Adolescent and Parent Perceptions of Patient-Centered Communication while Managing Type 1 Diabetes

Andrea Croom,[1] BS, Deborah J. Wiebe,[1] PhD, MPH, Cynthia A. Berg,[2] PhD, Rob Lindsay,[3] MD, David Donaldson,[3] MD, Carol Foster,[3] MD, Mary Murray,[3] MD, and Michael T. Swinyard,[4] MD

[1]Department of Psychiatry, University of Texas Southwestern Medical Center, [2]Department of Psychology, University of Utah, [3]Department of Pediatrics, University of Utah School of Medicine, and [4]Mountain Vista Medicine

All correspondence concerning this article should be addressed to Deborah J. Wiebe, PhD, MPH, Southwestern Medical Center, University of Texas, 5323 Harry Hines Boulevard, Dallas, TX, 75390-9044, USA. E-mail: deborah.wiebe@utsouthwestern.edu

Objective   To examine whether adolescents' and parents' perceptions of patient-centered communication (PCC) with the physician may be associated with aspects of patient empowerment (e.g., perceptions of competence) and diabetes management (i.e., adherence and HbA1c).   **Methods**   One hundred and ninety adolescents with type 1 diabetes and their parents rated perceptions of PCC following a clinic visit and completed measures of competence, illness perceptions, self-efficacy, and adherence in the weeks following their clinic visit, and again 6 months later. Metabolic control was indexed from medical records.   **Results**   Higher levels of PCC with physicians were associated cross-sectionally and longitudinally with greater perceptions of control and competence for both adolescents and parents. Mediation analyses indicated that PCC was indirectly related to subsequent adherence and metabolic control through perceptions of the adolescent's competence in diabetes management.   **Conclusions**   Perceptions of PCC with healthcare providers may empower adolescents and parents in their diabetes management.

Key words   adolescents; parents; patient-centered communication; type 1 diabetes.

Introduction

Managing chronic illnesses during adolescence is a complex process that requires ongoing interactions between families and healthcare providers. The present study examined whether perceptions of patient-centered communication (PCC) might empower families to better manage type 1 diabetes during adolescence. Type 1 diabetes is a common childhood chronic illness that is managed by coordinating multiple daily blood glucose tests, insulin injections, and diet and exercise in order to normalize blood glucose levels (American Diabetes Association, 2005). Adolescence is a time when adherence and blood glucose control often deteriorate (Anderson, Brackett, Ho, & Laffel, 2000), raising the potential of serious long-term complications (Bryden et al., 2001). Such deterioration is more likely if adolescents assume responsibility for diabetes management without having the requisite motivation or self-competence beliefs to independently manage their illness, or when the ongoing demands of diabetes management undermine families' motivation and efficacy (Holmes et al., 2006). We explored cross-sectional and longitudinal associations of adolescent and parent perceptions of PCC with aspects of patient empowerment and adolescent diabetes management.

PCC is a style of communication between healthcare providers and patients that includes partnership building, empathy, interpersonal sensitivity, and mutual exchange of information (Erickson, Gerstle, & Feldstein, 2005). PCC encourages patients and their healthcare providers to build a collaborative relationship by focusing on patient beliefs

and goals and activating the patient to take more control of their illness management (Michie, Miles, & Weinman, 2003). PCC is evidenced in more specific constructs such as motivational interviewing (Erickson et al., 2005), which is a therapeutic technique based on collaboration and behavior change, and shared-decision making (Charles, Gafni, Whelan, 1997), which focuses on the collaborative process of making specific treatment decisions. PCC reduces the power differential between healthcare providers and patients, and bolsters the patient's autonomy and perceived competence for illness management (Charles et al., 1997; Williams, Freedman, & Deci, 1998). In the adult population, aspects of PCC have been associated with fewer illness worries, a greater sense of control in illness management (e.g., Heisler et al., 2003), better self-care behaviors (e.g., eating and taking medications; Aikens, Bingham, & Piette, 2005), and reductions in HbA1c over a 12-month period (Williams et al., 1998). However, little is known about PCC with adolescent patients and their parents (diMatteo, 2004).

PCC may be particularly important during adolescence, as this is a time when children are sensitive to authoritarian treatment (Michaud, Suris, & Viner, 2004) and desire the opportunity to take a more adult role in their healthcare (Britto et al., 2004). Like adults, adolescents tend to behave either out of their own volition (e.g., take medication because they believe in its efficacy) or because they feel pressured by someone else (e.g., take medication because doctor or parents tell them). Engaging adolescents in PCC is likely to support their growing autonomy (Williams et al., 1998) and to increase their feelings of patient empowerment (Iannotti et al., 2006), such as self-efficacy, perceptions of control, and competence. Aspects of empowerment, in turn, may mediate relationships with treatment outcomes, such as adherence and metabolic control (Griva, Myers, & Newman, 2000; Ott, Greening, Palardy, Holdreby, & DeBell, 2000). PCC may also shape more adaptive illness beliefs (e.g., perceived treatment effectiveness), as patient-centered interactions may allow providers to facilitate a more accurate understanding of the illness. Understanding PCC associations with illness perceptions is important because such beliefs predict diabetes management behaviors (Griva et al., 2000; Skinner & Hampson, 2001).

Physician–patient relationships with adolescents are complex because they often involve the presence of a third party, the adolescent's parent (Gabe, Olumide, & Bury, 2004). Parents play an integral role in facilitating diabetes management throughout adolescence (Anderson et al., 2000; Wiebe et al., 2005), and good provider–parent relationships can be beneficial for the entire family

(Erickson et al., 2005). For example, parents who feel listened to and respected by their child's physician report better emotional well-being, more perceived control over their child's treatment, and may be more committed to treatment recommendations (Hummelinck & Pollock, 2007). Theoretical, observational, and qualitative research has explored the dynamics of the triadic relationship among physicians, parents, and children (Cox, Smith, & Brown, 2007; diMatteo, 2004; Gabe et al., 2004; Hummelinck & Pollock, 2007; Tates, Meeuwesen, & Elbers, 2002). However, the majority of this research has focused on younger children or a broad age range, with limited research focusing on the adolescent population in particular. The current study did not directly investigate the triadic nature of the relationship (Gabe et al., 2004), but did measure both adolescents' and their parents' perceptions about PCC with the physician.

Research on PCC with adolescents has been limited to qualitative studies and cross-sectional analyses, which makes it difficult to interpret the long-term consequences of PCC. The present study examined associations of adolescent and parent reports of PCC with physicians at the end of a routine diabetes clinic visit with changes in illness perceptions, feelings of competence, and adherence across a 6-month period. The aims were to determine: (1) whether adolescent and parent perceptions of PCC were related to illness perceptions (e.g., perceived control over diabetes), aspects of empowerment (i.e., competence and efficacy), adherence, and metabolic control; (2) whether PCC predicted changes in these variables over time; and (3) whether the longitudinal relationships between PCC and treatment outcomes were mediated by aspects of patient empowerment or illness perceptions. We hypothesized that PCC would have cross-sectional and longitudinal associations with more adaptive illness perceptions, higher feelings of competence and self efficacy for both adolescents and their parents, and better diabetes management. We also hypothesized that the association of PCC with subsequent diabetes management would be mediated by perceptions of illness control, competence, and efficacy.

Research Design and Methods
Sample

Data were collected as part of a larger longitudinal study examining parental involvement and adolescent diabetes management by following 252 families for 3 years, with assessments completed every 6 months. Eligibility criteria included 10- to 14-year-olds diagnosed with type 1 diabetes for at least 1 year, living with their mother (because the larger study targeted mother–child relationships

across time) and able to read/write English or Spanish. Participants in the larger study were recruited during routine outpatient visits to a university diabetes clinic (76%) or a community-based private practice (24%) that followed similar treatment regimens. Patients in these clinics typically see the same physician across appointments, and are prescribed a regimen of multiple daily injections or insulin pump therapy. The study was introduced to eligible adolescents and their mothers; if mothers were not present, they were recruited by telephone or the family was recruited at the next clinic visit. In the larger study, fathers were also actively recruited and 75% of the families had participating fathers. Interested participants were enrolled and scheduled for a laboratory appointment. Of the qualifying patients approached, 66% agreed to participate; refusals primarily involved distance, time constraints, and lack of interest in being studied. Eligible adolescents who did versus did not participate were older (12.5 vs. 11.6 years, $t[367] = 6.20$, $p < .01$), but did not differ on gender, pump status, HbA1c, or illness duration ($ps > .20$).

Participants for the present study included 190 adolescents (M age $= 13.01$ years, $SD = 1.54$) and a parent (M age $= 42.29$, $SD = 6.19$) who provided perceptions of their physician at the second and third wave of data collection. For ease of communication, we label these time points as baseline and follow-up. Only one parent completed the clinic visit measures. This was typically the mother (87%), who most commonly attended the clinic visit with her child. Because similar associations were found across mother and father reports and there were too few fathers to analyze separately, these reporters were combined and labeled "parent report." Table I describes the characteristics of the full sample that was eligible, as well as of the current 190 participants at baseline (i.e., at Wave 2 of the larger study). Participants in the current sample had shorter illness duration and lower HbA1c than the full sample, but did not differ on other demographic or illness variables.

Procedures and Measures

The study was approved by the appropriate institutional review boards. Parents gave written informed consent and adolescents gave written assent. Adolescents and parents individually completed a brief survey at the end of a routine diabetes clinic visit containing measures of PCC and perceptions of parent and teen diabetes competence. They completed additional measures at their laboratory appointment that occurred shortly after the clinic visit ($M = 10.70$ days, $SD = 12.86$, range $= 0$–72 days; no significant associations were found between range of days and variables of interest) including measures of illness

Table I. Characteristics and Comparisons of the Total Longitudinal Sample and the Current Sample

Variables	Total Sample[a] M (SD)	Current Sample M (SD)	Statistic for Comparison	P
Child sex (% female)	52.8 %	52.1 %	$\chi^2 = .41$	.52
Child age (in years)	13.01 (1.54)	12.95 (1.57)	$t = 1.14$	.26
Range	10–15	10–15		
Parent age (in years)	41.09 (6.02)	40.88 (6.17)	$t = 1.19$	.23
Range	27–58	27–58		
Ethnicity (% non-Hispanic Caucasian)	94.1%	94.7%	$\chi^2 = .23$	.63
Marital status (% married)	84.0%	83.2%	$\chi^2 = 3.61$	.73
Hollingshead Index[b]	41.42 (10.42)	41.12 (10.58)	$t = .81$	.42
Range	14–66	14–66		
Illness duration (in years)	4.19 (2.99)	3.93 (2.77)	$t = 2.48$	.01*
Range	1–12	1–11		
Insulin pump status (% using)	55.1%	56.8%	$\chi^2 = .23$	.63
HbA1c	8.45 (1.54)	8.34 (1.46)	$t = 2.16$	.03*
Range	5.0–14.0	5.0–14.0		

[a]Characteristics for the total sample are based on the second wave of data collection in the larger longitudinal study and may differ from previous articles reporting characteristics from the first wave of data collection. First column is the full eligible ($n = 252$) sample at baseline; second column is the current sample at baseline ($n = 190$).
[b]This Hollingshead Index score indicates a medium business, minor professional, technical status; most (73%) reported earning $50,000 or more annually.
*$p < .05$.

perceptions, self-efficacy, and adherence. Participants completed these same procedures 6 months later.

Clinic Visit Measures

Metabolic Control. At the beginning of each clinic visit, glycosylated hemoglobin (HbA1c) levels were obtained by clinic staff using the Bayer DCA2000. HbA1c provides information on average blood glucose levels over the preceding 3 or 4 months, with higher levels indicating poorer metabolic control.

Perceptions of PCC. At the end of each clinic visit, adolescents and parents completed a 5-item version of the Health Care Climate Questionnaire (Williams et al., 1998). This survey uses a Likert-based scale (1 = *strongly disagree* to 5 = *strongly agree*) to characterize perceptions of PCC (e.g., my doctor/my child's doctor listens to what I think before setting treatment goals; see Table II for all items). Scores were averaged across items with higher scores indicating higher PCC. Among adults with diabetes, this scale

Table II. *Principal Components Analysis and Reliability for PCC Measure*

Item	Adolescent Report			Parent Report		
	Mean (*SD*)	Factor	Item–Total Correlations	Mean (*SD*)	Factor	Item–Total Correlations
1. "My (my child's) doctor seems to really understand how I see things with respect to my (my child's) diabetes."	4.02 (0.93)	.85	.74	4.15 (0.72)	.79	.66
2. "My (my child's) doctor makes me feel confident in my ability to manage my (my child's) diabetes."	4.19 (0.82)	.83	.71	4.31 (0.74)	.82	.71
3. "My (my child's) doctor encourages me to ask questions about managing diabetes."	3.80 (0.96)	.79	.67	4.26 (0.74)	.84	.73
4. "My (my child's) doctor listens to what I think before setting treatment goals."	3.89 (0.87)	.80	.68	4.39 (0.69)	.82	.70
5. "My (my child's) doctor provides me with choices and options about managing diabetes."	4.08 (0.87)	.78	.66	4.30 (0.68)	.80	.68
Total variance explained		65.5%			65.9%	
Alpha coefficient		.83			.89	

had acceptable reliability ($\alpha = .80$; Williams et al., 1998). The scale was modified for the present study to be appropriate for a pediatric population and their parents. We initially describe in the results section the factor structure and reliability of the modified scale.

Adolescent and Parent Competence. Adolescents and parents completed the Perceived Competence for Diabetes Scale (Williams et al., 1998), using a 1 (*strongly disagree*) to 5 (*strongly agree*) scale. Participants reported on perceptions of both the adolescent's competence (e.g., I/my child have/has the ability to manage diabetes well; three items per reporter) and parent's competence to manage diabetes (e.g., My parent/I has/have the ability to manage diabetes well; three items per reporter) for a total of six items per reporter. Scores were averaged across items with higher scores indicating higher levels of perceived adolescent and parent competence. Internal consistency in prior research with adults with diabetes was high ($\alpha > .84$; Williams et al., 1998), and was acceptable in the present sample for both adolescent (adolescent report = .77, parent report = .73) and parent competence (adolescent report = .78, parent report = .75).

Laboratory Appointment

Illness Perceptions. Adolescents and parents completed the Illness Perceptions Questionnaire—Revised (Moss-Morris et al., 2002), to assess various personal beliefs about the adolescent's diabetes using a 1 (*strongly disagree*) to 5 (*strongly agree*) scale. We included seven subscales in the current study (i.e., timeline cyclical, timeline chronic, illness severity, illness coherence, parent control, adolescent control, and treatment control). First, timeline beliefs

about the illness were obtained to determine the extent to which participants view diabetes as *chronic* and as *cyclical* (i.e., it comes and goes). Second, we measured beliefs about the *severity* of the diabetes and *illness coherence* (i.e., extent to which diabetes and its treatments are understandable and make sense). Finally, all participants reported on the extent to which the adolescent and the parent had personal control over diabetes (i.e., *teen control* and *parent control*) and to which the treatment would control diabetes and its symptoms (i.e., *treatment control*). Although we predicted PCC would be particularly important for perceptions of personal and treatment control, we examined associations with all subscales to discern whether PCC is related to numerous aspects of illness perceptions or specifically to perceived control. Internal consistency was greater than $\alpha = .60$ for adolescent and parent report of all indices at baseline and follow-up, except for parent report of treatment control ($\alpha = .25$ and .36 at baseline and follow-up). Parent report of treatment control was thus not included in subsequent analyses.

Adolescent Self-Efficacy. Adolescents completed the Self-Efficacy for Diabetes Management Scale (Iannotti et al., 2006) to assess adolescents' perceptions of how confident they were in managing diabetes across 10 problematic situations. In our sample, this scale showed excellent internal consistency at baseline ($\alpha = .88$) and follow-up ($\alpha = .90$). Parents completed the scale to index their own confidence in their adolescent's ability to manage diabetes in problematic situations ($\alpha = .90$ and .93 at baseline and follow-up).

Adherence. Adolescents and parents completed a 16-item modification of the Self Care Inventory (Lewin et al., 2009) to assess the child's adherence to aspects of their diabetes regimen over the preceding month (1 = never did this to 5 = always did this as recommended without fail). The scale was adapted by adding two items to reflect current standards of diabetes communication with the assistance of a certified diabetes educator (e.g., adjusting insulin doses based on carbohydrate content of meals or snacks). Total scores demonstrated good internal consistency at baseline (adolescent report = .82, parent report = .82) and follow-up (adolescent report = .88, parent report = .87). The Self Care Inventory correlates well with more time-intensive interview methods for measuring adherence (Lewin et al., 2009).

Demographics. Parents completed a demographic questionnaire that measured basic information about their child (age, gender) and his or her diabetes (e.g., pump status, duration).

Analysis Plan

We initially examined the factor structure and internal consistency of the PCC measure. We then explored the need to include covariates in subsequent analyses. HbA1c and illness duration were covaried in all analyses for several reasons. First, as reported in Table I, current participants and the larger sample from which participants were drawn differed on these variables. Second, HbA1c ($M = 8.45$, $SD = 1.54$) at the beginning of the clinic visit was significantly correlated with PCC at the end of the visit for both adolescent ($r = -.17$, $p = .02$) and parent ($r = -.26$, $p < .00$) report. HbA1c was also correlated with adolescent and parent perceptions of teen competence ($r = -.50$ and $-.46$, $p < .00$, respectively), suggesting that metabolic control and perceptions of competence were closely linked. To ensure that associations with PCC occurred independently of metabolic control, baseline HbA1c was covaried in all analyses. It is important to note that perceptions of PCC were not correlated with child or parent gender, family income, illness duration, or pump status. Analyses revealed that adolescent age and gender did not moderate associations of parent and adolescent reports of PCC with variables at above chance levels.

Primary aims were analyzed first by conducting partial correlations of adolescent and parent report of PCC with cross-sectional measures of illness perceptions, empowerment and adherence, covarying for HbA1c and illness duration. Second, hierarchical regressions were used to examine linear associations of adolescent and parent report of PCC with laboratory appointment and clinic

measures obtained 6 months after the clinic visit. Residualized scores were calculated by entering baseline scores on the variable of interest into the equation as covariates, in addition to baseline HbA1c and illness duration. Finally, mediation was tested using the bootstrapping technique recommended by Preacher and Hayes (2008), which is the preferred method when sample sizes are limited or parametric assumptions are not met. In this analysis, a computer program randomly draws samples from the larger dataset and computes statistics on each of these datasets, providing a distribution of the statistic across the random samples. The estimates presented in the current research are based on 10,000 bootstrap samples. Covariates (i.e., baseline HbA1c, illness duration, and the outcome of interest) were included in all bootstrap analyses.

It should be noted that parent and teen reports of PCC at baseline were only modestly correlated ($r = .19$, $p = .01$), suggesting PCC reflected the personal meanings each participant derived from interactions with the physician. Because these personal meanings were likely to be associated with one's own competence and illness beliefs, but not necessarily with another person's beliefs, only within-reporter associations between PCC and illness perceptions were analyzed. We did, however, examine cross-reporter analyses for associations with adherence.

Results

As reported in Table II, principal components analyses supported a single component structure for both adolescent and parent reports of PCC (based on eigenvalues >1, examination of the scree plot, and factor loadings >.70). Internal consistency was high for both reporters. Average scores revealed adolescents ($M = 3.99$, $SD = 0.72$) and parents ($M = 4.28$, $SD = 0.58$) reported moderately high levels of PCC, with parents reporting higher levels than adolescents ($t[177] = -4.75$, $p < .00$). Parent (but not adolescent) reports of PCC were negatively correlated with child's age ($r = -.21$, $p = .01$), suggesting parents of older adolescents perceived lower PCC with the physician.

Cross-Sectional Associations with Adolescent and Parental Reports of PCC

Table III displays descriptive statistics and partial correlations (controlling for HbA1c and illness duration) of adolescent and parent reports of PCC with aspects of patient empowerment, illness perception and adherence measured at baseline. At the end of the clinic visit, adolescent reports of PCC were associated with higher perceptions of self and

Table III. *Descriptive Statistics and Partial Correlations for Adolescent and Parent Report of Cross-Sectional Variables (Controlling for HbA1c at Baseline and Illness Duration)*

Measure	Adolescent Report of PCC		Parent Report of PCC	
	Mean (SD)	Correlation	Mean (SD)	Correlation
Clinic survey				
Teen competence	4.00 (0.76)	.350**	3.94 (0.78)	.237**
Parent competence	3.94 (0.77)	.345**	4.08 (0.62)	.473**
Laboratory survey				
Illness perceptions				
Chronic timeline	3.99 (0.66)	.075	4.51 (0.47)	.077
Cyclical timeline	2.75 (0.83)	−.024	2.81 (0.90)	.101
Illness severity	3.28 (0.78)	−.027	3.55 (0.65)	−.122
Illness coherence	4.09 (0.70)	.127	4.30 (0.63)	.133
Teen control	4.16 (0.60)	.368**	4.08 (0.69)	.227**
Parent control	3.05 (0.67)	.205**	4.00 (0.62)	.125
Treatment control	3.72 (0.63)	.283**	—[a]	—
Self-efficacy	6.95 (1.75)	.285**	6.11 (1.74)	.039
Adherence	3.90 (0.53)	.226**	3.56 (0.54)	.202*

Note. Adolescent reports of PCC were correlated with adolescent reports of variables and parental reports of PCC were correlated with parental reports of variables

[a]The measure of parent report of treatment control did not have sufficient internal consistency ($\alpha = .25$) to be included in subsequent analysis.

*$p < .05$, **$p < .01$.

parental competence. Similarly, parent reports of PCC were associated with higher perceptions of child and self competence in managing diabetes. Reports of PCC were also associated with specific types of illness perceptions. Adolescent reports of PCC were associated with higher perceptions of both their own and their parent's ability to control diabetes, as well as higher beliefs that the treatment regimen will control diabetes. Parents' reports of PCC were associated with higher perceptions of teen control over diabetes, but not with parental control over diabetes. Adolescent and parental reports of PCC were not associated with other illness perception scores. Finally, adolescent reports of PCC were associated with higher self-efficacy for diabetes and better adherence. Parent reports of PCC were similarly associated with better adherence.

Longitudinal Associations with Adolescent and Parental Reports of PCC

Hierarchical regressions were used to examine associations of adolescent and parent reports of PCC at baseline with variables obtained 6 months following the clinic visit. Baseline scores for HbA1c, illness duration, and the outcome variable of interest were entered as covariates. As is inevitable with longitudinal studies, there were missing data across different points of data collection (clinic visit and laboratory assessment at baseline and follow-up).

Multiple imputation procedures (Rubin, 1987) through the Statistical Package for the Social Sciences version 18 (SPSS 18) were used to estimate missing values through statistically inferring responses for missing values in multiple iterations and then pooling the results. This technique is supported in longitudinal research (Jelicic, Phelps, & Lerner, 2009) and allowed us to compute longitudinal analyses on the full sample of 190 participants. Ten imputed data sets were generated, and longitudinal analyses were conducted on each set. Results reported below reflect the pooled results obtained from SPSS 18.

Longitudinal analyses showed that adolescent reports of PCC at baseline predicted positive change in adolescent's perceived self-competence ($t[185] = 1.91$, $p = .05$) and self-efficacy for diabetes management ($t[185] = 2.10$, $p = .04$) across a 6-month period. Parent reports of PCC at baseline predicted positive change in perceptions of their own control over diabetes ($t[185] = 1.95$, $p = .05$) across the subsequent 6 months and positive change in reports of their adolescent's adherence ($t[185] = 2.19$, $p = .03$).

Mediation Analyses of PCC Predicting Diabetes Outcomes through Empowerment

Bootstrapping techniques (Preacher & Hayes, 2008) were used to determine if adolescent and parent perceptions of PCC at baseline were indirectly linked to adolescent and parent report of adherence and HbA1c levels ($M = 8.46$, $SD = 1.59$) at follow-up through the empowerment variables (i.e., perceived competence, efficacy, and control). Tests were conducted separately for each of the potential mediators and baseline scores for HbA1c, illness duration, and the outcome of interest were entered as covariates. These procedures provide a 95% confidence interval (CI) for the indirect pathway between a predictor and an outcome; the indirect effect is statistically significant if the CI does not include zero. The following indirect paths were identified. First, adolescent reports of PCC were indirectly associated with parent reports of adherence through adolescent reports of self competence (CI = .01–.07) and self-efficacy (CI = .02–.08), and with their own reports of adherence through self-efficacy (CI = .03–.12). Similarly, there was an indirect path between parent PCC and parent reports of adherence through parent report of adolescent competence (CI = .01–.12). Second, there was an indirect path between adolescent PCC and follow-up HbA1c through adolescent perceptions of self competence (range = −.28 to −.05), as well as between parent PCC and follow-up HbA1c through parent perceptions of adolescent competence (range = −.41 to −.06). There were no indirect paths through reports of parent competence or perceived control by either reporter.

Discussion

The current study is one of the first to examine how adolescent and parent perceptions of PCC with the adolescent's healthcare provider are associated with aspects of patient empowerment (e.g., perceived competence for diabetes management) and treatment outcomes (i.e., adherence and HbA1c). Perceptions of PCC were associated with higher perceptions of competence and control for both adolescents and parents immediately after a clinic visit and 6 months later. Furthermore, beliefs about adolescent competence mediated PCC associations with subsequent treatment outcomes across reporter. Importantly, all results remained significant after controlling for baseline HbA1c, suggesting that our findings were not simply a reflection of illness management. The findings are unique in that PCC has rarely been studied in the adolescent population, particularly using quantitative and longitudinal methodologies. Such research is important for enhancing our understanding of how the healthcare provider context may facilitate diabetes management during the adolescent years.

The cross-sectional data suggested PCC empowered both adolescents with diabetes and their parents, extending previous findings among adults with diabetes (Williams et al., 1998) to the triadic context of pediatric healthcare. Both adolescents and parents reported fairly high levels of PCC, and these perceptions were associated with higher self-competence beliefs. At baseline, both adolescent and parent reports of PCC were also associated with higher levels of adherence and better metabolic control. However, interpretations of cross-sectional data are limited. For example, findings could suggest that physicians are more likely to take a directive approach or have negative interactions with their patients when diabetes is poorly controlled (Aikens et al., 2005). The longitudinal data suggested that PCC was related to a specific pattern of competence and illness beliefs that suggested PCC empowered patients to feel better able to manage diabetes across time. There was a direct relationship between parents' report of PCC at baseline and diabetes management, such that parents who had reported higher levels of PCC at baseline reported positive changes in their adolescents' adherence in the subsequent 6 months.

Mediation analyses showed that adolescent and parent perceptions of heightened adolescent competence was one mechanism through which PCC exerted its influence on diabetes management. It is meaningful that the central mediator appeared to be adolescent and parent perceptions of the adolescent's competence, rather than the parent's competence. We believe that this illustrates the importance of supporting adolescent autonomy in illness management and promoting adolescent involvement in their medical care. In addition, perceptions of PCC were related to enhanced patient empowerment (i.e., reports of adolescent competence, control, and efficacy across reporter), but PCC was unrelated to perceptions of the consequences of diabetes, the chronic nature of the illness, or the extent to which the family has a coherent understanding of the illness and its treatment. This pattern of convergent and discriminant correlations supports the idea that perceiving PCC with the healthcare provider is associated with increased feelings of empowerment but does not alter how patients and their parents think about the illness *per se*.

Our findings suggest several unique developmental processes taking place between parents and adolescents in the context of the healthcare provider relationship. First, we found that parent reports of PCC were negatively correlated with the child's age, such that parents of older adolescents reported lower levels of PCC with their child's physician. However, adolescents did not report increased levels of PCC as a function of their age despite the fact that adolescents in our sample had room to increase their perceptions of PCC. This finding potentially has important implications for transitions in later adolescence to an adult physician as it might reflect a time when parents feel less connected with their child's physician but the adolescent still does not feel completely engaged. Second, our data suggest that in the pediatric context of a triadic relationship, parent empowerment might be reflected not only in parents' own competence and control beliefs, but also in how they perceive their adolescent's ability to manage diabetes. Therefore, it is important to assess each person's perceptions of him or herself as well as their perceptions of the other members of the triadic relationship. Finally, additional mediators might also play a role in the relationship between PCC and diabetes management. For example, parents who perceive PCC during the clinic visit might be more inclined to implement these autonomy supportive behaviors at home with their adolescent, therefore minimizing intrusive aspects of involvement and promoting more collaborative aspects (Wiebe et al., 2008).

There are several limitations to the current study. First, the data are correlational and we cannot distinguish causal direction or rule out the influence of additional variables, such as physician characteristics (e.g., training experience, gender), parent characteristics (e.g., education level, parenting style), or other aspects of the medical visit (e.g., interactions with other members of the nursing team, child or parent mood prior to the clinic visit). Second, our sample was fairly homogenous and findings may not generalize to diverse populations covering a broader age

range (e.g., younger children or emerging adults) and different racial or ethnic backgrounds. For example, research suggests that different ethnic groups prefer varying levels of involvement in decision-making with their physicians (Knopf, Hornung, Slap, DeVellis, & Britto, 2008). Third, participants were on intensive insulin regimens (i.e., multiple daily injections or insulin pump therapy) and had longstanding relationships with the healthcare providers in the clinic. Results might vary in clinics where patients are on less intensive regimens or where they switch healthcare providers across appointments. Fourth, the present study only considered perceived communication with the adolescent's physician. However, adolescents and parents interact with other important members of the medical team and their perceptions of PCC are likely to be a reflection of their relationships with all of their healthcare providers.

Defining and measuring the construct of PCC had its own unique limitations. First, with the limited research available, it is difficult to clearly differentiate PCC from other similar theories and constructs such as motivational interviewing, shared medical decision making, autonomy supportive behavior, and therapeutic alliance (Charles et al., 1997; Erickson et al., 2005; Williams et al., 1998). These various constructs share many common features (e.g., physician–patient collaboration) that create the potential for construct overlap. Future research should disentangle these terms and develop a lexicon that will facilitate understanding and communication among researchers and healthcare providers. Second, the desire for active involvement in care and potentially for PCC may vary according to individuals, families, and the severity of the situation. Initially after diagnosis or in traumatic situations, adolescents and their parents may want to defer treatment responsibility to healthcare professionals (Charles et al., 1997; Hummelinck & Pollock, 2007; Knopf et al., 2008). Future research is needed to determine in what contexts increased PCC is beneficial to and desired by families. Finally, several aspects of the measure of PCC in the current study may have influenced the findings. The measure was adapted from previous research with adults with type 2 diabetes (Williams et al., 1998), but has not been formally validated on a pediatric population. We also did not have observational measures of the actual medical encounter. Procedures to objectively analyze PCC during medical encounters (e.g., Cox et al., 2007) may be useful to determine whether perceptions of PCC reflect aspects of the specific medical encounter or emerge out of more complex factors (e.g., relationship history, trust in doctor). Future research that examines perceptions and observations simultaneously may allow us to determine how actual interactions are perceived and whether they

independently predict important aspects of illness management.

Future research should continue to unravel the complexities of the triadic relationship between children, their parents, and healthcare providers (Gabe et al., 2004). We feel that it is important to understand the perspectives of all members of the triadic relationship. The current research was limited to examining these relationships in the context of two separate dyadic relationships (i.e., adolescent relationship with physician and parent relationship with the physician). However, future studies would benefit from including physician reports of PCC and physician characteristics (e.g., years in practice) to understand the healthcare provider's perspective of the relationship. We also believe that it is important to understand the interplay between each individuals personal characteristics as well as each of the separate relationships (i.e., parent–child, child–physician, and parent–physician). For example, what are the consequences of PCC and autonomy-supportive communication from the physician if the parent has an authoritarian communication style? Future studies should continue to explore patient and physician characteristics that are associated with PCC and how family functioning might either promote or hinder the ability of the adolescent to form a good patient–physician relationship (Gavin, Wamboldt, Sorokin, Levy, & Wamboldt, 1999).

PCC is associated with several aspects of patient empowerment (i.e., competence, self-efficacy, and perceived control), that might facilitate how families manage diabetes during adolescence. Interventions that facilitate patient-centered interactions may thus prove useful for providers and families. These interventions could target healthcare providers, teaching the medical team to utilize existing techniques such as motivational interviewing or interventions to enhance shared-decision making (Erickson et al., 2005; Kinmonth, Woodcock, Griffin, Speigal, & Campbell, 1998). In addition, programs aimed at encouraging adolescents or parents to become more active participants in their medical care are likely to be beneficial (Corser, Holmes-Rovner, Lein, & Gossain, 2007). Finally, attention should be paid to interventions that could increase perceptions of adolescent competence given the present findings that perceived competence is an important mediator of diabetes management.

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