MEMOTEXT

Literature Summary

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Version	Contributors	Date
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MEMOTEXT

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Introduction

Launched in 2012, MEMOTEXT® started as a configurable SMS reminder web application. From initial user data it was quickly realized that MEMOTEXT was being utilized by end-users for medication and motivational reminder purposes. Engagement analysis showed that on their own, however, reminders were only acknowledged for 30- 45 days by end-user participants. To facilitate and increase engagement over time, MEMOTEXT embarked on an iterative journey to build a platform that was contextual, relevant and evidence-informed. This was our opportunity; to leverage patient data and create an attempt at a behaviour change content delivery mechanism, one that automatically created a mobile health intervention that was as unique as its user.

Now more commonly referred to as Just-In-Time-Adaptive-Interventions (JITAI), MEMOTEXT pioneered the use of validated assessments and health data to tailor and sequence interactive and adaptive messaging by SMS, mobile notifications, social feeds (mobile and web applications), IVR and voice-assistants.

Over time MEMOTEXT started to ingest more objective and clinical data such as RX claims to reference refill dates and RX histories to identify risk, adherence trajectories and for time-series based machine learning analyses. In 2018 MEMOTEXT also started integrating external sources of data, such as wearable activity data (Google Fitbit), Apple Healthkit and data from electronic medical records (EMRs) to identify risk and tailor interventions more granularly.

MEMOTEXT's experience, and ability to design, consume and subsequently 'action' health-data has allowed us to create validated, efficacious digital health interventions. Our mission is to make health data useful to improve outcomes for all our healthcare stakeholder clients, partners and patient populations. Our defining characteristic has become understanding how to build, validate and scale digital patient engagement communications.

A platform for co-creation, MEMOTEXT uses health data to tailor adherence, care coordination and support omnichannel programs. MEMOTEXT enables academics/clinicians and our commercial partners to co-create interactive, adaptive, evidence-based engagement and digital therapeutics (DTx). Together we (co)commercialize those interventions with our provider, insurer and pharmaceutical clients on our developing library of digital interventions (our digital formulary).

To date, MEMOTEXT's solutions have featured in peer-review publications and presented at academic and industry conferences in Canada and the US. We have partnered with healthcare, academic and government agencies including the CAMH Hospital, The University of British Columbia, The University of Saskatchewan, Vanderbilt University and the British Columbia Ministry of Health among others, to validate and launch our mobile health interventions for improved patient care coordination and outcomes.

Methodology of Summary

The platforms chosen for this literature summary focus on research and programs completed by or in collaboration with the MEMOTEXT team. Posters, documents, presentations, and publications in this summary were reviewed both internally and externally by various commercial and academic groups and presented at academic and industry meetings in Canada and the US. The summary included publications and presentations dated between 2012 and June 2023.

Programs are described under the following sub-headings (applies to 2023 publications):

- Program description.
- Outcomes (eg adoption by a Ministry of Health, a Hospital Health System, pharmaceutical partner etc)
- Publications, posters and oral presentations (citations for full publications provided in the bibliography)
- Resources (program websites, webinars, press releases etc)
- Program partners

Contents of Summary

1.0 Health Literacy Programs

1.1 University of British Columbia (UBC): SmartMom

Program description

SmartMom is Canada's first validated pre-natal and postpartum adaptive SMS program that provides pregnancy resources to improve perinatal health literacy and pregnancy outcomes. It's also the first mHealth program for prenatal education to be endorsed by the Society of Obstetricians and Gynaecologists of Canada.

In a 2017 collaboration with UBC, the effects of a program titled SmartMom were studied in pregnant women in the northern health authority in British Columbia. This program took a specific focus on aboriginal women living in rural residences who were at a socio-economic disadvantage. UBC led the recruitment process for this program and it was promoted through websites, posters, and takeaway marketing material such as magnets.

Enrollment for this program was completed by the participant through a web portal or through TEXT2Enroll by texting a 5 digit short-code to sign up for the program. For this study, participants received three weekly messages scheduled based on their gestational week. Content included educational and supportive material with links to helpful website resources. In addition, there were six optional supplementary streams with additional educational content that a participant could choose to sign up for. Supplemental messages were delivered five minutes after their regular scheduled messages.

MEMOTEXT

The content for this project was created by the UBC and delivered by web portal or SMS. For participants who do not have access to a phone, they could view the messages from any computer (Munro, et al., 2017).

Outcomes

SmartMom has now moved to co-commercialization. The program is now used by thousands of parents across multiple health authorities in Canada to provide reliable and comprehensive prenatal education via SMS. SmartMom has been reported as 'highly valued' by expectant parents as texting makes comprehensive information easy to access in addition to being reliable, timely and tailored. In response to disproportionate access to web-based education that affects Indigenous and remote communities across Canada, an offline app that will store SmartMom messaging on a phone is being developed. A randomised clinical trial program is planned to investigate possible clinical outcomes associated with the SmartMom program. (quantitative outcomes)

During the COVID-19 pandemic, expectant mothers on the SmartMom program were linked to provincial websites that were regularly updated with COVID-19 related information.

Following the success of SmartMom, SmartParent, described below, was conceptualized as a follow-up the program to support new parents in their transition to parenthood.

Publications

- SmartMom Text Messaging for Prenatal Education: A Qualitative Focus Group Study to Explore Canadian Women's Perceptions. (Munro, 2017)

This formative qualitative evaluation explored women's preferences for a prenatal education program by text messaging. It provides evidence that a prenatal education program by text messaging, SmartMom, is acceptable to the end users. These findings support the usability of the SmartMom program at a population level and the development of an evaluation program exploring the effects of the text messages on adoption of health-promoting behaviors and maternal-child health outcomes.

- Expectant Parents' Preferences for Teaching by Texting: Development and Usability Study of SmartMom. (Murray, 2023)

This study sought to explore perceived information needs and preferences for the content and structure of prenatal education mHealth programs among persons enrolled in or eligible to enroll in SmartMom. The SmartMom SMS text messaging program was viewed as being evidence-based, providing comprehensive prenatal educational content without searching, and permitting tailoring to individual needs through opt-in message streams. Prenatal education must also meet the needs of diverse populations.

Resources (program websites, webinars, press-releases etc)

- Program Website

SmartMom

- Press releases/Health Authority announcements.

Island Health

First Nations Health Authority

Vancouver Coastal Health

Northern Health

Interior Health

- Webinar

SmartMom Text Messaging for Prenatal Education: A Qualitative Focus Group Study to Explore Canadian Women's Perceptions Prenatal education text messaging service launches throughout Northern B.C. SmartMom/SmartParent: Teaching by texting: Pre/Post Natal Support and Education – Dr. Patti Janssen at MOVES22

Partners

- Optimal Birth BC, BC Ministry of Health, First Nations Health Authority, University of BC, BC Association of Pregnancy Outreach Programs.
- Endorsed by The Society of Obstetricians and Gynaecologists of Canada and funded by the Canadian Institutes of Health Research (CIHR) and the BC Children's Hospital Research Institute

1.2 University of British Columbia (UBC): SmartParent

Program description

SmartParent was developed (Nov 2020) as a follow-up to the SmartMom program. SmartParent is Canada's first parent education program that provides trustworthy educational text messages to help guide parents through their baby's first year of life. The messaging content received is tailored to each baby's age and stage of development. Messaging includes evidence-based tips and links to support the transition to parenthood and the baby's growth and development. SmartParent is led by academic researchers from the University of British Columbia in collaboration with Optimal Birth BC.

Outcomes

SmartParent has been actively in use since 2021 and has started to scale with several BC provincial health authorities: Fraser Health, First Nations Health Authority, Northern Health, Interior Health, and Vancouver Coastal Health.

Resources

- Program website

SmartParent

- Press releases/Health Authority announcements

MEMOTEXT, The University of British Columbia developing Indigenous Elder-led app to support parents' Two-Eyed Seeing for parenting

SmartParent: Parenting Education by Text

Fraser Health

First Nations Health Authority

Women's Health Research Institute at BC Women's

Pathways Maple Ridge – Pitt Meadows

Partners

- Optimal Birth BC, BC Ministry of Health, First Nations Health Authority, University of BC, BC Association of Pregnancy Outreach Programs.

1.3 Canadian Pulmonary Fibrosis Foundation: Inspiration Patient Assistance Program

Program description

The educational program titled "Inspiration Patient Assistance Program" was a 2014 partnership with the Canadian Pulmonary Fibrosis Foundation. This initiative was an educational program for patients undergoing Esbriet (pirfenidone) treatment for idiopathic pulmonary fibrosis (IPF). Eligible participants were newly or previously diagnosed with IPF and prescribed Esbriet for treatment. Enrollment was open to anyone on the medication; however, the disease is typically found in males over the age of 50. In this program, participants were given the choice of receiving up to three messages per day. Message content varied from education, motivation, and healthy lifestyle and was offered via IVR, SMS and Email in both English and French.

Outcomes

The outcomes of this program are confidential and proprietary for ESBRIET®

2.0 Adherence and Care Coordination Programs

2.1 Adaptive and Data Driven Adherence Programs
Johns Hopkins University (JHU): ADRS

In collaboration with Johns Hopkins University, a medication reminder program was created in 2014 for post-operative glaucoma patients in the JHU Hospital system. The program was titled "Impact of Automated Dosing Reminders on Medication Adherence Using Microsoft HealthVault" (ADRS). Recruitment and enrollment were led by the clinicians, and enrollment was completed online. For this intervention, participants received two segmented reminder messages per day via SMS or IVR (Boland, Chang, & Frazier, 2014). a prospective cohort study of medication adherence, followed by a randomized intervention for those found to be nonadherent, of individuals recruited from a university-based glaucoma subspecialty clinic. A total of 491 participants were enrolled in the initial assessment of adherence. Of those, 70 were nonadherent with their medications after 3 months of electronic monitoring and randomized to intervention and control groups. A personal health record (HealthVault) was used to store the list of patient medications and reminder preferences. On the basis of those data, participants randomized to the intervention received daily messages, either text or voice, reminding them to take their medication. Participants randomized to the control group received usual care.

Outcomes: From this intervention, a 31% increase was seen in adherence to post-op glaucoma therapy versus a match control group. Results are published in JAMA Ophthalmology (Boland, Chang, & Frazier, 2014).

Link: Automated Telecommunication-Based Reminders and Adherence With Once-Daily Glaucoma Medication Dosing

Boots UK: Type 2 Diabetes Medication Reminder Program

A medication reminder program with an education component was created in 2012 with Boots drugstores in the UK for patients with Type 2 Diabetes. Recruitment was led by Boots UK pharmacists who would complete a paper form at the pharmacy. This form was sent to call center who then filled out an online application. Participants could choose their own frequency of messages to be either daily, weekly or bi-weekly. Messages included reminders, education, and motivational material related to medication, disease, lifestyle, or diet. This program was offered via SMS or IVR. The program segmented patients and content based on health attitudes, beliefs, and subsequent self-management and adherence behaviours. Re-segmentation occurred after six months to improve content targeting.

Outcomes: Greatest improvements in medication adherence were seen in those with the lowest adherence at program start based on historical Medication Possession Ratio (MPR). Results showed that 80-85% of patients demonstrated improved knowledge of diabetes management, 83% showed improved knowledge of diabetes medication, and a decrease from 50% to 25% of clients that missed a dose one or more times a week was seen. Additionally, patients filled their prescriptions for METFORMIN an average of 2.3 days earlier than in prior refill claims history.

ALLERGAN: Treatment Support Program

A Treatment Support Program with Allergan was created for Chronic Dry Eye Disease patients prescribed Restasis in 2016. Allergan led the recruitment process by administering brochures to doctors prescribing the target medication. Doctors then provided their patients with the brochure and a copay for enrollment card. Patients could enroll via TEXT2ENROLL or through an external web portal created by MEMOTEXT. This medication reminder and education program recorded self-reported adherence in participants who received two messages per day either via IVR, SMS, or Email. The first message was education or refill focused while the second message was a medication reminder automatically scheduled 12 hours after the first message to accommodate medication requirements. Content delivered was segmented based on participant responses to survey questions. The pilot was initially limited to residents of Ontario but was later expanded to all of Canada.

<u>Outcomes:</u> Outcomes of this intervention include a significant reduction in the typical adherence drop off rate after the first 6 months. Specific KPIs are confidential.

Massachusetts General Hospital (MGH): Simple Online Family Intervention for ADHD (SOFIA)

In collaboration with MGH a medication adherence program was created in 2017 called SOFIA. SOFIA is a system designed for the parents of children ages 6-12 who are prescribed stimulant medications to treat ADHD. For a feasibility study, parents were recruited through a Partners Healthcare EMR to identify children 6-12 taking stimulant medication for ADHD. The healthcare providers were then contacted by MGH administrators inviting them to participate in the program. Participants received a set number of messages per week and educational content was segmented and delivered to participants based on their responses to trigger questions asked periodically. Reminders for prescription renewals were sent based on the 30-day medication cycle and were based on a refill validation process. Content included reminders, tips, facts, and 2-way (responsive) SMS messages in the form of myth debunking questions.
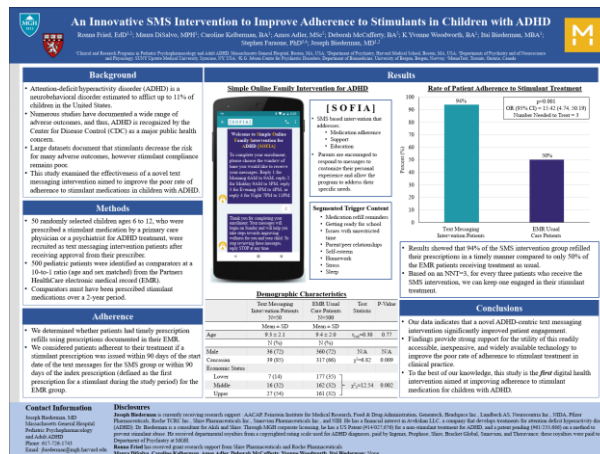
Figure 1. SOFIA Poster Presentation presented at the APSARD 2020 annual meeting

<u>Outcomes:</u> 85% of SMS intervention patients refilled their prescriptions in a timely manner compared with 62% of patients receiving treatment as usual.

<u>Link:</u> <u>An innovative SMS intervention to improve adherence to stimulants in children with ADHD</u>

Link: <u>American Society of PsychoPharmacology SOFIA Presentation 2020</u>

Green Shield Canada (GSC): Stick2it

The Stick2it intervention (2015) was targeted at plan members with less than 6-months of historical claims for specific Cholesterol and Hypertension medications. Recruitment was led by GSC and involved two recruitment campaigns. Members were mailed postcards and completed via IVR and a web portal. This intervention was an adaptive education support program which involved self-reported adherence and participants receiving up to three messages per day based on personal preference. The message content included reminders, education, motivation and healthy lifestyle which includes heart-healthy recipes. Content delivered in both English and French was segmented at intake and subsequent weekly intervals based on participant survey responses through IVR, SMS and Email.

Outcomes: The Stick2It program had a retention rate of 91.1% (n=434) of participants and over a period of ten months. The program increased refill persistence by 37.3% based on claims data compared to a control group. A decreased medication dropout rate also proved significant.
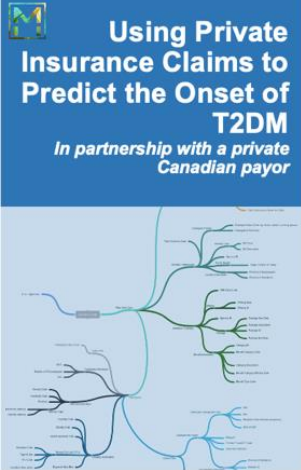
Link: The Importance of Sticking To it: Non-Adherence To Prescription Medication

Green Shield Canada: Dot the Bot: Using Private Insurance Claims to Predict the Onset of T2DM

A 2-year AI collaboration focusing on the Type 2 Diabetes (T2DM) population with one of Canada's leading health benefits providers led to the creation of multiple predictive models to address specific clinical business needs such as identifying: high cost plan members, drug switching in early stage treatment, and disease onset. By focusing on prevention and adherence to lower cost monotherapy medications as well as addressing the factors that increase the likelihood of cost escalations associated with T2DM, overall expenditures can be reduced. Using this knowledge and health behaviour change methodologies, a digital health intervention for plan members at risk of developing T2DM (assumed prediabetes population) and plan members with T2DM was developed to keep members at low-risk and low cost. Members who had certain prediabetes risk factors were screened using the CANRISK questionnaire, then onboarded to the prediabetes stream of the digital intervention. On the other hand, members who were already claiming T2DM medications were enrolled into the T2DM stream to assess, improve, and sustain adherence to their medications. In the end, a digital health navigator care bot engaged plan members for over 6 months, connecting to the health benefits provider's service offerings and sending them daily support, educational content, health trivia, and medication reminder messaging.

Outcomes: Findings revealed that staying adherent to high-cost T2DM medications, as calculated by the proportion of days covered (PDC) metric, leads to higher associated T2DM costs in the lens of the health benefits provider. In other words, it costs to stay healthy, proving

that one of the most effective ways to avoid diabetic costs from the Canadian private insurer perspective is to prevent or delay members from developing diabetes in the first place.

Results
Comparison to Manual Tagging

	Manual Rules*	Machine Learning
Accuracy	66.4%	83.0%
Recall	55.1%	41.5%
Precision	8.6%	14.0%
False Positive Rate	31.1%	13.8%
Specificity	67.1%	85.4%

Identifying T2 risk using ML is a great improvement over rule-based tagging. However, a balance between ML & human intervention is required.

Notes: manual rules involved identifying plan members who were over a certain age criteria and had claims on file for specific drug categories (ex. high blood pressure, smoking cessation, etc.)

Figure 2. 2020 Pharmacy Quality Alliance (PQA) Annual Conference Poster Presentation

Genentech: MyCFCoach

Genentech partnered with MEMOTEXT to create MyCFCoach in 2015 for adults with Cystic Fibrosis and who were prescribed Pulmozyme as a supplement to their existing therapies. Genentech led the recruitment by providing clients with resources and advertising on social media. Enrollment for this reminder program was completed through a web portal. Participants self-reported adherence and received two messages per day. Messages included reminders, education, support, motivation and healthy lifestyle content which was segmented based on participant responses to survey questions. The content was delivered via SMS and email.

Outcomes: This intervention showed a high degree of patient satisfaction with the support program and above 90% retention rates.

Accountable Health Solutions (AHS): Blood Glucose Monitor (BGM) Adherence

In partnership with AHS, MEMOTEXT initiated a pilot program to in 2014 to assess and address patient adherence to prescribed BGM regimens in members with Type II Diabetes. Eligible participants were members who have claims for Diabetes testing supplies who are over the age of 18. AHS led recruitment by reaching out to eligible members via direct mail and enrollment was completed via a web portal. This reminder program included self-reported adherence and participants received up to 3 messages per day based on their own preferences. Message content included reminders, education, motivation, and healthy lifestyle. In addition, participants received a weekly mood meter. Content delivered via SMS and email was segmented based on participant responses to survey questions focused on diabetes health literacy, improving lifestyle, and increasing motivation.

PerformRX: HealthNHand

Developed by PerformRx, in conjunction with MEMOTEXT, a digital health intervention called HealthNHand launched in 2014 as an asthma medication adherence program (Figure 2). For this intervention, eligible participants were identified based on previous claims filled for a controller medication in the 6 months prior to the launch with no prior claims for medications used to treat COPD only. Recruiting was completed by direct outreach via phone or mail and participants self-enrolled through a web portal or by calling into the PerformRx call centre. The intervention itself was a tailored medication reminder, education, and support program where participants self-reported adherence. Participants

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received up to four messages per day based on their controller medication requirements. Messages included reminders, education, live air quality index forecasts from airnow.gov, asthma triggers, motivation, and support for a healthy lifestyle. Refill calls were determined based on the date their last claim was filled. The content was delivered via IVR, SMS, and email and segmented based on participant survey responses.

Outcomes: Results of this intervention showed a conversion of 40% of non-adherers (participants that take their medications less than half the time) into moderate or optimal adherers. Results were presented by poster at Stanford Medicine X Conference in Palo Alto California and by presentation at the 2015 Vendor Education Series for the Association for Community Affiliated Plans.
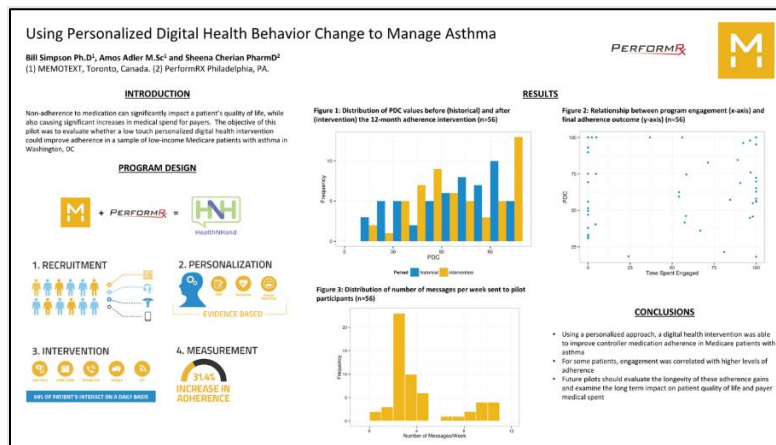

Figure 3. The PerformRX poster presented at the Stanford Medicine X Conference 2015.

Humana: Humana Health Connect

Humana Health Connect is a text-based messaging program designed to guide plan members with Diabetes towards the use of statins using digital solutions to promote patient engagement and drive behavior change. All members eligible were segmented into cohorts based on eligibility status for SUPD, and their Diabetes Complications Severity Index (DCSI) and Charleston Comorbidity Index (CCI) scores. A segmentation survey was deployed upon enrollment to personalize the type of educational and supportive content that would be delivered to the plan member based on their health literacy levels, beliefs about medication, and self-efficacy. Phase 1.0 was initiated May 2019 and consisted of recruitment of ~6000 members via email and IVR channels. Phase 1.5 in Nov 2019 followed up previous recruitment efforts with re-targeting text messages and email campaigns

<u>Outcomes:</u> Achieved program objectives by increasing statin users by 33% and showed significant improvements in knowledge and understanding of reasoning for statin adherence through educational messaging.

2.2 Static Adherence Programs
Nova Southeastern University (NSU): ReMIND

In partnership with Dr. Kevin Clauson at NSU, a Diabetes Medication Reminder Program called ReMIND was established in 2012. ReMIND was a parallel group, open-label, randomized, controlled clinical trial study to use SMS messages to improve medication adherence in patients with Type II Diabetes. Recruitment was done by the clinical trial leader and enrollment was completed by the clinician through a web portal created by MEMOTEXT. Participants received one SMS message per day at 9:00 am.

<u>Link:</u> <u>What Happens When You Combine The Participatory Design Research Approach And A Patient Engagement Company For A Mhealth Study?</u>

McKesson Canada: INVIVA SMS & IVR Appointment Reminder Tool

MEMOTEXT partnered with McKesson Canada in 2017 for an INVIVA SMS Appointment Reminder Tool. This solution was designed to improve the appointment reminder process for patients at INVIVA infusion clinics. As there is a mandate for Patient Care Coordinator (PCCs) to provide appointment reminder phone calls within the 4-6 days prior to a scheduled appointment, the objective of this pilot project was to increase the ability of PCRs to send reminders while decreasing the daily call burden on PCCs through appointment reminders and care coordination. Patients of INVIVA were onboarded by PCRs and an e-consent was completed by SMS, IVR, or manually via nurses at the infusion clinics. A web portal was created to manage both users, patients, reminders, and to create reports. For this tool, patients were sent a reminder via their preferred primary communication method 5 days prior to their appointment. If no response was received, a second reminder was sent 3 days prior to their appointment. If there was still no response from the patient, a third reminder was sent via their preferred secondary communication method the day before the appointment. All message content, including emails, SMS messages, and IVR call scripts were created by McKesson.

As of March 2020, MEMOTEXT began performing COVID-19 screening for patients prior to their appointments to assess health risk. MEMOTEXT integrated a secure mobile-web based COVID-19 screening tool within the SMS care-coordination stream of messaging. We

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have also worked alongside McKesson to update the screening algorithm as COVID-19 circumstances evolve.

Outcomes: This project is currently active in 67 INVIVA Clinics.

Link: Case Study: Inviva Rises To The Pandemic Challenge

Sanofi Genzyme: Medication Reminder Program

In partnership with Sanofi Genzyme, a medication reminder and education program was developed in 2010 for adults with lower phosphorus levels as a result of Chronic Kidney Disease. Recruitment was done via online advertising and enrollment was completed by Sanofi Genzyme online or via a faxed form from the patient. In the program, participants received up to one message per day which included content such as recipes that focused on kidney health.

Outcomes: Outcomes of this intervention are confidential.

Leo Pharmaceuticals: Data Collection by IVR

A data collection intervention was completed for Leo Pharmaceuticals for participants that were newly diagnosed with Actinic Keratosis in 2013. The population was typically over 40 years of age and prescribed PICATO® as their primary treatment. Recruitment was led by participating HCPs and was integrated with the existing STI/Copay program. Physicians would provide patients with a non-activated coupon card with their prescription to participate in the program each with their own unique identifier. Patients could then complete enrollment and activate their card by inbound IVR or a web portal. In this medication reminder program, messages were scheduled on a predetermined sequence based on rigid dosing and outcomes requirements. Messages included reminders, educational content, and surveys in both English and French via SMS or IVR.

Outcomes: Results of this project were high patient satisfaction with the intervention and a self-reported increase in ease of use of the product.

Arizona State University: TEXT2COPE

In a 2013 collaboration with Arizona University, a pilot study titled TEXT2COPE was developed to establish the feasibility, acceptability, and preliminary effects of a mobile technology cognitive behavioural intervention. A study of healthy lifestyle behaviours of parents of overweight and obese preschoolers was delivered in a primary care setting. Recruitment was done by the clinical trial leader and enrollment was completed by the clinician

through a web portal designed by MEMOTEXT. This reminder program delivered up to one message a day to participants containing supportive messages. The content was curated by Arizona University and was offered via SMS (Mititello, Melnyk, Hekler, Small, & Jacobson, 2016).

Outcomes: Self-reported findings indicate that the program is feasible and acceptable in the population. The intervention also showed significant improvements in parental knowledge about nutrition (P=.001), physical activity (P=.012) and in their behaviours towards engaging in healthy lifestyle choices for their children (P=.040) (Mititello, Melnyk, Hekler, Small, & Jacobson, 2016).

Link: Automated Behavioral Text Messaging and Face-to-Face Intervention for Parents of Overweight or Obese Preschool Children: Results From a Pilot Study

Link: Healthy lifestyles for families using an interactive voice ecosystem Lisa K. Militello, PhD, MPH, RN, CPNP MEMOTEXT Outcomes Virtual Engagement Symposium March 2022

Biogen Idec Canada: AVOTALK

In partnership with Biogen Idec Canada, a free telephone reminder and education services called AVOTALK was created in 2008 for patients with Multiple Sclerosis who take the once-a-week prescription AVONEX. Eligible participants were typically between 18 and 30 years old. Patient recruitment was done via case manager through their call centre and those who opted in received reminders and educational information about self-injections of Avonex. Additionally, support was offered via a live nurse should the patient have any questions or concerns. Each patient was able to personalize the timing of delivery of a medication reminder sent via IVR or SMS and all message content was created in English and French by Biogen.

Outcomes: Outcomes of the intervention show an adherence rate of 100% (n=40) and a retention rate of 96.5%.

Link: The Real Cost of Patient Non-Adherence

3.0 Personalized SMS Support Programs
Novartis: Gilenya Program

For Novartis, MEMOTEXT acts as an SMS aggregator for their Gilenya program targeting multiple sclerosis. For this program, Novartis created the message content and MEMOTEXT handled the SMS communication. Novartis led the recruitment process and completed the enrollment. This program is offered in English and French.

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University of Saskatchewan: BeWell

Co-created with the University of Saskatchewan and CAMH, this SMS Intervention was developed to support all residents of Saskatchewan who were looking for mental health and wellness supports and resources during the COVID-19 pandemic. The MEMOTEXT platform provided a personalized interactive digital messaging intervention to allow individuals to get access to mental health support and resources. The research was funded by a Canadian Institute of Health Research (CIHR) nationally funded grant. The program was also in-licensed by MEMOTEXT for co-commercialization in the employer, academic and institutional industry verticals.

Link: Lessons learned developing and deploying a provincial virtual mental health support during the COVID-19 pandemic

Supporting population mental health and wellness during the COVID-19 pandemic in Canada: protocol for a sequential mixed-method study

Be SaskWell: COVID-19 mental health navigation and support – Dr. Tracie Risling and Dr. Gillian Strudwick at MOVES22

CAMH : BeWell Mental Health Intervention

The BeWell Mental Health Intervention is a secure text messaging service to listen, learn and guide employees and students to curated health resources and available mental health benefits. Co-created with The Centre for Addiction and Mental Health (CAMH), the secure mental health check-in, support and recommendation tool was developed based on a CIHR funded research grant with Dr. Tracie Risling and Dr. Gillian Strudwick and validated in a CIHR funded study.

The study found that 76% of employees want technology to better support mental health in the workplace.
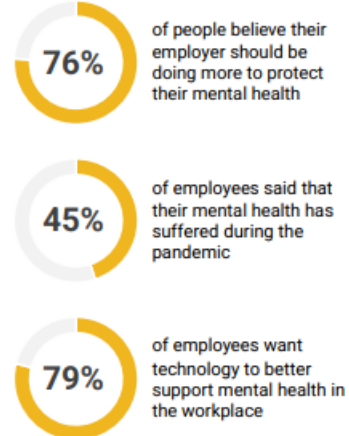
BeWell
MEMOTEXT

The MEMOTEXT BeWell Digital Mental Health Engagement Intervention is an automated, intelligent text-messaging service with supporting online assessments to match users with curated digital mental wellness tools and supports made available by employers.

Co-created with The Centre for Addiction and Mental Health (CAMH), the secure mental health check-in, support and recommendation tool was developed based on a CIHR funded research grant with Dr. Tracie Risling and Dr. Gillian Strudwick.
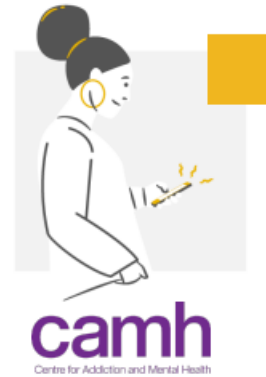
Validated in a CIHR funded study, the MEMOTEXT BeWell intervention allows employers and educational institutions to promote validated, evidence-based mental health tools and engagement with their own eligible mental health benefits.

BeWell is an inclusive mental health text messaging program that provides support, promotes curated mental health resources, and provides wellness supports to users.

76% of people believe their employer should be doing more to protect their mental health

45% of employees said that their mental health has suffered during the pandemic

79% of employees want technology to better support mental health in the workplace

https://mtxt.io/BeWell4U

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Figure 4. BeWell Mental Health Intervention data presented at the e-Health 2023 Conference and Tradeshow May 28-30, 2023

The Georgian College: BeWell Digital Mental Health Engagement Success

Originally inspired by the need to provide mental health support during the COVID19 pandemic, Georgian College's Mental Health and Well-being (MHWB) Team worked with MEMOTEXT to engage students with BeWell @ Georgian, a digital stepped-care model intended to:

i) Increase mental health literacy

ii) Improve awareness of available mental health supports and services and

iii) Make system navigation straightforward and intuitive.

Success in co-design and user-growth has resulted in consistent growth, student engagement and the addition of a digital peer-support secure live-chat function.

BeWell @ Georgian has inspired widespread collaboration across the Georgian system, to ensure the platform's content and message delivery schedule is responsive and reflective of significant, stressful time periods in the student academic and life cycle.

Program features include:

i) Curated digital supports delivered in a stepped care model with apps delivered by SMS or WhatsApp

ii) Event, Calendar, Course and School Year Announcements

iii) Secure, safe virtual space for students to chat with peer support and MHWB team members

The MEMOTEXT BeWell Solution and the digital peer-to-peer web-based secure chat are highly configurable and securely hosted solution to ensure privacy, security and audit requirements are met.

Figure 5a BeWell @ Georgian data presented at the e-Health 2023 Conference and Tradeshow May 28-30, 2023

Figure 5b. BeWell @ Georgian data presented at the e-Health 2023 Conference and Tradeshow May 28-30, 2023

University of California San Diego (UCSD): CalmDoc

Program description

CalmDoc is a text-based system to continuously follow physician stress levels in their native environment. Our system sends one single-item stress question (SISQ) per week via text at random times (between 9am and 4pm) and days (Monday-Friday). It has been shown that SISQ scores correlate with exhaustion, workplace injury, sense of control/reward, depression, and intention to leave. The simple assessments occur continuously and are coordinated throughout an institution providing numerous stress data points weekly. Assessing stress and burnout in this manner highlights where interventions are most needed both temporally and spatially in the hospital.

Outcomes

CalmDoc was evaluated in a longitudinal pilot study at the University of California, San Diego Health Medical Center (UCSDH), to determine if the program can efficiently track physician mental health. Findings of the study are reported below.

Publication

- Evaluating the Mental Health of Physician-Trainees Using an SMS Text Message–Based Assessment Tool: Longitudinal Pilot Study (Goldhaber, 2023)

In this pilot project, we evaluated the utility of and participant engagement with a simple, longitudinal, and SMS text message–based mental health assessment system for physician-trainees at the study institution. The goal of the SMS text message–based assessment system was to track stress, burnout, empathy, engagement, and work satisfaction levels faced by users in their normal working conditions.

Responses demonstrated that SMS text message–based mental health assessments are potentially useful for recording physician-trainee mental health levels in real time with minimal burden, but further study of SMS text message–based mental health assessments should address limitations such as improving response rates and clarifying participants' sense of privacy when using the SMS text message–based assessment system. The findings of this pilot study can inform the development of institution-wide tools for assessing physician burnout and protecting physicians from occupational stress.

Resources

- Program website

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CalmDoc

- Webinar

CalmDoc: Clinician burnout prediction using ecological momentary assessments – Dr. Byron Fergerson at MOVES22

Program partners

University of San Diego, MEMOTEXT Inc

4.0 Enhanced Clinician Support Programs
4.1 Clinical/Commercial Deployment Programs & Digital Therapeutics

The Centre for Addiction and Mental Health (CAMH): A4i

Program description.

The App4Independence (A4i) is a Joint Venture between the Centre for Addiction and Mental Health (CAMH) and MEMOTEXT. A4i is Canada's first digital therapeutic with a regulatory pathway for complex behavioural health. A4i's premier indication is to provide support, isolation-reduction and relapse-risk identification in schizophrenia and psychosis spectrum illnesses. We have brought together the expertise of Dr. Sean Kidd, Chief-Psychology Division and Senior Scientist at CAMH, Associate Professor of Psychiatry at the University of Toronto and Amos Adler M.Sc., the CEO of MEMOTEXT Corp. a leading innovator in personalization of validated digital therapeutics and strong advocate for evidence and empathy based digital patient engagement solutions.

A4i is a response to the gaps in the current system of care for individuals with schizophrenia-spectrum illnesses. Treatment and provider engagement are challenging areas in schizophrenia care. Challenges in schizophrenia-spectrum illness include poor community-based supports, care-transitioning, medication adherence and dissatisfaction with clinical care. These challenges contribute to frequent, lengthy, and costly hospital readmissions, low QOL, high levels of distress and difficulties engaging in community roles. Digital engagement is a promising but largely unexplored and under-studied resource in schizophrenia care compared to advances in areas such as mood and anxiety disorders. They are particularly salient given their reach, low cost, and increasing relevance to younger schizophrenia populations most of whom use mobile technologies.

Outcomes

The co-commercialized provider-innovator partnership has been iterating and testing the feasibility of a mobile intervention called App4Independence (A4i). A4i is an (iOS/Android)

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intervention to help reduce isolation, improve care coordination and support and validate models towards predictive insights into relapse risk. The patient co-designed app personalizes engagement using a data-driven (social) feed, notifications and messaging based on an evidence-informed intake portal, responses to notifications and ambient phone data (sleep/activity data and objective usage/digital phenotypes). Personalization manifests in peer-to-peer, evidence-based and ADL feed and notification content tailored to the individual. The app also provides symptom based 'toolkit' elements such as a patent pending ambient sound detector to help patients determine the difference between ambient noise and auditory hallucinations. Over the course of 18 months the team iteratively developed the intervention with involvement of patients, families and clinicians, design team and an e-patient in residence. Feasibility testing involved 38 individuals with psychosis, primarily with schizophrenia and schizoaffective disorder diagnoses. Looking at three key areas: app usage, quantitative outcomes, and qualitative feedback, the results highlighted high user engagement and retention rates of: 100% at 7 days and 94% at 20 days (Kidd, et al., 2019).
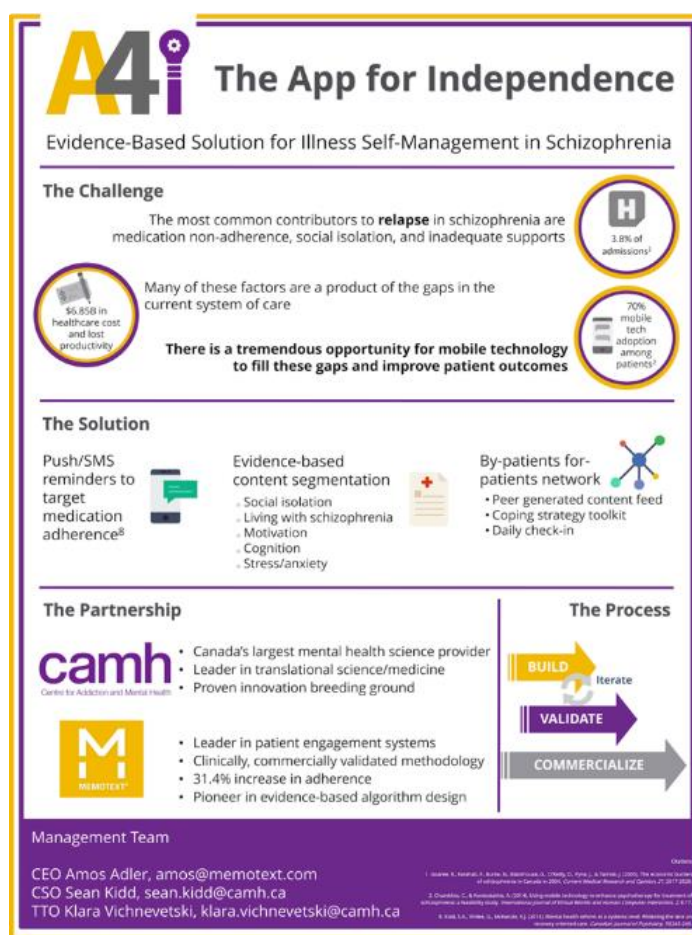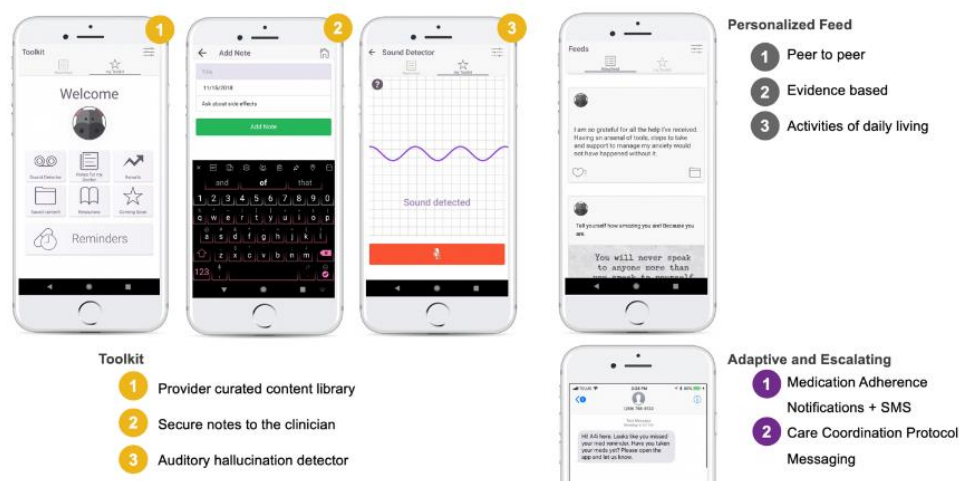

Figure 6. A4i Poster Presentation

Figure 7. The A4i Application

Publications

- <u>Feasibility and outcomes of a multi-function mobile health approach for the schizophrenia spectrum: App4Independence (A4i) (Kidd, 2019)</u>

Relative to the large investments in mobile health (mHealth) strategies for mental illnesses such as anxiety and depression, the development of technology to facilitate illness self-management for people with schizophrenia spectrum illnesses is limited. The focus of this study was upon the feasibility of a schizophrenia-focused mobile application: App4Independence (A4i). A4i is a multi-feature app that uses feed, scheduling, and text-based functions co-designed with service users to enhance illness self management. Among the 38 individuals with a primary psychosis who participated, there was no research attrition and classic retention on the app was 52.5%. Significant improvement was observed in some psychiatric symptom domains with small-medium effects. Significant change in recovery engagement and medication adherence were not observed after controlling for multiple comparisons. This research suggested that A4i is feasible in terms of outcome and process indicators and is a technology that is ready to move on to clinical trial and validation testing. The study contributes to the small but emergent body of work investigating digital health approaches in severe mental illness populations.

- <u>Examining a Digital Health Approach for Advancing Schizophrenia Illness Self-Management and Provider Engagement: Protocol for a Feasibility Trial. (Kidd, 2021)</u>

This feasibility trial will examine a digital health platform called App4Independence (A4i), which was designed to enhance illness self-management and treatment engagement for individuals with schizophrenia. This research will provide critical information for the development of this new technology in the larger effort to address a key problem in the

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schizophrenia field—how to leverage technology to enhance illness self-management and care engagement in resource-limited-service contexts. The study was funded by the Canadian Institutes of Health Research in January 2020 and received Institutional Review Board approval on August 13, 2020. This study plans to begin recruiting in January 2021 and will be completed within 3 years. Data collection is projected to begin in January 2021.

Resources

- Program website

  a4i

- Webinars

A4i: Bringing digital health to one of healthcare's most challenging and costly domains: Severe and persistent mental illness – Dr. Sean Kidd at MOVES22

- Press releases

CAMH embraces the future of digital health

Addressing complexities in recovery with severe mental illness (SMI)

- Pamphlet

Predictive Insights, Support and Care Coordination in Complex Behavioural Health

Program partners

Centre for Addiction and Mental Health, MEMOTEXT Inc

Saint Elizabeth Healthcare (SE Health): Ring of Support

Ring of Support (RoS) is a program which supports both caregivers/care providers and the seniors they are caring for. RoS is a personalized digital engagement system incorporating the use of Amazon Alexa/IVR technology to prolong independence for seniors at home and provide peace of mind while reducing the burden of stress for caregivers. A user experience evaluation was conducted with 50-60 SE health home care clients in the Central East LHIN in Ontario. The objective of this study was to get an understanding of the overall experience, preferences, and interests of seniors and their caregivers. We are currently working with the SE futures team on commercialization of Ring of Support and have conducted numerous market research surveys which have shown strong interest in the product.

Figure 8. Poster presentation 2019 Canadian Frailty Network Conference, Canada

Outcomes: 100% of the users communicated using IVR, Alexa, and SMS, with IVR being the most popular modality both for seniors and caregivers. 87% of users reported high satisfaction with the services and caregivers reacted extremely positively to being notified of updates about their loved ones. We were able to evaluate user preferences for modalities, interests, and abilities of older adults. We were also able to provide the technical and operational feasibility of the solution after having done change management with the virtual nurse team and implement it within a clinical environment.

4.2 Academic Research Programs
SickKids Research Institute: KiT

Program description

Researchers at the SickKids Research Institute, together with adolescents and emerging adults and paediatric and adult T1D providers and MEMOTEXT, co-designed a text message-based intervention, Keeping in Touch (KiT), to deliver tailored transition support for youth living with type 1 diabetes (T1D). The researchers aim to test the effectiveness of KiT on diabetes self-efficacy in a randomised controlled trial.

Outcomes

The study protocol and accompanying documents were approved, details of which are provided below.

Publications

- <u>Text message-based intervention, Keeping in Touch (KiT), to support youth as they transition to adult type 1 diabetes care: a protocol for a multisite randomised controlled superiority trial</u> (Sanmugalingham, 2023)

The primary objective of this study is to test the effectiveness of KiT on diabetes self-efficacy in a randomised controlled setting. 183 adolescents with T1D aged 17–18 years will be randomised within 4 months of their final paediatric diabetes visit to the intervention or usual care. Participants randomised to the intervention arm will receive the KiT text message transition support programme for 12 months, hosted by MEMOTEXT Inc, a company that provides a secure platform for digital patient engagement. We hypothesize that compared with usual care, youth who use KiT for 12 months starting within 4months before their final paediatric visit will have improved diabetes self-efficacy 12 months after enrolment.

Findings of this research will add to the literature about the effectiveness of interventions for transition to adult diabetes care without the need for healthcare provider support. Next steps are to assess the cost effectiveness of the intervention and to consider opportunities to scale KiT and to adapt it for other childhood chronic illnesses.

Resources

Invitation to enroll: The BETTER Registry

<u>Transitioning to adult care: Staying in Touch with Young Adults in Transition to Type 1 Diabetes Care – Keeping in Touch (KiT)</u>

Partners

MEMOTEXT Inc and researchers from SickKids Research Institute, UHN Research Institute of the McGill University Health, Canadian Institutes for Health Research (CIHR) Strategy for Patient-Oriented Research Network in Chronic Disease among others.

McMaster University: DESI

DESI is a program piloted with McMaster University that determines if a culturally personalized nutrition intervention delivered by a health coach improves blood sugar levels and reduces the incidence of gestational diabetes in South Asian women to a greater extent than usual nutrition advice. DESI consists of a clinical health coaching portal and SMS program to facilitate diet and exercise.

<u>Link: DESI: Diet and Physical Activity Intervention in S. Asian Women at Risk of Gestational Diabetes – Dr. Russell de Souza at MOVES22</u>

New York University (NYU): 4Me

4Me is a program that provides messaging on healthy behaviours and diet by asking questions, passively tracking FitBit data while also utilizing data inputs from Bitesnap to determine the type of content to send, the right time to send it and the right frequency to send it. The program begins with a 2-week monitoring period to obtain a baseline for the participant and what areas they need support in. The main areas of focus are exercise, diet, sleep, and stress. The specific breakdown of messages will depend on the participants barriers and facilitators, which are determined through surveys conducted by the research team. These include self-efficacy, health literacy, busyness, motivation, and social support. Participants receive a total of 10 per week; 2 messages from each barrier and 1 message from each facilitator. Participants also have access to a website that provides them with visualizations of their progress and resources to help them achieve their goals.

Link: 4Me: Personalized Health solutions leveraging ecological momentary assessment to tailor health promotion and behavior change – Dr. Azizi Seixas and Dr. Alicia Chung at MOVES22

Nova Southeastern University (NSU): Smoking Cessation Program

A research study was completed in 2017 with NSU involving adults wishing to receive support to help them quit smoking. Recruitment and enrollment were done onsite by clinicians through a web portal designed by MEMOTEXT. Throughout this program, participants received one SMS message in a predetermined sequence. Messages were focused on goals and motivation to assist with smoking cessation and the content and schedule were provided by NSU (Bronsburg, 2017).

Outcomes: Results of this study were published in the Online Journal of Applied Knowledge Management in 2016 and suggest that motivational intervening focused text messages may have had a positive impact on tobacco quit rates when coupled with evidence-based tobacco cessation programs (Bronsburg, 2017).

Link: Text messaging's impact on an evidence based medicine tobacco cessation program

St. Michael's Hospital: Flu Shot in Pregnancy

Alongside St. Michaels Hospital a randomized controlled trial was completed in 2017 to evaluate if text message reminders increase the likelihood of receiving the flu shot among pregnant women Eligible participants included pregnant women who saw their OBGyn for a prenatal visit during flu season with no restriction on age. Recruitment occurred onsite at the hospital by a clinician via a web portal created by MEMOTEXT. During this educational program, participants received one message in a predetermined sequence containing

information about pregnancy and flu shot safety. The content and schedule were provided by the St. Michael's Hospital (Yudin et al., 2017).

Outcomes: Weekly text messages reinforcing the recommendation for and safety of the influenza vaccine in pregnancy did not increase the likelihood of receiving the vaccine among pregnant women (Yudin et al., 2017).

Vanderbilt University: REACH

A 2016 study titled REACH was created in partnership with Vanderbilt University. This study targeted individuals with Type II Diabetes on various therapies including oral medications, injectable medications, and insulin. Participants must have been adults who have demonstrated difficult maintaining adherence to prescribed treatments. Recruitment was driven by the REACH research team and the clinical trial leaders. Enrollment was completed by the clinician using their REDCap portal during face-to-face interviews with the participant. The REDCap Portal was integrated with MEMOTEXT for easy data exchange. For this study, participants received up to five SMS messages per day including educational material, self-reported adherence, self-reported healthy lifestyle, and feedback based on responses. Message content included reminders, education, support, behavioural skills, and goals. Messages contained both one-way and two-way communications and content was segmented based on questionnaire responses. An additional message was sent to notify participants when their A1c lab results were ready for them to view on a HIPAA-compliant hosted web page (Nelson et al., 2016).

Outcomes: Overall, participants were satisfied with REACH and provided favourable ratings for each of its elements and demonstrated a 96% response rate to assessment test messages (Nelson et al., 2016).

Link: Development and Usability of REACH: A Tailored Theory-Based Text Messaging Intervention for Disadvantaged Adults With Type 2 Diabetes

An additional research study was conducted with Vanderbilt University to examine user engagement in a 12-month text message intervention for diverse adult patients with diabetes. Eligible participants were over the age of 18, diagnosed with Type 2 Diabetes, and are both prescribed and responsible for their diabetes medications. Enrollment for this study was completed by RA's who conducted a preliminary baseline survey and an HbA1c test. Participants' relevant information was transferred from REDCap to the MEMOTEXT health platform. MEMOTEXT used this information to schedule and send text messages to the participants. For the first 6 months of the study, participants received daily text messages that included self-care and interactive content, a subset of participants also received monthly phone coaching. After 6 months, participants had the option of receiving fewer text messages (Nelson et al., 2020).

<u>Outcomes:</u> Patients were satisfied and there was a 91% response rate to interactive text messages over the 12-month period. Nearly half of the participants opted to continue receiving daily text messages after the first 6 months messages (Nelson et al., 2020).

<u>Link: REACH: A tailored SMS intervention for supporting type 2 diabetes self-management – Dr. Lindsay Mayberry and Dr. Lyndsay Nelson at MOVES22</u>

FHI360: HIV Strategy

FHI360 teamed up with MEMOTEXT in 2015 to develop and assess the efficacy of an integrated and scalable strategy to identify, recruit, link to care, retain in care, and maintain viral suppression among HIV-infected men who have sex with men (MSM). Eligible participants were adult patients on antiretroviral drugs or combination therapies. Recruitment was restricted to participants in the study and enrollment was completed by case managers through a MEMOTEXT-designed web portal. Participants in this study received up to three medication reminders, one motivational message, and an unlimited amount of refill or appointment reminders per day. These reminders were set by IVR, SMS or email based on participant preference. Participants had the functionality to reach out to the Case Manager directly from the message in any of the three communication methods offered.

<u>Outcomes:</u> Just over half of the study participants used the system for support. 20 participants were successful in using the communication platform to let their case managers know that they needed assistance.
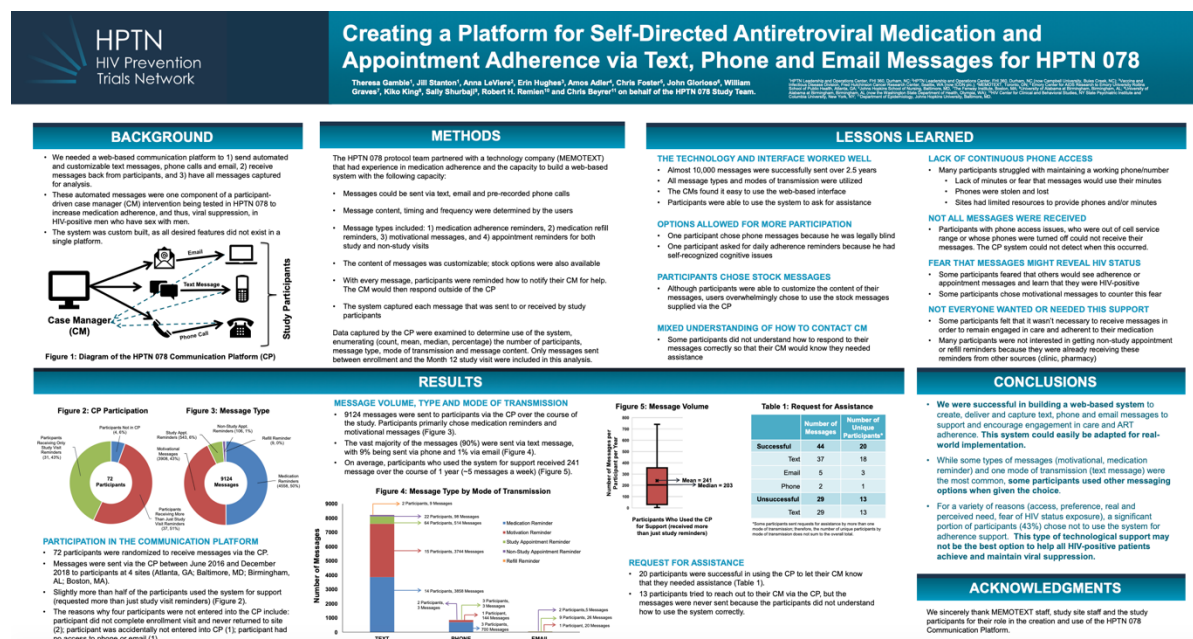
Figure 9. FHI 360 Poster Presentation

5.0 Support Programs

Broward Regional Health Planning Council (BRHPC): Wellness Support Program

A wellness support program was developed in collaboration with BRHPC. For this program, eligible participants were already enrolled in a wellness program with BRHPC and MEMOTEXT was provided with client contact information. Participants received one SMS message per week focused on living a healthy lifestyle. This program was carried out from April to July of 2017 and concluded successfully.

6.0 COVID-19 Response Programs

MEMOTEXT: RapidResponse

In response to the spread of COVID-19 across North America's health systems, MEMOTEXT has developed a clinical-grade COVID-19 digital engagement response tool for outreach, assessment and follow-up. RapidResponse is a rapidly customizable SMS/IVR (interactive voice response) and web-based tool that can adapt to changing risk, volumes and specific protocol needs. The tool engages with employees, students, parents, or patients to assess health risk and needs and provide recommendations and supports for resources to support one's health based on risk and rapidly changing needs. The customizable dashboard and reporting surfaces insights for providers, clinicians, employers, and administration. In use with employers, home healthcare and large clinics across North America, MEMOTEXT Rapid Response has shown significant reductions in call center times and increased engagement with employees, patients and seniors.

Outcomes: More than 10,000 proactive SMS, IVR, or email messages are sent out each day to patients, students, parents, and employees.
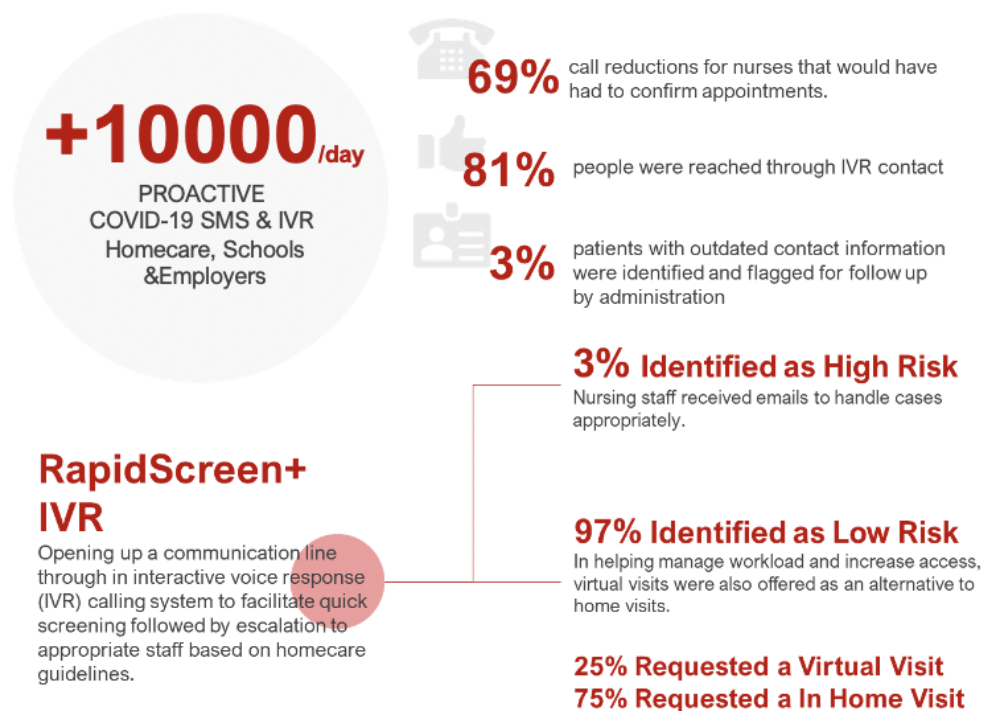
Figure 10. RapidResponse Results

7.0 Quality Improvement Initiatives
MEMOTEXT: *Balanced Adherence Metric*

While the standard Proportion of Days Covered (PDC) metric quantifies adherence in patients with complex regimens, it may not accurately quantify other important dimensions of adherence. MEMOTEXT set out to combine PDC with Compliance Rate (CR), Delay to Refill, and Medication Persistence into a single, simple to interpret, metric which. The Balanced Adherence Metric (BAM) for claims data was created. This study showed that a mathematical combination of currently available adherence metrics may be more beneficial than either metric alone in objectively assessing adherence. Results were presented via poster (Figure 4) at the 2016 Pharmacy Quality Alliance (PQA) Annual Meeting & Innovation Forum in Arlington, Virginia.
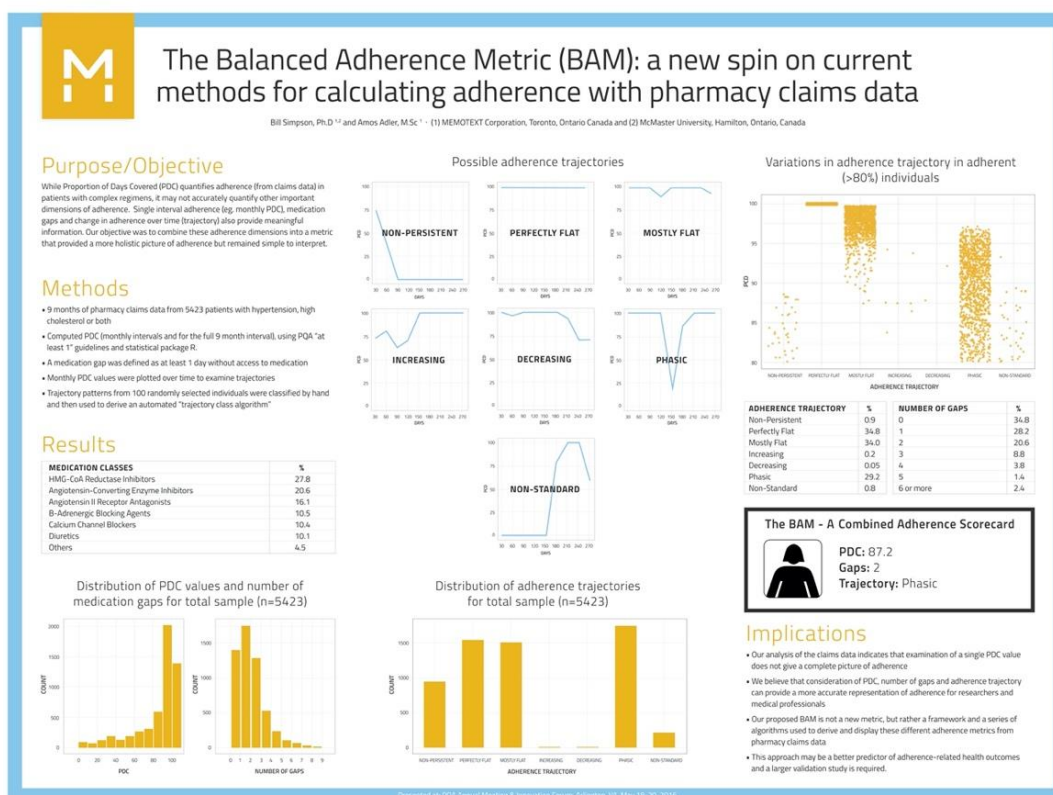
Figure 11. BAM 2016 poster presented at the Pharmacy Quality Alliance Annual Meeting & innovation Forum in Arlington, Virginia.

Conclusion

MEMOTEXT has been clinically and commercially validated since 2012 with solutions that are proven to improve adherence, provide efficiencies in care coordination, and empower provider decision support in commercial, clinical, and academic settings.

Through the 30+ education, reminder, support, aggregation, care coordination application, and research interventions identified in this review, MEMOTEXT has demonstrated expert abilities as a behaviour change engine that successfully leverages health data to personalize digital patient engagement communications solutions. The highly customizable and evidence-based approach positions them to tackle the many challenges facing healthcare systems today.

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