Patient Education for Prenatal Aneuploidy Testing using a Chatbot: a Multicenter Randomized Controlled Trial

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INTRODUCTION

Professional society guidelines support the offering of both screening and diagnostic tests to all pregnant women, regardless of maternal age or risk status and stress the importance of appropriate pretest counseling. Primary obstetric providers have become the first point of contact for women considering genetic testing options with counseling necessitated at the first obstetric visit. In a 2015 survey of 258 obstetricians, barriers to counseling patients about NIPT included lack of time and physicians' limited familiarity and experience with NIPT.[1] With the current landscape of personal communication devices and an increasingly technology-proficient population, an interactive chatbot can be a viable tool in healthcare.

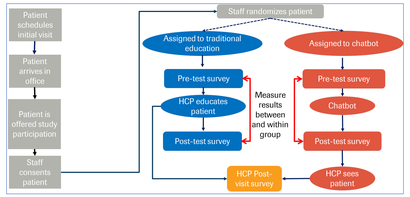
AIM

To investigate the potential use of this tool in pre-test prenatal counseling, a smartphone-enabled chatbot was developed to provide patient education about prenatal genetic testing options. A randomized control study measured patient knowledge of prenatal testing options before and after chatbot or traditional education, and satisfaction following chatbot education.

METHOD

This randomized controlled trial was conducted at two centers: a university hospital (Indiana University, Indianapolis IN) and a private practice clinic (New Horizons Women's Care Branch of Arizona Ob/Gyn Affiliates, Chandler, AZ). The chatbot was built using the Dialogflow API (Google, Mountain View, CA) by a software development team (Roche Global IT Solution Center, Poznan, Poland) affiliated with the study sponsor to be implemented as a mobile application. The application was installed onto secure iPads stored at each study site.

Eligible subjects who consented to join the study were block randomized into one of two groups: those who received pre-test education with the chatbot, and those who received pre-test education with her provider. See below flow diagram.



The primary endpoint was change in knowledge score between baseline and post-education tests, which comprised 20 total questions. Our hypothesis was equivalence between the two cohorts in change of knowledge score. The secondary endpoints included patient and provider satisfaction, measured on a subjective 10 point scale (1 = least satisfied, 10= most satisfied) as well as time spent for pre-test counseling and total visit time, as reported by the healthcare provider. To compare these endpoints, a student t-test was used. Data was analyzed with Microsoft Excel (Redmond, WA). All tests were two sided and we employed P-Values of <0.05 as the cutoff for statistical significance. All analysis was by intent to treat.

RESULTS

Patient flow

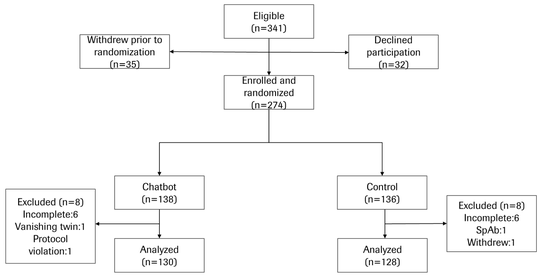


Figure 1. *Of the 341 eligible subjects, 91% agreed to participate. Ultimately, data from 130 patients from the chatbot arm and 128 from the control arm were analyzed.*

Primary Endpoint: Knowledge gain

	Conventional education	Digital tool education	P value
N =	128	130	
Correct responses pre-education survey (20 questions)	8.98	9.02	0.917
Correct responses post-education survey (20 questions)	10.86	13.09	<0.001
Individual change	+1.88	+4.08	<0.001

Figure 2. *The mean baseline score for both cohorts was 9 correct multiple choice questions. Those randomized to the intervention arm had a greater knowledge gain compared to the control arm. On average, those in the conventional education arm score 1.88 more questions correct, while those in the digital tool arm scored 4.08 more questions correct.*

Primary Endpoint: Distribution of knowledge gains

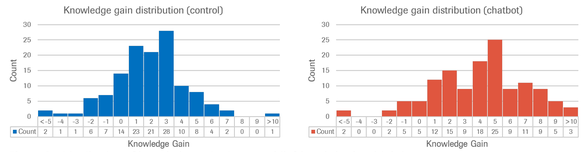


Figure 3. *Distribution of knowledge gains in control (left) and chatbot (right).*

Secondary Endpoints: Patient and Provider satisfaction

	Conventional education	Digital tool education	P value
N =	128	130	
Patient satisfaction (1-10 scale)	8.48	8.23	0.346
N =	121	115	
Provider satisfaction (1-10 scale)	8.38	8.67	0.129

Figure 4. *Although high satisfaction scores were reported by both providers and patients in both cohorts, there was no significant difference between these two.*

Secondary endpoints: Total visit time and counseling time

	Conventional education	Digital tool education	P value
N =	121	115	
Total face-to-face time, provider reported	20.4 minutes	21.04 minutes	0.525
Time discussing genetic testing options, provider reported	5.06 minutes	4.70 minutes	0.367

Figure 5. *Total visit time and counseling time did not differ between the cohorts. Pre-test counseling was accomplished in roughly five minutes.*

Evaluation of quantity and complexity of information delivered

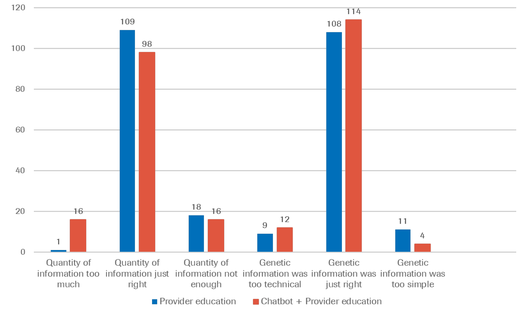


Figure 6. *Regardless of study arm, most patient deemed that the information provided to them was satisfactory in quantity and understandability.*

Subjective ratings of chatbot

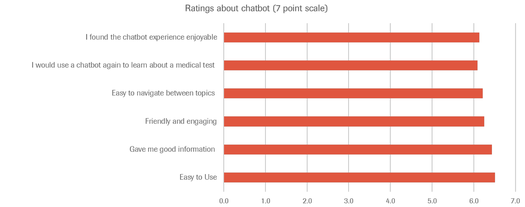


Figure 7. *Patients assigned to the chatbot arm rated their experience favorably with all mean scores greater than 6 on a 7 point likert scale (1=strongly disagree, 7=strongly agree).*

CONCLUSIONS

Pre-test education via a chatbot-based tool can increase patient knowledge of prenatal testing choices with high patient and provider satisfaction. Counseling time and total visit time did not differ between the cohorts. Providers should consider this digital interactive tool to enhance personalized education.

The chatbot is available in the United States, Italy, and Australia in the Apple App store and Google Play as iPrenatal.

REFERENCES

[1]Farrell RM, Agatisa PK, Mercer MB, Mitchum A, Coleridge M. The use of noninvasive prenatal testing in obstetric care: educational resources, practice patterns, and barriers reported by a national sample of clinicians. Prenat Diagn. March 2016.

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The chatbot can be downloaded using QR Code to the right.