residency training.[26,27]

Despite these many challenges, critical elements of successful programs have begun to emerge.[4,5] The importance of a dedicated research rotation and the presence of a research director have been highlighted as strategies to enhance resident research.[28,29]

To address the challenges of promoting academic scholarship and enhancing research productivity of our housestaff, in July 2002 we instituted a new curriculum within our pediatric training program. One of its key elements was the introduction of a 3-month required block rotation, the career-development block (CDB), in the PGY-3 year. The CDB rotation is designed to provide housestaff with a defined, structured block of time to enhance research training and foster individual academic development.

PROGRAM DESCRIPTION

Philosophy and Goals of the CDB

Our residency program has a core philosophy of training leaders for future academic careers in medicine including general academic and subspecialty pediatrics, public health, and advocacy. The CDB rotation is viewed as the final stage of an independent learning environment that provides residents with a foundation for future academic work.[30] Our primary goal is to provide residents with an experience and curriculum that provides an opportunity for them to develop a scholarly project.

Structure of the CDB

Two senior health services researchers serve as rotation directors. Residents are assigned to the CDB rotation in groups of 8 to 9 (25% of the PGY-3 class) and rotate together for the entire 3-month block of time. Each resident works with a faculty member who serves as their project mentor. Together they develop a project charter which outlines the goals of their independent learning experience. Residents are encouraged to develop an academic product such as an educational curriculum, review article, abstract, or manuscript from their work in the CDB rotation.

Project evaluation occurs throughout the rotation as each resident presents updates at "works in progress" sessions and at a required final presentation. During the CDB rotation, residents have no other responsibilities except for continuity clinic and their assigned on-call duties.

A mandatory curriculum is a key element of the CDB rotation, which occurs once a week, for 3 hours. The curriculum includes ~25 hours of seminars on topics such as research methodology as well as topics that broaden residents' exposure to quality improve-

ment, patient safety, and health policy (Appendix).

Rotation Directors

Rotation directors are responsible for oversight of CDB curriculum, including selection of faculty speakers. Although they are not responsible for mentorship on individual projects, they offer suggestions to enhance the success of individual projects and monitor the progress of each CDB project.

Project Mentors

Each resident selects a faculty member who serves as their project mentor. The mentor is expected to provide leadership and direction to allow successful completion of the project. Mentors provide input on the scientific merit and statistical plans of a proposed project.

Financial Support for Residents

To address the challenge of the financial support for resident research, both the Boston Medical Center and the Children's Hospital Boston have established endowments to support the research activity of our housestaff. These competitive intramural funding sources provide grants in amounts from $500 to $8 000 per grant. For work accepted at a national meeting, the program provides residents with the necessary funds to attend the meeting.

METHODS

In September 2007, an anonymous survey consisting primarily of closed-ended questions was distributed by e-mail to 165 residents who completed the CDB rotation between July 2002 and June 2007. Additional qualitative questions focused on the residents' perspective of the most important characteristics of the CDB rotation. Three subsequent attempts, by e-mail, were made to reach nonrespondents.

Descriptive statistics (means and frequencies) were used to characterize the study sample. To understand the variables associated with project success, we analyzed associations with various factors, including resident characteristics (ie, year of residency, gender, residency track, having an additional graduate degree), previous research training, and project characteristics (ie, the nature of the research project, funding, evaluation of mentor) by using χ^2 or Fisher's exact test (where expected cell counts were <5). A successful project was defined as any project leading to a published or presented abstract, workshop presentation, or manuscript (in press or published). This same set of variables were then used in univariate and multivariate logistic regression models to predict the odds of project success; variables that were found to be significantly ($P < .05$) associated with project success were included in the multivariate model. Alpha was set at .05 for all tests. All analyses were performed by using Statistical Analysis System 9.1 for Windows (SAS Institute, Cary, NC).

The study was approved by the Boston University Medical Center Institutional Review Board.

RESULTS

One-hundred thirty-six of 165 residents (82%) responded to the survey. Physician characteristics and previous research experience of residents are described in Table 1. In addition to their doctor of medicine degree, 28 residents (21%) started residency with an advanced degree (master of public health, $n = 9$; doctor of philosophy, $n = 8$; master of science, $n = 5$; doctor of jurisprudence, $n = 2$; other degrees, $n = 4$). Of 122 residents who reported the type of research project they conducted, 59 (48%) completed a clinical/health services project, 24 (20%) completed a project in education or curriculum development, and 7 (6%) worked in basic science. Eighteen (15%) used their time to enhance their clinical skills and 12 (10%) assisted in laboratory work or career planning. Thirty-five residents (27%) received funding to support their work, with 8 residents having more than 1 funding source. Twenty-nine awards were obtained from intramural hospital grants and 14 awards were obtained from other local or national organizations.

Forty-nine residents (36%) met our definition for a successful project and had developed a published or presented abstract, a workshop presentation, or a manuscript (in press or published). Some residents had more than 1 successful publication or presentation. From this group of 49 residents, the CDB has resulted in 35 (26%) presentations at national meetings such as the Pediatric Academic Societies. Thirty-two residents (23%) have published abstracts and 15 residents have had manuscripts published or in press; 22 (16%) additional residents have submitted manuscripts for publication (Table 1).

Resident assessment of the CDB rotation was positive (Table 2). The majority of residents (84%) rated the rotation as very or somewhat positive and 81% stated the CDB rotation provided an individualized training experience or enhanced (77%) their residency training experience. Mentoring was seen as positive or very positive by 76%. Qualitative, open-ended assessment by the residents described the strongest components of the rotation as follows: (1) protected independent learning environment; (2) dedicated research time; and (3) structured educational experience and curriculum. Residents identified the following barriers to accomplishing research during the CDB rotation (data not shown): (1) limited time allocated for the research projects, especially for tasks such as the institutional review board

TABLE 1 Sample Characteristics and Research Experience of 136 Physicians Participating in the CDB Rotation Between 2002 and 2007

Sample Characteristic	*n*	%
Year of residency (*N* = 136)		
2002–2003	24	18
2003–2004	23	17
2004–2005	35	26
2005–2006	25	18
2006–2007	29	21
Gender (*N* = 136)		
Female	93	69
Male	43	31
Residency track (*N* = 134)		
Primary care	40	30
Categorical	94	70
Advanced degree (*N* = 136)		
None	108	79
Any	28	21
Research requirement for medical school (*N* = 134)		
No	114	85
Yes	20	15
Nature of primary project (*N* = 122)		
Education/curriculum development	24	20
Clinical/health services	59	48
Basic science research	7	6
Enhanced clinical experience	18	15
Career planning	12	10
Other	2	2
Funding (*N* = 128)		
No funding	93	73
Any funding	35	27
Funding source		
Internal Boston Medical Center or Children's Hospital Boston award	29	23
External funding award	14	11
Publication status of work (*N* = 136)		
No. of residents with at least 1 type of publication[a]	49	36
Abstract	32	23
Manuscript	—	—
Published or in press	15	11
Submitted for publication	22	16
Presentation of research project (*N* = 135)		
National meeting	35	26
Local or regional meeting	16	12

[a] Any type of publication is defined as having any type of abstract (poster or oral) and manuscript (in press or published). Note that an individual is only counted as a "success" once because some individuals have >1 publication product.

process; (2) variability in faculty mentorship; and (3) lack of preparation during the first 2 years of training.

Several factors were associated with project success (Table 3). In univariate regression models, the odds of project success were directly and significantly associated with being in the categorical track (odds ratio [OR]: 2.46 [95% confidence interval (CI): 1.06–5.73]), having a master of public health degree (OR: 7.08 [95% CI: 1.41–35.59]), having funding (OR: 4.87 [95% CI: 2.13–11.14]), conducting a clinical, health services, or basic science research project (OR: 5.52 [95% CI: 2.39–12.76]), and higher rating of the research mentor (OR: 2.21 [95% CI: 1.07–4.59]) (Table 3). Factors that were significantly related to success in multivariate modeling included funding (OR: 3.37 [95% CI: 1.34–8.42]) and the nature of the research project (OR: 3.55 [95% CI: 1.40–9.04]) (Table 4).

TABLE 2 Evaluation of Components of the CDB Rotation by 136 Residents Who Participated in the Rotation Over a 5-Year Period[a]

Components of the CDB Rotation	*n*	%
Provided background in topics not covered in the residency curriculum	111	84
Overall rating of the CDB rotation	110	84
Provided individualized training experience	108	81
Enhanced residency training	103	77
Quality of the mentorship	97	76
Provided a foundation for a future career in pediatrics	94	70
Enhanced research skills	76	57

[a] Questions were based on a 5-point Likert scale. All data are the total number of residents who responded either somewhat or very positive to each question.

DISCUSSION

In response to the Accreditation Council of Graduate Medical Education training requirements and the recommendations of the American Academy of Pediatrics Committee on Research, we believe our training program has successfully implemented a curricular change that has improved research training and academic productivity of our housestaff.[16,17] In the 5 years since it has been introduced, the CDB rotation has resulted in 35 presentations at national meetings. Thirty-two residents have published abstracts of their work and 15 residents have had manuscripts published or accepted for publication. Twenty-two additional residents have submitted manuscripts for publication. Overall, residents report that the CDB rotation enhanced residency training and provided a strong foundation for a future career in pediatrics.

We believe the educational value of research training is significant and should be emphasized in core pediatric training. For an individual resident, a significant research accomplishment may strengthen their application for fellowship training, provide them with an introduction to the academic environ-

TABLE 3 Factors Associated With Creating a Successful Research Product[a] Among 136 Residents[b] Participating in the Boston Combined Residency Program Between 2002 and 2007

Factor	Successful, *n* (%)	Not Successful, *n* (%)	*P*[c]
Year of residency			.35
2002–2003	8 (33)	16 (67)	—
2003–2004	5 (22)	18 (78)	—
2004–2005	14 (40)	21 (60)	—
2005–2006	8 (32)	17 (68)	—
2006–2007	14 (48)	15 (52)	—
Gender			.56
Female	32 (34)	61 (66)	—
Male	17 (40)	26 (60)	—
Residency track			.046
Primary care	9 (23)	31 (78)	—
Categorical	37 (39)	57 (61)	—
Graduate degree			
Any degree	13 (46)	15 (54)	.20
Master of public health	7 (78)	2 (22)	.01
Nature of research project			.0002
Education/curriculum development	9 (38)	15 (63)	—
Clinical/health services	32 (54)	27 (46)	—
Basic science research	4 (57)	3 (43)	—
Enhanced clinical experience	1 (6)	17 (94)	—
Career planning	0 (0)	12 (100)	—
Other	0 (0)	2 (100)	—
Funding			
No funding	24 (26)	69 (74)	<.0001
Any funding	22 (63)	13 (37)	—
Research requirement for medical school			.62
No	39 (34)	75 (66)	—
Yes	8 (40)	12 (60)	—
Time spent in research in medical school			.09
No time	7 (19)	29 (81)	—
<3 mo	16 (43)	21 (57)	—
3–12 mo	19 (44)	24 (56)	—
>12 mo	6 (32)	13 (68)	—
Evaluation of mentor			.07
1 (highest)	28 (47)	31 (53)	—
2	13 (34)	25 (66)	—
3	3 (20)	12 (80)	—
4	3 (20)	12 (80)	—
5 (lowest)	1 (100)	0 (0)	—

[a] A successful research product was defined as any project leading to a published or presented abstract or manuscript (in press or published) ($n = 49$).

[b] Sample sizes are based on those who answered both questions (ie, success and factor of interest) as follows: residency track, $n = 134$; nature of primary project, $n = 122$; funding, $n = 128$; research requirement for medical school, $n = 134$; and evaluation of mentor, $n = 128$.

[c] For statistical testing of the overall association between each factor and a successful research product, χ^2 analysis was performed for expected cell counts of >5, and Fisher's exact test was used for expected cell counts of <5.

ment, and prepare them for fellowship scholarly activity requirements.

The broad spectrum of child health research and its importance to all pediatricians has challenged educators to consider research training as an important element in the education of all pediatric residents, not just those emphasizing careers in subspecialty disciplines. With recent advances in molecular biology, gene therapy, and health services research the integration between clinicians and researchers will become a more important element of pediatric care over the next decade, requiring educators to incorporate core knowledge about research into our training programs.

Because the majority of residents will not become independent researchers, it is critical to assess the value of such a research rotation during residency training for future clinicians, educators, and child health advocates. A recent study suggests that the majority of residents do not understand the statistics they encounter in journal articles.[31] Developing a resident research program promotes quality patient care and skill development in lifelong learning. We believe that a resident research program helps future physicians understand the evidence base that informs clinical pediatric care.[32–35] As parents, payers, and policy makers increasingly seek "evidence-based" care, physicians' ability to assess current research will be critical. The additional focus of our CDB on quality improvement, patient safety, and other areas is not coincidence. Physicians will be required to have a deep and functional understanding of principles in these areas. Establishing skills for lifelong learning in all of these areas is a major focus of the CDB.

Many barriers to accomplishing research during residency training have been described, including limited time devoted to research, lack of mentoring, no formal research curriculum, inadequate faculty presence to support research, and inadequate funding.[2,3,21,22,24,25] We designed the CDB to address these barriers which challenge the ability of residents to accomplish research during residency training.

A key element of the CDB rotation is the protected independent learning environment established by providing this 3-month block rotation in the PGY-3 year. The rotation provides residents with the research continuum described by Hamann et al[36], including a "preparatory phase" to generate a research topic, an "investigatory phase" for data collection, and a "synthesis phase" for analysis, review, reflection, and abstract presentation or publica-

TABLE 4 Associations Between Physician Characteristics and Odds of Creating a Successful Research Product Among 136 Physicians Participating in the Boston Combined Residency Program Between 2002 and 2007

Factors Associated With Success[a,b]	Univariate Models		Multivariate Model[c]	
	OR (95% CI)	*P*	OR (95% CI)	*P*
Gender, male	0.80 (0.38–1.69)	.56	—	—
Year of residency, earlier than 2005–2006	1.40 (0.69–2.85)	.35	—	—
Residency track, primary	2.46 (1.06–5.73)	.04	1.36 (0.49–3.81)	.55
Having a graduate degree, no	1.73 (0.75–4.03)	.20	—	—
Having a master of public health degree, no	7.08 (1.41–35.59)	.02	—	—
Funding, none	4.87 (2.13–11.14)	.0002	3.37 (1.34–8.42)	.001
Research requirement for medical school, no	1.28 (0.48–3.40)	.62	—	—
Time spent in research in medical school, <3 mo	1.47 (0.42–2.98)	.28	—	—
Clinical, health services, or basic science research project, all else	5.52 (2.39–12.76)	<.0001	3.55 (1.40–9.04)	.008
Evaluation of mentor, >1	2.21 (1.07–4.59)	.03	1.87 (0.80–4.36)	.15

[a] A successful research product was defined as any project leading to a published or presented abstract or manuscript (in press or published) ($n = 49$). Multivariate logistic regression analysis was used to predict odds of success; statistical significance was defined at $\alpha < .05$ (2-tailed).

[b] Sample sizes are based on those who answered both questions (ie, success and factor of interest), as follows: residency track, $n = 134$; nature of primary project, $n = 122$; funding, $n = 128$; research requirement for medical school, $n = 134$; and evaluation of mentor, $n = 128$.

[c] Potential variables in the multivariate model included those that were statistically significant in univariate analyses ($P < .05$), with the exception of the master of public health degree because of the small sample size ($n = 7$).

tion. A CDB preparatory workshop for post graduate year (PGY-2)-2 residents at our residency spring retreat provides a description of the CDB rotation and the emphasis on accomplishing an academic product. Careful planning allows residents to use the CDB rotation for the investigatory phase of their project. Requiring each resident to present during a "works in progress" session allows rotation directors to monitor the progress of each resident. Residents and mentors use remaining time in the CBD rotation and throughout the PGY-3 year for the synthesis phase with culminates with completion of their academic work.

Leadership is a critical element of educational innovation and the importance of a research director has been described as a key component of other successful programs.[29,37] With exposure to rotation directors, who have extensive research experience, the residents benefit from their expertise and the rotation becomes an academic research block. The CDB directors select faculty who are outstanding teachers to lead each interactive seminar. We believe this has contributed to the consistently strong ratings for the rotation.

Funding support is provided to residents through intramural grants established by endowments at both institutions involved in our residency program. Our study results highlight the critical importance of obtaining funding to support resident research. Over the past 5 years, 35 residents (26%) had funding to support their work, with 8 residents having more than 1 funding source. This funding represents new funding for each resident, rather than a continuation of funding from previous work or research. Residents who received funding for their projects were more likely to be successful in developing an abstract for a national meeting or producing a manuscript of their work when compared with those residents without funding.

A significantly greater proportion of residents conducting clinical/health services or laboratory-based research were successful (54% and 57%), compared with those involved in education and curriculum development (38%, $P = .0002$). These results are expected because many of the residents who selected educational projects focused on educational enhancements to our residency or medical student programs; these projects usually address a particular educational need of our own program and may not be generalizable to other settings, thus decreasing the likelihood of publication.

We noted a significant association between project success and residents' perception of their CDB mentor. Lack of proper mentoring has been well described in the literature as a barrier for residents to succeed in research.[26,27,38–40] In our study there was a trend which suggested that residents who rated their mentor highly were more likely to achieve success, although this association was attenuated and no longer significant in multivariate analyses, possibly indicating a lack of statistical power. An additional potential advantage of strong mentors is their ability to assist the resident in obtaining funding for their work.

A greater proportion of residents in the categorical track were successful compared with those in the primary care track. Our residency program contains 2 tracks with significant overlap in curriculum and training experiences. A higher proportion of residents with research backgrounds choose to train in the categorical track, which is designed to support residents with interest in subspecialty pediatrics. The small number of residents with previous research experience and advanced degrees precludes

meaningful analysis of the differences in outcomes between residents in the 2 tracks.

Most important to us is the overall impact of the CDB rotation on our training program. Residents appreciate the value of an independent learning environment which emphasizes their academic development within a structured educational experience. The majority of our residents state that the CDB rotation affords them an individualized training experience which provides a foundation for a future academic career. As educators we are encouraged by the impact of the curriculum for enhancing the academic training of future pediatricians.

LIMITATIONS

Because we have not tracked the academic productivity of residents who trained before the introduction of the CDB rotation we cannot compare the true impact of this rotation. However, the overwhelming perception of program leadership suggests significant academic productivity of our housestaff as a result of their participation in the CDB rotation. Certainly the number of academic presentations at national meetings has increased dramatically.[30]

Eighteen percent of residents did not respond to the survey. Although it is possible their lack of response reflects dissatisfaction with the CDB rotation, we annually evaluate all rotations in our residency program and the CDB rotation is consistently rated among the best rotations in our program. In the group of nonresponders, at least 5 (17%) residents were successful in achieving at least 1 publication from the CDB project, highlighting that even among this group there was modest academic success from their CDB project.

Although scholarly research activity is the primary focus for residents during the CDB rotation, ~25% of residents pursue additional clinical and education projects that enhance practice careers. It is possible that the high rating of this rotation reflects our flexibility in allowing residents to merge the selection of their CDB experience and project with individual academic or clinical practice aspirations. In our judgment, programs instituting a similar curricular experience may need to adjust the academic versus clinical focus of a similar curriculum to provide flexibility which balances the resident's career direction with the training goals and philosophy of the residency program. For example, a residency program with an academic focus can encourage basic and clinical research projects; a program with a primary care focus can encourage projects in clinical practice, education, or prevention.

Consistent with the theme of quality improvement, we have made modifications to enhance and improve the CDB rotation, including significant changes to the curriculum. These changes have occurred throughout the first 5 years of the CDB rotation and preclude us from identifying the single most important aspect of the CDB rotation. To assist our residents with preparing for the PGY-3 CDB rotation, during our current academic year (2008–2009) we have added a 2-week CDB planning rotation in the PGY-2 year. This was in response to feedback about the lack of time to prepare for the CDB rotation during the first 2 years of residency training. During the CDB planning rotation, residents meet with 1 of the CDB rotation directors and develop goals for their project. This allows for time to identify the rate limiting step of their work such as the need for institutional review board approval.

Finally, many of our residents continue to develop and refine the research first started in the CDB rotation. This article may actually underreport the impact of the CDB rotation, because research started during residency may reach completion and publication during fellowship training. With many of our residents pursuing fellowship training it may be difficult to assign a true impact of the CDB rotation because their work during residency training may overlap with their subsequent research as a subspecialty fellow.

CONCLUSIONS

Residency programs should continue to discuss approaches to research training within their training programs. A dedicated required academic rotation that included substantial "protected time," senior faculty leadership and mentorship, supplemented by program funding, can lead to productive research accomplishments by pediatric residents. Effective support of academic work during residency training may encourage engagement in a variety of academically oriented activities, regardless of the career path of individual residents. As educators we are pleased with the positive outcomes and attributes of this program and encourage other programs to consider similar models to support the academic development of pediatric residents.

APPENDIX: CURRICULAR COMPONENTS OF WEEKLY SEMINAR SERIES OVER A 3-MONTH PERIOD IN THE CDB ROTATION

1. Health information technology
2. Quality improvement and patient safety
3. Study design and critical reading of the literature
4. Academic career counseling
5. Professionalism
6. Global HIV crisis
7. National immunization policy
8. Industry relations with academic health centers
9. Research topics

- Overview of study design
- Randomized clinical trials
- Meta-analysis
- Evidence-based medicine
- Cochrane reviews
- General research discussion during "works in progress" sessions

10. Health care outcomes
    - Neonatal mortality
    - Infant mortality
    - Life expectancy
    - Environmental health
11. Health care financing
12. Health disparities

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