

Intervention to promote adolescents' communication and engagement in diabetes clinic encounters: A pilot randomized controlled trial

I. Coyne^{a,*}, B. Sleath^b, J. Surdey^a, S. Pembroke^a, C. Hilliard^f, K. Chechalk^c, S. Rafferty^a, S. Rogerson^a, M. Hughes M^a, M. Murphy^a, D. Cody^e, E. Roche^{c,d}

^a Trinity College Dublin, School of Nursing and Midwifery, Dublin 2, Ireland

^b University of North Carolina at Chapel Hill, Division of Pharmaceutical Outcomes and Policy, UNC Eshelman School of Pharmacy, Chapel Hill, NC, United States

^c Trinity College Dublin, School of Medicine, Dublin 2, Ireland

^d Children's Health Ireland, Department of Endocrinology and Diabetes, Tallaght, Dublin 24, Ireland

^e Children's Health Ireland, Department of Diabetes and Endocrinology, Crumlin, Dublin 12, Ireland

^f Children's Health Ireland, Dublin 8, Ireland

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ABSTRACT

Aim: To conduct a pilot randomized trial of an intervention to improve adolescent question-asking and provider education during paediatric diabetes visits.

Methods: Adolescents aged 11 to 17 with type 1 diabetes and their parents were enrolled from two urban tertiary paediatric clinics. Adolescents were randomised to the intervention group or control group. Adolescent consultations were audio-recorded, their HbA1c level was recorded, and they completed surveys after three clinic appointments. The intervention group completed a question prompt list and watched a video on a tablet with their parents before meeting their doctor and completed a short evaluation after each visit.

Results: Six consultant endocrinologists and ninety-nine adolescents and their parents participated. The intervention increased adolescents' question asking and provider education in diabetes encounters. Total patient question-asking across the 3 consultations and a higher baseline HbA1c at time one was significantly associated with HbA1c at time three.

Conclusions: Question prompt lists and an educational video are useful tools to increase adolescents' question-asking and communication between adolescents and their providers.

Practice implications: Interventions that encourage adolescents' question-asking in healthcare encounters may lead to more meaningful providers-adolescents' communication and tailored education. Interventions to improve professionals' listening, communication and educational skills are also required.

1. Introduction

Adolescence is a key stage of development and transition into young adulthood which can be quite challenging for adolescents who live with Type 1 diabetes [1]. They have to manage a complex regime which includes; their nutrition, physical activities, monitoring their blood glucose, administering insulin, avoiding/treating hyper- and hypoglycaemia and taking over their self-care from their parents/caregivers. Adolescence is a period of social, biological, and cognitive changes, which adolescents have to navigate along with managing their complex diabetes regimen. Adolescence is also a risky period because metabolic

control tends to deteriorate partly due to pubertal insulin resistance and partly due to psychosocial factors such as reduced adherence to diabetes regimen, assumption of risk taking behaviours, difficulties taking on self-management, and reduced attendance at clinic appointments [2,3]. All of these changes can make maintaining optimal diabetes care more challenging for adolescents [4] and potentially lead to an increased risk of complications, morbidity, and mortality [5,6]. Comparatively, adolescents have less favourable glycaemic control than other age groups with type 1 diabetes and from early to late adolescence average glycated hemoglobin (HbA1c) levels increase [7,8]. Research shows that attitudes and behaviours developed during adolescence influence health

* Corresponding author.

E-mail address: coynei@tcd.ie (I. Coyne).

¹ ORCID ID: 0000-0003-0977-8428

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behaviours into adulthood[9] and better self-management leads to better glycaemic control, fewer complications, and improved quality of life[10,11]. Considering the potential risks to adolescents' health, it is essential that they are encouraged and supported to actively participate in clinic visits so that they can obtain help with their needs, receive advice and support, and develop self-advocacy skills.

Good relationships and effective adolescent-provider communication may encourage adolescents to engage in diabetes encounters and promote regular clinic attendance which may help with diabetes control [3,12–14]. However, the structure, focus and style of clinic encounters can create barriers that lead to reduced adolescent participation and impaired provider-adolescent communication[14–18]. Research studies report that lengthy wait times, limited time with the endocrinologist, coupled with perceived doctors focus on numbers (blood sugar levels) led to some adolescents perceiving clinic encounters as stressful resulting in their disengagement [12,19]. Adolescents can find it challenging to communicate with doctors, have low self-confidence out of fear of being wrong, forget to ask questions, and receive inadequate provider education leading to disinterest[20]. In addition, communication is often complicated in clinics due to the interplay and competing communication needs of the adolescent and parent [19]. Studies of triadic communication report that providers generally direct their communication towards parents leaving adolescents feeling marginalised and unimportant[21,22]. While parents play an important role as advocates for their adolescents, it is necessary to support adolescents to develop self-advocacy skills, an aspect of which involves actively participating in clinic visits[23]. However, our prior research and other studies have found sub-optimal levels of adolescents' participation and impaired provider-adolescent communication during clinic visits which are barriers to preparing them to assume a more active role in diabetes management as they age out of paediatric care [3,17,24,25].

Clearly there is a need for interventions that will promote adolescents' engagement and communication in clinic consultations. While interventions aimed at improving provider communication are needed [12,26,27], interventions directed at adolescents may help them to acquire skills that will help with their lifelong diabetes care [28]. Current diabetes guidelines recommend adolescent-centred healthcare that enables and empowers adolescents to ask questions and be actively involved in their diabetes care[2]. Interventions such as pre-visit videos and question prompt lists have been shown to help adolescents engage more, increased adolescents' question-asking and provider education about asthma [29]. Adolescents are likely to receive better emotional and informational support when they participate actively and communicate their needs in communication encounters. To our knowledge, no prior research has examined the impact of a pre-visit diabetes question prompt list/video intervention on adolescents' question-asking about diabetes care and provider education about diabetes. Therefore, our study aim was to conduct a pilot randomized, controlled trial (RCT) to examine the effectiveness of a pre-visit question prompt list/ video intervention to increase: (a) adolescents' question-asking about diabetes and its treatment and (b) provider educations about diabetes treatment and management.

2. Materials and methods

2.1. Description of intervention

The intervention aimed to improve adolescents' question-asking and provider education during paediatric clinic visits. The intervention was informed by Bandura's Social Cognitive Theory (SCT)[30] and a key construct self-efficacy which refers to a person's belief in their capabilities to organise and execute courses of action[31]. Self-efficacy can be developed through mastery experiences (developing knowledge and skills to perform behaviour), and our intervention sought to increase adolescents' self-efficacy to ask questions about diabetes care during clinic visits. Prior to starting the study, ethical approval was obtained

from both participating hospitals and the university research ethics committee. Twenty-four interviews and three focus groups were held with adolescents, parents, and providers to explore their experiences of clinic visits and to identify content for a question prompt list/video [32]. Six workshops were held with our youth advisory group (three female and two male adolescents with diabetes) and a parent advisory group (four mothers and one father) to co-design the intervention[20,33]. A participatory co-design approach was integral to the development of the question prompt list/video to ensure that the content, format and terminology resonated with adolescents[34].

The one-page question prompt list (QPL) for adolescents consisted of 16 questions and a box where adolescents could add any additional questions they may have (see Fig. 1). The youth advisory group felt that the QPL could increase self-efficacy in asking questions, secondly it could encourage provider education as the QPL would act as a trigger to ask questions they had not thought of before, and finally it would help ease the pressure of communicating with providers[20].

The video for adolescents was developed iteratively between the research team, videographer, and youth and parent advisory groups [33]. The video was nine minutes duration and had six themes: 1) message of empowerment; 2) managing your diabetes so you can get on with the fun stuff in life; 3) Promoting independence; 4) Reasons for not speaking at clinic visits and reassurance; 5) Becoming comfortable to speak and ask questions at clinic visits; 6) Practical advice on how to ask questions. The five adolescents in the youth advisory group acted in the video and spoke directly to the camera. Previous studies have shown that content/advice delivered by adolescents' peers, is more acceptable and more effective [34,35].

2.2. Procedure

Six consultant endocrinologists and ninety-nine adolescents aged 11 to 17 years with type 1 diabetes from two tertiary urban multidisciplinary diabetes services agreed to participate. With approval from the clinic staff, the researchers attended the scheduled adolescent diabetes clinics every Wednesday to recruit. During the pre-visit wait time, the researchers explained the study, obtained written parental consent and adolescent assent, and administered an eligibility screener. Adolescents' eligibility criteria included age 11 to 17 years with type 1 Diabetes and previously visited the clinic at least once, and ability to speak and read English. The parents' eligibility criteria included that they were at least 18 years of age, could speak and read English, and were the adolescents' legal guardian. Participants were enrolled from September 2019 to January 2021 and the intervention (question prompt list and video intervention) was administered at three consecutive clinic visits from October 2019 to March 2022. Participants were randomised to experimental or control group, stratified by clinic attended to ensure group balance. The control group received the usual care. Randomisation was done by computerised random number generator and the statistician prepared opaque, sealed envelopes containing group assignments. Providers were blinded to the adolescent's group assignment.

Adolescents and parents in the intervention and control groups, completed one survey together that took approximately 15 min to complete, and their HbA1c (average blood glucose level over 3 months) was recorded. The surveys completed included age, gender, number of years the adolescent has had diabetes, diabetic treatment regime, clinic attendance, adverse events, complications and composition of family. Adolescents in the intervention group watched the video [https://youtu.be/DTkgTABgan0] on a tablet with their parents and checked the questions on the QPL that they wanted to ask doctor at the visit. They completed a short evaluation survey at the end of the consultation. Their parents completed a short survey about the youth intervention. The average wait time for a clinic visit was 1.5 h which allowed sufficient time to administer the intervention.

All consultations were audio recorded and transcribed verbatim. Three research assistants were trained to code the transcripts using a

Questions that young people with Type 1 Diabetes can ask.

Read these questions and put checks by the ones you want to ask the doctor.

- ☐ What is HbA1c and what does it measure?
- ☐ How do I change my insulin?
- ☐ What are ketones and when should you test for ketones?
- ☐ What are the symptoms if my blood sugar is too high or too low?
- ☐ What should I do if I feel sick?
- ☐ What do I need to do to manage my blood sugars when I get my period?
- ☐ How do I count carbs when I am eating out or at a party?
- ☐ How does exercise affect my blood sugar and how do I manage it?
- ☐ Is it ok to drink alcohol?
- ☐ Is it ok to skip meals if you do not feel hungry?
- ☐ How do I manage my diabetes during my exams?
- ☐ What should I do when I am away on holidays/school trip to manage my diabetes?
- ☐ Can you tell me more about changing to the adult clinic?

Questions about the pump

- ☐ What is an insulin pump?
- ☐ Do I have to check my blood sugars when using an insulin pump?
- ☐ How long can I disconnect my insulin pump for?

Write any other questions you have in the space below:

Fig. 1. Question Prompt List.

detailed coding tool developed and adopted from Sleath's asthma study [29]. The research assistants coded whether adolescents asked questions and if providers educated adolescents on their diabetes regimen during their visits. Two coders coded half of the same transcripts throughout the study period to assess inter-rater reliability. After each transcript was coded, it was subsequently audited by a third coder to ensure inter-rater reliability. Any divergence was discussed and agreed by consensus.

Adolescent age was measured as continuous variables and gender were measured as dichotomous variables. Adolescent ethnicity was measured using two categories: Caucasian and non-white. All adolescents' visits were audiotape recorded, transcribed verbatim and coded. Two researchers were trained to code the transcripts using a detailed coding tool adapted from Sleath's asthma study [29]. The coders were blinded as to whether adolescents were in the intervention or control groups. They coded the following: (a) whether adolescent asked one or more questions about diabetes, treatment, exercise, lifestyle and (b) whether the provider educated the adolescent during visits about diabetes management, medication administration and monitoring,

medication, school performance, health promotion, psychosocial issues and how many topics they educated about in each area. The two coders coded 45 of the same transcripts throughout the study to assess inter-rater reliability which ranged from 0.86 to 0.99.

2.3. Analysis

Before beginning enrolment into the study, we conducted an a priori power analysis. In the clinics, there were approximately 500 attendees of which approximately 220 were adolescents aged 11–17 years. For a hypothesised clinically important difference of a 10% reduction in the outcome measure (HbA1C), using a significance level of 0.05, a population standard deviation of 2.9 (based on Conway [36]) and with 80% power, a sample size of 70 adolescents in each group was required. To allow for 20% attrition, we planned to recruit 88 adolescents per arm.

Data from the coded transcripts and QPLs were analysed with SPSS (v 27). Between group differences were compared using independent samples t-tests for continuous variables and Chi Square χ^2 for categorical

variables. For the primary communication outcome after viewing an educational video and providing QPL at their clinic visits adolescents will be more engaged and likely to ask questions, unadjusted comparisons between the intervention and control groups at all three visits and 3 visit total using independent sample t-tests, showed a significant difference between intervention and control groups.

We conducted a linear regression to examine how study group, age, gender, and mean Hemoglobin A1c predicted total adolescent question-asking about diabetes across all 3 visits. We then conducted a linear regression to examine the association between study group, age, gender, and mean Hemoglobin A1c at time one, was associated with total provider education about diabetes across all 3 visits. We then added patient question-asking across all visits to the regression. Finally, we conducted a linear regression to examine the association between study group, age, gender, mean Hemoglobin A1c at time one, total adolescent question-asking and total provider education about diabetes across all three visits were associated with Hemoglobin A1c at time three.

3. Results

Six consultant endocrinologists agreed to participate in the study. One hundred and fifty-one adolescent/parent agreed to meet with the research assistant to learn about the study. Fifty-two adolescent/parent refused to participate because of reasons such as: lack of interest, lack of time and stressful being in the clinic. The onset of the Covid pandemic in March 2020 impacted the planned recruitment of adolescents due to closure of the clinics and infection control measures (Authors, date to be added). A total of ninety-nine adolescents aged 11 to 17 years with Type 1 diabetes attending two clinics and their parent were enrolled, with 49 in the intervention group and 50 in the control group. Five adolescents were lost during the study due to being transferred to adult services or discharged from the clinics. The participation of the patients in the trial is shown in the CONSORT (Consolidated Standards of Reporting Trials) diagram (Fig. 2).

Table 1 shows comparisons between the intervention and control group demographic characteristics. On average, adolescents were about 13 years old, about half were female, and almost all were Caucasian. They had diabetes for about 6 years, 56% used Continuous

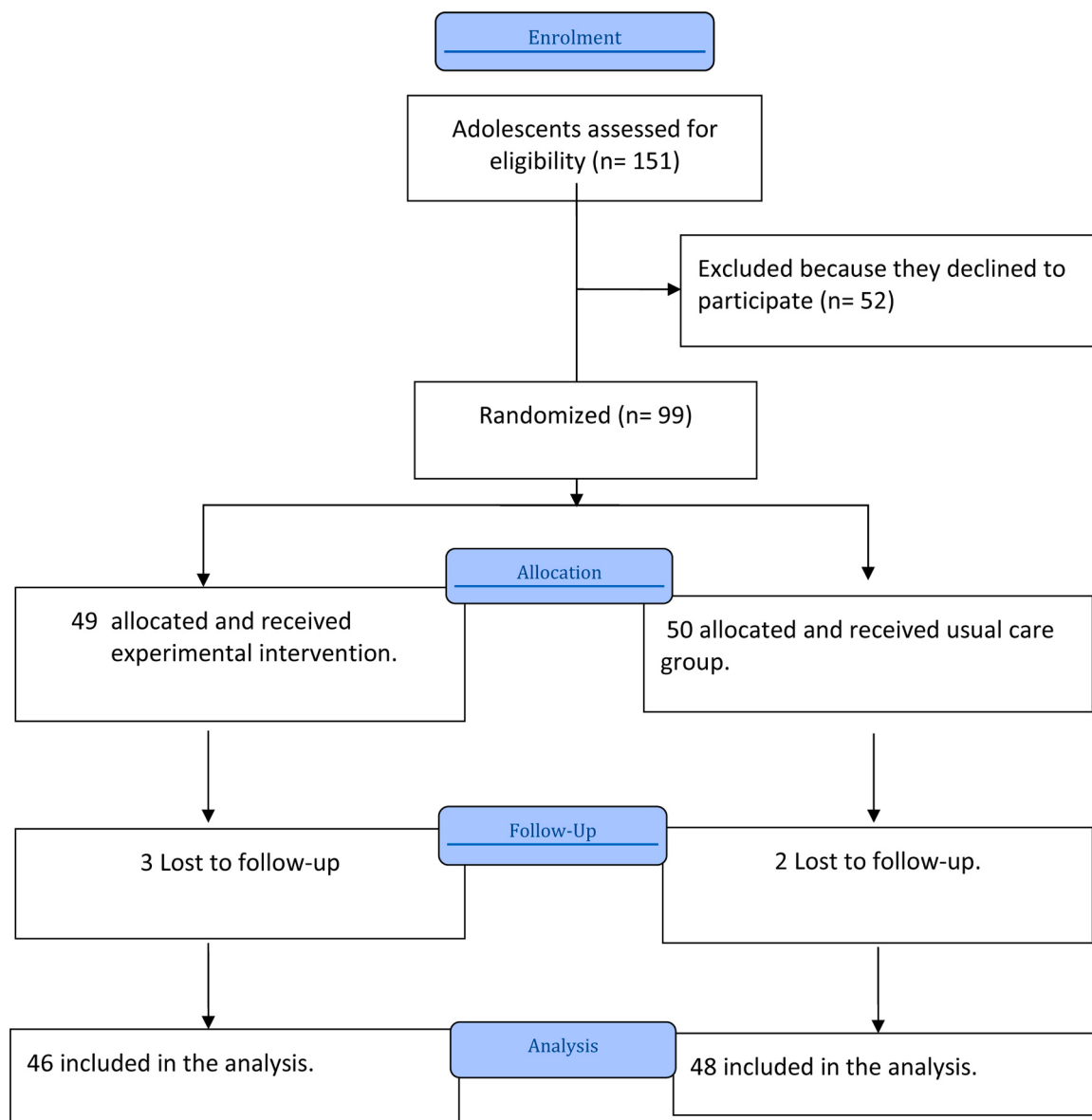


Fig. 2. Adolescents participation in the trial.

Table 1

Adolescents Characteristics. Values are mean $\pm$ SD. Between group differences were compared using independent samples t-tests for continuous variables and χ^2 for categorical variables*.

Characteristics	Intervention group (n = 46) Percent (N)	Control group (n = 48) Percent (N)
Age (years)	13.00 $\pm$ 1.52	13.08 $\pm$ 1.83
Gender		
Male	43.4% (20)	50% (24)
Female	56.5% (26)	50% (24)
Ethnicity		
Caucasian	95.6% (44)	96.8% (46)
Non-White	4.3% (2)	4.1% (2)
Attend Clinic with mom	80% (37)	67% (32)
HbA1c visit 1 mmol/mol percentage	65.13 $\pm$ 13.39	62.57 $\pm$ 10.21
	8.10 $\pm$ 1.21	7.876 $\pm$.92
HbA1c visit 3 mmol/mol percentage	64.86 $\pm$ 15.42	62.68 $\pm$ 13.81
	8.03 $\pm$ 1.36	7.87 $\pm$ 1.25
Clinic Attended		
Clinic A	43.4% (20)	50% (24)
Clinic B	56.5% (26)	50% (24)
Length at clinic (years attending)	5.77 $\pm$ 3.27	5.29 $\pm$ 2.84
Years since diagnosis	5.97 $\pm$ 3.26	5.40 $\pm$ 2.96
Mean time visit 1 in consultation (minutes)	32.78 $\pm$ 12.57	27.67 $\pm$ 11.88
Mean total consultation time (minutes)	86.89 $\pm$ 22.09	85.26 $\pm$ 27.22

There were no significant differences between intervention and control patients.

Subcutaneous Insulin Infusion Therapy (CSII) or “pump therapy” and 44% used multiple daily injection therapy, with mean HbA1c of 63 mmol/mol. Participating parents were mostly mothers (73%). The three-visit total time spent in consultation was about 86 min. There were no statistically significant differences between the intervention and control group on any of these variables.

The most frequent questions asked by adolescents from the question prompt list across three visits were “Is it ok to skip meals if you do not feel hungry?” (n = 22), “What is HbA1c and what does it measure?” (n = 19), “How do I count carbs when I am eating out or at a party?” (n = 11), and “How do I manage my diabetes during my exams?” (n = 11). No adolescent asked “What is an insulin pump” or “Do I have to check my blood sugars when using an insulin pump” at any of the visits. This indicates that adolescents wanted to know about managing their diabetes in the context of school, parties, and lifestyle. Doctors provided education to adolescents most frequently on blood sugar monitoring (n = 111), administering insulin (n = 108), and diet (n = 77) and least education was provided on treating hypos/lows (n = 12) and managing diabetes at school (n = 23). There was no difference in parent question-asking between treatment and control groups at any of the three visits or overall. Total Parent Questions asked: 4.59 intervention and 4.13 control across all 3 visits (unstandardized beta = -0.45, 95% confidence interval = -2.22, 1.31).

The data as outlined in Table 2, showed a significant difference in adolescents’ question asking between intervention and control groups at all time points. Providers were significantly more likely to provide more education to adolescents in the intervention group across the 3 visits than those in the control group. Table 3 illustrates that adolescents in the intervention group were significantly more likely to ask more questions about diabetes than those in the control group across all 3 visits (unstandardized beta = 3.0, 95% confidence interval = 1.5, 4.4).

Table 4 shows that providers were significantly more likely to educate adolescents more in the intervention group about diabetes than adolescents in the control group across all 3 visits (unstandardized beta = 2.1, 95% confidence interval = 0.74, 3.4). When we added adolescents’ question-asking to the model, study group became insignificant and adolescents’ question-asking about diabetes across all 3 visits significantly predicted provider education about diabetes across all 3 visits (unstandardized beta = 0.29, 95% confidence interval = 0.11, 0.48). Adolescents with a higher mean hemoglobin A1c at time one was

Table 2

Adolescents question asking, parent question asking, provider education (n = 94).

	Intervention (n = 46) Mean	Control (n = 48) Mean	p-value	Between group difference (95% CI)
3 visit total Adolescent Questions Asked	4.17	0.91	< 0.001 **	-3.25 (-4.74, -1.77)
Time 1 Adolescent Questions Asked	1.54	0.34	< 0.001 **	-1.20 (-1.85, -0.55)
Time 2 Adolescent Questions Asked	1.54	0.34	< 0.001 **	-1.20 (-1.85, -0.55)
Time 3 Adolescent Questions Asked	0.88	0.23	0.01 *	-0.65 (-1.14, -0.15)
Adolescents who asked no questions at 3 visits	(16) 34.7%	(30) 62.5%		
Adolescents who asked 1 or more questions at 3 visits	(30) 65.3%	(18) 37.5%		
3 Visit Total Health Care Provider Education	8.31	6.11	0.002 **	-2.20 (-2.2, -3.60)
Time 1 Parent Questions Asked	2.0889	2.0625	.953	-.026 (-.91,.857)
Time 2 Parent Questions Asked	1.3913	1.2174	0.647	-.173 (-.926,.578)
Time 3 Parent Questions Asked	0.9762	0.9149	0.83	-.061 (-.620,.497)
3 Visit Total Parent Questions asked	4.59	4.13	0.61	-0.45 (-2.22, 1.31)

P-value: * significant at the 5% level ** significant at the 1% level

Table 3

Linear regression predicting total adolescent question-asking across all visits (n = 94).

Variables	Unstandardized beta (95% CI)
Intervention	2.984 (1.5, 4.4) * **
Age	.165 (-0.3, 0.6)
Gender-female	.290 (-1.2, 1.7)
Mean HBA1c at time 1	.028 (-0.03, 0.09)

CI-confidence interval

* ** p < 0.001

significantly more likely to receive more provider education across all 3 visits (unstandardized beta = 0.08, 95% confidence interval = 0.02, 0.13).

Table 5 illustrates that adolescents’ question-asking about diabetes across all 3 visits was significantly associated with hemoglobin A1c at time three (unstandardized beta = 1.1, 95% confidence interval = 0.42, 1.8). Hemoglobin A1c at time one was also significantly associated with hemoglobin A1c at time three (unstandardized beta = 0.77, 95% confidence interval = 0.57, 0.97).

Participants provided positive feedback about the intervention. This may be due to the fact that adolescents with type 1 diabetes led the co-design and development of the intervention, and their input was

Table 4

Linear regression predicting total provider education about diabetes across all visits (n = 94).

Variables	Unstandardized beta (95% CI)	Unstandardized beta (95% CI)
Intervention	2.1 (0.74, 3.43)* *	1.1 (−0.32, 2.5)
Age	0.14 (−0.28, 0.55)	0.06 (−0.34, 0.45)
Gender-female	1.3 (−0.10, 2.6)	1.1 (−0.16, 2.4)
Mean HbA1c at time 1	0.08 (0.03, 0.14)* *	0.08 (0.02, 0.13)* *
Adolescents' question-asking about diabetes across all 3 visits		0.30 (0.11, 0.48)* *

CI=confidence interval

* * p < 0.01

Table 5

Linear regression predicting Hemoglobin a1c at time 3 (n = 94).

Variables	Unstandardized beta (95% CI)
Age	-0.31 (−1.7, 1.1)
Intervention	-3.4 (−8.5, 1.8)
Gender-female	-4.9 (−9.6, −0.223)* *
Mean HbA1c at time 1	0.68 (.48, 0.88)* **
Total Provider Education across 3 visits	0.79 (−0.001, 1.6)
Total patient question-asking across 3 visits	0.77 (0.06, 1.5)* *

CI= 95% confidence interval

* * p < 0.01, * ** p < 0.001

prioritised in the finalising of the question prompt list and video[20]. Of the 49 adolescents in the intervention group, 96% recommended that adolescents complete the QPL before visits, 80% recommended adolescents watch the video before visits, and younger (13–14 years) or more recently diagnosed adolescents found the video more useful. Ninety-two percent of adolescents said the intervention helped them feel more confident to talk to their provider and more knowledgeable on managing their condition. All parents (100%) recommended adolescents should complete the QPL before visits and 96% recommended adolescents should watch the video before visits.

4. Discussion and conclusion

4.1. Discussion

The findings indicate that the intervention group were significantly more likely to be engaged and ask more questions than adolescents receiving usual care. These important findings indicate that interventions focusing on developing adolescents' skills can improve their level of engagement and participation which has been reported before [37]. Similar co-designed interventions (QPL and video) for adolescents with asthma have demonstrated an increase in question-asking and clinic engagement and provider education [34]. A systematic review of other studies reported that videos were effective in promoting behavioural change [38] and videos can help influence positive change in self-management routines for adolescents with long-term conditions [39–41]. Similarly, a review of question prompt lists studies, found that a question prompt list provided before the consultation was associated with increased patient question asking and provider information and education [42].

The diabetes QPL and video also increased the amount of education that providers gave during visits. Given that adolescents' question-asking led to more education from providers, indicates that communication between adolescent-provider may have been more relevant to their needs at that time. Our findings indicated that adolescents wanted to know about managing their diabetes in the context of school and lifestyle which is consistent with other studies [12,17]. Prior research in diabetes indicates that adolescents often perceive consultations as

formal and rushed, leading to them feeling frustrated and disengaged from communication interactions [12]. Furthermore, information provision may not always align with their concerns and lifestyle issues under-explored [12,17]. Therefore, the QPL could help re-focus the consultation towards the adolescent's agenda, leading to more meaningful and relevant discussions/education between providers and adolescents. Taking an agenda-setting approach may help promote a person-centred individualised approach in consultations, and encourage adolescents to take an active role in their diabetes care [43]. It may be time efficient as our study showed that there were no significant differences in consultation length when intervention consultations were compared to controls. Since the question prompt list encouraged adolescents to identify their own individual questions, this may have resulted in not taking up additional time because the consultation was structured according to their agenda. Doctors are often concerned that interventions will extend or delay clinic consultation time. Since the intervention did not increase consultation time, this is positive when considering the feasibility of implementing the intervention in practice as time pressures can influence how doctors respond [44].

Helping adolescents to feel more confident to ask question and to engage with their provider is likely to contribute to enhanced self-efficacy which may benefit health promoting behaviours [45]. Comparatively, adolescents have less favourable glycaemic control than other age groups with type 1 diabetes, therefore it is important finding that adolescents' question-asking about diabetes across all 3 visits was significantly associated with hemoglobin A1c at time three. The intervention group's mean HbA1C was higher at baseline (8.10 ± 1.21), which suggests that perhaps they asked more questions over the three visits because they wanted to achieve better HbA1C control. The recommended optimal HbA1C for children and adolescents is considered to be < 7% (53 mmol/mol) in Ireland.

Both adolescents and parents reported that the question prompt list helped the adolescents to feel more confident to talk to their provider and to feel more knowledgeable about managing their diabetes. Overall, compliance was excellent with this simple intervention, as evidenced through high rates of completion. Adolescents and parents were very positive about the QPL and video which is similar to prior research with adolescents with asthma [46]. There is a need for more patient-centred research, and this study adds new insights into how simple interventions that are co-designed for and with youth can make a difference. To our knowledge, this is the first type of intervention co-designed with adolescents with diabetes to increase their question-asking and engagement during clinic visits.

4.2. Limitations

This pilot randomized controlled trial has several limitations. First, the sample size was small and was powered to detect primarily medium to large effects as it was a pilot randomized trial. One third of those reached by research staff declined to enrol in the study, suggesting additional intervention approaches will be needed to reach the full population of adolescents with type 1 diabetes and to ascertain if there was a difference in diabetes care between those who participated in the study and those who didn't. It is also another limitation that some providers might have been unblinded if they noticed the adolescent using the one-page question prompt list during the visit.

The study findings are limited in their generalizability as participants were mainly Caucasian Irish from two urban pediatric diabetes clinics, based in Dublin, Ireland, albeit with a large catchment area with both urban and rural populations. In addition, the video was developed with adolescents who identified as Irish and reflected traditional sport and music in Ireland, thus, the video style may not appeal to other cultural groups. Future work is necessary to adapt the video to other cultures, languages and special needs groups. The QPL may also need to be tailored to the specific concerns of patients at the different stages in the care trajectory and to younger children. For example, newly diagnosed

patients may have quite different needs/questions to those who have diabetes from birth. The QPL was designed by adolescents so the questions may need to be tailored to the needs and literacy levels of younger children (<11 years). It would be important to test the QPL intervention without the video in future research to assess if there is a difference in observed outcomes. Further testing of the intervention with adolescents with poorly controlled diabetes could produce more clinically relevant outcomes.

Our intervention was focused on youth and on increasing their question-asking. However, all adolescents in the intervention and control were accompanied by their parents. It is possible that some of the questions may have been sensitive to discuss in front of parents (e.g., is it okay to drink alcohol?). Additionally, parent-adolescent dynamics may influence the extent to which adolescents ask questions. Research on triadic interactions suggest that parents' presence can have a major influence on turn-taking in conversations. Likewise providers can prioritise parents' information needs in the communication interaction rather than the adolescent[22]. Providing adolescents with time alone with the provider could help them to ask their questions thereby facilitating a more open communication, some research indicates that parents are supportive of adolescents having time alone with their provider[47].

Due to the Covid-19 pandemic, study enrollment and data collection had to be extended, and adolescents were enrolled over a sixteen-month period (October 2019 until January 2021). Over that time this population were exposed to natural maturation. We enrolled adolescents regardless of whether their diabetes was well controlled or not. Also, worth future investigation is why 16 or 34.8% of the adolescents (n = 49) who received the intervention before their visits did not ask their providers any questions.

4.3. Conclusion

This intervention holds promise to have a positive impact on adolescents' engagement, diabetes question asking, understanding and provider relationships. Adolescent question-asking during visits about diabetes management increased threefold with the question prompt list with video intervention. There was a statistically significant increase in provider education following the intervention. Clinics could refer adolescents to the video on the YouTube channel and they could consider placing the question prompt list in the clinics for adolescents to complete before their visits. The data from this study support preliminary feasibility and acceptability of this brief clinic-integrated intervention for adolescents with type 1 diabetes. Brief psychosocial interventions that can be delivered during routine diabetes care are likely to have more reach with adolescents [48] and may also encourage adolescents to attend clinic visits [49] which is important for diabetes care. Adolescents usually attend diabetes clinic appointments every 3–4 months, so it is important to maximise those opportunities and make every contact count. The positive feedback from adolescents, parents, and providers indicates that the intervention was well received and has potential for further study and dissemination in practice without disruption to clinic flow.

4.4. Practice implications

We listened to our youth advisory group who advised us to make the intervention video available on an accessible platform (see [https://youtu.be/DTkgTABgan0]). Healthcare providers could refer adolescents with diabetes to the video and provide the question prompt list to complete prior to clinic consultations. The QPL is a simple tool that could prompt adolescents to write down their questions/concerns in advance thereby ensuring that the consultation starts with a focus on their concerns. Encouraging adolescents to ask questions in healthcare encounters may contribute to more clinic engagement which is a core outcome in diabetes care[50]. Taking a two-pronged approach of changing adolescent behaviour in conjunction with training in

patient-centered communication skills for healthcare professionals[14] may lead to regular clinic attendance and positive health outcomes for adolescents [49]. Adolescence is a risky period for non-adherence and adverse health complications; therefore, it is critical that providers use every contact to strengthen adolescents' self-efficacy and active engagement in diabetes care.

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Declaration of Competing Interest

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