Healthcare Transition Readiness, Family Support, and Self-management Competency in Korean Emerging Adults with Type 1 Diabetes Mellitus

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ABSTRACT

Purpose: The current study investigated factors related to healthcare transition readiness, including family support and self-management competency, in emerging adults with Type 1 diabetes mellitus (T1DM).
Design and methods: A cross-sectional survey was conducted with 87 individuals, aged 16–24 years. Participants were recruited both from the outpatient clinic of Severance Children's Hospital, and an online self-help group for emerging adults with T1DM in South Korea. Participants reported perceived levels of family support, self-management competency, and healthcare transition readiness through a structured questionnaire.
Results: Healthcare transition readiness was positively correlated with family support ($r = 0.257$, $p = .016$) and self-management competency ($r = 0.606$, $p < .001$). Multivariate linear regression analyses revealed that only self-management competency was a significant factor associated with healthcare transition readiness ($\beta = 0.699$, $p < .001$).
Conclusions: For emerging adults with T1DM, ongoing family involvement in diabetes care and enhanced self-management competency can strengthen their healthcare transition readiness. Furthermore, primary factors associated with healthcare transition readiness in the present study were identified as self-management competency and participants' age.
Practice implications: Healthcare providers should assess and enhance healthcare transition readiness in emerging adults with T1DM. A primary method of addressing transition readiness is helping people strengthen their self-management competency.

Emerging adulthood, defined as the transition period from childhood to adulthood, is a challenging time for people with Type 1 diabetes mellitus (T1DM) in maintaining continuity of diabetes care (Garvey, Markowitz, & Laffel, 2012). Emerging adults with T1DM are vulnerable to lapses in disease care due to competing priorities within situational changes, such as academic attainment, employment, and social demands (Arnett, 2000). During these situational changes, many of these individuals experience deterioration in adherence to prescribed guidelines and glycemic control, in turn, increasing the risk of acute diabetes complications, emergence of chronic complications, and early mortality (Peters & Laffel, 2011).

Healthcare transition, defined as purposeful and coordinated movement from pediatric to adult care for individuals with chronic medical conditions (Betz, 2007; Rosen, Blum, Britto, Sawyer, & Siegel, 2003), occurs during the period of emerging adulthood. During the healthcare transition process, the challenges to maintaining proper disease control that are faced by emerging adults with T1DM increase, and often become more complicated (Lotstein et al., 2013). Prior research has suggested that an inappropriate healthcare transition for emerging adults with T1DM may contribute to an increased risk of adverse health outcomes and a decreased frequency of follow-up visits (Garvey et al., 2017; Lotstein et al., 2013).

To ensure a successful transition, many previous studies have suggested that healthcare transition readiness should be assessed prior to the transition (Garvey, Markowitz, & Laffel, 2012; McManus et al., 2013; Monaghan, Hilliard, Sweenie, & Riekert, 2013). It is widely accepted that the proper timing of transition should be decided depending on the transition readiness of the emerging adults. The completion of transition—only when emerging adults demonstrate readiness—has been shown to result in better post-transition outcomes, such as good adherence to prescribed guidelines and glycemic control (Garvey et al., 2012; Garvey et al., 2017). In addition, greater family support

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and higher self-management competency of emerging adults has been shown to facilitate transition readiness (Fenton, Ferris, Ko, Javalkar, & Hooper, 2015; Treadwell et al., 2016; van Staa, van der Stege, Jedeloo, Moll, & Hilberink, 2011). Therefore, to enhance the readiness of people and stability of the healthcare transition, it is vital to understand the dynamics between family and their children during the transition period.

Although the critical need for transition care for emerging adults with T1DM is a global issue, most research has focused on people in Western countries. In Western regions, many transitional interventions have been implemented increasingly in diabetes clinics, based on the long history of professional movements on transition, since Surgeon General Koop raised the issue of the importance of transition care for emerging adults with chronic diseases (Koop, Magrab, & Millar, 1989), and the American Diabetes Association published a position statement on the needs of transition care in 2011 and 2018 (Chiang et al., 2018; Peters & Laffel, 2011). However, in Asia, there is still little awareness of the need for transition care, and, in South Korea, many emerging adults are staying in pediatric care settings even when older than 21 years, which differs from Western countries. Further, the Asian Confucianism-driven culture may hamper the healthcare transition in Asian emerging adults by parents' over-involvement in diabetes care, both during and after the transition period (Cha et al., 2012; Choi, Walker, & Palermo, 2017). Therefore, it is necessary to investigate the current situation regarding healthcare transition in Asia to understand the cultural context within transition and to provide culturally appropriate transition care.

The purpose of the present study was (1) to assess healthcare transition readiness, family support, and self-management in emerging adults with T1DM, and (2) to identify factors associated with healthcare transition readiness in the Korean healthcare setting.

Methods

Study design

The current descriptive, cross-sectional study utilized survey methodology, with participants completing a self-administered questionnaire. The sample was recruited from the pediatric endocrinology outpatient clinic of Severance Children's Hospital in Seoul, Korea, and from an online social network (http://cafe.naver.com/dmtype1) comprising approximately 7900 members (i.e., patients with T1DM and their families).

Inclusion criteria of the age were 16–24 years considering the Korean-specific clinical situation, in which there is a lack of awareness and no official clinical guidelines for transition care as compared to Western countries. Accordingly, current Korean emerging adults with T1DM can decide to stay in a pediatric setting even when they are older than 21 years. In addition, emerging adulthood is classified into early (aged 18–24 years) and later (aged 25–30 years) phases, as suggested by a contemporary developmental theorist (Arnett, 2000). Individuals in the early phase are known to have more struggles with delays of assuming adult roles, while those in the later phase have more mature adult roles. Consequently, in this study, we focused on individuals in the early phase.

Other inclusion criteria were (1) diagnosis of T1DM prior to the age of 19 years, (2) diagnosis and follow-up in a pediatric endocrinology setting, (3) ability to read and understand the survey questionnaire, and (4) consented to participate in this study.

One-hundred four questionnaires were collected from May to June 2017. Of these, 17 were excluded because of missing responses; therefore, 87 questionnaires were included in data analyses. Of these, 63 were collected online and 24 were collected from the outpatient clinic. The required sample size for the study was calculated as 85 to achieve a power of 0.80, a moderate effect size of 0.50, and a probability level of 0.05, with four factors for multivariate linear regression (Faul, Erdfelder, Lang, & Buchner, 2007). Therefore, the total sample size of

87 met the applicable requirements. Factors for multivariate linear regression analysis were derived based on a literature review and included the patient's age, a plan to move from a pediatric setting to an adult setting, family support, and self-management competency (Bingham, Scalzi, Groh, Boehmer, & Banks, 2015; Fenton et al., 2015; Schwartz, Tuchman, Hobbie, & Ginsberg, 2011; Treadwell et al., 2016; Tuchman, Slap, & Britto, 2008; van Staa et al., 2011).

Measurements

Family support

The questionnaire used to determine levels of family support was originally developed in Korean for adults with diabetes (Park, 1985), and was then adapted in 2016 to people aged 10–18 years (Kim, 2016). Family support levels were measured by 16 questions in two domains: therapeutic and emotional support. Specific questions determined levels of therapeutic support (e.g., how much family members are supportive of children's diabetic care, including insulin injection and diet/exercise control). Questions determined levels of perceived emotional support (e.g., how much family members consider children as an important person). Responses were given on a five-point Likert-type scale, with higher scores indicating greater family support (1 = never, 2 = rarely, 3 = sometimes, 4 = often, and 5 = always). Reported Cronbach's alphas for the scale were. 94 (Park, 1985), 0.81 (Kim, 2016), and 0.94 in the present study.

Self-management competency

The questionnaire measuring self-management competency was developed in 1985 for adults with diabetes (Park, 1985), and then adapted to children in 1993 (Sim, 1993). It comprises sixteen questions in nine domains: glycemic control, insulin injection, diet, hygiene, exercise, rest, regular check-ups, and hypo/hyperglycemia management. Responses were provided on a five-point Likert-type scale, with higher scores reflecting better self-management competency (1 = very poor, 2 = poor, 3 = fair, 4 = good, and 5 = very good). Reported Cronbach's alphas for the scale were 0.86 (Kim, 2016), 0.73 (Sim, 1993), and 0.87 in the present study.

Healthcare transition readiness

The questionnaire to determine healthcare transition readiness —"The Successful Transition to Adulthood with Therapeutics = Rx (STARx) Questionnaire"—was originally developed in 2015 (Ferris et al., 2015). After obtaining permission to use the questionnaire from the main author, we adapted the questionnaire to the Korean healthcare setting by adding two additional items suggested by a pediatric endocrinologist based on clinical experience. One of the added questions asked, "How often did you check your blood sugar level before injecting insulin and deciding on the amount of insulin depending on the sugar level?" This was asked because many emerging adults have been found to skip the self-monitoring of blood glucose and administer insulin arbitrarily. The other item added was derived from one of the original questions: "How often do you ask your doctor or nurse questions about your illness, medicines, or medical care?" This question was further divided into two time points: "during office appointments" and "outside of office appointments" because the effective communication between healthcare providers and emerging adults reflects how much the one is active and independent on his/her health care.

The revised STARx Questionnaire was translated using a back-translation technique and then evaluated to verify content validity by a pediatric endocrinologist, two pediatric nurse practitioners, a staff nurse with more than five years of experiences in a pediatric ward, and a current supervisor nurse of a pediatric ward. The content validity index for the 20 items (I-CVI) was 0.80 to 1.00. Twenty questions were included in six domains: medication management, provider communication, engagement during appointments, disease knowledge, adult responsibilities, and resource utilization. Responses were provided on a

five-point Likert-type scale, with higher scores indicating that the participant demonstrated better healthcare transition preparation. Cronbach's alphas for the scale were 0.80 in Ferris and colleagues (Ferris et al., 2015) and 0.81 in the present study.

General and disease-specific characteristics

To determine general and disease-specific characteristics, a questionnaire containing 22 items was developed by the researcher. Questionnaire items included sex, age, weight, height, residence, religion, education level, perceived economic level, family members living together, and the most supportive family member towards disease management. Items concerning disease-specific characteristics included diabetes duration (years), most recent Hemoglobin A1c (HbA1c) level, mode of insulin delivery, frequency of blood sugar monitoring per day, hospitalization experience due to diabetes, experience of diabetic complications, follow-up period, diabetes camp experience, and plan of transfer to adult endocrinology. Plan of transfer to adult setting was added to reflect the current Korean medical setting, in which it is not compulsory for both emerging adults with T1DM and the pediatric endocrinology team to transfer to adult care.

Procedure

Participants from the outpatient clinic were provided information of the study by a nurse specialist or pediatrician of the clinic. The questionnaires were completed by participants in a private room of the clinic. For participants that were recruited from the online self-help group, a questionnaire was developed using a Web-based survey tool. All survey responses were anonymous. Questionnaires took approximately 20 min to complete. Participants received a ₩3000 electronic gift card after completing the survey.

Ethical considerations

The current protocol was approved by the Institutional Review Board of Yonsei University Healthcare System. Both participants and parents were informed about the study purpose. Informed, written consent was obtained from all participants and, if a participant was younger than 19 years, a parent provided informed consent on behalf of their children. All participants could withdraw at any point without adverse consequences.

Statistical analyses

Descriptive statistics are presented as frequencies, percentages, means, and standard deviations. Student's t-test and a one-way analysis of variance with a Sheffé post-hoc comparison were used to examine differences by general and disease-specific characteristics in family support, self-management competency, and healthcare transition readiness. Pearson correlation coefficients were computed to examine associations between variables. A multiple regression analysis was conducted to identify related factors related to healthcare transition readiness. To identify the variables affecting healthcare transition readiness in emerging adults with T1DM, a multivariate linear regression analysis was performed. The independent variables used in regression analysis were family support and self-management competency. Furthermore, age (Bingham et al., 2015; Fenton et al., 2015; Javalkar et al., 2016) and plan to transfer to adult endocrinology (Schwartz et al., 2011; Tuchman et al., 2008) were also added, which have been identified as factors affecting healthcare transition readiness in previous studies. The variable, "plan to transfer to adult endocrinology," measured on a nominal scale, was converted to dummy variables, and those who answered "have decided not to transfer to adult endocrinology" were used as the reference group. The dependent variable was healthcare transition readiness. Statistical analyses were performed using SPSS version 23.0 (IBM SPSS Statistics, Armonk, NY, USA).

Results

General and disease-specific characteristics

Eighty-seven emerging adults with T1DM participated in the study (42.5% men; mean age 19.7 ± 2.38). The mean diabetes duration was 10.26 ± 6.04 years, and the mean HbA1c level was 7.65 ± 1.52%; 35.6% of participants had a plan to transfer to adult endocrinology, 28.7% had no plan, and 35.6% had not decided. Participants' characteristics are presented in Table 1.

Family support, self-management competency, and healthcare transition readiness

Mean scores for family support, self-management competency, and healthcare transition readiness are provided in Table 2. With respect to family support, levels of therapeutic support were lower relative to those of emotional support. Of the subscales pertaining to self-management competency, scores for hypoglycemia management were the highest in nine domains, while those for dietary/exercise control and others were lower. Scores for all subscales for healthcare transition readiness, with the exception of disease knowledge and medicine management, were lower relative to the grand mean of the total scores.

Additionally, results of the analysis of the relationships between participant responses and general and disease-specific characteristics are presented in Table 1. Correlations among family support, self-management competency, and healthcare transition are presented in Table 3. Healthcare transition readiness was significantly positively correlated with family support ($r = 0.257$, $p = .016$) and self-management competency ($r = 0.606$, $p < .001$).

Factors associated with healthcare transition readiness

The multiple linear regression analysis showed that self-management competency and participants' age significantly explained 40.1% of the variance of healthcare transition readiness ($F = 12.527$, $p < .001$). Additionally, ($\beta = 0.699$, $p < .001$) and participant's age ($\beta = 0.229$, $p = .010$) were significant factors associated with healthcare transition readiness (Table 4).

Discussion

This study was conducted to determine relationships among healthcare transition readiness, family support, and self-management competency and to predict the primary factor affecting healthcare transition readiness of emerging adults with T1DM, in a Korean healthcare setting.

The current results showed that emerging adults with T1DM perceived themselves as having increased competency regarding daily tasks related to direct glucose control, such as insulin administration and self-monitoring of blood sugar level, when compared to dietary or exercise control. This indicates that participants may have had more chances to practice related therapeutic skills from a young age, at least within the context of self-administering insulin, which can often begin at elementary school age (Jackson et al., 2015). However, participants may have rarely had enough opportunities to learn how to establish important elements of their own lifestyle, such as diet and/or exercise, as these aspects may have been more directly controlled by parents. Therefore, it is necessary to begin educational programs during the transition period, for both emerging adults and their parents, which focus on children's needs and typical competency weaknesses. Further, this educational program should not only deliver knowledge, but also develop practical self-care competency in emerging adults via a multidisciplinary approach, such as information provided by nutritionists and/or exercise therapists.

Table 1
Family support, self-management competency and healthcare transition readiness by characteristics of subjects ($N = 87$).

Variables	Categories	N (%)	Mean ± SD (min, max)	Family support			Self-management competency			Healthcare transition readiness		
				Mean ± SD	t or F	p	Mean ± SD	t or F	p	Mean ± SD	t or F	p
Sex	Male	37 (42.5)	–	61.81 ± 15.03	−0.499	.619	56.65 ± 11.06	0.348	.729	69.22 ± 9.94	−0.152	.880
	Female	50 (57.5)		63.40 ± 14.23			55.88 ± 8.89			69.54 ± 9.74		
Age (yr)	≤18	38 (43.7)	19.7 ± 2.38	65.26 ± 17.21	1.447	.152	58.16 ± 11.97	1.649	.103	67.92 ± 11.38	−1.250	.215
	>18	49 (56.3)	(16, 24)	60.76 ± 11.82			54.69 ± 7.54			70.55 ± 8.25		
Education level	High school	40 (46.0)	–	65.35 ± 16.78	1.571	.120	57.75 ± 11.87	1.360	.178	67.83 ± 11.53	−1.356	.180
	≥College	47 (54.0)		60.49 ± 11.99			54.89 ± 7.53			70.74 ± 7.85		
Perceived economic level	High	5 (5.7)	–	65.80 ± 21.82	0.889	.415	60.40 ± 16.41	1.797	.172	65.60 ± 7.70	0.406	.668
	Middle	59 (67.8)		63.78 ± 13.54			57.03 ± 9.18			69.39 ± 10.83		
	Low	23 (26.4)		59.35 ± 15.37			56.21 ± 9.81			69.40 ± 9.77		
Diabetes duration (yr)	≤5	20 (23.0)	10.26 ± 6.04	66.30 ± 16.87	0.826	.441	57.50 ± 13.20	0.247	.782	67.55 ± 12.74	0.777	.463
	5–10	28 (32.2)	(1, 20)	62.25 ± 13.80			56.14 ± 8.70			71.07 ± 7.79		
	>10	39 (44.8)		61.23 ± 13.77			55.58 ± 8.70			69.15 ± 9.37		
Most recent HbA1c (%)[a]	<7.5	34 (39.1)	7.65 ± 1.52[b]	61.44 ± 17.07	−0.624	.535	56.53 ± 9.73	0.187	.852	69.06 ± 9.55	0.084	.993
	≥7.5	36 (41.4)	(5.0, 14.0)	63.75 ± 13.58			56.08 ± 10.25			68.86 ± 10.15		
Frequency of SMBG per day	≤4	39 (44.8)	5.22 ± 2.71[b]	62.05 ± 11.26	0.291	.748	54.49 ± 8.03	1.164	.317	69.21 ± 9.30	0.853	.430
	>4	43 (49.4)	(1, 10)	63.74 ± 16.26			10.98 ± 1.67			70.19 ± 10.26		
	CGM	5 (5.7)		59.20 ± 22.65			11.68 ± 5.22			64.20 ± 9.20		
Plans of transfer to adult endocrinology	Yes	31 (35.6)	–	65.39 ± 13.63	1.449	.241	58.81 ± 9.17	3.056	.052	71.65 ± 9.18	2.164	.121
	No	25 (28.7)		58.84 ± 18.59			52.48 ± 11.07			66.28 ± 11.51		
	Not decided	31 (35.6)		63.19 ± 10.99			56.61 ± 8.67			69.68 ± 8.36		

Abbreviations: CGM, continuous glucose monitoring; HbA1c, Hemoglobin A1c; SMBG, self-monitoring of blood glucose; yr, year.
[a] Except who answered 'don't know' and no responses.
[b] Calculated except don't know/no responses and continuous glucose monitoring.

Most participants reported higher transition readiness on disease knowledge and medication management, when compared to other sub-categories, such as provider communication and engagement during appointments. This is consistent with previous research that found similar results in patients with various chronic diseases (Ferris et al., 2015), suggesting that current patient education may have too strong an emphasis on information of disease itself and medication administration. However, as several studies have suggested, especially for emerging adults, education should include more information regarding healthcare transition, such as differences between the pediatric and adult care setting in their approaches to care (Garvey et al., 2014; Hilliard et al., 2014), as many emerging adults who abruptly move to adult settings fail to

adjust to the new environment and come back to pediatrics, or stop attending follow-up appointments altogether, resulting in the increased occurrence of complications (Garvey et al., 2013; Lebensburger, Bemrich-Stolz, & Howard, 2012).

In addition, as many participants had lower confidence with provider communication and engagement during appointment, patient education should also include effective patient-provider communication skills. Much of the published literature described that this is one of the key areas required for successful transition (Luu et al., 2016; Simms, Baumann, & Monaghan, 2017). Related communication skills include disclosing information regarding risky behaviors (e.g., sexual risk, substance use), and asking related questions (Majumder, Cogen, & Monaghan, 2017). As emerging adults are known to struggle with physical and psychosocial challenges, which may cause negative impact on diabetes self-management, it is essential for them to discuss potential changes with providers before and after the transition. Previous studies have documented that these skills usually do not improve with age, while disease self-management skills are generally enhanced (Whitfield, Fredericks, Eder, Shpeen, & Adler, 2015). This implies that patient communication skills may require a distinct intervention; therefore, future research is recommended to explore factors to facilitate patient-provider communication skills, and to develop effective interventions.

Table 2
Scores of major variables of study subjects ($N = 87$).

Categories (possible score range)	Total mean ± SD	Item mean ± SD[a]
Family support (16–80)	62.72 ± 14.51	3.92 ± 0.92
Therapeutic (13–65)	49.91 ± 12.52	3.84 ± 0.96
Emotional (3–15)	12.82 ± 2.61	4.27 ± 0.87
Self-management competency (16–80)	62.72 ± 14.51	3.92 ± 0.91
Glycemic control (4–20)	14.55 ± 3.07	3.64 ± 0.77
Insulin injection (2−10)	7.52 ± 1.81	3.76 ± 0.90
Dietary control (3–15)	9.38 ± 2.35	3.13 ± 0.78
Hygiene control (2–10)	6.70 ± 1.61	3.35 ± 0.80
Exercise control (1–5)	3.13 ± 1.21	3.13 ± 1.21
Rest (1–5)	3.02 ± 1.01	3.02 ± 1.01
Regular check-up (1–5)	3.33 ± 1.13	3.33 ± 1.13
Hypoglycemia handling (1–5)	4.39 ± 0.69	4.39 ± 0.69
Hyperglycemia handling (1–5)	4.18 ± 1.07	4.18 ± 1.07
Healthcare transition readiness (20–100)	69.40 ± 9.77	3.47 ± 0.49
Medication management (5–25)	16.20 ± 2.06	4.05 ± 0.52
Provider communication (3–15)	9.61 ± 2.76	3.20 ± 0.92
Engagement during appointment (4–20)	13.47 ± 3.03	3.37 ± 0.76
Disease knowledge (3–15)	12.71 ± 2.51	4.24 ± 0.72
Adult responsibilities (2–10)	5.76 ± 1.48	2.88 ± 0.74
Resource utilization (3–15)	7.87 ± 2.64	2.62 ± 0.88

[a] 5-point Likert scale.

Table 3
Correlations in family support, self-management competency and healthcare transition readiness ($N = 87$).

Variables	Family support	Self-management competency	Healthcare transition readiness
Family support	1.00		
Self-management competency	0.587 (<0.001)	1.00	
Healthcare transition readiness	0.257 (0.016)	0.606 (<0.001)	1.00

Table 4
Factors associated with the healthcare transition readiness ($N = 87$).

Variables	B	Standard error	β	t	p
Constant	16.548	9.615		1.721	.089
Age	0.942	0.355	0.229	2.651	.010
Plans of transfer to adult endocrinology[a]					
Decided to transfer	1.537	1.954	0.076	0.787	.434
Not decided yet whether to transfer	0.252	2.086	0.012	0.121	.904
Family support	−0.083	0.070	−0.124	−1.193	.236
Self-management competency	0.695	0.105	0.699	6.632	<.001

$R^2 = 43.6$, Adjusted $R^2 = 40.1$, $F = 12.527$, $p < .001$.

[a] Reference group = those who answered 'decided not to transfer to adult endocrinology'.

It is essential to provide more realistic strategies to emerging adults with T1DM, specifically demonstrating diabetes care tasks that are necessary to perform in daily life, such as blood glucose monitoring and insulin injections. Although people have adequate knowledge of disease care, there are social barriers hindering the actual care performance. In South Korea, many patients with T1DM report problems finding an appropriate location to administer insulin, as they are reluctant to inject openly. This results in patients hiding or skipping insulin injections. Considering the diabetes stigma found in Asian culture, and the fact that this culture places emphasis on family and society over the individual (Cha et al., 2012; Choi et al., 2017; Lam et al., 2018), Asian patients might tend to hide their disease conditions from the public. Therefore, patient education for emerging adults that strengthens their self-management should emphasize the importance of adherence to prescribed health guidelines, regardless of current social and cultural barriers. Furthermore, healthcare providers need to propose policy to improve the social awareness of T1DM.

Ongoing family involvement in diabetes management is necessary to enhance self-management competency and healthcare transition readiness. Concerning familial involvement in diabetes management, these findings add to the literature suggesting that there is a need for ongoing family support during the transition period to strengthen children's self-management competency (Hilliard et al., 2014). However, it should be noted that excessive family involvement in the care of children may trigger a loss of engagement in self-management and difficulties with the transition (de Silva & Fishman, 2014; Huang et al., 2011). Conversely, several previous studies have documented that an abrupt decrease in, or complete absence of, parental support is one of the barriers to successful transition (Huang et al., 2014; Pyatak et al., 2014; Wagner, Ulrich, Guttmann-Bauman, & Duke, 2015). Thus, it is critical for family to find the right balance between the needs of the children and familial roles, functioning to transfer diabetes care responsibilities from parents to the children.

Further, it is vital for cultural background to be considered when treating Asian patients and their families. As mentioned above, because Asian cultures emphasize family as central to society (Cha et al., 2012; Choi et al., 2017), many Asian parents feel at fault for the chronic diseases experienced by their children. This negative emotion towards their children's disease may cause self-stigmatization of parents, which may affect and be transferred to the children. Consequently, parental stigma may occur because of involvement in children's disease care, ultimately hindering children's responsibility for their diabetes care. Therefore, healthcare providers should try to understand cultural/ethnic differences and provide culturally sensitive education for children and their families to establish a new relationship throughout the transition process.

Primary factors associated with healthcare transition readiness were identified as emerging adults' self-management competency and their age. However, although several previous studies indicated family support as a related factor (Fenton et al., 2015; Huang et al., 2011; Treadwell et al., 2016), it was not found to be significant in the present study. This is assumed to be due to the small sample size and the limitation of survey questionnaires to measure various aspects of family support of emerging adults with T1DM, and to consider Korean cultural differences.

Regarding age as an affecting factor, this study supports previous research showing (Fenton et al., 2015; Javalkar et al., 2016; van Staa et al., 2011) that transition readiness is positively associated with patients' age. Specifically, results indicate that older emerging adults are more prepared for the transition, with stronger levels of independence. Therefore, healthcare providers should consider patients' age when considering transition readiness, with individuals that are too young being unable to transition appropriately. However, as age is not a modifiable factor, enhancing emerging adults' self-management competency is likely the most effective method of promoting transition readiness, which is consistent with numerous previous studies (Chiang et al., 2018; Treadwell et al., 2016; van Staa et al., 2011).

The proper timing of the transition to an adult care setting has been previously argued and remains unclear. The current results suggest that readiness can be determined according to patients' age as related to self-management abilities. In other words, transition care must be provided based on a combination of biological age and individual needs. As the American Diabetes Association and numerous other professional societies have recommended (Chiang et al., 2018; Peters & Laffel, 2011), the ideal onset for transition preparation is 16 years of age. The South Korean educational system has an older age of entry for all levels of schooling, from elementary to college, when compared to other countries; as such, it is common for adolescents to live with parents until marriage (Park & Sandefur, 2005). Given this, it is possible that South Korean emerging adults exhibit delayed independence from parents in all aspects of life, up to and including disease care. Thus, future research is needed to identify a South Korean specific age for commencement of transition.

The current study has several limitations. First, the present sample included retrospective data, such as HbA1c, which is subject to recall and possibly unreliable. Second, related to generalizability of the findings, while the recruitment methods utilized were multimodal (i.e., online and offline), the sample size was small. This was primarily due to the challenges faced by all researchers in recruiting emerging adults with T1DM, which is a minority group worldwide. Third, the questionnaire for family support may have limitations in concisely measuring South Korean culture-specific family dynamics of emerging adults. Therefore, future studies should develop a proper measurement of the characteristics of emerging adulthood in this population, both developmentally and culturally.

In conclusion, this study indicates that South Korean emerging adults with T1DM perceived themselves as having great family support, both in therapeutic and emotional aspects, better competency on direct glucose control compared to dietary and exercise control, and better transition readiness on medication management and disease knowledge. In addition, ongoing family involvement in diabetes care and strengthened self-management competency may lead to better healthcare transition readiness in this population. As the primary factors associated with healthcare transition readiness were identified as self-management competency and age, it is necessary to provide education regarding self-management while considering proper timing for education. Lastly, providers must consider cultural differences when planning the healthcare transition, while considering cultural attitudes towards diabetes and dynamics between families and emerging adults. In particular, pediatric nurses should understand their unique position among families and providers, as they care for emerging adults before and during the transition. Moreover, they can facilitate families' participation in

the transition process, educate emerging adults to perform their self-management skills, and improve patients' transition readiness for successful healthcare transition.

Declarations of interests

None.

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Author statement

All authors certify that they have participated sufficiently in the work to take public responsibility for the content, including participation in the conceptualization, methodology, validation, formal analysis, investigation, writing an original draft and revision of the manuscript.

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