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ORIGINAL PAPER

Continuity of Infant Well Care in a Community Health Center Resident Clinic

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Abstract
Achieving patient continuity in resident continuity clinic is challenging. Patients, residents and primary care providers (PCP) benefit from this ongoing relationship. We examined rates of continuity of infant well care for first year pediatric residents (PL1) and associated factors in three clinics (W, E and K) in a community health center system. We collected the number of infants who had PL1 PCPs for academic years 2010, 2011 and 2012 and patient demographic data. We measured continuity using the usual provider of care method. We assessed rates of continuity, total numbers of infants and factors associated with continuity and medical home by Chi Square, ANOVA, Student's t test and multivariate linear regression (SPSS version 21). 115 patients had a PL1 PCP and attended 408 visits with 19 residents. The mean number of infants seen per PL1 in each clinic was W 7.8 ± 2.2, E 3.8 ± 1.5 and K 3.7 ± 2.9 ($p < .01$). PL1 continuity percentage was 66% at W, 47% at E and 54% at K ($p < .01$). Total continuity of care for all providers at W was 70%, E 65% and K 60% ($p < .01$ W vs. K only). In multivariate linear regression, only continuity of care for all providers was associated with mean PL1 continuity with β of 2.24 (95% CI 1.13–3.34), $p < .001$. PL1 continuity differed significantly between clinic sites. The only predictor of PL1 well care continuity was total clinic continuity of care. Maximizing continuity through the Medical Home practice was significantly associated with increased resident continuity of care.

Keywords Continuity of care · Resident education and training · Medical home · Patient numbers

Introduction

One of the hallmarks of primary care is sustained relationships between care providers and patients. Higher rates of continuity are consistently associated with higher patient and clinician satisfaction [1–3]. Parents feel more respected, listened to and better educated by providers when levels of continuity are high. Parents who experience higher continuity also give higher ratings to clinics and providers [4]. Residency training programs and residents themselves, irrespective of their future career choices, value continuity of care as part of the educational experience [5–7].

Health outcomes and health care utilization also benefit from higher continuity. Patients with higher continuity have a lower risk of ED visits and hospitalizations and a dose relationship is observed with lower continuity resulting in increasing ED use and hospitalization [8]. Other associated benefits of continuity of care include increased vaccination and health maintenance rates, improved care of some chronic illnesses and improved parental perception of care coordination [9–12].

Continuity clinics for pediatric residents were suggested by the pediatric Residency Review Committee (RRC) in 1980; in 1989 the RRC required a weekly continuity clinic to provide "the continuous care of a group of patients throughout the 3 year training". Currently, pediatric residents are required to spend 36 half-day sessions per year in a longitudinal outpatient experience exposing them to pediatric well care, care of sick children, care coordination and long-term

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management of children with chronic conditions and special health care needs [7]. Continuity clinics occur in hospital based settings and community settings including private practices, community health centers and other sites. There has been increasing focus in resident education on maximizing the longitudinal learning that occurs during sustained patient relationships [7, 13]. The Continuity Special Interest Group of the Academic Pediatric Association notes the "mission of the continuity experience is to help residents acquire competencies essential for comprehensive, coordinated longitudinal care of children with a wide variety of medical, behavioral, and social problems" [14]. However, no consensus exists around what constitutes optimum continuity on the educational side and from the patient care perspective [7, 15, 16]. Despite the recognized importance of the continuity experience, resident duty hour regulations challenge scheduling of continuity clinics. There has been little recent published literature about resident continuity.

Starting in 2009 one community health center (clinic W), and subsequently our safety net hospital system, embarked on a Patient-Centered Medical Home (PCMH) transformation in participation with the Safety Net Medical Home Initiative [17]. Increasing provider and patient continuity was one area of focus. Our objective is to examine rates of continuity of infant well care for first year pediatric residents (PL1) in a community health center system. We looked at rates of continuity, total numbers of infants cared for, and factors associated with continuity.

Methods

Denver Health Community Health Centers are part of Denver Health [18, 19], a safety net hospital system including a general hospital with newborn nursery, NICU, pediatric ward and PICU. Community health center pediatric clinics at three sites (clinics W, E, K) provide resident continuity clinic for around 20 residents of the Children's Hospital of Colorado residency program.

From Denver Health administrative data, we collected data on all infant patients ≤ 12 months of age who had a PL1 listed as their assigned primary care provider (PCP) at any time during the academic years of 2010–2011 (year 1), 2011–2012 (year 2), and 2012–2013 (year 3). Data for well care visits of any infant for which the PL1 was the PCP were collected, including: the listed PCP for each visit, the provider who actually provided the care, and the provider billing for the visit. Preferred language by parental report, infant gender, age and insurance status were collected for all visits. Chart review was completed for all infants having a PL1 listed as the PCP to verify the clinician who provided the care at all well care visits between 2 weeks of age through the 12 month visit. Infants had to have been seen by the PL1 for at least two well care visits to be included in the project. If the infant was seen by a resident for the newborn (3–5 day) visit it was counted as a well care visit (total of six possible visits). The newborn visit is usually performed by nurses who then assign the PCP per parental request or open provider panels, thus in most cases, the first visit analyzed was the 2 week well care visit. If the PCP or the clinic attended changed during the year, any reason for why this occurred was noted. Acute or follow-up visits were not counted.

Residents were assigned to the Denver Health clinics by the residency program and residents in the W clinic were requested to speak Spanish fluently. Data on resident days in continuity clinic was collected from the computerized resident scheduling system. Each half day session was counted as 1 session and 1 day. Full days in clinic were counted as 2 sessions and 1 day. Two sessions in 1 week counted as two sessions and 2 days.

Clinic scheduling by phone for resident patients is done by a centralized appointment center in the same manner for all providers and all clinics, except for well care visits at Clinic W which could only be appointed with the PCP. Appointments are scheduled no more than 2–3 weeks in advance by the appointment center. Resident patients at Clinic W could be appointed 1 month in advance by the in-clinic clerk. At the newborn, 2 week, 2 month and 4 month well care visits parents are encouraged to schedule their next well care visit with a clerk prior to leaving the clinic. Scheduling reminder slips are given for the 9 and 12 month well care visits. Appointment reminder calls are made for all appointments.

Data on overall provider continuity of care for each clinic was collected from administrative data that was available starting in March of 2011 for compliance with the Denver Health Medical Home certification. Mean clinic continuity was the % of all patient visits that occurred with the patient's PCP for each month. For infants seen between June, 2010 and February, 2011 mean clinic continuity was imputed as the mean of each clinic's continuity for the months of February to June of 2011. Of the published methods for measuring continuity of patient care, we used the usual provider of care (UPC) which is the proportion of visits during which a patient is seen by their PCP [20]. This was averaged for each resident's infant well care visits.

Data analysis using SPSS version 21, (SPSS, IBM Corp) included Chi Square, ANOVA with Bonferroni's inequality, Student's t test and multivariate linear regression. This project was classed as a quality assurance project by the Colorado Multiple Institutional Review Board and informed consent was not required.

Results

Resident Characteristics

During the 3 years of the project, there were 20 PL1 residents assigned in the three continuity clinics. Two (2) were male and 18 were female. Ten (10) were assigned to W, 6 to K, and 4 to E clinic. The mean number # of days that the residents were in clinic varied over the years from 40.4 in year 1, to 32.3 in year 2 to 38.7 in year 3 ($p < .001$, ANOVA). The mean percentage of sessions as distinct days was 99.7% in year 1, 85.5% in year 2, and 99.2% in year 3. ($p < .001$, ANOVA). One resident in year 2 had 5 months in a row with only 1 clinic day (2 sessions)/month.

Characteristics of Infants/Patient Visits

There were 408 well care visits for 115 infants for which a PL 1 was listed as the PCP and was the provider for at least two visits. Characteristics of the infants are listed in Table 1. When the infants were assessed by clinic and year, there was no difference in insurance. There were more female infants at W clinic ($p < .02$, Chi Square). There was no difference in the language spoken by the infant's families or in the number of infants seen by year. Of the 33 infants whose parents spoke Spanish, 31 (94%) were seen at the W clinic ($p < .001$, Chi Square). The mean number of infants seen per resident over the 3 years was 5.75 ± 3.0 (range of 0–10) and varied significantly among the clinics, with mean of 3.7 ± 2.9 at K clinic, 3.8 ± 1.5 at E clinic, and 7.8 ± 2.2 at W clinic ($p < .001$ ANOVA). One male resident at K clinic had no infants whom he saw ≥ 2 times and for whom he was listed as the PCP leaving only 1 male resident in the data analysis.

Of the 408 well care visits, information on the visit type is listed in Table 2. There was no difference among the three clinics in the infant age distribution of visits. The mean percentage of visits the infant was seen by their PCP was $60 \pm 28\%$ with a range of 20–100%. There was no difference among the study years. There was a significant difference in resident continuity rates among the three clinics with W clinic having the highest resident continuity of $66 \pm 12\%$, E $47 \pm 8\%$ and K $54 \pm 18\%$ ($p < .02$, ANOVA with Bonferroni). There was no difference between E and K clinics. The measurements of mean overall clinic continuity (mean percentage of all patient visits seen by their PCP for all providers in each clinic) was statistically significantly different among with three clinics with W clinic having the highest average of $65 \pm 4\%$, and being different from both E clinic at $60 \pm 2\%$, and K clinic at $57\% \pm 6\%$ ($p < .001$ ANOVA with Bonferroni).

We used multivariate linear regression with the outcome variable, the % of infant continuity with their resident PCP, and dependent variables being: study year, number of

Table 1 Characteristics of infants whose PCP was a PL1 in three clinics

Characteristic	Total	Clinic E N (%)	Clinic K N (%)	Clinic W N (%)	Statistical significance
Gender					
Male	63 (55%)	13 (81%)	16 (64%)	34 (46%)	$p < .025$*
Female	52 (45%)	3 (19%)	9 (36%)	40 (54%)	
Language					
English	80 (69%)	15 (94%)	21 (84%)	44 (60%)	$p < .001$*
Spanish	33 (29%)	1 (6%)	2 (8%)	30 (40%)	
Other	2 (2%)	0	2 (8%)	0	
Year					
1—2010–2011	38 (33%)	9 (56%)	2 (8%)	27 (37%)	$p < .01$*
2—2011–2012	36 (31%)	4 (25%)	8 (32%)	24 (32%)	
3—2012–2013	41 (36%)	3 (19%)	15 (60%)	41 (36%)	
Insurance					
Commercial	3 (3%)	0	1 (4%)	2 (3%)	$p > .5$*
SCHIP	5 (4%)	0	1 (4%)	4 (5%)	
Medicaid/medicaid pending	106 (92%)	16 (100%)	22 (88%)	68 (92%)	
Uninsured	1 (1%)	0	1 (4%)	0	
Mean N of infants/resident over the 3 years	5.75 ± 3	3.8 ± 1.5	3.7 ± 2.9	7.8 ± 2.2	$p < .03$**
Range of N of Infants/resident over the 3 years	0–10	3–6	0–8	4–10	

*Chi square

**Compared W vs both E and K by ANOVA

Table 2 Comparison of infant well care visits and continuity

Characteristic	Total	Clinic E N (%)	Clinic K N (%)	Clinic W N (%)	Statistical significance
Visit type–newborn	19	2 (3%)	1 (1%)	16 (6%)	p > .5*
2 week WCC	96	10 (17%)	22 (27%)	64 (24%)	
2 month WCC	105	14 (24%)	24 (30%)	67 (25%)	
4 month WCC	93	14 (24%)	18 (22%)	64 (24%)	
6 month WCC	62	10 (17%)	11 (14%)	41 (15%)	
9 month WCC	27	7 (12%)	4 (5%)	16 (6%)	
12 month WCC	3	1 (2%)	1 (1%)	1 (1%)	
Mean resident continuity percentage		47% ± 8	54% ± 18	66% ± 12	p < .02**
Total clinic continuity		60% ± 2	57% ± 6	65% ± 4	p < .001**

*Chi square

**ANOVA with Bonferroni W was different from E and K for both analysis

resident months with ≤ 1 clinic day, Spanish speaking family versus not, and the mean clinic % continuity for the months that the infants had visits (Table 3). The only dependent variable that was associated with resident infant continuity was the mean clinic percentage of continuity care with a β of 2.34, 95% CI (1.13–3.34) with p < .001.

We evaluated the number of times the PCP assigned to an infant was changed. Of the 115 infants, 37 (32%) had a PCP change. For 19 infant changes (51%) the reason was unknown. The most common known reason was change in clinic location (11), 4 were due to maternal request of which 2 were related to resident clinic day, 1 related to language preference, 1 PCP change was to make the PCP correspond to the provider who had actually been seeing the infant. Of the 37 changes, 22 (60%) were from resident to non-resident provider, 2 (5%) were from resident to resident, and 13 (35%) were from non-resident provider to a resident provider.

Discussion

In this study, the only factor associated with increased resident continuity of care was increased all-provider continuity of care. Rates of all-provider and resident continuity in clinics E, W and K were significantly different. The differences in resident continuity were not affected by calendar year, patient insurance, Spanish versus non-Spanish speaking or number of resident months with less than 1 continuity clinic session. System processes at the clinic level affect provider, including resident, continuity. Clinic W was a pilot site for the PCMH transformation project and empanelment was one

Table 3 Results of multivariate linear regression analysis of factors associated with resident infant continuity

Factors analyzed	Clinic E N (%)	Clinic K N (%)	Clinic W N (%)	Statistitcal significance
Number of infant visits				
Year				
1—2010–2011	9 (56%)	2 (8%)	27 (37%)	β = − 0.24
2—2011–2012	4 (25%)	8 (32%)	24 (32%)	95% CI (− 6.3 to 6.8)
3—2012–2013	3 (19%)	15 (60%)	41 (36%)	p = .94
Number of residents with ≤ 1 month with ≤ 1 day of clinic	2 (50%)	1 (20%)	5 (50%)	β = − 0.19 95% CI (− 3.4 to 3.1) p = .91
Language				
Spanish	1 (6%)	2 (8%)	30 (40%)	β = 8.55
Non-Spanish	15 (94%)	23 (92%)	44 (60%)	95% CI (− 2.6 to 19.7) p = .13
Mean clinic continuity for the months the infants had visits	60% ± 2	57% ± 6	65% ± 4	β = 2.34 95% CI (1.13–3.34) p < .001*

*Multivariate linear regression

focus of this PCMH project. Specific changes that occurred as a result included only scheduling patients with PCP for well care visits and allowing residents to schedule patients 1 month in advance (a change from the existing open-access mode). This benefited the residents, in particular, given their more variable schedules and increased time out of clinic. Additionally, clinic W distributed patient education material that included PCP name and picture.

Comparing our continuity rates with published literature is challenging because few studies exist with resident data and those that do have varying methods of continuity calculation. Using the UPC method, our resident rates of continuity of 47–66% were similar to those of Lerner et al. who demonstrated well care continuity rates of 56–59% [21]. In stark contrast, over a decade earlier when fewer duty hour restrictions existed, Darden et al. demonstrated well care resident continuity rates upwards of 96% [20]. McBurney et al. showed similarly high rates for the same period of time and found that increasing time in clinic by 1/2 day/week increased continuity by 11% [22]. While there may not be an optimal number to define continuity, the importance of a consistent education of pediatric residents across sites and years exists. We highlight here that given the relative paucity of literature documenting absolute and relative rates of continuity across the country, we have less objective data on which to assure our residents are receiving the longitudinal experience that is being called for. Even within our own institution, the variation is significant.

A 2002 policy statement by the AAP defined a pediatric medical home as a model of primary care in which all children should receive care. Care within this medical home should be "accessible, continuous, comprehensive, family-centered, coordinated, compassionate and culturally effective" [23]. In a resident clinic continuous care with the resident PCP is likely the most challenging of these tenets. In community practices such as ours, non-resident clinicians provide the majority of care given their more regular presence in clinic. The volume and variety of patients seen by residents in this setting are affected and continuity may or may not be maintained [24].

Of additional interest in our study is the absolute number of infants receiving routine care that are cared for by resident PCPs. The ACGME does not have specific requirements regarding the absolute number of patients on a pediatric resident's continuity panel, rather it emphasizes the panel should contain patients newborn through adolescence, some of whom are healthy and some with a variety of chronic illnesses [7, 14]. The 3 practices in our system had significantly different numbers of infants cared for by the Pl 1, which creates disparity in resident experience. Recent reports suggest this disparity is present in other aspects of residency training, i.e. procedural experience, and can negatively affect a resident's sense of preparedness for their future career choice and may even affect career choice [25–27]. We did not find any published data on how many infants residents should have in their continuity panel. This agrees with findings by Osborn over 20 years ago [24]. We would argue that four infants in a panel do not provide sufficient exposure to this age group to gain the necessary knowledge pertinent to infants, particularly for conditions with lower prevalence rates. Is 7 or 10 infants enough? The residents may have more newborns in their 2nd or 3rd year, however our data does not capture panel numbers for the span of residency. In addition, 32% of the infants in this study had a change in PCP during their first year of life and the majority was from a resident to a not-resident provider.

There are several limitations to this report. We chose to evaluate only infant well-child visits given the higher number of routine visits during the first year of life. Older children, seen only 1–2 times per year, would have less opportunity to be seen during 1 year of study. We chose PL 1 s as opposed to 2nd and 3rd year residents because their continuity would be more related to clinic practices and less affected by other factors, such as exposure to patients in multiple settings (inpatient units, ED, etc.). Serwint found that families felt more connected to their resident PCP if they were patients of the resident when the child was younger and for a longer period of time [28]. Although we evaluated 3 years of data, only 19 residents were studied and the project took place in one community health center system. Our infants were largely covered by Medicaid, however this is similar to the population of many continuity clinics. We could not evaluate the effect of resident gender on continuity since only 1 resident was male. We also only studied the PL 1 year. Other factors related to resident continuity could include the resident making sure they are listed as the PCP, discussing with the parent that they would like to be the child's PCP, resident preceptors encouraging continuity, and resident interactions with the families. With retrospective data, we could not measure any of these factors. All of these factors limit the generalizability of this study.

Conclusions

Patient continuity of care is important to patients, care providers, health outcomes and resident education. Maintaining continuity of care during resident education is challenging due to scheduling constraints on the residency side and due to individual practice design. We found that including residents in practice design changes focused on maximizing continuity through the Medical Home Practice significantly increased resident continuity of care for a panel of infants for whom the residents were the PCP. Further research is needed to better understand how continuity rates and absolute number of patients impact resident competence in providing

infant well care and if this has an effect on resident career choice.

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