CART-GRAC

Contraception Access Research Team

Groupe de recherche sur l'accessibilité à la contraception

Putting Technology in the Service of Family Planning:

Developing Best Practices for Informing the Public and Training Health Professionals

Event Proceedings: February 26, 2013

Executive Summary

Members of CART-GRAC (Contraception Access Research Team\Groupe de recherche sur l'accessibilité à la contraception) and GRAND (Graphics, Animation and New Media Design), as well as representatives of patient, health professional and advocacy organizations, met on February 26, 2013. The purpose of this intensive one-day meeting was to develop a five-year plan of research with an overall goal to identify projects to help reduce unintended pregnancies in Canada.

Specifically the program of research developed will:

1. Improve family planning knowledge among health care professionals;

2. Enable health care professionals to deliver high quality family planning knowledge and services; and

3. Support Canadians, particularly those in rural and remote locations, youth and among vulnerable populations, to plan and space their pregnancies.

Combining the expertise of CART-GRAC and GRAND will help develop innovative technologies to improve family planning management skills and expertise among health care professionals and the general public.

Opening Remarks

Drs. Wendy Norman and Eleni Stroulia, leaders of CART-GRAC and GRAND contingents respectively, welcomed everyone and discussed the plan for the day. Drs. Norman and Stroulia stated that the goal of the day's meeting was to combine the technology expertise of GRAND with the research, clinical collaborators, and health professional education collaborators expertise of CART-GRAC in order to identify and develop an outline to guide the next 5 years of research.

Throughout Canada, there is substantial and, as yet unmet, need for family planning knowledge and services. Current knowledge is lacking with respect to indications and the range of modern contraceptives – both among the health care professionals, who may lack opportunities to increase their family planning management skills and among the public, who may lack access to family planning information. Special attention was drawn to populations of women who currently experience inequitable access and significant barriers to attain the knowledge, methods and services they require for family planning, e.g., women from the north and rural and remote communities, those of Aboriginal heritage, very young women and girls and those facing poverty, mental health or substance use challenges.

Technology Fair

Attendees were invited to progress through three separate technology stations. At each station, GRAND members briefly presented projects they had developed which incorporate various aspects of technology , and may be suitable for adaptation or as a foundation for new technology to apply to the current context. Conati (UBC) presented artificial-intelligence methods for user modeling that enable personalization of training. Kapralos (UOIT) demonstrated a virtual-world environment for surgical simulations. Stroulia (U Alberta) demonstrated several mobile applications for personalized health-and-wellness management.

The purpose of the Technology Fair was to expose meeting attendees to unique ways in which technology can be used to reach various populations. Attendees were thus primed to think creatively about how technology could be used to share their own work with a large audience.

Following the Technology Fair, attendees were instructed to individually identify potential ways in which technology could be utilized to share their work.

Nominal Group Process

In preparation for the afternoon (when attendees would select a particular project they were interested in creating), attendees were organized in small groups (5-6 people). In these small groups, attendees were asked to individually nominate the various ideas they had independently identified after the Technology Fair.

The ideas nominated by the small groups were then shared with the larger group and formed the basis on which projects were chosen to further develop during the afternoon session.

Knowledge Café

Following the independent idea generation and the nominal group process, meeting attendees were invited to join one of four groups that would further develop a specific research project.

The following four projects were proposed:

Contraception Tower Defense Game

Team Lead: Eleni Stroulia;
Team Members: Brent Cowan, Dylan Gibbs,
Lyba Spring, Judith Soon

A contraception tower defense game was proposed, which was modeled after traditional tower defense games. Tower defense is a style of gaming where the protagonist or antagonist is prevented from reaching a final destination due to obstacles, such as traps or being attacked from various enemy towers. Various components of tower defense gaming were incorporated into the proposed contraception game. The purpose of the proposed tower defense game is to interactively teach users how to reduce unintended pregnancies.

A number of towers, or obstacles, would be presented to users as the enemy (e.g., sperm) attempt to proceed through the designated geographical area of the game. In order to move beyond the obstacle successfully, users would have to identify the correct strategy or solution to overcome the obstacle (i.e., a ladder to overcome an obstacle). One particular family of obstacles would be "defense failures" which would include scenarios in which a potential pregnancy might occur. Potential failures could be (but are not limited to the following): scenarios of perfect-use versus typical-use contraception rates, condom issues (e.g., latex allergies, condom breaks, condom is expired), lactation, or non-adherence to oral birth control pills. A user would move beyond the obstacle once they successfully navigate the specific situation.

The contraception tower defense game would be tailored to various users (e.g., male, female, couples, groups of users). Players would be given a persona or story (e.g., an individual from low SES status, an intoxicated individual) at the beginning of the game that would inform the strategies they should use throughout the game. Three levels of difficulty were proposed including pre-coital behaviour(s), emergency contraception, and abortion. The type of relationship and sexual activity could also be manipulated (e.g., sexual assault, monogamous sexual partners, casual sexual partners).

Other Issues

Issues to consider in the development of the contraception tower defense game include ensuring users understand the specific metaphors associated with tower defense gaming, ensuring the game has the capacity to teach users who have varying contraception knowledge levels, determining an appropriate number of towers (i.e., obstacles) to include in the game, and how to determine if a user has successfully navigated the game (e.g., reached the final destination without a pregnancy) and retained accurate contraception knowledge and information. Other issues that were identified included ensuring that it is possible to develop a sophisticated game that is competitive with others existing games to the specific target audience (e.g., demographic background, cultural background, sexual orientation).

Training Modules for Health Care Professionals

Team Lead: Bill Kapralos;
Team Members: Suzanne Campbell, Heather Carnahan, Sharla King, Juliette Link

The development of virtual simulation modules using avatars was proposed to teach health care professionals using module-based scenarios. The modules would use Sims-like characters to teach specific skill sets. Users' skill levels could range from pre-licensure (e.g., skill acquisition) to practitioners (e.g., skill maintenance). Various forms of technology would be incorporated into the modules, such as graphics, sounds, and haptics (e.g., tactile feedback) to provide real-time feedback to the users.

These modules could also be used to engage health care professionals in ongoing interprofessional education (IPE) to encourage collaboration and consultation with one another. Overall, modules would be used to examine if and how the creation of a continuum of learning from training to practitioner could be used in family planning settings and determine if simulated learning environments results in changes to behaviour in clinical settings.

IUD Insertion Module

Intrauterine device (IUD) insertion was proposed as one specific training module that would lend itself well to the use of Sims modules to teach health care professionals. Multiple modules would be created for the various training levels. The fidelity level of the various scenarios created would be manipulated based on the user's skill/training level (e.g., a visually impaired patient, an anteverted uterus,

someone at high risk for STIs). Users' skill levels would be assessed based on multi-modal interactions within the modules, such as communication of contraindications, cultural sensitivity, or communication and language barriers.

Other Issues

Some development issues raised included the cost of developing sophisticated modules with avatars and the capacity to provide users with haptic feedback. For example, what type of haptic feedback could be used to communicate incorrect placement of an IUD to the user? The level of sophistication in regards to haptic feedback provided to novice versus expert health care professionals was also identified.

Other development issues include the evaluation and outcomes of skills training, retention of skills learned by health care professionals, and communication and knowledge translation.

Online Health Services Directory

Team Lead: Angel Foster;
Team Members: Sheila Dunn, Jolanta Scott-Parker

An online directory of health services was proposed, which would be modeled after other online business directories (e.g., Yelp) that incorporate social networking properties and the capacity for users to review various businesses and services. The purpose of the health services directory would be to provide an online location where user-generated feedback, reviews, and comments about various health organization and services are posted for the general public. For example, the directory would present reviews of various organizations and services (e.g., friendliness of staff, convenience of location, availability of appointments) available in a particular community. The directory would help create an online community or hub where users can exchange information and engage with one another regarding various sexual and reproductive health issues and services available.

User-Generated Content

Site designers, in conjunction with various stakeholders, will create the directory listings of organizations and services available in a particular community. However, the majority of the site's content will be generated in the form of user reviews, comments, and discussion threads. This

would help create a sense of ownership of the content and potentially de-stigmatize aspects of sexual and reproductive health. Because users are generating the content, users may view the information as more genuine or legitimate than information or communications messaging scripted by specific organizations. In this way, the users will determine the content on the directory and can feel a sense of community ownership of the site.

Development of the Directory

It is necessary to engage various stakeholders (e.g., users, staff of organizations) throughout the development and creation of the health directory. A series of focus groups with these various levels of stakeholders will be necessary in the development phase of the site. In particular, involving the organizations early is important to ensure that the directory information posted accurately reflects how the organizations and/or businesses want to be presented within the directory. Additionally, engaging organizations in this development phase will ensure that concerns about how their services will be presented, and subsequently reviewed, are mediated from the beginning.

Pilot Project

To determine the feasibility of a health services directory, a pilot project/proof of concept project would be conducted. The pilot project would incorporate evaluation feedback from potential users, as well as organizations that would be featured on the site to determine which aspects of the directory would be the most useful. This initial project would help the designers identify a number of key issues related to the overall conceptualization of the directory including the best type of rating system(s) to use, the level of detail needed for the featured organizations, and to determine the level of moderation required.

The degree of moderation required for the directory was identified as an important aspect in regards to the development of the directory. The purpose of user feedback is to generate a community whereby users share their experiences in a constructive atmosphere versus venting about a negative experience. The pilot project would be necessary to determine the most appropriate level of moderation required, including how organizations wish to address potential negative feedback while still protecting the anonymity and confidentiality of users and organizations (i.e., to protect anonymity of service providers).

Other Issues

Meeting participants identified some key issues that would need to be addressed in the development of the directory. Existing forums that serve a similar purpose should be examined to identify the best set-up and what types of ranking or rating systems are currently used. Also, the directory would have to comply with existing legal regulations regarding confidentiality and privacy. This may be especially important in regards to the type of services that various users would be commenting on to ensure that users' profiles are kept anonymous. It was suggested that legal counsel should be consulted regarding these privacy and confidentiality issues. Another important issue identified included how the site would be hosted, either as a stand-alone site or in collaboration with another health agency or university.

Public FAQ Portal

Team Lead: Cristina Conati;
Team Members: Janusz Kaczorowski, Weihong Chen, Wendy Norman

A Frequently Asked Questions (FAQ) public portal was proposed that would be the authoritative source of family planning and contraceptive information. Information within the portal would be presented in a hierarchical fashion based on user characteristics, such that the portal would adapt its responses based on the user. For example, the portal would quickly learn about the user and provide 'smart' answers that were tailored and personalized to the user. The portal would then connect users to specific resources matched to their background (e.g., age, geographic location, ethnicity) and would filter responses based on the user profile.

Development of the Portal

The first step in order to develop this iterative portal would be to build a conceptual hierarchy of FAQ that are ordered based on temporal searches. Google analytic information would be incorporated into the search questions to increase the predictive nature of the portal to respond based on the users' characteristics. The portal will build itself over time as users ask questions that are stored in the database.

A high degree of user evaluation will be required to both successfully develop the content of the portal and ensure the capacity of the portal improves over time. The biggest challenge to building the FAQ is to teach the system to

incorporate user feedback at various levels. The portal needs to iteratively learn from users based on feedback loops that are built within the system. Users would be prompted with questions like "Did this answer your question?" or "Did the answer options personally work for you?" The portal will use this feedback to filter subsequent responses back to the user. Additionally, exit evaluations when the user closes their browser could be incorporated in order to capture overall user feedback. The portal will process the various types of feedback so that subsequent searches provide better responses to the users. Thus, the algorithms for the portal will be in constant training and evolution.

Resources Provided to the User

A variety of resources will be provided to the users from various organizations (e.g., Society of Obstetricians and Gynaecologies of Canada, Public Health Agency of Canada, Canadian Federation for Sexual Health, CART-GRAC, various ministries of health across Canada). Organizations that collaborate in the development of the portal will be able to leverage their existing tools and resources by including links to these resources within the portal. This will help users locate the vast array of available online resources. Large-scale sponsorship was identified as a potential avenue to explore with organizations that may want to highlight existing tools and resources already developed (e.g., Public Health Agency of Canada).

The user will be able to determine how to filter responses (e.g., only provide local resources, only link to websites versus videos) so that the portal is maximally tailored to each user.

Methodological Issues for All Projects

Meeting attendees identified a number of methodological issues to be aware of in the development of any new projects. The most important step identified was to expand our current environmental scan of existing projects and services that combine family planning and technology. This will ensure new projects do not replicate what already exists and can instead build upon the existing knowledge. More importantly, the expanded environmental scan would could detail existing technology gaps for both health care

professionals and citizens in terms of family planning and how technology can be used to address those gaps in knowledge.

In regards to projects and tools that are designed to increase the knowledge of health care professionals, attendees highlighted the importance of consulting family planning experts to help identify the most important individual differences that should be considered when developing new tools for training and/or instruction. Projects that utilize training modules should be designed with sequential and cumulative knowledge building that can be targeted and adapted to specific audiences who have varying knowledge and expertise levels.

For projects where the general public is the target end user, attendees re-iterated the importance of involving these users in the design process from the beginning. Engaging the general public is also important as researchers can ensure they incorporate cultural sensitivity and adapt the scenarios and overall frameworks appropriately based on the desired population of interest that the tool or project is created for.

These methodological concerns should remain at the forefront as researchers build a program of research that combines aspects of family planning and technology together.

Closing Remarks

To conclude the day, Drs. Norman and Stroulia thanked everyone for attending and for their important contributions to helping CART-GRAC and GRAND develop a future research program that will combine the contributions of family planning and technology. Meeting attendees were informed that the immediate next steps were to compile formal reports to GRAND and CIHR and to develop formal conference proceedings, which would serve as the road map to develop a formal research program for the next 5 years. A key next step was to conduct an expanded environmental scan of the existing projects and tools that are in use. Attendees were invited to collaborate on any future projects that were developed as a result of the meeting.

Appendix A: Agenda

TUESDAY, FEBRUARY 26, 2013

MORNING	**Understanding gaps & opportunities in technology-based learning platforms and in family planning health professional education and public education**	
8:00-8:30	**REGISTRATION, BREAKFAST BUFFET**	
8:30-8:40	**Welcome and overview**	Drs. Norman, Stroulia
8:40-9:00	**Family planning education – health professional & public current challenges and gaps**	Jocelyn Wentland
9:00-10:00	**Technology fair**	GRAND team leads
10:00-10:15	**Individual idea generation**	Facilitator
10:15-10:30	**NUTRITION AND NETWORKING BREAK**	
10:30-12:00	**Nominal group process**	Group with facilitator
10:30-11:15	**– small groups**	
11:15-12:00	**– large group discussion**	
12:00-13:00	**LUNCH**	
AFTERNOON	**Setting priorities, planning a research program**	
13:00-13:15	**Welcome and review morning results**	Facilitator
13:15-13:30	**Introduce the knowledge cafés**	Facilitator
13:15-14:30	**Knowledge café (A)**	
	– Small groups: break into smaller groups and discuss ideas generated from morning	Group
	– Large group: identify research program themes from among all ideas generated	Group
14:30-14:45	**NUTRITION AND NETWORKING BREAK**	
14:45-15:45	**Check-in post break**	
14:45 –15:45	**Knowledge Café (B)**	Group, Facilitator
	– Self-select into specific groups based on theme **– Small groups: brainstorm a research program by theme**	
15:45-16:30	**Groups share proposed research ideas with entire group** **Group: prioritize research themes**	Group, facilitator
16:30-16:45	**Next steps**	Team leads
16:45-17:00	**Wrap-up; closing remarks**	Group, team leads

Apendix B: Attendees

Leadership:

Wendy V. Norman, Co-Chair, Assistant Professor, Department of Family Practice, University of British Columbia; Scholar, Michael Smith Foundation for Health Research; Co-lead, CART-GRAC, Vancouver, BC

Eleni Stroulia, Co-Chair, Professor, Department of Computer Science, University of Alberta; NSERC/AITF Industrial Research Chair on Service Systems Management; Member, Health Science Education Research Consortium

Jolanta Scott-Parker, Principal Knowledge User; Executive Director, Canadian Federation for Sexual Health

Participants:

Melissa Brooks, Senior Obstetrics and Gynecology Resident, Dalhousie University

Suzanne Campbell, Director, School of Nursing, University of British Columbia

Heather Carnahan, Professor, Department of Physical Therapy, University of Toronto; Director, Centre for Ambulatory Care Education, Women's College Hospital; BMO Chair in Health Professional Education Research, Wilson Centre

Cristina Conati, Associate Professor, Department of Computer Science, University of British Columbia

Brent Cowan, Trainee, University of Ontario Institute of Technology, Faculty of Business and Information Technology

Leanne Currie, Associate Professor, School of Nursing, University of British Columbia

Jessica Danforth, Founder and Executive Director, Native Youth Sexual Health Network

Sheila Dunn, Associate Professor, Department of Family and Community Medicine, University of Toronto; Research Director, Women's College Hospital, Department of Family and Community Medicine; Research and Program Director, the Bay Centre for Birth Control; Co-lead, Contraception Access Research Team (CART-GRAC)

Angel Foster, Associate Professor, Interdisciplinary School of Health Sciences, University of Ottawa; ECHO Endowed Chair of Women's Health Research

Dylan Gibbs, Developer, Department of Computer Science, University of Alberta

Jennifer Hulme, Junior Family Medicine Resident, University of Toronto

Janusz Kaczorowski, Professor and Research Director, Department of Family and Emergency Medicine, University of Montreal

Bill Kapralos, Associate Professor, Game Development and Entrepreneurship Program, Faculty of Business and Information Technology, University of Ontario Institute of Technology

Sharla King, Assistant Professor, Department of Educational Psychology, Faculty of Education, University of Alberta; Director, Health Sciences and Education Research Commons

Juliette Link, Masters Student, Department of Computer Science, University of British Columbia

Judith Soon, Assistant Professor, University of British Columbia, Faculty of Pharmaceutical Sciences

Lyba Spring, Independent Sexual Health Educator and Consultant; Retired Public Health Nurse Educator, Toronto, Ontario

Jocelyn Wentland, Facilitator and Co-presenter, PhD Candidate, University of Ottawa

Krysta Williams, Advocacy and Outreach Coordinator, Native Youth Sexual Health Network

Appendix C: Technical Report to GRAND on Meeting Outcomes

MEETING HELD ON FEBRUARY 26, 2013

Report prepared by Eleni Stroulia, Cristina Conati, Bill Kapralos

The meeting was organized by Drs. Wendy Norman (Family Medicine UBC) and Eleni Stroulia (Computing Science, U Alberta) to bring together technologists, educators and health professionals to brainstorm ideas for ways to build/design/test new technology in the service of reducing unintended pregnancies. The goal for the meeting was to outline a number of specific research projects combining our technology expertise (GRAND), health professional education expertise, and the broad range of academic disciplines and public perspectives (CART-GRAC).

The GRAND members attending were Eleni Stroulia (PNI), Cristina Conati (PNI), Bill Kapralos (CNI), Sharla King (CNI), Dylan Gibbs (HQP) and Brent Cowan (HQP). After introductions, the meeting started with a demonstrations and poster presentations of technologies developed by the GRAND members. It was followed by open discussion and focus groups which led to the development of four project ideas discussed in further detail below.

With respect to steps going forward, the following opportunities are pending:

1. The decision regarding the CHRP proposal, led by Stroulia and Norman, will be announced early April. If successful some of the ideas below may be incorporated in it.

2. A CIHR knowledge synthesis program (deadline April 2, 2013) may be pursued to conduct a systematic literature review of the area.

3. A new KT program is expected to been announced by CIHR; they are usually targeted so it is not clear whether our activities will fit.

4. Finally, once the GRAND funding allocations are announced we will revisit which of these activities we can start and at what scale.

With respect to key health-care participants, in addition to Dr. Norman, the following should be noted (potentially for consideration in the renewal process):

1. Angel M. Foster, Echo's Endowed Chair of Women's Health Research, Institute of Population Health, University of Ottawa

2. Sheila Dunn, Department of Family and Community Medicine, Women's College Hospital

3. Janusz Kaczorowski, Professor and Research Director, Department of Family and Emergency Medicine, University of Montreal

1.1.1 An Authoritative Resource for Aggregate Knowledge Repositories
(Cristina Conati's breakout group)

The objective of this activity is to develop a web site to support information retrieval on family planning issues for the public. There are several such web sites already available, but the envisioned added value will be the personalization of the information for the individual user.

The web site will be organized as a repository of FAQs, originally acquired from existing repositories and then expanded upon as users pose new questions. Some of the key research questions we plan to focus on are as follows.

1. We want to develop an ontology to support the easy search and use of the posed questions.

2. Answers will be provided at varying levels of detail and using different modalities and tools (e.g., simple text, a video game, simulation, using an interactive avatar), based on each user's needs. Essentially, each question could serve as a research tool to compare different modes of delivery.

3. We aim to collect ratings on the usefulness of each answer, along with information about the user, in order to develop a hybrid recommender system for answer selection, i.e. that is both content based and rating based. We will devote special efforts in making the site authoritative, i.e. endorsed by reputable institutions.

1.1.2 Yelp-like crowd-sourcing of service-provider recommendations

Beyond accessing authoritative information about contraception, and potentially in parallel with it, there is a need for collecting and recommending information about providers of familyplanning and contraception services. To that end, we envision a platform for crowd-sourcing the collection of this information, in a manner that ensures validity and yet is sensitive of the identity of providers and clients.

1.1.3 Contraception Tower Defense
(Eleni Stroulia's breakout group)

The objective of this activity is to adopt a model-driven engineering methodology to construct a game that will communicate up-to-date information about contraceptive methods and their recommended use and effectiveness.

First, there is a market for these types of games (we were shown a few at the meeting including Power Defense, a tower defense game developed specifically for adolescent diabetes numeracy skills training) and it appears that young people use them. Through wide distribution, we can collect qualitative data on the demographics of our users; through feedback mechanisms built into the game, we can measure the perceived value of the information communicated.

Second, the game will be developed based on a number of underlying domain models, in order to enable (a) regular updates of the information communicated, and (b) the construction of multiple variants so that we may systematically and comparatively assess the effectiveness of different designs for different audiences.

Tower Defense (TD) games all have the same basic premise: defend a point by building structures to stave off the enemy waves. Once developed, the structures target and attack enemies automatically. Each "tower" acts differently – some attack a single target, some attack multiple targets, and some don't attack at all but provide support to others.

The player decides which towers to build and where to place them. The contraception game will follow this metaphor: a player will be given contraceptive defenses to prevent attacking sperm from meeting an egg and eventually allowing a baby to be gestated beyond the point where adoption is advisable.

The types of defenses will model the various forms of contraception. The design of each defense will hint at the corresponding contraceptive method and its behavior will model (a) the contraceptive mechanism and (b) its effectiveness both in perfect and typical use.
   One fairly important game mechanic is the notion of levels; at each level, the player unlocks new defenses, which provides a good place to incrementally provide information about each new contraceptive method. The levels can also be associated with different "scenarios", where particular conditions prevent the use of some contraception methods and make others more advisable.

The nature of the sexual relationship may also be modeled (potentially in the sperm design).   The layout of the game (and the narrative vignettes) should model the monthly cycle, the timing of the intercourse in the cycle, the methods available to the players (we will experiment with different variants for male/female players) and should be styled to appeal to the target demographic.

1.1.4 Virtual-World simulations health professionals/practitioners training
(Bill Kapralos's breakout group)

The objective of this activity is to develop training materials for students and practicing health professionals on a number of contraception-related procedures. The solution is based on a modular design where we design/develop our simulation tool in three levels:

Level 0 (Base Level):
   It will contain features common to all simulations supported by our system, including, sound, graphics, and haptics rendering, artificial intelligence and physics support etc. Essentially this level will perform the rendering functions required for any serious game.

Level 1 (Module Level):

    This level will consist of domain-specific modules on top of the Base Level, such as a module representing abortion or intrauterine device (IUD) insertion (of which a number of variants exist).

Level 2 (Scenario Editor):

    Each module will incorporate the scenario editor in order to develop and/or modify scenarios within each module. Using such a modular approach will allow us to re-use components and thus reduce development time. We will also use the simulation framework as a research tool to examine issues pertaining to multi-modal interactions and simulation fidelity. The IUD module (and every other module that is developed) will allow for multi-player capability to allow for a team of health professionals to log in (remotely) and work together. This will also provide the opportunity to practice interprofessional education where players (trainees) can take on another role (i.e., within the game, the doctor can take on the role of the nurse, and vice versa).

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