CIHR Team in Access to Children's Mental Health Services, the CATHI Pilot Project

Internship Report

Meredith R. Whitney

B00356322
whitney@cs.dal.ca

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IWK Health Centre
5850/5980 University Avenue
Halifax NS B3K 6R8

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I would like to thank the CIHR Team in Access to Children's Mental Health Services co-investigators, Dr. Patrick McGrath and Dr. Charles Cunningham for their feedback throughout the study preparation and Vanessa Varalli for providing me with this opportunity to work on this grant and be the lead in creating a Pilot study. I would also like to thank the IWK Team and my Centre colleagues for their continuous support and feedback throughout my internship.

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Meredith Whitney

EXECUTIVE SUMMARY

The healthcare system, like any other system, is an intricate web of elements that combine together to form many components and processes. Currently Canada is working towards improving their healthcare system to allow for easier communication processes between healthcare professionals within organizations, between organizations, as well as through interactions with patients. Health informatics simply stated is the study of obtaining/retrieving, sharing, storing, and organizing knowledge through the use of information and communication systems to help manage the healthcare system.[1] Health Informatics focuses on understanding the basic building blocks of the existing systems and the nature in which they are used, to create and develop new modifications for the systems that are unique and useful and provide positive impact on the healthcare system.

Wait times in the Canadian healthcare system are of big debate daily and require a solution if not many solutions to curb the time people wait for certain services. One solution being used at the Centre for Research in Family Health at the IWK Health Centre is found in the Family Help Program. The Family Help Program uses distance treatment by means of telephones to access clients with mild to moderate mental health problems. These clients, in need of services, may be on the wait list to see a specialist or may not be able to access care conveniently in their communities. Telephones are common basic form of technology that allows two-way communication between parties, and technology boosts affiliations with clients. The Centre for Research in Family Health is housing research titled CIHR Team in Access to Children's Mental Health Services, which focuses on finding new ways, using innovative technology to reduce wait times for children with mental health problems. Computerized telephony is one way to enhance the already proven successful Family Help Program. Computerized telephony enhances the telephone by allowing a computer to call into someone giving a sense of anonymity. The possibility of developing and integrating computerized telephony into the Family Help Program was first evaluated by Dr. Hadi Kharrazi in his 2005 Masters Thesis (approved by Dalhousie University REB; submitted March 2005; defended March 28, 2005). Dr. Kharrazi concluded that integrating an interactive voice response (IVR) system would help reduce delivery costs for the Family Help Program.[2]

To determine whether an interactive voice response (IVR) system will work for the Family Help Program, a pilot project is being prepared to assess usability and satisfaction of a system called CATHI the 'Computer Automated Telephone and Help Information' system. The CATHI system is a tool used to support parents during their treatment (clinical care). In order to enhance the system's output, results from the recently conducted parental focus groups at McMaster University, in Hamilton Ontario, were reviewed. Parents in the focus groups suggested that if the CATHI system was integrated into the Family Help Program, parents in the treatment program may not be as accepting of CATHI, and parents would much prefer to speak with human.[3] Parents in the focus groups, stressed the importance of creating a bond or connection between the people helping them on the other line.

To date, the system has been modified from a basic computer voice (text to speech) to a pre-recorded voice that sounds pleasant. The researchers hope that the pre-recorded voice will enhance the likelihood that parents will accept the system in the treatment program. Actions have been taken to assess qualities of computer systems that people have preferred in the past such as: complimentary

statements or statements of support, a multi-tone voice, ample time for people to interact with the system so as they feel like they are participating and getting the most out of the system. Once the Pilot study has been completed, further information will be assessed to improve upon CATHI.

1.0 INTRODUCTION

Wait times are an ongoing topic for heated discussions in Canada. Currently, researchers at the IWK Health Centre and McMaster Children's Hospital are working together to create ways to reduce wait times for Children's Mental Health Services and increase timely access to families in need. The team grant, funded by the Canadian Institutes of Health Research (CIHR) is titled the CIHR Team in Access to Children's Mental Health Services. This team grant, organized around five projects, will aspire to evaluate strategies for reducing children's mental health waitlists. Dr. Patrick McGrath from the IWK Health Centre and Dalhousie University and Dr. Charles Cunningham from McMaster University are the co-principal investigators.

The Family Help Program is a distance treatment program, offered at the IWK Health Centre in Halifax, Nova Scotia. The Family Help Program provides evidence-based, psychological and behavioural interventions for families with children with mild to moderate mental health problems.[4] With the help of weekly telephone calls from a trained 'coach', parents work through a structured series of sessions in a handbook (Appendix A-paper copy only), watch videos demonstrating efficient and unsuccessful parenting strategies, complete problem-solving exercises, practice new skills while applying the new skills to solve their child's difficulties.[5] The Family Help Program delivers care to families over the telephone at a time convenient for them. This unique approach helps to minimize some of the barriers that prevent families from using children's mental health services such as childcare, transportation, travel, and work schedules.

The Family Help coaches interact with families in the treatment program weekly over the telephone providing support by responding to questions and emphasizing the skills provided in the handbook. The Family Help coaches also schedule future appointments, reschedule missed appointments, and act as a reminder system for families (coaches call in advance to remind parents of a future appointment, coaches call parents to remind them to read a session in the handbook or to practice a particular skill). According to Family Help coaches, they normally spend between 45-minutes to 1-hour amount of time per week with a parent during a single treatment session.

The costs associated with coaches and their responsibilities; make a considerable contribution to the overall Family Help Program delivery costs. The number of coaches in the Family Help Program is limited, preventing children and families from getting the immediate help they need. An Ontario study, found that over 80% of children who show signs of diagnosable psychological problems have little or no contact with mental health services. Many of these children who do have contact with mental health services may not end up receiving the treatment they need.[6] The waitlist times for mental health services can be from months up to a year, causing disconnects between the time of information intake and the time that a child and family begins treatment.[7] These disconnects, in fact increases the severity of the problems that the families experience.

Interactive voice response (IVR) systems are script-automated systems used to collect information from users over the telephone by means of touch buttons or recorded responses.[8] Interactive voice response systems are accessible either day or night and they have the ability to receive telephone calls as well as make telephone calls. Voice recognition also known as speech recognition is the process of converting a speech signal to a sequence of words by means of an algorithm implemented as a computer program.[9]

As a part of the CIHR Team in Access to Children's Mental Health Services project, a pilot project at the IWK Health Centre was designed specifically to focus on reducing the cost associated with the Family Help Program coaches, by evaluating an interactive voice response (IVR) system. The system to be piloted is called a 'computer automated telephone help and information system', referred hereafter as CATHI. CATHI was developed with and runs on the Nuance Voice Platform produced by Voxeo Corporation.[i] The system communicates with callers via a recorded female voice (as chosen by the researchers). Studies suggest that systems with female voices receive more positive responses than those systems with male voices, possibly because female voices emit a caring and less commanding tone.[10] [11] The interactive script used by CATHI is based on information provided in the Family Help handbook[ii] (Appendix A-paper copy only).

CATHI has been designed as a tool to: provide a brief review of the information in the Family Help handbooks, monitor/track families' progress through the treatment program, help families with goal setting, and provide extra tips and examples not found in the handbooks. Integrating CATHI will allow the Family Help Program to become more flexible for families (the system may be accessed throughout the day and night), and the program will be able to accommodate more families at one time. Introducing CATHI will also reduce personnel costs associated with coaches, and therefore reduce overall Family Help Program delivery costs.

The idea of CATHI is to deliver to families a self-administered program (the coach component would be excluded) that incorporates a telephone system to support the Family Help program's materials (handbook and video). Families would be responsible to keep on track with the program with the support of CATHI. Automated telephone systems have many applications including: patient care, clinical research, and medical education.[12] Computerized telephony is a sophisticated but relatively inexpensive technology that can be programmed to deliver general and individualized information to families over the telephone.[5] One paper concluded after conducting literature reviews, that the telephone and computer communication improves the clinical health care practice, patient outcome, and compliance in taking medication.[13]

The purpose of this project is to pilot the CATHI system to evaluate the usability of the system. Usability testing is a methodology that evaluates the system interface and user needs by providing feedback on the system functions as well as suggestions for improvement by users.[14] Themes that emerge from usability testing may include: learnability, efficiency, memorability, errors, and satisfaction.[15] In effect, this project represents a small part of the health informatics field – health informatics essentially tries to "optimize the acquisition, storage, retrieval, and use of

[i] www.voxeo.com
[ii] Family Help Manual (ADHD DBD Parent © Version 1 March 27, 2003)

information in health and biomedicine", this pilot projects aims to optimize mental health services so it is easy to access.[16]

Currently, the pilot project is being edited before submission to the Research Ethics Board at the IWK Health Centre. To date, the author's role as a Research Trainee have been to collect and examine related data to the pilot project, create scripts for CATHI, and design the pilot project. Should the pilot project be approved, the author's role will be to coordinate the pilot project under the direction of the co-investigators, Dr. Patrick McGrath and Dr. Charles Cunningham as well as the Project Manager, Vanessa Varalli.

2.0 ORGANIZATIONAL BACKGROUND

The IWK Health Centre provides, "quality care to women, children, youth, and families, in the Maritimes and beyond."[17] The IWK Health Centre works with interdisciplinary teams to focus on putting the needs of its patients and their families first.[18] The IWK Health Centre provides tertiary, secondary, and primary care to families and is committed to promoting healthy lifestyles, training and educating (IWK Health Centre is affiliated with Dalhousie University), as well as research. Last year, the IWK Health Centre, obtained approximately 10.9 million dollars of funding for research that was underway.[19]

2.1 The Centre for Research in Family Health

Under the direction of Dr. Patrick McGrath, newly appointed Vice President of research at the IWK Health Centre, is the Centre for Research in Family Health. The Centre for Research in Family Health is supported by research grants, contracts, and service agreements. The Centre for Research in Family Health employs: various health professionals, scientists, research investigators, program managers, program psychologists, data coordinators, administrative assistants, research project administrators, research assistants and trainees, coaches, and web programmers. Together they work towards research that aids families. In addition, many graduate students work on projects within the centre as well as volunteers.

Overall the Centre for Research in Family Health focuses on spreading a wealth of knowledge across a large number of groups, communities and people. The long-term goal is to ensure that all families have ready access to effective ways of improving their mental health and quality of life.[12] New initiatives in the Centre for Research in Family Health include the use of web-enabled technology to form communities of practitioners, the use of games in teaching health behaviour and using PDA's and computerized telephony to cue and remind health behaviour.

2.2 Family Help Program

The original Family Help Program was created in 1999, as a series of randomized clinical trials funded by the Canadian Institutes of Health Research (CIHR) consisting of five modules in the key areas of: oppositional defiance disorder, attention deficit disorder, anxiety disorders, recurrent pain and enuresis (bedwetting).[20]

The Family Help Program is designed specifically to help families cope with and manage childhood behavioral problems from their own homes at an early age to prevent the problem from worsening.[1] The Family Help Program offers many advantages in comparison to traditional treatment programs including: quick processing times, early intervention focus, help from the privacy of your own home, convenient call times, and free treatments.[1] It also helps provide a seamless connection between the families' physicians and the treatment specialists. Parents learn to cope with and manage their child's behavioral problems with the help of a trained coach, manuals, videotape, and audiotapes. The coach speaks with the parents on a weekly basis over the telephone to review what they have learnt in the past week and discuss current problems and way to manage those problems. The goal of the CATHI Pilot Project is to bring access to more children and families will hopefully help improve the Family Help Program, making it more robust.

The Family Help Program has treated over 300 children in Nova Scotia Health Districts 4 (Hants Community Hospital), 5 (Musquodoboit Valley Memorial Hospital) and 6 (Queen Elizabeth II Health Sciences Centre).

2.4 Other Centre for Research and Family Health Projects

The Centre for Research in Family Health accommodates many research projects apart from the CIHR Team Grant in Access to Children's Mental Health Services – some of which are listed below and on the IWK Intranet.[21]

- Family Help Program 'Sleep Module' – Sleep problems in children, and have been linked to behavioural problems and increased risk of developing mental health problems later in life. ~ Dr. Penny Corkum

- Parent-Adolescent Communication – A web-based module was created (funded by the Innukshuk Foundation) to help families use specific skills to talk and problem solve with each other. ~ Dr. Alexa Bagnell

- The Women's Health in Rural Communities – This grant funds three streams of research (mental health, child farm safety, and community resilience) focusing on health of Nova Scotia through the health of young women.

- MOM (Managing our Mood) – This project looks at mothers with depression. ~ Amanda Coakes

3.0 JOB DESCRIPTION

The main responsibility of the CIHR Team Grant Research Trainee was to develop and coordinate the CATHI Pilot Project at the Centre for Research in Family Health at the IWK Health Centre. As discussed earlier the CATHI system (Computer Automated Telephone and Help Information) is an interactive voice response system that will be used in one arm of the clinical trials

funded by CIHR. The CIHR Team Grant Research Trainee was responsible for: completing literature reviews, script writing, participating in the design of the usability study, writing the study protocol, and assisting with the execution of the study. All research activities were performed according to Good Clinical Practice (GCP).

The CIHR Team Grant Research Trainee reports directly to the Team Grant Project Manager, Vanessa Varalli and the newly appointed Vice President of Research, Dr. Patrick McGrath.

Other duties required of the CIHR Team Grant Research Trainee included: assisting in the development of an adequate filing system for the CATHI Pilot Project as per ICH (International Conference of Harmonisation) guidelines, assisting in the development of study documents, entering the scripts into the CATHI system, and providing reports as needed to the Team Grant Project Manager and the Vice President of Research.

The CIHR Team Grant Research Trainee requires the following qualities: excellent organizational skills, the ability to multitask, excellent interpersonal and communication skills delivered in a caring and respectful manner, the ability to provide and receive constructive feedback effectively.

In the future, upon project approval from the Research Ethics Board (REB) at the IWK Health Centre, the job responsibilities will expand to include: identifying and reporting protocol deviations/violations, creating participant files, tracking participants, verifying that consent and randomization are maintained in sequence, performing quality checks on calls into the CATHI system, reporting quality and data collection issues to the Team Grant Project Manager, and reporting issues to applicable staff for correction.

3.1 Performance Evaluation

This internship officially started in January 2007; however it is pertinent to note that the author has been working on the CIHR Team Grant in Access to Children's Mental Health Services since August 2006. For the four months prior to the internship start date, the Research Trainee's main priorities included learning about the research processes, familiarizing herself with the Centre for Research in Family Health, familiarizing herself with the different projects within the Team Grant in Access to Children's Mental Health Services, and conducting extensive literature reviews on the different aspects of the CATHI system. The Research Trainee's job responsibilities did change when the internship began. At the beginning of January, a performance evaluation was conducted by the Project Manager, Vanessa Varalli (Appendix B-paper copy only) and another evaluation will be conducted again on April 26, 2007. Even though this performance evaluation is not an evaluation of the author's internship, it is believed to be an important aspect of progress throughout the course of the CATHI Pilot Project development. For example, on page five of the Performance Evaluation Report (Appendix B-paper copy only) the developmental plan included

completing the Tri-Council Policy Statement[iii] to enhance knowledge of ethics. The Tri-Council Tutorial, was completed online during Winter 2007 (see Certificate in Appendix C-paper copy only).

3.2 Breakdown of Tasks

In order to assess the amount of time spent on tasks during the internship, the author kept a journal of tasks performed daily and the amount of time spent on a specific task each week. The tasks were organized and grouped into similar categories portraying the type of work done. Table 1 shows the percentage of time spent monthly on each task.

Table 1: Percentage of time spent on job related tasks

Tasks	January	February	March	April
Literature Reviews	16	19	18	16
Tutorials	5	0	0	1
Office Work (filing, organizing, copying, telephone, printing)	3.5	3	4.5	2.5
Script Writing	29	22	15	14
Meetings	6	6	10	7
Pilot Study	39	50	52.5	39.5
Interviews	1.5	0	0	0
Work on other projects	0	0	0	20
	100	100	100	100

Literature reviews were performed using online research tools (i.e. Yahoo.com, Google.ca, PubMed, etc…), the Dalhousie University Libraries, and other forms of searches (i.e. help from peers, co-workers). In order to provide a solid foundation of information to support the usage of an interactive voice response (IVR) system, extensive research was required. Approximately 17.25% of the author's time on the job was spent conducting literature reviews. The author reviewed literature to: compare various systems world wide, look at benefits and downfalls of certain aspects of systems (such as the gender of the voice, and the speed of the dialogue), determine what the average person would expect from a computer system assuming that they would use it in treatment programs among others.

The author spent about 20% of her time working on voice scripts. This task began by editing the call flow charts (anticipated dialogue between a coach and a parent; Appendix D) previously created in the Visio program and then entering the flow chart dialogue into the online voice editor system. The author learnt about the background of the interactive voice response (IVR) system, including where it was purchased, how the system operates, how to input the scripts into the system,

[iii] http://www.pre.ethics.gc.ca/english/tutorial/

and how to write basic VoiceXML language (schema and/or tags). The VoiceXML language helped format the text to make it easy to edit. The VoiceXML schema and/or tags were used to: create varying ranges in pitch and tone in CATHI, change the speed of the voice (i.e. <prosody duration="10500ms"></ prosody>), change the depth of the voice, change the loudness of the voice, and create breaks between words or sentences (i.e. <break strength="strong"></break>). For an example of VOICE XML tags used, please refer to Appendix E (paper copy only). It is also important to mention that specific schema were used to allow for a variety of answers from the caller such as when the caller answers 'Yes' – CATHI can pick up on other variants of yes including: yup, yeh, ya, yep, and so forth.

Almost half (45.25%) of the author's time was directed towards getting the CATHI Pilot Project running. With the help of peers, co-workers, and previous research, the author created a pilot study to assess the usability of the CATHI system. Substantial feedback was given to create a study that should provide a great starting point for the clinical trials set to being within the next year. Time spent on the CATHI Pilot Project also included creating an instruction manual for participants so they understand a bit more about the system they will be interacting with; and taking this one step further creating a manual for future parents in the clinical trials.

4.0 PROJECT SUMMARY

The team grant is organized around five projects that will aim to evaluate strategies for reducing children's mental health waiting lists. It is the team's goal to 'revolutionize' the Canadian Health Care System. They use the term 'revolutionize' to show the importance of the unique strategies being used in the projects.[22]

Project 1: Examining the children's mental health policy environment to gain influential factors regarding waitlist strategies currently in place in Canada.[23]

Project 2: Conducting a series of consumer preference studies/focus groups to determine what consumers regard as primarily as important.[24]

Project 3: Developing state of the art technology to aid and support in the proposed waitlist management/reduction strategy.[25]

Project 4: Evaluating the effectiveness of the proposed waitlist management strategy in randomized control trials.[26]

Project 5: Dissemination of results and waitlist management strategies.[27]

4.1 The CATHI Pilot Project

The CATHI Pilot Project is part of Project 3 of the CIHR Team in Access to Children's Mental Health Services. This is the technology portion of the Team Grant. Subject to Ethics approval the CATHI Pilot Project with run for 3 weeks and it will involve 30 participants in total.

The participants used in this study, subject to approval from the Research Ethics Board, will be families that have at least one child between 3 and 12 years of age. The age range is based on the age range treated by Family Help's Active Child module (3-12 years old) and Anxiety module (8-12 years old). The participants will include parents who can speak, read, and write English, with different education backgrounds, family configurations, and cultures to ensure a broad range of views. The parents will go through a screening process to ensure that:

- Participants have ready access to a telephone
- Participants have at least one child between the ages of 3-12 years old
- Participants have provided verbal consent over the telephone
- Participants can speak, read, and write English
- Participants have not previously received or are currently receiving treatment from the Family Help Program
- Participants whose and/or children have been diagnosed with signs of Disruptive Behaviour Disorder and/or Attention Deficit/Hyperactivity Disorder

Participants will be asked to read a session from the current Family Help Handbook teaching a skill (i.e. Transitional Warnings and When Then Statements, see Appendix A – paper copy only), call into and interact with CATHI on two occasions (Introduction Session and Family Help Content Session) and answer demographical questions, and usability and satisfaction questions about the system. All interactions with CATHI will be digitally recorded for quality assessment management to ensure that participants are using the system as it was intended. When listening to the recordings the study staff will use the CATHI Checklist to see if participants are responding to questions.

Each week 10 different participants will read one session from the Active Child Handbook and view the accompanying DVD. After completing the readings and videos, the participant will call into the CATHI system (after pre-scheduling a telephone appointment) and interact with the CATHI system by discussing the past week's events and progress through a given session, going over session content and homework, and as well as setting goals for the week ahead. Upon completion of the conversation with the CATHI system, the participants will be directly connected to a trained member of the stuffy staff member to answer 3 questionnaires: Demographic questionnaire, CATHI Satisfaction Survey (developed specifically for the pilot study to measure specific characteristics of CATHI such as the speed of speech; Appendix F), and the System Usability Scale (developed by John Brooke, at Digital Equipment Company Limited in the UK in 1986; Appendix G).[28] The total participation time is assessed at being no more than 1.5 hours. All participants in this study will be exposed to the same session and DVD from the Active Child Handbook.

The CATHI system will be available to participants from Wednesday through Saturday, 11 am to 8 pm (Atlantic Standard Time, Canada). Between each testing week (Monday and Tuesday), the study staff will modify the CATHI system in response to the participants' questionnaire feedback and information gathered from the CATHI Checklists. For example, if the majority of participants

report that CATHI does not speak fast enough, the system will be modified accordingly. Session content will remain consistent. A scoring scale will be used to assess perceived helpfulness and usefulness of the system, yet to be approved.

The results from this Pilot Project will enable the researchers edit CATHI to make her more robust for the participants in the randomized control trial of Project 3, where participants are actually receiving treatment.

4.2 Relevance to Clinical Care

"The core of healthcare is the encounter" said Dr. M. Graven in a Systems and Issues class in 2006.[29] Everything revolves around the encounter. The problem that results around the encounter may consist of the numerous steps to help the encounter. The steps may involve many people from various departments, documents, tests, and institutions. In order for an encounter to run smoothly everyone must be connected (and willing and able) and data must be streamlined. Pinpointing knowledge gaps and lack of communication between administrators and health professionals and filling the gaps or disconnects with viable information or processes is part of what health informaticians wish to achieve. In doing so, the core of healthcare can become more efficient and robust.

The waitlist issue in Canada is a re-occurring theme in Health Informatics. Essentially, solving waitlist problems is a major undertaking, but if solved will relieve pressure off of various levels of the Health Care system. Many of the issues surround waitlists involve disconnects between departments and further hospitals, clinics, insurance companies and so forth. Miscommunication, lack of communication, and lack of knowledge transfer all add up to a longer encounter while others are waiting to be helped. Currently the Family Help coaches can only help one family at one time; whereas if CATHI becomes integrated into the treatment program, she may be able to access up to 12 families at a time. The intention of the CATHI Pilot Project is to help bridge the knowledge and communication gaps so that there is seamless communication and knowledge transfer between health professionals, Mental health Services, parents and children so those in need can access treatments in a more timely fashion. The end result will reduce wait times in Children Mental Health Services, making those encounters seamless.

4.3 CATHI and Health Informatics

The CATHI system is connected to health informatics in many ways as mentioned throughout the paper. Primarily CATHI supports the notion of consumer health informatics when speaking about increasing access. Consumer health informatics is conveniently described as, 'information technology which is used to support the health and communication needs of individuals'.[30] When one speaks about health informatics in a more general term, CATHI is an information and communication tool that has the potential to improve the outcomes of clinical care for children with mild to moderate behaviour problems in two primary ways:

1. Data Collection, Storage, and Tracking – CATHI is a tool that will be used to uniquely collect information from its users. The weekly interactions parents have with CATHI will provide the Family Help Program with valuable information to help treat the needs of the family. The complete parent-CATHI interaction is recorded as a default in the CATHI system and crucial data, such as whether the child had something serious happen to him or herself (in the future) will be flagged in the system as important. The flag system will pinpoint important information which will be easier to retrieve during quality assessments. CATHI will also be able to build upon the parent's weekly interactions with CATHI in separate files to produce notes about the individual's progress through the treatment program. For example, parents will be able to look at how many times they completed their weekly exercises or watched the video.

2. Data Mining – As previously mentioned, the progress of a family's treatment can be collected in an efficient manner. This information can be broken down and used to determine patterns in the way which parents are answering questions. On a larger scale, should patterns be of interest to the Family Help Program, there is potential to gain more knowledge about different groups of families by looking at how they answer questions. In the CATHI Pilot Project specifically, demographic questionnaires will be conducted to help derive valuable knowledge about the parents testing CATHI. The researchers wish to find patterns and associations to predict the type of people that may enjoy using the CATHI system, and find ways to entice parents who may be less likely to enjoy using the CATHI system. By linking the usage of certain household technological equipment (i.e. palm pilot, internet service, i-pod) to the satisfaction of the system, researchers will be ale to pinpoint areas that may need improvement and areas of strength. Most data mining techniques are used on large volumes of data however the CATHI Pilot Project will not be generating large volumes of data. Regardless, it is necessary to find patterns in the data to enhance CATHI.

5.0 MAKING CATHI APPEALING

CATHI can potentially be a very helpful tool in the Family Help Program should it be accepted by parents. However, in a growing world where technology is the centre, there are still many people sceptical about how technology can really help.

CATHI's voice is built (based) on a text to speech (TTS) system that converts text into an artificial form of a human voice. The voice scripts (text) are entered into the voice editor program accessed online, and when saved and tested the system repeats out loud what has been written Originally, CATHI's voice was very harsh. Words were mispronounced (i.e. sorry, helpful, manual, Joseph), the speech was fast with no breaks between sentences, and the voice did not vary enough in pitch and tone. CATHI's voice was considered to be too computerised. The author learnt how to effectively use VoiceXML schema and tags from the Web Programmer at the Centre for Research in Family Health and tested variations in the scripts to make CATHI's voice sound more natural. Research suggests that users generally prefer natural sounding voices and pleasant voices regardless of whether it was a human voice or artificial voice.[31] Modifying the scripts became a large time commitment, as scripts would be edited then the scripts would be tested to find the exact sentence

flow necessary to mimic that of a human's. However, after hours of modifications and noticeable progress, the Team Grant Management Committee and the Co-principal investigators, were still not pleased with the voice.

Coiera states that 'every clinical action, every treatment choice, and investigation is shaped by available information and how effectively that information is communicated'.[32] By applying five fundamental informatics skills, one can expand on their knowledge to help create a better end result. The five fundamental skills, Coiera uses in his Health Informatics text book are: communication, structuring, questions, searching, and making decisions. Based on these five fundamental informatics skills, the author (with the support of the Project Manager, Vanessa Varalli) devised a plan to help determine how to make CATHI better sounding.

Communication involves the understanding of other's thinking processes and being able to understand one's own thinking process to share with others. The author spoke with a variety of people at the Centre for Research in Family Health including parents, non-parents, coaches, and PhD students to see how they felt about the notion of CATHI. The author received varying degrees of opinions across the board. The author decided to conduct a set of informal discussions with various groups of individuals at the Centre for research in Family Health to see if there was a certain aspect of CATHI that was liked or disliked. The informal meetings gave the groups an opportunity to listen to CATHI and respond to a set of questions that specifically targeted CATHI's voice, the retainment of information, and the idea of speaking with a computer. By structuring the questions with a purpose, the author thought valuable information could be gained to improve the system; potentially making CATHI more appealing to the target population (parents in need of treatment). The results were astounding and this provided the author with a rich addition of new knowledge and opinions, some of which had previously been thought of. The theme that emerged was on target with the opinions of the Management Committee and the Co-principal investigators – CATHI's voice was not natural sounding and was not pleasant enough to show compassion for the caller. In particular many people suggested the usage of a pre-recorded voice. The author took the next step to search for information about pre-recorded speech. The author set out to create a list of comparisons between pre-recorded speech and text to speech. After completing a thorough literature search, the following information was collected:

- Naturally produced voices are slightly more robust, providing a better speech quality of the phone than that of a synthesized voice.[33]
- Naturally sounding voices are more pleasant, easier to understand, and may generate more participation on the part of the users.
- Pre-recorded speech can be costly (time spent in recording studio, editing, re-takes)
- Pre-recorded speech is not as flexible as a Text to Speech voice. For example, if the CATHI system wanted to personalize the encounter for each user and use first names, it would be harder to prerecord every name.
- Pre-recorded sentences from humans may create a much better emotional connection with callers.
- Normally the best of breed systems in the industry use pre-recorded voices for constant sentences and computer-generated voices for variable words (industries tend to limit computer generated voices because users don't like it).[34]

This information was evaluated and assessed in order to make a sound decision about CATHI's voice. There were two extreme options 1) leave CATHI with a synthesized voice (text to speech) or 2) pre-record all of the scripts with a person and input the voice clips into the system. Ideas such as reducing the amount of synthesized voice and adding in pre-recorded examples so there would be two types of voices were tossed around; however after compiling the evidence, and looking at the target population, a decision was made to design CATHI so that she sounded more like a human so users (parents) would feel more comfortable speaking on the phone with a computer system.

The five fundamental informatics skills were re-used after the final decision many times again. The author and the team needed to reconsider the way in which the script was written. Identifying information (i.e. names) was removed from the scripts. Originally CATHI was going to call into the parents, however without being able to use names a decision was made that the parents would call into the system. The author and the team had to strategically choose a person to record the scripts as CATHI and a sound booth was reserved at Dalhousie University.

After recording the Introduction Session, the voice clips were input into the system. A synthesized version of the Introduction Session was saved to provide a comparison of voices for the groups to listen to again at the Centre meeting, and on their own time. Positive feedback was received about the pre-recorded voice. This has not yet been tested, but will be once the CATHI Pilot Project has been approved by the Research Ethics Board.

6.0 CONCLUSIONS

The ultimate goal of the CIHR Team in Access to Children's Mental Health Services is to develop cost-effective interventions to reduce wait lists. The CATHI Pilot Project if approved will assess the use of technology to reduce delivery costs associated with coaches and proved access to more families in need of treatment. CATHI will also improve the workflow of the Family Help Program, because it will free up time for the coaches so that they can focus on each client file more so than they do currently. Although, the CATHI Pilot Project has not yet been approved, the author and researchers believe that if CATHI is integrated properly into the Family Help Program, the treatment program will become stronger and will in fact reduce wait lists.

7.0 FUTURE CONSIDERATIONS

One of the greatest uncertainties of any researcher with investments (time and effort) in an innovative project such as the CIHR Team in Access to Children's Mental Health Services, is that the new interventions may not be accepted by the target population. Keeping that in mind, the original idea was that CATHI would be fully integrated into the Family Help Program (should consistent positive results be found after the randomized control trials). However, if CATHI is not accepted as a viable treatment option, ideas have been proposed to slowly integrate CATHI into the Family Help Program, providing the target population with an opportunity to slowly get used to the

idea of interacting with an interactive voice response (IVR) system. It is with great hope and anticipation that CATHI is accepted by the target population.

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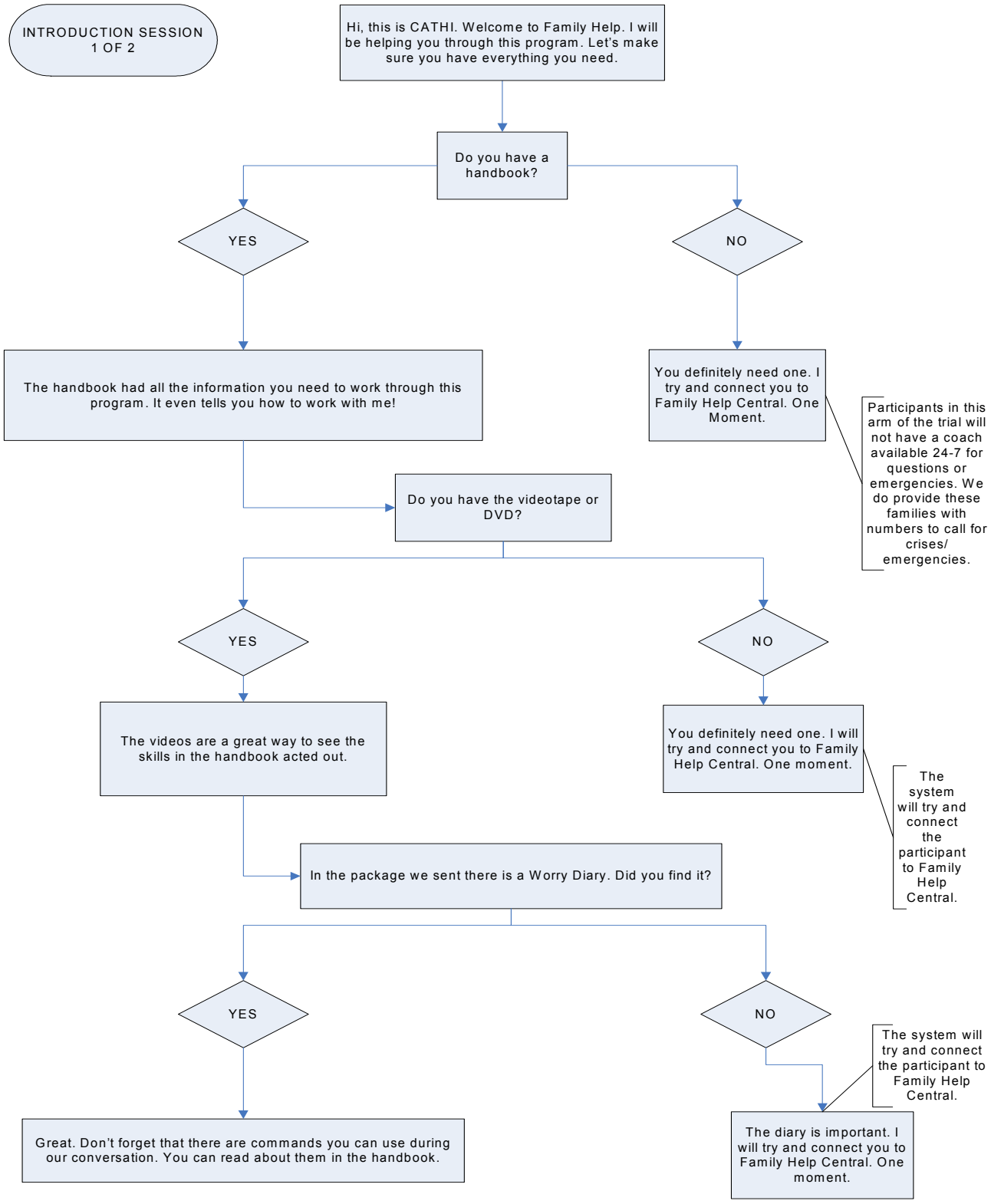
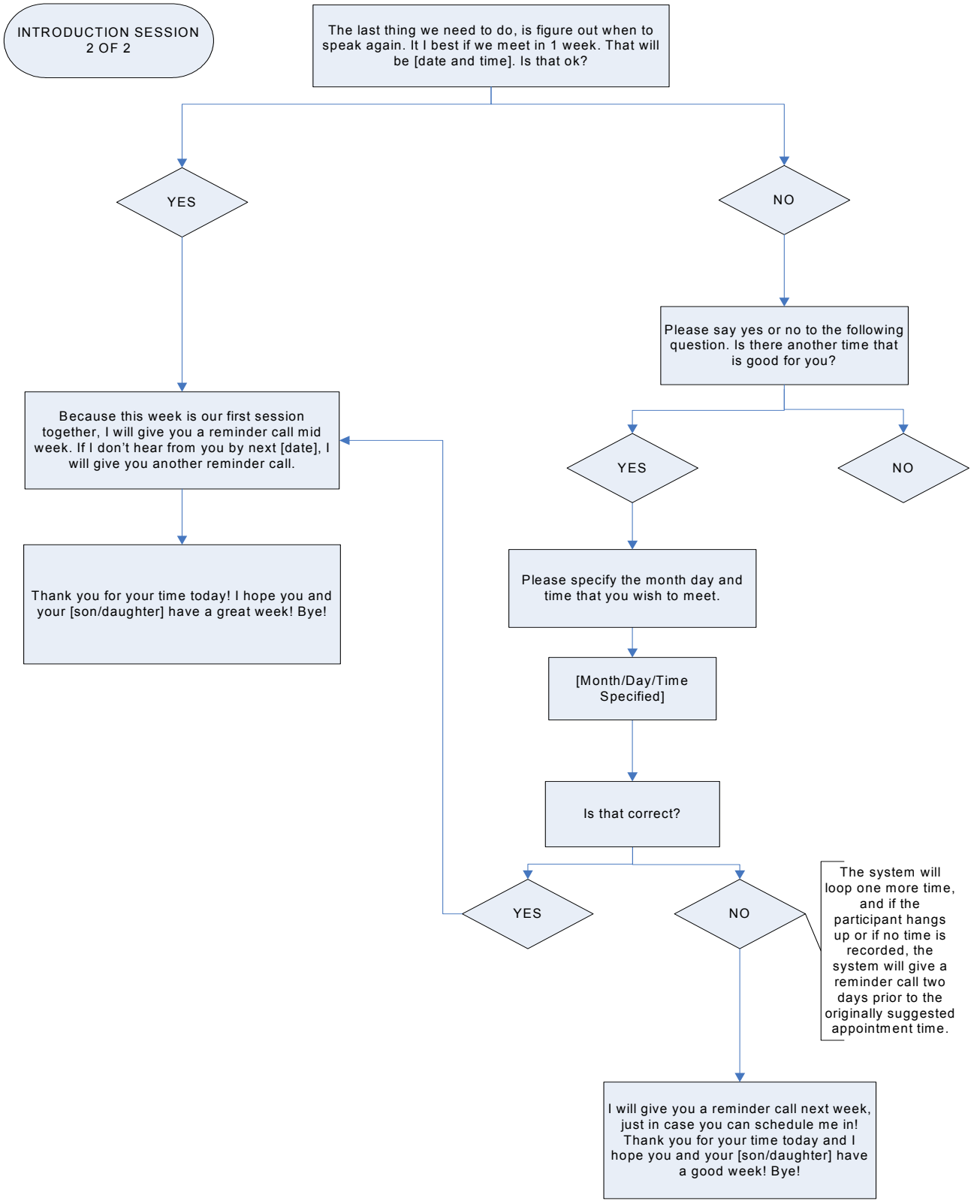
APPENDICES

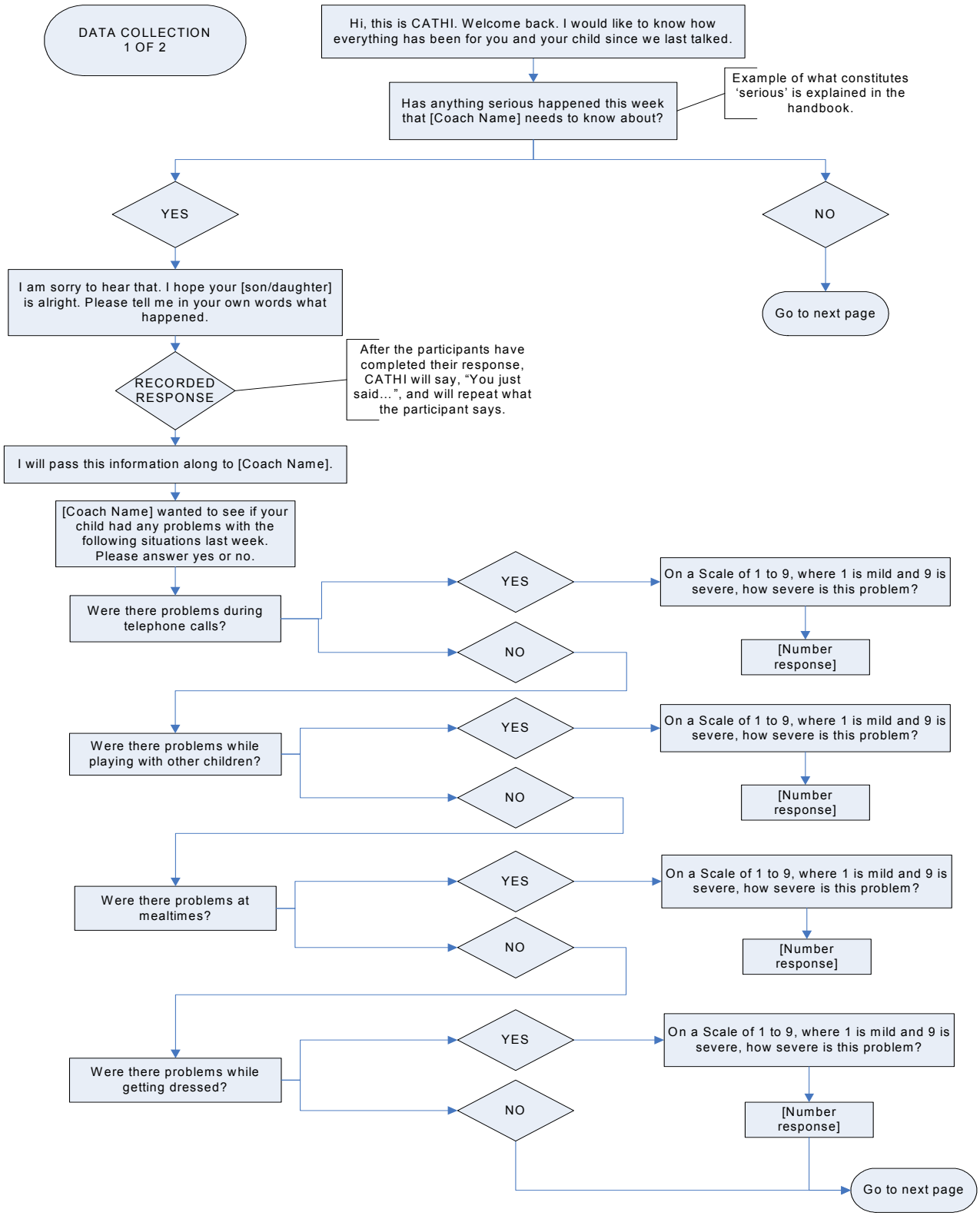
*Please note some Appendices are paper copies only.

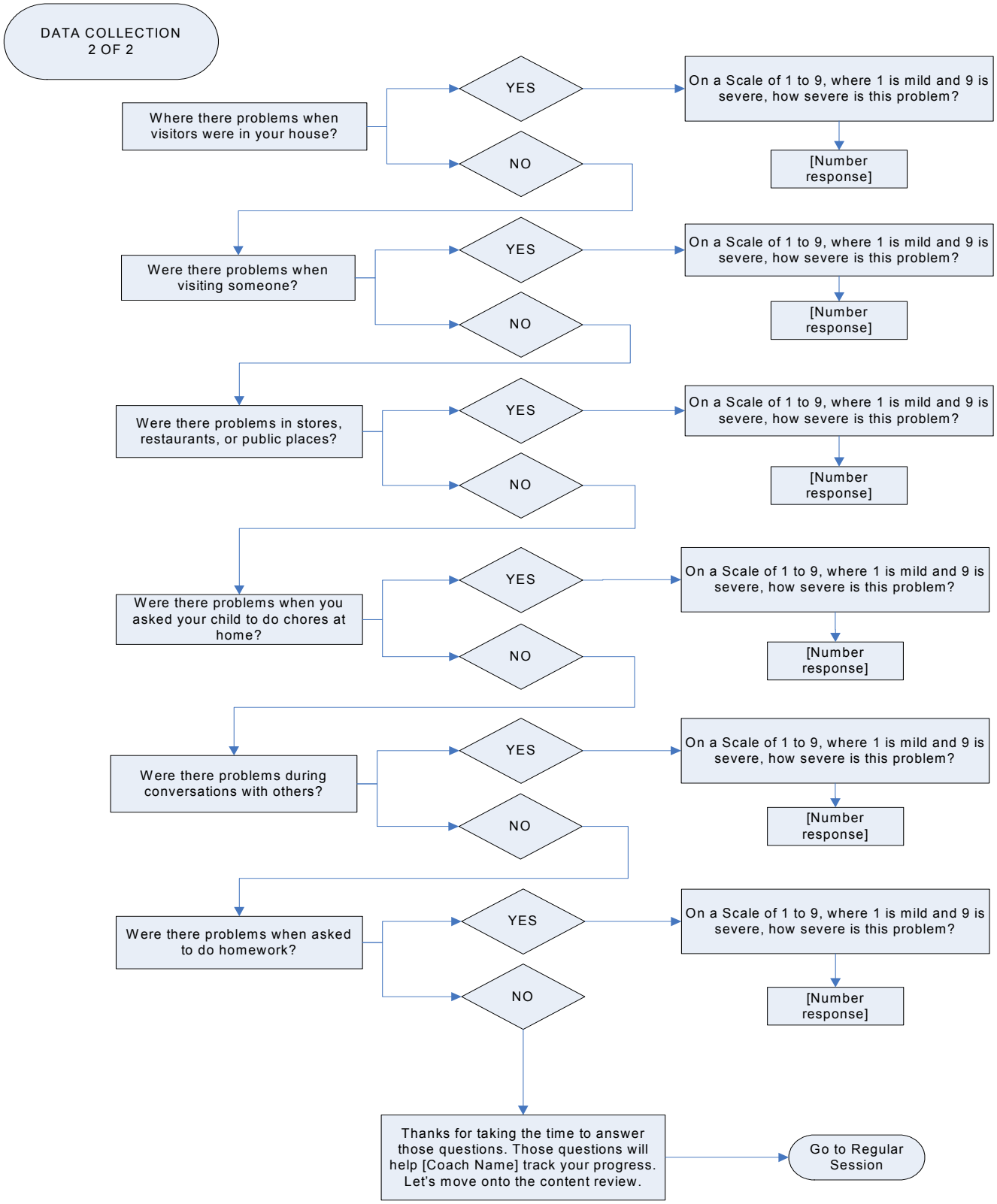
*A – Sample Family Help Session: Transitional Warnings and When Then Statements
*B – Performance Evaluation Report
*C – Tri-Council Policy Statement
D – Sample Call Flow
E – Dialog Editor: VoiceXML Schema/Tags
F – CATHI Satisfaction Survey
G – System Usability Scale

APPENDIX D – SAMPLE CALL FLOW

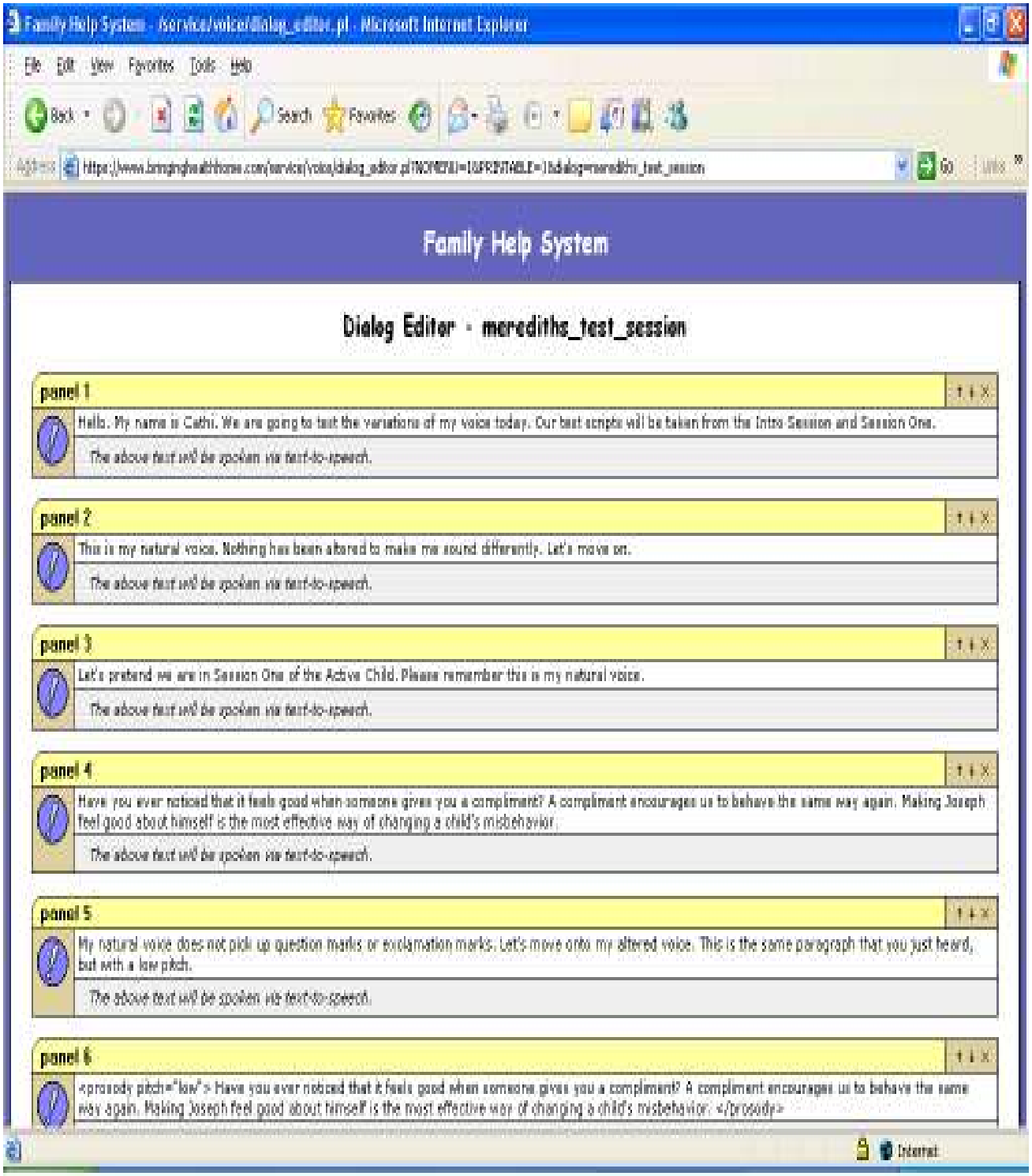


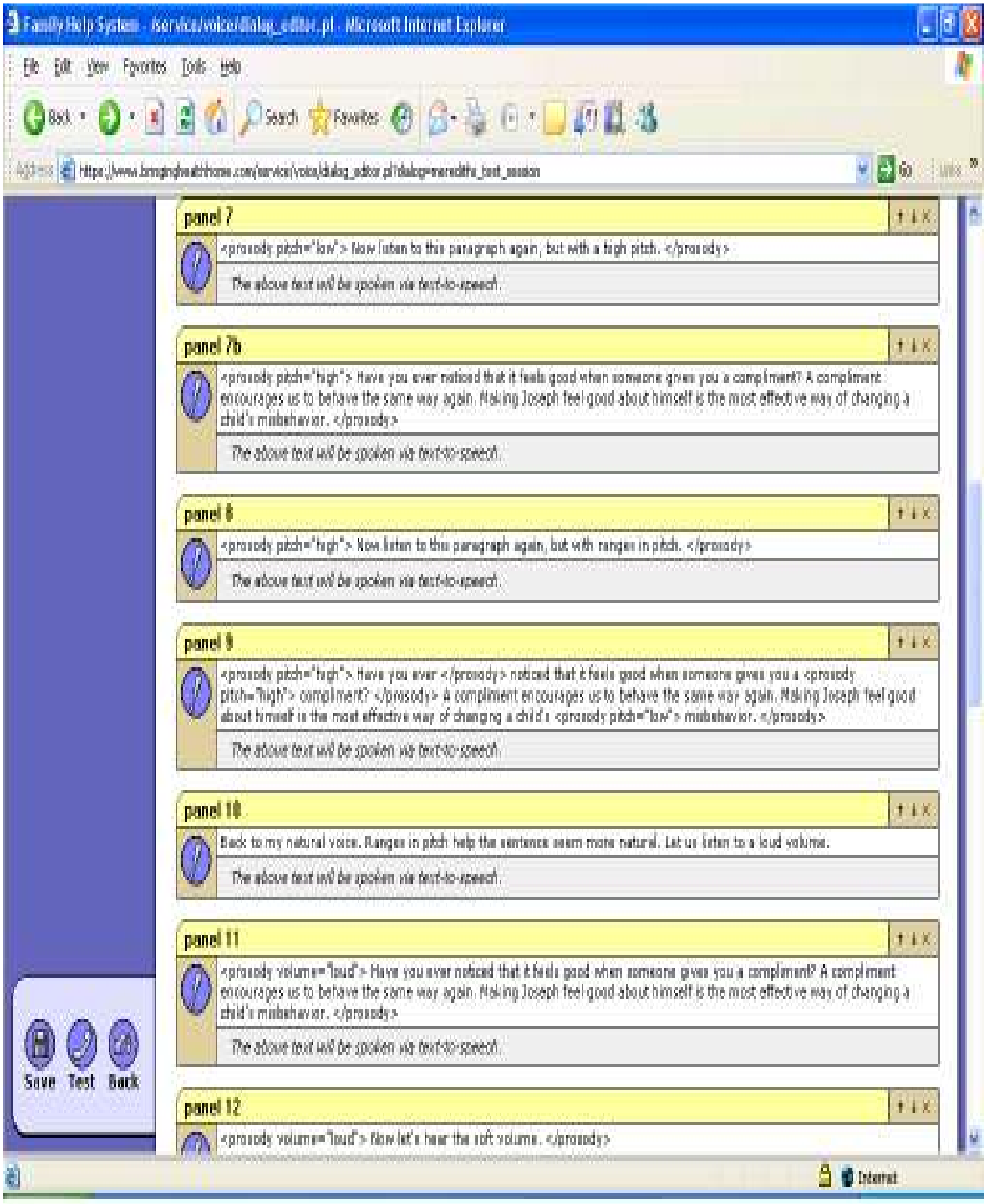

INTRODUCTION SESSION 2 OF 2
The last thing we need to do, is figure out when to speak again. It I best if we meet in 1 week. That will be [date and time]. Is that ok?
YES
NO
Because this week is our first session together, I will give you a reminder call mid week. If I don't hear from you by next [date], I will give you another reminder call.
Thank you for your time today! I hope you and your [son/daughter] have a great week! Bye!
Please say yes or no to the following question. Is there another time that is good for you?
YES
NO
Please specify the month day and time that you wish to meet.
[Month/Day/Time Specified]
Is that correct?
YES
NO
The system will loop one more time, and if the participant hangs up or if no time is recorded, the system will give a reminder call two days prior to the originally suggested appointment time.
I will give you a reminder call next week, just in case you can schedule me in! Thank you for your time today and I hope you and your [son/daughter] have a good week! Bye!


DATA COLLECTION 1 OF 2
Hi, this is CATHI. Welcome back. I would like to know how everything has been for you and your child since we last talked.
Has anything serious happened this week that [Coach Name] needs to know about?
Example of what constitutes 'serious' is explained in the handbook.
YES
NO
I am sorry to hear that. I hope your [son/daughter] is alright. Please tell me in your own words what happened.
Go to next page
RECORDED RESPONSE
After the participants have completed their response, CATHI will say, "You just said…", and will repeat what the participant says.
I will pass this information along to [Coach Name].
[Coach Name] wanted to see if your child had any problems with the following situations last week. Please answer yes or no.
Were there problems during telephone calls?
YES
NO
On a Scale of 1 to 9, where 1 is mild and 9 is severe, how severe is this problem?
[Number response]
Were there problems while playing with other children?
YES
NO
On a Scale of 1 to 9, where 1 is mild and 9 is severe, how severe is this problem?
[Number response]
Were there problems at mealtimes?
YES
NO
On a Scale of 1 to 9, where 1 is mild and 9 is severe, how severe is this problem?
[Number response]
Were there problems while getting dressed?
YES
NO
On a Scale of 1 to 9, where 1 is mild and 9 is severe, how severe is this problem?
[Number response]
Go to next page


DATA COLLECTION
2 OF 2
Where there problems when visitors were in your house?
YES
NO
On a Scale of 1 to 9, where 1 is mild and 9 is severe, how severe is this problem?
[Number response]
Were there problems when visiting someone?
YES
NO
On a Scale of 1 to 9, where 1 is mild and 9 is severe, how severe is this problem?
[Number response]
Were there problems in stores, restaurants, or public places?
YES
NO
On a Scale of 1 to 9, where 1 is mild and 9 is severe, how severe is this problem?
[Number response]
Were there problems when you asked your child to do chores at home?
YES
NO
On a Scale of 1 to 9, where 1 is mild and 9 is severe, how severe is this problem?
[Number response]
Were there problems during conversations with others?
YES
NO
On a Scale of 1 to 9, where 1 is mild and 9 is severe, how severe is this problem?
[Number response]
Were there problems when asked to do homework?
YES
NO
On a Scale of 1 to 9, where 1 is mild and 9 is severe, how severe is this problem?
[Number response]
Thanks for taking the time to answer those questions. Those questions will help [Coach Name] track your progress. Let's move onto the content review.
Go to Regular Session

APPENDIX E – Dialog Editor: VoiceXML Schema/Tags




Family Help System - /service/voice/dialog_editor.pl - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
panel 7
<prosody pitch="low"> Now listen to this paragraph again, but with a high pitch. </prosody>
The above text will be spoken via text-to-speech.
panel 7b
<prosody pitch="high"> Have you ever noticed that it feels good when someone gives you a compliment? A compliment encourages us to behave the same way again. Making Joseph feel good about himself is the most effective way of changing a child's misbehavior. </prosody>
The above text will be spoken via text-to-speech.
panel 8
<prosody pitch="high"> Now listen to this paragraph again, but with ranges in pitch. </prosody>
The above text will be spoken via text-to-speech.
panel 9
<prosody pitch="high"> Have you ever </prosody> noticed that it feels good when someone gives you a <prosody pitch="high"> compliment? </prosody> A compliment encourages us to behave the same way again. Making Joseph feel good about himself is the most effective way of changing a child's <prosody pitch="low"> misbehavior. </prosody>
The above text will be spoken via text-to-speech.
panel 10
Back to my natural voice. Ranges in pitch help the sentence seem more natural. Let us listen to a loud volume.
The above text will be spoken via text-to-speech.
panel 11
<prosody volume="loud"> Have you ever noticed that it feels good when someone gives you a compliment? A compliment encourages us to behave the same way again. Making Joseph feel good about himself is the most effective way of changing a child's misbehavior. </prosody>
The above text will be spoken via text-to-speech.
panel 12
<prosody volume="loud"> Now let's hear the soft volume. </prosody>
Save Test Back
Internet

APPENDIX F – CATHI Satisfaction Survey Version 1.

CATHI SATISFACTION SURVEY

1. CATHI talked slowly enough that I could understand.

0 1 2 3 4 5

Never Always

2. CATHI understood me when I talked.

0 1 2 3 4 5

Never Always

3. I always knew what to say to CATHI.

0 1 2 3 4 5

Never Always

4. CATHI gave me time to think about my answers.

0 1 2 3 4 5

Never Always

5. The length of time on the phone was acceptable.

0 1 2 3 4 5

Never Always

6. The instructions given to me need improvement.

0 1 2 3 4 5

Never Always

7. I liked being able to call CATHI myself.

0 1 2 3 4 5

Never Always

8. I would prefer that CATHI call me weekly.

0 1 2 3 4 5

Never Always

9. I would prefer to negotiate a time to meet with CATHI

0 1 2 3 4 5

Never Always

10. It would be helpful if CATHI left a voice mail reminder for an appointment.

0 1 2 3 4 5

Never Always

11. I could get used to speaking with CATHI.

0	1	2	3	4	5
Never					Always

12. I liked listening to Dr. Pat's tips.

0	1	2	3	4	5
Never					Always

13. I liked setting goals with CATHI.

0	1	2	3	4	5
Never					Always

14. I would want to see a record of my progress (could include when I called CATHI, when I had my homework done, and when I met goals or not).

0	1	2	3	4	5
Never					Always

15. I would recommend CATHI to other parents.

0	1	2	3	4	5
Never					Always

16. I think my partner would use CATHI.

0	1	2	3	4	5
Never					Always

17. I like the idea of having a program that allows me to learn at my own pace.

0	1	2	3	4	5
Never					Always

18. I like the idea that someone is listening to my interactions with CATHI.

0	1	2	3	4	5
Never					Always

19. The tips and examples during the phone call helped me understand things better.

0	1	2	3	4	5
Never					Always

20. The examples read by parents were helpful.

0	1	2	3	4	5
Never					Always

APPENDIX G – System Usability Scale (SUS)

SYSTEM USABILITY SCALE

1. I think that I would use this system frequently.

0	1	2	3	4	5
Strongly Disagree					Strongly Agree

2. I found the system unnecessarily complex.

0	1	2	3	4	5
Strongly Disagree					Strongly Agree

3. I thought the system was easy to use.

0	1	2	3	4	5
Strongly Disagree					Strongly Agree

4. I think that I would need the support of a technical person to be able to use this system.

0	1	2	3	4	5
Strongly Disagree					Strongly Agree

5. I found the various functions in this system were well integrated.

0	1	2	3	4	5
Strongly Disagree					Strongly Agree

6. I thought there was too much inconsistency in this system.

0	1	2	3	4	5
Strongly Disagree					Strongly Agree

7. I would imagine that most people would learn to use this system very quickly.

0	1	2	3	4	5
Strongly Disagree					Strongly Agree

8. I found the system very cumbersome to use.

0	1	2	3	4	5
Strongly Disagree					**Strongly Agree**

9. I felt very confident using the system.

0	1	2	3	4	5
Strongly Disagree					**Strongly Agree**

10. I needed to learn a lot of things before I could get going with this system.

0	1	2	3	4	5
Strongly Disagree					**Strongly Agree**