PRENATAL EXPERIENCE WITH DIGITAL VISIT PREPARATION

CO-DESIGNING AN IMPROVED PRENATAL EXPERIENCE WITH DIGITAL

VISIT PREPARATION

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LAY ABSTRACT

Satisfied patients are more likely to have better health outcomes, are more likely to provide a positive review about their care provider and are less likely to pursue malpractice claims. One possible way to make patients more satisfied is to better prepare them for visits with their doctor. This study explored the current pregnancy experience of patients at an obstetrics clinic in Niagara and combined patient and staff input to come up with potential ways to help them prepare. Most patients were satisfied with their care, especially ones who said they felt well prepared for their visits. Patients in their first pregnancy felt least prepared for their visits. Patients in early pregnancy shared that they had many questions and that they wished they could have seen their physician earlier. To help patients, a digital on-boarding package was designed to answer patients' questions and connect them with trustworthy resources.

ABSTRACT

Objective: Increased prenatal care satisfaction is associated with positive clinical and business outcomes. Despite a link between pre-visit preparation interventions and patient satisfaction, little is known about the development of digital pre-visit interventions to improve prenatal patient satisfaction.

Methods: A two-phase approach was employed. In the first phase, a mixed-methods survey was deployed to establish determinants of patient satisfaction, to identify unmet patient needs, determine current preparation practices and determine what visit patients felt the least prepared for. A convenience sample of 87 prenatal patients completed a self-administered survey on a tablet within 4 weeks of their estimated due date. In the second phase, a combination of participant interviews and staff workshops followed a Design Thinking methodology to co-design a prototype intervention to help patients prepare for their visit.

Results: Of the participants surveyed, 94.1% reported feeling satisfied with their prenatal care. Visit preparedness was found to be a statistically significant predictor of overall satisfaction. Preparedness was lowest in early pregnancy and for primigravida patients. Patients reported a mismatch between high informational needs and low visit frequency in early pregnancy. To fulfill their information needs, participants conducted frequent research on their pregnancy, often using digital resources such as websites, peer-forums, mobile applications and social media. Participants reported low satisfaction with system characteristics of their care, citing the wait time needed to see their provider, time spent in

the waiting room and a lack of flexibility in appointment scheduling as pain points in

their care. Utilizing a Design Thinking approach, a prototype digital on-boarding package

was co-developed with patients and clinic staff.

Conclusions for Practice: Implementation of a digital on-boarding package for patients

ahead of their first visit has the potential to fulfill informational needs and set

expectations for their care journey, which in turn can increase preparedness and

satisfaction.

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GLOSSARY AND LIST OF ABBREVIATIONS

AHRQ: Agency for Healthcare Research and Quality

BORN: Better Outcomes Registry & Network

CAHPS: Consumer Assessment of Healthcare Providers & Systems

AHS: Alberta Health Services

DA: Decision aid

FAQ: Frequently Asked Questions

FFS: Fee-for-service

FP: Family Practitioner

multigravida: A woman who has been pregnant more than once

MW: Midwife

OB: Obstetrician

OHIP: Ontario Health Insurance Plan

OBGYN: Obstetrician-gynaecologist

parturition: the act of giving birth

primigravida: A woman who is pregnant for the first time

PESPC: Patient Expectations and Satisfaction with Prenatal Care

PRW: Physician Review Website

RIAS: Roter Interaction Analysis System

SDMP: Shared Decision Making Process

SOB: Schedule of Benefits

DECLARATION OF ACADEMIC ACHIEVEMENT

I, Vernon Schneider, declare this thesis and the research described herein to be my own work. I am the sole author of this document.

My supervisor, Dr. Norm Archer and the members of my supervisory committee, Dr. Elaina Orlando and Dr. Uthra Mohan, have provided guidance and support at all stages of this project.

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1. INTRODUCTION & BACKGROUND

1.1 Overview

Understanding patient experience is a key part of providing patient-centred care and has the potential to drive better clinical outcomes as well as financial benefits for healthcare organizations. It is also recognized as a key pillar for healthcare in Ontario (*Annual Business Plan 2022/23*, 2022). In addition to the intrinsic moral value of providing quality patient experiences, better care experiences are associated with higher levels of adherence to treatment, better clinical outcomes, improved patient safety and less health care utilization (Price et al., 2014). There are also financial benefits to healthcare organizations that provide better patient experience, including decreased malpractice suits (Hickson et al., 1994a), better patient retention, and higher willingness of patients to recommend a provider, facility or health plan (Quigley et al., 2021). This is particularly relevant for obstetricians who pay the highest rates for malpractice insurance across Canada (Canadian Medical Protective Association, 2021) and have lost market share to midwives in the provision of prenatal services (BORN, 2022).

One approach to improving patient experience is to better prepare patients for visits with their health care practitioner. Interventions designed to prepare patients for an upcoming consultation with a physician have the potential to increase question asking, improve patient satisfaction, and decrease anxiety (Kinnersley et al., 2009). Relative to pre-visit interventions that are paper-based or rely on a human interviewer or coach, digital solutions have the advantage of being scalable with low incremental costs.

Despite this, a review of the literature shows that there have been few studies on the efficacy of digital visit preparation interventions. The majority of the visit preparation interventions reported in the literature (39 out of 43 that were reviewed) are paper-based, telephone-based, or involve in-person coaching (Albada et al., 2015; Kinnersley et al., 2009; Lindfors et al., 2019; Sepucha et al., 2019; Unnithan & Chidgey, 2021; Versluijs et al., 2021; Vo et al., 2019; Wolff et al., 2014; Zanini et al., 2016). Furthermore, studies have shown that pregnant patients are particularly open to engaging with digital technology to supplement their in person visits in order to receive information on their pregnancy (Butler Tobah et al., 2019).

1.2 Patient Experience as an Outcome

Patient Experience has become an important measure of delivering patient-centred care: all Canadian hospitals are required to survey patients on their experience with the hospital (*Patient Experience*, n.d.) while in the United States the use of patient experience measures has seen increasing utility in accreditation and pay-for-performance programs (LaVela & Gallan, 2014). Patient Experience has been broadly defined by the Beryl Institute as *"the sum of all interactions, shaped by an organization's culture, that influence patient perceptions across the continuum of care"* (The Beryl Institute, n.d.).

Critics of the use of patient experience as an outcome often point to a well-designed US study by Fenton et al. (2012) which found an association between patient satisfaction and greater inpatient use, higher healthcare and pharmaceutical expenditures and increased mortality over a 5-year period as evidence that measurement of patient experience can lead to negative health outcomes (Detsky & Shaul, 2013). This line of

reasoning deprecates the importance of treating patients according to their "individual preferences, needs and values", which is an essential part of quality care (*Quality of Care*, n.d.) and can be at odds with purely financial and physical health measures (Donabedian, 1966). Furthermore, a subsequent systematic review by Doyle et al. (2013) shows that although the evidence is mixed, there are strong associations between patient experience, clinical effectiveness and patient safety. Analysis by Manary et. al (2013) shows that mixed results may be related to inconsistent methodologies across studies that were reviewed, and that the quality of evidence depends on the following five factors:

1. Surveys that ask participants to consider specific events or visits vs a general assessment of a health plan have stronger associations with positive health outcomes.

2. Survey questions related to specific patient-provider interactions including supporting personnel (e.g. nurses, clerks, etc.) have stronger associations than questions about facilities and other elements of care.

3. Surveys delivered in a timely fashion after the provider-patient interaction are less likely to be affected by recall bias.

4. Outcomes that are risk-adjusted and related to the interaction of interest are more accurate.

5. Definitions of satisfaction differ between studies with varying degrees of usefulness.

The role of patient experience has been especially relevant in improving the quality of obstetrical care. Patient activism transformed the paternalistic perinatal practices of

enemas, episiotomies, perineal shaving, isolated birthing and narcotic use in the mid 20th

century (Arms, 1975; Sargent & Waldman, 2019) to modern obstetrical care which

fosters partner involvement and informed consent along with skin-to-skin contact and

breast-feeding of new-born infants (AHS, n.d.).

1.2.1 Why Patient Satisfaction?

Patient satisfaction was selected as a primary outcome for this study for 3 reasons:

1) there are validated surveys for evaluation of prenatal care, 2) it is a well-established

indicator of service quality within and outside of healthcare (Bitner et al., 2008) and 3) it

is easy to administer a patient reported outcome.

1.2.2 Patient Satisfaction as a Construct

Although satisfaction as a measure of service quality is a concept that is

intuitively simple, its social-psychological underpinnings make it a complex and widely

studied construct (Worthington, 2005). The model that shows the most promise for

patient experience is the Consumer Model of Satisfaction that incorporates assimilation-

contrast theory (Worthington, 2005). This theory postulates that satisfaction is derived

from a comparison of a consumer's expected experience and their actual experience. If

the distance between expectation and the actual experience are within a "zone of

tolerance," an individual's perception of their actual experience will be adjusted to match

their expected experience. If the individual's actual experience is outside of the "zone of

tolerance," their satisfaction or dissatisfaction will be amplified. An analogy for this

would be that seeing an overflowing garbage can at a local fair would draw much less

disgust than seeing one inside a restaurant. In the case of the local fair, the experience is within the "zone of tolerance" of expectations whereas it would be decidedly outside of the zone in a restaurant, leading to an amplified negative experience. The perceived lack of choice and power discrepancy between patients and providers have led to concerns that an overly wide "zone of tolerance" exists in the Canadian health care context that would explain observed high rates of satisfaction (Worthington, 2005). It is therefore prudent to consider questions about specific elements of care, about which patients tend to be more critical, and to ensure that qualitative questions are asked in order to capture details of the patient's perception of care that would not otherwise be captured on a standardized survey (Worthington, 2005). Asking for specific feedback about elements of their care and allowing patients to put their feedback in their own words allows for better granularity on where the patient experience may have fallen beyond the zone of tolerance and identify opportunities for improvement.

1.3 The Clinical Case for Satisfaction in Prenatal Care

The past 100 years have seen significant improvements in the maternal and infant outcomes of pregnancy (Canadian Public Health Association, n.d.). These improvements have been borne out of advancements in the understanding of the physiology of gestation and parturition. The result is that among managing diet, supplements, organizing blood work and ultrasounds, being pregnant in 2021 is a complex proposition for patients. Prenatal care will likely become more complex as Canadian women continue to have babies in their later reproductive years (Johnson et al., 2012). Despite the on-going debate

on how to best define it, adherence to prenatal care leads to better outcomes (Alexander & Kotelchuck, 2002), particularly in Black and low-income populations (Misra, 1998).

Patient experience has shown positive associations with adherence to treatment (Doyle et al., 2013) generally and specifically in the context of prenatal care (Bennett et al., 2006; Evans & Sheu, 2019)

1.4 The Business Case for Patient Satisfaction in Prenatal Care

1.4.1 Competition in Providing Prenatal Care

In the context of the Ontario healthcare system, prenatal care is a somewhat unique medical specialty in that patients have the choice of three fully insured types of provider: family practitioners, obstetricians or midwives.

According to data from the Better Outcomes Registry & Network (BORN, 2022), which tracks information on maternal health in Ontario, obstetricians provided prenatal care for 10,651 fewer patients in 2021 than they did eight years prior (Table 1).

Table 1

Prenatal Care by Healthcare Provider (BORN, 2022)

Provider	2012-2013 Fiscal Year	2020-2021 Fiscal Year	Change
Family Doctor	35,583	32,302	-3,281 (-9%)
Midwife	17,877	26,552	8,675 (49%)
Obstetrician	106,312	95,661	-10,651 (-10%)
None	1,109	559	-550 (-50%)
Other	3,724	2,058	-1,666 (-45%)
Unknown	1,458	6,727	5,269 (361%)
Total Babies	141,502	136,782	-4,720 (-3%)

Note: Fiscal year is defined by infant date of birth. Each fiscal year ranges from April 1st - March 31st.

Data shows that between fiscal years ending 2013 and 2021, there was a 7.6% increase in share of prenatal care provided by midwives and corresponding drops in share of prenatal care by family practitioners and obstetricians of approximately 3.8% and 2.3% respectively as shown in Figure 1.

Figure 1

Main Antenatal Care Provider(s) in Ontario 2012/13 to 2020/21
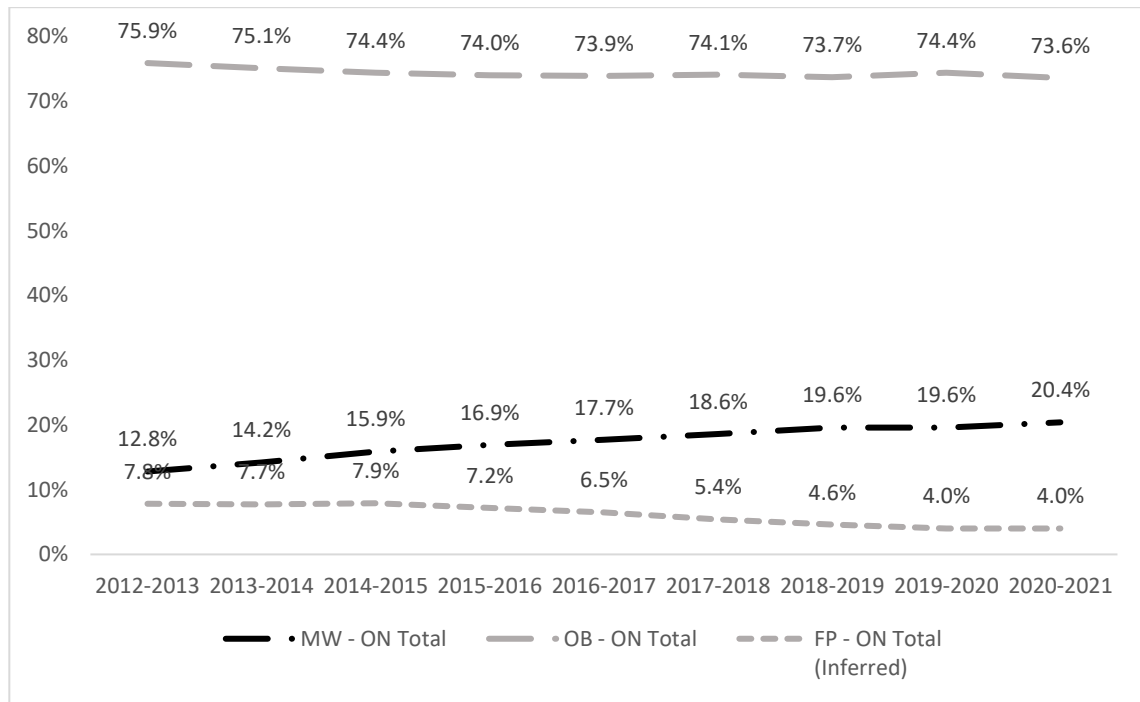
Although the reasons leading to this shift in share of prenatal care providers in Ontario have not been fully explored in the literature, reasons cited for selecting a midwife include preferring a home-birth, reduced pain management and medical interventions, continuity of care after delivery and longer prenatal appointments with a focus on physical and emotional needs (Changing Childbirth in British Columbia, 2019; Karr, 2020). A systematic review by Quigley et al. (2021) found that patients with positive care experiences were more likely to lead to repeat business, and voice fewer complaints, particularly when there was strong communication and trust with their health care provider.

The impact of patient satisfaction on the provider's business is also amplified via physician review websites (PRWs). A study by Bidmon et al. (2020) of 7,038 German general practitioner physician surveys posted on a PRW found that satisfaction and in particular, the interpersonal relationship between patient and physician has a significant impact on ratings posted on physician review websites. A study by McBride et al. (2015) found that 78% of a similar population (parents of children <17) were aware of PRWs and that 28% of them had used a PRW to help them select a pediatrician. Given that in Canada, obstetricians and gynecologists are among the most frequently rated specialty on these sites (Liu et al., 2018), PRW ratings and the experiences that inform them are critical to the long term success of their practices.

1.4.2 Risk Mitigation and Malpractice Insurance

Obstetricians pay the highest malpractice insurance of any medical specialty in Canada (Canadian Medical Protective Association, 2021). This is due to a higher rate of lawsuits, and the fact that potential awards consider the entire life of the infant (Rostow et al., 1990). A study by Hickson et al. (1994) found that obstetricians whose patients felt rushed, did not receive explanations for tests or had complaints about physician-patient interactions had a higher frequency of malpractice claims and higher settlement amounts than those who did not. Better patient preparation has the potential to improve the quality of provider-patient interactions through better question asking, and creating a stronger feeling of control for the patient (Thompson et al., 1990), which may lead to not only higher satisfaction with care but also decrease malpractice claims against prenatal care

providers. This, by extension, would decrease malpractice insurance premiums for all prenatal care providers.

1.5 Connecting Preparedness to Patient Satisfaction

A key determinant of prenatal care satisfaction is the interpersonal relationship between patient and clinician (Gregory et al., 2020). The clinicians' friendliness and courteousness, lack of perceived discrimination, respectfulness, and emotional support are all significant predictors of satisfaction (Wong et al., 2004). Fee-for-service (FFS) payment models, such as the one in place for obstetricians in Ontario, incentivize seeing many patients. As an example, in the fiscal year ending 2021 the estimated[1] 12-14 obstetricians in Niagara provided prenatal care for an average of 203-237 patients (BORN, 2022). This model means that physicians spend a significant amount of appointment time covering the bio-medical aspects of a patient's care (Roter et al., 1999), leaving less time to build the patient relationship or address their psychosocial needs. It has also been shown that time spent with a prenatal patient has a positive impact on patient satisfaction (Vedam et al., 2019). In contrast, midwives in Ontario are compensated based on an entire course of care (prenatal, perinatal and postpartum care)

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[1] This is an estimate supported by insights from the physicians at GROW Niagara Health. While the number of obstetricians with hospital privileges in Niagara has remained stable at 13, exact numbers are difficult to assess due to vacancies, parental leaves and obstetricians without hospital privileges providing prenatal care in the community.

and are capped at 40 prenatal patients per year (Cornish et al., 2017) and spend more time with their patients in each visit (Changing Childbirth in British Columbia, 2019).

The midwifery model of spending more time with a fewer number of patients is, in part, enabled by a supportive compensation program. In Ontario, midwifery compensation is negotiated individually between transfer payment agencies and individual midwifery practices. These agreements cover both care fees that are dependent on the experience level of the midwife and allocated by course of care as well as funding for overhead costs such as travel disbursements, professional development, leasehold improvements and office equipment (Courtyard Group, 2010). By comparison, Ontario compensation for FFS physicians such as obstetricians is negotiated between the Ministry of Health and the Ontario Medical Association and outlined in the Physician Services Agreement Schedule of Benefits (PSA SOB) (MOHLTC, 2022). Because of the differences in compensation methodologies, comparison of the prenatal care compensation between midwives and fee-for-service physicians can be challenging. However, estimates can be derived by calculating the full course of care compensation for midwives (Courtyard Group, 2010), subtracting the percentage of the course of care that applies to perinatal care (Walters et al., 2015) and then comparing the average visit compensations for prenatal and postpartum care between care providers as shown in Appendix A. This approach suggests that midwives are paid between 1.8 and 2.6 times as much as obstetricians for their prenatal and postpartum visits.

Based on the current fee-for-service model in Ontario, it is unlikely that physicians will financially be able to provide longer prenatal appointments, particularly in

the current financial environment where physician fees are increasing at lower rate than inflation (Bank of Canada, n.d.; OMA, 2022). As a result, an intervention allowing patients and physicians to enhance the quality of interaction during appointments is critical to maintaining patient satisfaction.

2. LITERATURE REVIEW

2.1 Search Strategy

A literature search was conducted to evaluate existing evidence for pre-visit interventions on patient satisfaction. Three databases were used: PubMed, which has good coverage of medical literature, PsycINFO which covers behavioural science topics and CINAHL which covers topics of nursing or allied health (Bramer et al., 2017). Reference lists of articles were also reviewed. The following search terms were used: (Pre-visit OR inter-visit OR "between visits" OR pre-consultation OR previsit OR "pre consultation" OR pre-appointment) AND ("Patient satisfaction" OR "patient experience"). Because eHealth is a rapidly evolving field, the search was restricted to between 2015 and when the search was completed in August 2021.

2.2 Selection Criteria

Inclusion criteria were 1) high quality studies with 2) a patient intervention that 3) occurs before a visit and 4) includes evaluation of satisfaction or other experience metrics. High-quality studies were determined by applying the Mixed Methods Appraisal Tool (Pluye & Hong, 2014). To allow for applicability to the Canadian system, countries with similar healthcare system and cultures were chosen for inclusion (i.e. North America, Western Europe). Only English studies were selected for inclusion. Randomized control trials, cohort trials, systematic reviews were included.

Exclusion criteria include 1) interventions that consist only of an appointment reminder, and 2) interventions that consist of a survey solely for research purposes.

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2.3 Data Collection and Analysis

Given that this was not a formal systematic review, a single researcher assessed the output, selected studies for inclusion and extracted the data using the Covidence systematic review package (Veritas Health Innovation, 2021). Given the broad range of studies being considered, the Mixed Methods Appraisal Tool developed at McGill University (Pluye & Hong, 2014) was used to evaluate the search studies. The results of the evaluation are included in Appendix B.

2.4 Search Results

An overview of the search results is shown in Figure 2. A total of 120 articles were found that met the search criteria. After removing duplicates, 94 articles were screened against the selection criteria. Of those, 15 full text articles were reviewed for quality and exclusion criteria and 8 studies were selected for extraction.

Figure 2

PRISMA Diagram Showing Articles Selected for Extraction
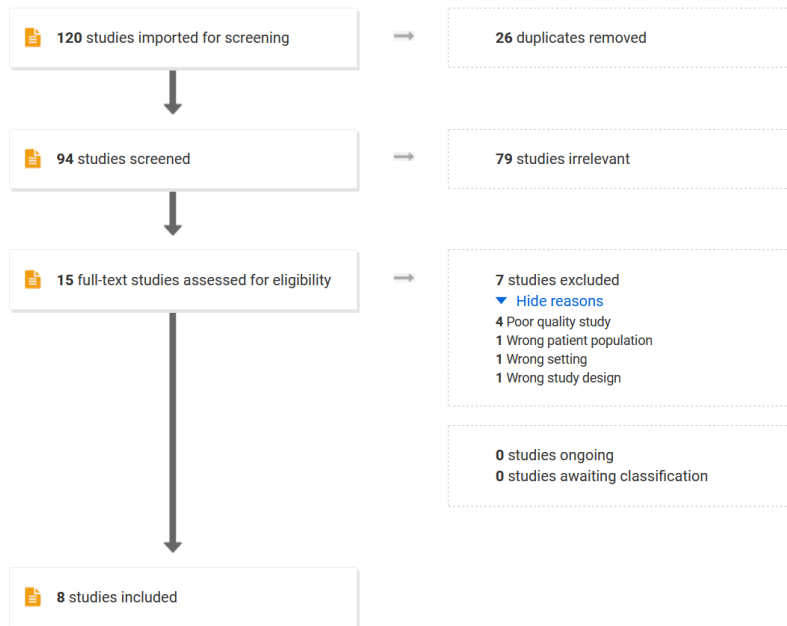
The characteristics of the studies reviewed are included in Table 2.

Table 2

Characteristics of Included Studies

Author(s), location	Country	Study period	Study design	Sample size	Strength of Evidence
Versluijs et al.	USA	May 2018 – Sept 2019	Prospective Randomized Control Trial	122	Good
Lindfors et al.	Sweden	Autumn 2016 – Spring 2017	Randomized	291	Good

			intervention study		
Sepucha et al.	USA	April 2017 – Dec 2017	Randomized comparative effectiveness trial	967	Good
Wolff et al.	USA	April – August 2012	Randomized pilot study	32 (17 dyads)	Good
Unnithan et al.	USA	Not reported	Prospective cohort study	407	Good
Albada et al.	Netherlands	Feb 2008 – Apr 2010	Randomized Control Trial	197	Good
Zanini et al.	Switzerland	Not reported	Qualitative study	50	Good
Vo et al.	USA	March 2015 – Oct 2016	Pragmatic Cluster Randomized Control Trial	456	Good

Appraisal of the evidence is shown in Table 3.

Table 3

Appraisal of Evidence

Author(s), year, location	Mode of intervention	Description of Intervention	Outcomes measured	Evaluation of objectives	Key Findings
(Versluijs et al., 2021), USA	Phone	Patients were called by an orthopedic surgeon before their scheduled visit	Impact of decision conflict, perceived empathy or no showing at the appointment	Post-call survey	No significant difference in decision conflict, perceived empathy or missing the appointment. Strong opinion from surgeons that calls could replace visits.
(Lindfors et al., 2019), Sweden	Phone	Patients were informed of appointment length when booking	Decreased visit length	Time and motion, post-visit survey	No significant differences in consultation time, patient satisfaction, patient enablement or physician satisfaction. Stratified data showed significantly shorter time for the intervention group at one site and for one group of physicians.
(Sepucha et al., 2019), USA	Online / video decision aids	Decision aids (DAs) were provided ahead of patient orthopedic consultations. Patients were either given a short or long survey and were asked to complete a short survey regarding their care preferences. In one cross-sectional group, physicians reviewed the data prior to the visit while in other they did not.	Patient knowledge, decision quality, shared decision making process (SDMP), surgeon satisfaction	Post-visit surveys	SDMP scores were similar across DAs and surgeon groups. Most surgeons were extremely or very satisfied with the visits (84.8%) and reported visit durations were either normal (68.6%) or shorter (20.1)% across both DAs. The short DA was more effective in improving knowledge and was associated with higher shared decision making with low literacy patients. Knowledge level remained high well after the intervention. Whether the surgeon read the patient preference report did not have an impact on outcomes.
(Wolff et al., 2014), USA	Pre-visit checklist	Geriatric patients were provided with a pre-visit checklist to complete in the waiting room (with their companions where applicable) prior to going into a physician visit	Perception of checklist Perception of physician communication Patient-centred communication Visit duration Patient and companion verbal activity	Roter Interaction Analysis System (RIAS) analysis of visits Post-visit survey Physician survey	Increased patient-centred communication. Physicians indicated patients helped them to provide better care. Visit duration, total verbal activity by patients and companions were not statistically different vs the control.
(Unnithan & Chidgey, 2021), USA	Pre-visit informational handout	Patients were provided with a handout that detailed approach, expectations for treatment process and opioid prescribing policy	Did their plan meet their expectations Satisfaction of treatment plan Would additional information be helpful	Post-visit survey	Significantly higher satisfaction scores and higher met expectations with the intervention group. 62% of the control group indicated they would have liked to know more prior to their visit.

Author(s), year, location	Mode of intervention	Description of Intervention	Outcomes measured	Evaluation of objectives	Key Findings
(Albada et al., 2015), Netherlands	Pre-visit educational website	Patients were provided access to a website with information about breast cancer	Visit satisfaction Positive experience with counseling Perceived personal control Information recall Knowledge level Anxiety Cancer worry Risk perception alignment Adherence to breast surveillance advice	Questionnaires at pre- and post-counseling and 1 year follow-up	Intervention group were more satisfied with their visit, and had more positive experiences with counseling. They also had higher perceived personal control after one year. No significant effects were found on recall, knowledge, anxiety, cancer worry, risk perception alignment and adherence to breast surveillance advice.
(Zanini et al., 2016b), Switzerland	Pre-visit consultation sheet (PCS)	Chronic pain patients were asked to write down their answers to 5 questions about their health condition and 5 questions about their treatment preferences. PCS was then used as a basis of conversation during the discussion	Patient satisfaction Physician satisfaction How intervention affects the consultation. The perceived value / usefulness of the intervention for patients and physicians	Video-recording Post-visit interviews	Satisfaction reported with both patient and physician groups. Patients value PCS as a summarization tool, a means to make their views known (and protected) and reducing first visit anxiety. Physicians value PCS as an effective way to gather patient information including their expectations and views.
(Vo et al., 2019), USA	Pre-visit secure email through online portal	Patients with uncontrolled diabetes would submit top 1-2 priorities per visit. These would show up as part of the patient's chart prior to the patient's consultation	Proportion of patients that reach their HbA1c goal at year 1 Patient-provider communication Patient care experiences	Chart review Post-visit telephone surveys	Intervention arm patients reported preparing questions for their visit and being given treatment choices to consider. No significant differences HbA1c reduction between arms

No studies on pre-visit preparations specific to prenatal care were found but it is reasonable to assume that interventions in other areas of medicine would apply to obstetrical care. The interventions described in the studies were designed to help prepare a patient for their upcoming consultation with a physician. Slightly different mechanisms of preparation were employed: three studies used education (Albada et al., 2015; Sepucha et al., 2019; Versluijs et al., 2021), two studies used expectation setting (Lindfors et al., 2019; Unnithan & Chidgey, 2021) and four studies required that the patient record information about their condition, and/or their objectives for their upcoming consultation (Sepucha et al., 2019; Vo et al., 2019; Wolff et al., 2014; Zanini et al., 2016). Five of the six studies that included patient satisfaction as an outcome reported significant improvements (Albada et al., 2015; Sepucha et al., 2019; Unnithan & Chidgey, 2021; Zanini et al., 2016b). None of the studies showed an increase in consultation time.

Of the studies reviewed, three had pre-visit interventions with direct physician involvement (Versluijs et al., 2021; Vo et al., 2019; Zanini et al., 2016), four had pre-visit interventions with no direct physician involvement (Albada et al., 2015; Lindfors et al., 2019; Unnithan & Chidgey, 2021; Wolff et al., 2014) and one study had arms with and without direct pre-visit physician involvement (Sepucha et al., 2019). Three out of four of the studies without direct physician involvement showed positive results, while one out of three of the studies with direct physician involvement showed positive results, suggesting that the role of the physician in pre-consultation planning may have limited influence on the satisfaction outcome.

2.5 Systematic Reviews

Two systematic reviews were discovered that are relevant to pre-visit interventions although they did not show up in the search strategy due to either incompatible search terms or a publishing date prior to 2016. The quality of these studies was evaluated using the Critical Appraisal Skills Programme (CASP) checklist for systematic reviews (Appendix B) and are discussed in more detail below.

2.5.1 Kinnersley Systematic Review

Evaluation of the Kinnersley et al. Systematic Review (2009) using the CASP checklist suggests that it is of high quality. The researchers reviewed 33 randomized control trials with pre-consultation interventions. Only studies with interventions that were designed to help patients and their caregivers address information needs inside the consultation (e.g. to consider and/or express the information that they need or to clarify specific topics) were included. The authors excluded interventions that provided information unrelated to the consultation, that provided general information about their symptoms or illness, training that was directed solely at clinicians, or symptom diaries unless it also appeared to encourage identification of patient information needs. The characteristics of interventions included in the study are listed in Table 4.

Table 4

Characteristics of Interventions

Number of Studies	Intervention	Components	Format
15	Single	Single	Written materials
4	Single	Single	Coaching
1	Single	Single	Audiotape of previous consultation
4	Single	Multiple	Coaching and written materials
1	Single	Multiple	Coaching and a computer program
1	Single	Multiple	Coaching, written materials and a video
1	Multiple	Multiple	Written materials vs written materials + coaching
1	Multiple	Multiple	Written materials vs brief advice on question asking
1	Multiple	Multiple	Brief message about question asking vs interview to identify questions vs coaching
2	Multiple	Multiple	Two forms of written materials
1	Multiple	Multiple	Two forms of coaching
1	Multiple	Multiple	Written materials vs brief message about question asking

Kinnersley et al. also conducted a meta-analysis on outcomes data where possible. The authors used the weighted mean difference (WMD) method for outcomes that were homogeneous across studies and the standard mean difference (SMD) method for outcomes that were heterogenous across studies. Their findings are outlined in Table 5.

Table 5

Findings of Meta-Analysis (Kinnersley et al., 2009)

Outcome	Method of Comparison	Finding	CI (95%)
Question asking	SMD	0.27 (increase)	0.19 – 0.36
Patient satisfaction	SMD	0.09 (increase)	0.03 – 0.16
Anxiety before consultation	WMD	-1.56 (decrease)	-7.1 – 3.97
Anxiety after consultation	SMD	-0.08 (decrease)	-0.22 – 0.06
Patient knowledge	SMD	0.34 (reduced)	-0.94 – 0.25
Consultation length	SMD	0.10 (increased)	-0.05 – 0.25

The researchers found that although coaching and written materials had similar effects on question asking, coaching led to a smaller increase in consultation length with a larger increase in patient satisfaction. With respect to the timing of the intervention, they found that an intervention right before a consultation had a small but statistically significant increase in consultation length and that interventions that happened two weeks or earlier before a consultation had no effect. Patient satisfaction increased for interventions that happened both immediately before and a long way before consultation, but the increase was only statistically significant for those that occurred immediately before the consultation. There were no benefits found from clinician training in addition to patient interventions, though evidence is limited.

One of the articles included in the systematic review was based on two randomized controls trials that explored the impact of prompting patients to think about questions they would ask during their OBGYN visit while waiting in an obstetrician-

gynaecologist office. The study found that patients who wrote down questions or received a message from their physician encouraging them to ask questions were more satisfied with their visit, more satisfied with the quality of information they received, had greater perceptions of control and were more likely to ask all the questions that they wanted to (Thompson et al., 1990). Although the sample sizes were small, and the study included both obstetric and gynaecologic patients, it lends support to the theory that pre-visit preparation can increase satisfaction with prenatal care.

2.5.2 Gholamzadeh Systematic Review

Evaluation of the Gholamzadeh et al. (2021) article using the CASP checklist suggests that it is of extremely low quality and cannot be used for the basis of this study. Despite being more current (published in 2021), the paper is attempting to both conduct a systematic review and provide a framework for pre-visit planning, which make it not particularly useful for either. The inclusion criteria of "improve patient-centered care" is particularly problematic as it embeds bias into the study design. No further analysis was done.

2.6 Study Rationale

The literature shows that interventions designed to prepare patients for consultation have the potential to increase question asking, improve patient satisfaction, and decrease anxiety (Kinnersley et al., 2009). At the same time there has been a rapid increase in the adoption of digital health technology – particularly amongst the population that are most likely to have babies (women between the ages of 18-39) (Mahajan et al.,

2021; Provencher et al., 2018). However, little research has been done on the application of digital interventions on pre-visit preparation. Of the forty-three studies reviewed, only four included pre-visit interventions that involved the use of a computer or the internet and none explored digital pre-visit preparation specifically in the context of prenatal care.

There is therefore an opportunity to improve the patient experience by creating a digital intervention to prepare patients for their visits. Analysis suggests three mechanisms have been shown to be effective in increasing patient satisfaction: 1) education, 2) setting expectations and 3) getting the patient to summarize their conditions and their desired outcomes from the consultation. It is also clear that interventions can have an impact even without the participation of a physician.

2.7 Research Questions

The over-arching research question to be initiated in this thesis is whether digital visit preparation increases patient satisfaction with their prenatal care. Before the intervention can be evaluated, it first needs to be defined. The objective of this thesis is thus to answer the following questions in the context of a single prenatal clinic:

1) What are baseline levels and determinants of patient satisfaction?

2) How do patients prepare today?

3) What period during their pregnancy do patients feel the least prepared for?

4) What are patients' unmet needs as it relates to their prenatal care?

5) What digital interventions might be effective in improving patient preparedness and/or satisfaction?

3. PLAN OF INVESTIGATION

To answer these research questions, a two-phase approach was utilized as outlined in Table 6. Phase I established a baseline and helped to better understand existing patient needs and practices, utilizing a mixed methods quantitative & qualitative survey, combined with targeted patient interviews. Outputs from Phase I were then used in Phase II to iteratively design prototype patient interventions using a Design Thinking methodology.

Table 6

Research Plan

Phase	Description	Objectives	Methodology
Phase I	Baseline & Needs Assessment	• Establish baseline levels and determinants of patient satisfaction • Identify unmet patients needs • Determine what period patients felt least prepared for • Explore current preparation practices	Mixed-methods survey
Phase II	Prototyping	• Co-develop digital intervention prototypes with the potential to improve preparedness and/or satisfaction	Design Thinking Workshop Patient Interviews

3.1 Population & Setting

Phases I & II were conducted in conjunction with the GROW Niagara Health Obstetrics & Gynecology Clinic in St. Catharines (Mohan, 2022), within the Niagara region of Ontario,Canada. Niagara encompasses 12 municipalities in the area west of Hamilton that is bordered by two Great Lakes to the North and South and the state of New York in the East. It has a median after-tax income of $72,105, which is 9% less than

the provincial average (Niagara Region, 2021). There are approximately 4,000 births in the Niagara region each year (Niagara Region, n.d.). The prevalence of smoking in the region is 57%, which is higher than the provincial average (Niagara Region, n.d.). There is also a high rate of obesity (Niagara Region, 2021). The GROW Niagara Health clinic has been in operation since October 2021, and includes three certified OBGYNs. They manage the care of approximately 20% of the region's obstetrical patients each year. The clinic's vision is rooted in patient experience: *"We are the preferred choice for OBGYN care in Niagara. When patients come to us, they feel heard and are able to make the best decisions for their care. We are recognized for our holistic approach, excellent care and patient experience. We make positive contributions to the community."* (Mohan & Baker, 2019). In addition to providing quality care, the physicians are committed to achieving a high level of patient satisfaction.

3.2 Ethics

Ethics review of the study proposal was obtained from the McMaster Research Ethics Board (MREB) prior to commencement of the study (MREB# 5866; Appendix C). Informed consent was obtained from participants electronically for the survey and orally for interviews, in line with MREB guidelines.

4. PHASE I: BASELINE & NEEDS ASSESSMENT STUDY

4.1 Objectives

The objective of Phase I was to build a baseline understanding of the current patient experience in four dimensions:

1) What are baseline levels and determinants of patient satisfaction?

2) What period during their pregnancy do patients feel the least prepared for?

3) How do patients prepare today?

4) What are patients' unmet needs as it relates to their prenatal care?

4.2 Methods

4.2.1 Study Implementation

The questionnaire was implemented via a McMaster hosted instance of the cloud-based research platform REDCap (*REDCap*, n.d.). The survey was self-administered by patients while awaiting their prenatal appointments at or shortly after 36 weeks gestational age.

4.2.2 Outcomes Measured

The questionnaire contained five sections aligned with the survey objectives as stated in Section 4.1.

Baseline Satisfaction with Prenatal Care

Evaluation of patient satisfaction was adapted from the Patient Expectations and Satisfaction with Care Instrument (PESPC) instrument developed by Omar et. al. (Omar et al., 2001). The validated instrument probes were utilized in a similar setting (Gregory et al., 2020). The PESPC has the benefit of looking at the patient's satisfaction as well as what their expectations were, since expectations have been found to influence satisfaction (Hadler et al., 2020). Patients were also asked to provide an overall assessment of their satisfaction and rate their willingness to recommend GROW Niagara to a friend or family member.

The Best Opportunity for Visit Preparation

The survey also included a question that asked patients to recollect their preparedness for visits at four points in the pregnancy: while seeing their primary care physician, their first visit and subsequent visits during their first, second and third trimesters where applicable.

Unmet Needs

Three additional open-ended questions were incorporated for context on the quantitative feedback and to build a deeper understanding of unmet needs. To accomplish this, participants were asked what went well and what they would have changed regarding their prenatal care at the clinic using supplemental questions taken from the Agency for

Healthcare Research and Quality's (AHRQ) Consumer Assessment of Healthcare

Providers & Systems (CAHPS) survey list (AHRQ, n.d.).

Current Practices and Information Sources

Patients were asked to describe their current preparation processes and to list the

resources outside of prenatal visits that they find most useful. Qualitative questions are

shown in Table 7.

Table 7

Qualitative Questions

Source	Question
AHRQ CAHPS Survey	Thinking about your prenatal care at GROW Niagara, what went well? Please explain what happened, how it happened, and how it felt to you.
AHRQ CAHPS Survey	Thinking about your prenatal care at GROW Niagara, what do you wish had gone differently. Please explain what happened, how it happened, and how it felt to you.
New	How do you prepare for your visits at GROW Niagara? Please be as descriptive as possible.

Patient Characteristics and Demographics

Potential confounders to the evaluation of patient satisfaction were identified and

include emotional health, whether the pregnancy was high risk, and basic demographic

information including household income (Galle et al., 2015; Tough et al., 2004). Two

simple Likert questions assessing the participant's physical and mental and emotional

health were developed from a study by Tough et al. (Tough et al., 2004) and with input

from clinic staff. Basic demographic information was assessed by adapting questions on

education status, minority status, and year of birth. Wording was adapted from the demographics section of the Canadian Institute for Health Information's (CIHI) Canadian Patient Experiences Survey (CIHI, 2019). Although there are many options to capture demographic information, this survey was considered adequate as it is widely used and is updated frequently. Separate questions on annual income, pregnancy risk factors and gravidity/parity were also included. Patients were not asked to identify their gender as the combination of low prevalence of non-binary pregnancies in the population (Moseson et al., 2020; Statistics Canada, 2022) and low target sample size would limit exploration of meaningful differences in the pregnancy experience for this group. The full survey can be found in Appendix D.

4.2.3 Eligibility Criteria

Inclusion criteria were that the patient must 1) be pregnant at the time of the survey, with a live fetus of at least 36 weeks gestational age, 2) have had at least 4 physician visits with a physician at the clinic, 3) be at least 16 years old and 3) be able to read and complete a survey in English. Patients were excluded if they were being seen due to a transfer of care from another OB/GYN or midwife.

4.2.4 Patient Recruitment and Informed Consent

Participants were pre-screened for eligibility by clinic staff based on their estimated due date, the number of visits they had had at the time, their age, and the type of referral they had. Potential participants were then highlighted on a day sheet used by clinic staff as part of their standard processes and were invited to participate in the study

via one of two tablets that were kept in the office for easy access. Because the survey was cloud based, no patient health information was saved on the tablet itself. Study information and informed consent was obtained electronically on the tablet prior to initiating the study.

4.2.5 Sampling

Comparative statistics were not required therefore a convenience sample of 60-80 patients was sought.

4.2.6 Data Analysis

Descriptive data analysis was completed on all quantitative variables. Willingness to recommend was used to calculate Net Promoter Score (NPS) (Reichheld, 2004) and compared to satisfaction. Overall satisfaction was compared to specific elements of care, as well as potential covariates including race, socio-economic factors, education and whether the patient was primigravida (first pregnancy) or multigravida (second or subsequent pregnancy) using the Kruskal Wallis test for comparison between the groups. Findings were compared to similar studies (Galle et al., 2015; Gregory et al., 2020; Hadler et al., 2020). The average of the four satisfaction domains of care in the PESPC survey were calculated by assigning a value of 1 to 4 to each Likert score value ranging from low to high accordingly. Quantitative analysis was conducted using R-Studio version 2022.2.2.485 (RStudio, 2022).

Qualitative analysis was conducted using Microsoft Excel version 2302 (Microsoft, 2023). Data on what patients felt went well and what they would have changed was coded deductively into seven themes that have been shown to encompass how patients describe their care (Worthington, 2005): patient-centred care, access, communication & information, courtesy and emotional support, efficiency of care / effective organization, technical quality, and structure and facilities.

Open-ended questions on how patients currently prepare for visits and helpful information sources were analyzed using inductive content analysis (Elo & Kyngäs, 2008). After reviewing the feedback, categories based on common responses were developed with more specific sub-categories where applicable. The content was then coded and summarized in frequency tables.

4.3 Results

4.3.1 Recruitment

The survey was in field for 12 consecutive weeks starting in May 2022. Out of the 103 patients that were pre-screened for participation, 87 (85%) agreed to participate in the survey.

4.3.2 Demographics and Patient Characteristics

The demographic characteristics of the patients are listed in Table 8. The age[2] of participants ranged from 21 to 42 with a mean of 31.87 years. The participants were well educated with the majority (87%) having some form of post secondary education. Most were employed (83.5%), married (94%), and do not identify as a visible minority (85.9%). A majority of participants had a medium (44.7%) to high (40.8%) income. Relative to the general population of women in Niagara, the sample was better educated, more likely to be married and had higher household incomes. The proportions of participants that were employed and identified as visible minorities were similar to those found in the general population.

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[2] Age corresponds to the age that the participant reached in 2022 and is derived using the formula [2022 – year of birth]

Table 8

Demographics and Characteristics of Participants

Characteristic	n	Percentage	Population (%)[a]	Mean (SD)
Age (years)	75			31.87 (4.55)
Highest Education Attained				
High School	11	12.9	31.0	
College or other non-university certificate or diploma	35	41.2	32.0	
Undergraduate degree or some university	20	23.5	15.0	
Post-graduate or professional designation	19	22.4	6.0	
Total	85			
Employment				
Employed	71	83.5	83.1	
Student	5	5.9		
Not employed	9	10.6		
Total	85			
Marital Status				
Married	78	94.0	55.0	
Not Married	5	6	45.0	
Total	83			
Visible Minority				
Yes	11	14.1		
No	67	85.9	86.8	
Total	78			
Household Income				
≤$49,999	11	14.5	70.5	
$50,000-$99,999	34	44.7	24.1	
≥$100,000	31	40.8	5.4	
Total	76			

[a]2021 Census of Population of Women in the Regional Municipality of Niagara (Statistics Canada, 2023). Detailed statistics were not available for non-binary residents.

Patient-reported health characteristics are reported in Table 9. Participants reported favourable self-assessments of their physical (90.6% good or better) and mental health (89.4% good or better). The distribution of first-time pregnancies vs returning mothers was nearly equal with 49.4% primigravida and 50.6% multigravida participants.

Table 9

Participant Reported Health Characteristics

Characteristic	n	Percentage
Physical Health		
Excellent	15	17.6
Very good	35	41.2
Good	27	31.8
Fair / Poor	8	9.4
Total	85	
Mental Health		
Excellent	15	17.6
Very good	30	35.3
Good	31	36.5
Fair / Poor	9	10.6
Total	85	
First Pregnancy		
Primigravida	41	49.4
Multigravida	42	50.6
Total	83	

4.3.3 Prenatal Patient Expectations

A total of 87 participants completed the questions on their expectations. The results are shown in Figure 3.

Figure 3

Participant Expectations with Specific Elements of Care
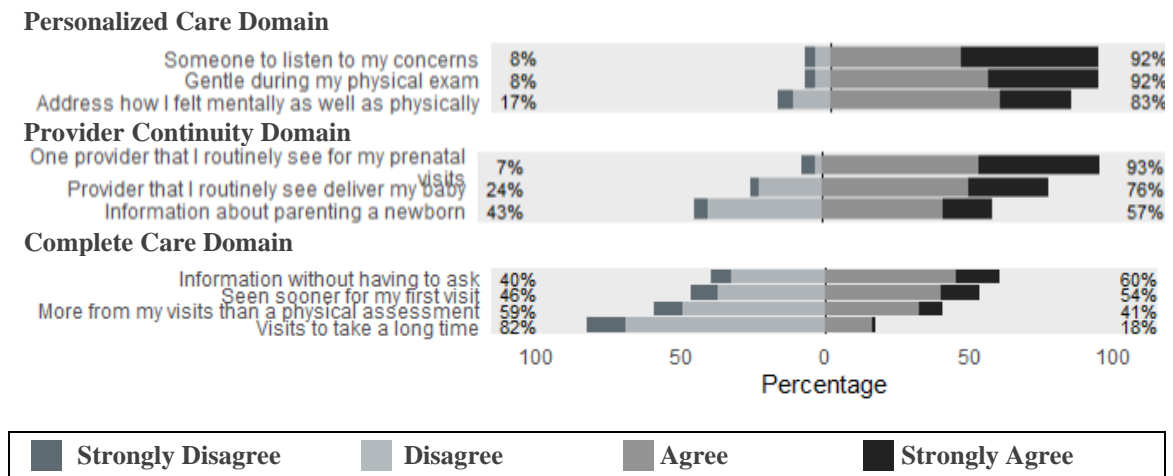
Participants had the highest expectations as it relates to being seen by one provider for their prenatal visits, having someone to listen to their concerns, being gentle during their physical exam and addressing both their mental and physical needs. Expectations varied on other elements of their care with some participants agreeing and some disagreeing about whether they expected 1) their usual prenatal care provider to deliver their baby, 2) to receive information without having to ask a lot of questions, 3) to receive information about parenting a newborn and 4) to be sooner for their first visit. Participants had low expectations as it relates to having more from their visits than being weighed and having baby's heartbeat checked and visits taking a long time.

Among the domains outlined by Omar et al., (2001), expectations of personalized care ranked the highest with a mean of 3.63 (SD = 0.46) out of a possible score of 4, followed by expectations of provider continuity with a mean of 3.00 (SD = 0.56) and expectations of complete care with a mean of 2.43 (SD = 0.55).

4.3.4 Patient Experience Evaluation

Participants had a high degree of satisfaction with 21 (24.7%) selecting that they were "satisfied" and 59 (69.4%) selecting that they were "Very Satisfied" with their overall care. This is consistent with a high net promoter score of 73.3% (a detailed breakdown of the calculation from willingness to recommend is outlined in Table 10).

Table 10

Net Promoter Score

Willingness to Recommend	n	Percentage
Promoter (9-10)	68	79.1
Neutral (7-8)	13	15.1
Detractor (0-6)	5	5.8
Net Promoter Score (% Promoters - % Detractors)		73.3

The results from the satisfaction questions are shown in Figure 4. Participants were on average satisfied with elements of their care and unequivocally satisfied with the waiting room facilities (100%, n=87), the ability to ask questions without embarrassment (100%, n=87) and the respect that they were shown by their providers (100%, n=87). A significant portion of participants reported not being satisfied with the total time spent at the office/clinic (11.8%, n=10), how their provider prepared them for labour and delivery

(12.0%, n=10), their ability to schedule or reschedule appointments (15.6%, n=13), the

wait time to be seen for their provider (18.8%, n=16) and how easy it was to get early

prenatal care (30.5%, n=25).

Figure 4

Participant Satisfaction with Specific Elements of Care

Satisfaction with Care Provider

Ability to ask without embarrassment	0%	100%
Provider respect	0%	100%
Provider quality of care	1%	99%
Feeling of not wasting provider's time	3%	97%
Not repeating my story every time	4%	96%

Satisfaction with Staff

Staff time and interest	2%	98%
Staff deals with all my medical problems	4%	96%
Staff interest and concern	6%	94%

Satisfaction with Information

Ability to ask without embarrassment	0%	100%
Provider respect	0%	100%
Provider quality of care	1%	99%
Feeling of not wasting provider's time	3%	97%
Not repeating my story every time	4%	96%

Satisfaction with System Characteristics

Waiting room facilities	0%	100%
Number of prenatal visits in the first 6-7	1%	99%
Having all the recommended tests	1%	99%
Examination room	2%	98%
Total time spent at the office/clinic	12%	88%
Ability to schedule or reschedule	16%	84%
Wait time to be seen by my provider	19%	81%
Easy to get early prenatal care	30%	70%

100   50   0   50   100

Percentage

■ Strongly Disagree   ▩ Disagree   ▨ Agree   ■ Strongly Agree

The ordinal value of the Likert questions were then averaged based on their domains of care (Omar et al., 2001). Evaluations of their care provider ranked the highest with a mean of 3.63 (SD = 0.46) out of a possible score of 4, followed by satisfaction with staff with a mean score of 3.41 (SD = 0.59), and satisfaction with information with a mean score of 3.37 (SD = 0.54). Satisfaction with system characteristics scored the lowest with a mean score of 3.32 (SD = 0.48).

Table 11

Correlation of Experience Measurements with Overall Satisfaction

Outcome	Spearman's Rho (p)
Willingness to Recommend	0.548 (<0.001)
Satisfaction with Information	0.607 (<0.001)
Satisfaction with Provider Care	0.565 (<0.001)
Satisfaction with Staff Interest	0.424 (<0.001)
Satisfaction with System Characteristics	0.547 (<0.001)

The Spearman's correlation between overall satisfaction and other experience metrics shown in Table 11 indicate that they are correlated. Overall satisfaction was therefore used as the sole experience outcome for the balance of the analysis.

4.3.5 Predictors of Patient Satisfaction

Demographic and patient characteristics were evaluated as predictors of Overall Satisfaction using the Kruskall-Wallis test. Given the low number of unsatisfied and neutral patients, they were grouped together in the category "not satisfied". The results are shown in Table 12.

Table 12

Predictors of Overall Patient Satisfaction

Variable	Category	Not Satisfied	Satisfied	Very satisfied	p
Age in 2022 (years) n= 74 (85.1%)	Under 25	0 (0.0)	2 (11.1)	4 (7.8)	0.604
	26 to 30	0 (0.0)	5 (27.8)	15 (29.4)	
	31 to 35	3 (60.0)	6 (33.3)	22 (43.1)	
	36 to 40	2 (40.0)	4 (22.2)	10 (19.6)	
	Over 40	0 (0.0)	1 (5.6)	0 (0.0)	
Education n = 84 (96.6%)	High school or high school equivalency certificate	0 (0.0)	4 (19.0)	7 (12.1)	0.591
	College, CEGEP or other non-university certificate or diploma	2 (40.0)	9 (42.9)	23 (39.7)	
	Undergraduate degree or some university	3 (60.0)	4 (19.0)	13 (22.4)	
	Post-graduate degree or professional designation	0 (0.0)	4 (19.0)	15 (25.9)	
Employment Status n = 79 (90.8%)	Employed	4 (100.0)	17 (85.0)	49 (89.1)	0.931
	Not Employed	0 (0.0)	3 (15.0)	6 (10.9)	
Marital Status n = 82 (94.3%)	Not married	0 (0.0)	2 (9.5)	3 (5.3)	0.705
	Married	4 (100.0)	19 (90.5)	54 (94.7)	
Identify as visual minority n = 77 (88.5%)	Yes	0 (0.0)	4 (20.0)	7 (13.5)	0.908
	No	5 (100.0)	16 (80.0)	45 (86.5)	
Household Income n = 75 (86.2%)	≤ $49,999	1 (20.0)	2 (10.5)	8 (15.7)	0.540
	$50,000 to $99,999	1 (20.0)	8 (42.1)	24 (47.1)	
	≥ $100,000	3 (60.0)	9 (47.4)	19 (37.3)	
Physical Health Self Assessment n = 84 (96.6%)	Excellent	3 (60.0)	1 (4.8)	11 (19.0)	0.895
	Very good	2 (40.0)	8 (38.1)	25 (43.1)	
	Good	0 (0.0)	10 (47.6)	16 (27.6)	
	Fair / Poor	0 (0.0)	2 (9.5)	6 (10.3)	
Mental Health Self Assessment n = 84 (96.6%)	Excellent	2 (40.0)	3 (14.3)	10 (17.2)	0.951
	Very good	2 (40.0)	7 (33.3)	21 (36.2)	
	Good	1 (20.0)	9 (42.9)	21 (36.2)	
	Fair / Poor	0 (0.0)	2 (9.5)	6 (10.3)	
First Pregnancy n = 82 (94.3%)	Yes	3 (60.0)	12 (60.0)	25 (43.9)	0.186
	No	2 (40.0)	8 (40.0)	32 (56.1)	
	Extremely unprepared	0 (0.0)	2 (10.0)	1 (1.9)	0.2961

Variable	Category	Not Satisfied	Satisfied	Very satisfied	p
Preparation: Primary Care Visit n = 79 (90.1%)	Somewhat unprepared	1 (20.0)	2 (10.0)	7 (13.0)	
	Neutral	2 (40.0)	2 (10.0)	11 (20.4)	
	Somewhat prepared	1 (20.0)	13 (65.0)	20 (37.0)	
	Extremely prepared	1 (20.0)	1 (5.0)	15 (27.8)	
Preparation: First OB Visit n = 83 (95.4%)	Extremely unprepared	0 (0.0)	4 (19.0)	0 (0.0)	0.003
	Somewhat unprepared	1 (25.0)	1 (4.8)	1 (1.7)	
	Neutral	1 (25.0)	1 (4.8)	6 (10.3)	
	Somewhat prepared	1 (25.0)	13 (61.9)	25 (43.1)	
	Extremely prepared	1 (25.0)	2 (9.5)	26 (44.8)	
Preparation: First Trimester OB Visit n = 24 (27.6%)	Extremely unprepared	0 (0.0)	1 (16.7)	0 (0.0)	0.257
	Somewhat unprepared	0 (0.0)	0 (0.0)	0 (0.0)	
	Neutral	0 (0.0)	0 (0.0)	1 (5.9)	
	Somewhat prepared	0 (0.0)	4 (66.7)	5 (29.4)	
	Extremely prepared	1 (100.0)	1 (16.7)	11 (64.7)	
Preparation: Second Trimester OB Visit n = 80 (92.0%)	Extremely unprepared	0 (0.0)	3 (15.0)	0 (0.0)	<0.001
	Somewhat unprepared	0 (0.0)	1 (5.0)	0 (0.0)	
	Neutral	2 (40.0)	1 (5.0)	1 (1.8)	
	Somewhat prepared	2 (40.0)	11 (55.0)	18 (32.7)	
	Extremely prepared	1 (20.0)	4 (20.0)	36 (65.5)	
Preparation: Third Trimester OB Visit n = 83 (95.4%)	Extremely unprepared	1 (20.0)	2 (9.5)	0 (0.0)	<0.001
	Somewhat unprepared	0 (0.0)	1 (4.8)	0 (0.0)	
	Neutral	0 (0.0)	2 (9.5)	0 (0.0)	
	Somewhat prepared	2 (40.0)	12 (57.1)	14 (24.6)	
	Extremely prepared	2 (40.0)	4 (19.0)	43 (75.4)	

Preparedness for obstetrical visits were the only variables that showed statistically significant associations with patient satisfaction. The one exception is preparedness for the first trimester OB visit, which had fewer respondents due to its applicability to a fewer number of patients.

4.3.6 Qualitative Evaluation of Patient Experience

A total of 54 (62%) of participants responded to the question "Thinking about your prenatal care at GROW Niagara, what went well? Please explain what happened, how it happened, and how it felt to you." A total of 32 (37%) of participants responded to

the question "Thinking about your prenatal care at GROW Niagara, what do you wish had gone differently. Please explain what happened, how it happened, and how it felt to you." Coded findings from the qualitative analysis and selected patient verbatims for both questions are summarized in Table 13 and 14. Where patients referred to their doctor by name, the verbatims have been edited to "my doctor" to avoid the risk of identification of participants.

Table 13

Qualitative Participant Feedback on What Went Well with their Care

Domain	% of respondents (n)	Sample Verbatim
Patient-Centred Care	63% (34)	*My doctor and staff treat me like a human.*
		My doctor and the clinic team are always attentive with the proper care that's needed to best suit my pregnancy.
		My care provider is very caring, warm and understanding of all concerns. She is also size inclusive and that is important to me.
Courtesy and Emotional Support	54% (29)	*Everyone here is extremely friendly and respectful. It is easy to call about any concerns and have them addressed immediately. I felt listened to and cared for.*
		The doctor's flexibility and genuine concern to all her patients. It was the best.
		My doctor made me feel at ease. She was very thoughtful and approachable.
		Everything. Everyone is so polite and helpful and are good at keeping the pregnant ladies from feeling like a crazy person.
Communication & Information	43% (23)	*My doctor is very informative and answers questions well*
		All questions are answered and any concerns are always talked about.
		All my questions and concerns have been answered and dealt with, with care and great satisfaction on my end.

Domain	% of respondents (n)	Sample Verbatim
Efficiency of Care / Effective Organization	30% (16)	*Waiting room wait times aren't long usually seeing the doctor within a half hour.*
		Plans were made and shared to help elevate my concerns about my health issues.
		The staff were amazing. Receptionists are friendly. My doctor and nurses were super friendly and supportive.
Technical Quality	17% (9)	*My doctor was thorough with all testing and preventative measures to ensure both baby and I remained healthy along the way.*
		Attentiveness from my physician has been great. Thorough in exam and if any concerns, investigations were ordered.
Access	2% (1)	
Structure and Facilities	0% (0)	

Participants most frequently reported that they felt that their care had gone well in domains related to patient-centred care, courtesy and emotional support, and communication & information. Participants frequently cited their interpersonal relationship with their provider across these domains reporting that their care provider tailored their care based on their needs and preferences, they listened to their patients, were polite and courteous and created space in the conversation to answer questions without judgement. Domains of technical quality, access and structure and facilities were cited least frequently.

Table 14

Qualitative Participant Feedback on What They Wish Had Gone Differently

Domain	% of respondents (n)	Sample Verbatim
Access	41% (13)	*I wish I had been brought into the clinic earlier in my pregnancy. I was not seen until after 20 weeks and was unable to access a few tests that get done earlier in a pregnancy.*
		Doctor having more availability to book around my schedule and not just given a time on one specific day.
		Doctor not booking so many people in at once and having to wait almost an hour to be seen multiple times, having more availability to book around my schedule and not just given a time on one specific day.
Efficiency of Care / Effective Organization	34% (11)	*A couple times the wait was over an hour past my appointment time. Was usually a reason (training a resident/student, etc.).*
		For most of my appointments I waited quite long before being seen. It wasn't too much of an issue for me since I was alone, however next time around I would probably need to take a child alone, or get child care.
Communication & Information	31% (10)	*I wish when my anatomy US came back and it showed 2VC the OB had reviewed it and given me more info before the appt.*
		Recommend handout or a website to educate patients that prenatal vitamins, pelvic floor physio, natural path,osteopath, chiropractor acupuncture breast pump scan be covered through insurance. What to expect during labour and what to pack for the hospital.
		More explanation about labour and delivery and what to expect at each visit.
Patient-Centred Care	16% (5)	*For my partner, the father to be with me in every prenatal visit.*
		Longer prenatal visits with a breakdown of your pregnancy if there are concerns to discuss the next steps so patient is well prepped.
		I wish my partner could have come with me to my appointments earlier in my pregnancy.
Courtesy and Emotional Support	3% (1)	
Structure and Facilities Technical Quality	3% (1)	

When asked what they wish had gone differently, participants most frequently

cited issues related to the domains of access to care, efficiency of care / effective

organization and communication & information. Within the domain of access, there were

two sub-themes that emerged with 54% of participants indicating they wish they had been

seen sooner for their first visit and 38% citing challenges with booking appointments.

Within the domain of efficiency of care / effective organization, the most common

feedback was that the wait to be seen was too long. The communication and information

domain was more varied, but feedback included wanting to have a better understanding of

what to expect for their visits, more educational information and better access to their

personal health information ahead of their visits. In the domain patient-centred care,

nearly all responses were related to the desire to have the patient's partner allowed to

accompany them in their prenatal visit[3].

4.3.7 Association Between Preparedness and Satisfaction

As shown in Figure 5, the data showed a strong association between patient

preparedness and satisfaction, with most patients who reported feeling somewhat or well

prepared for their visits being somewhat or very satisfied with their care. Notably patients

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[3] The exclusion of patient partners in their prenatal visits was a temporary measure implemented in response to the COVID-19 pandemic.

who reported being somewhat or extremely prepared for their first visit were 60% more likely to be very satisfied with their prenatal care than patients who were not.

Figure 5

The Relationship Between Feeling Prepared and Overall Satisfaction
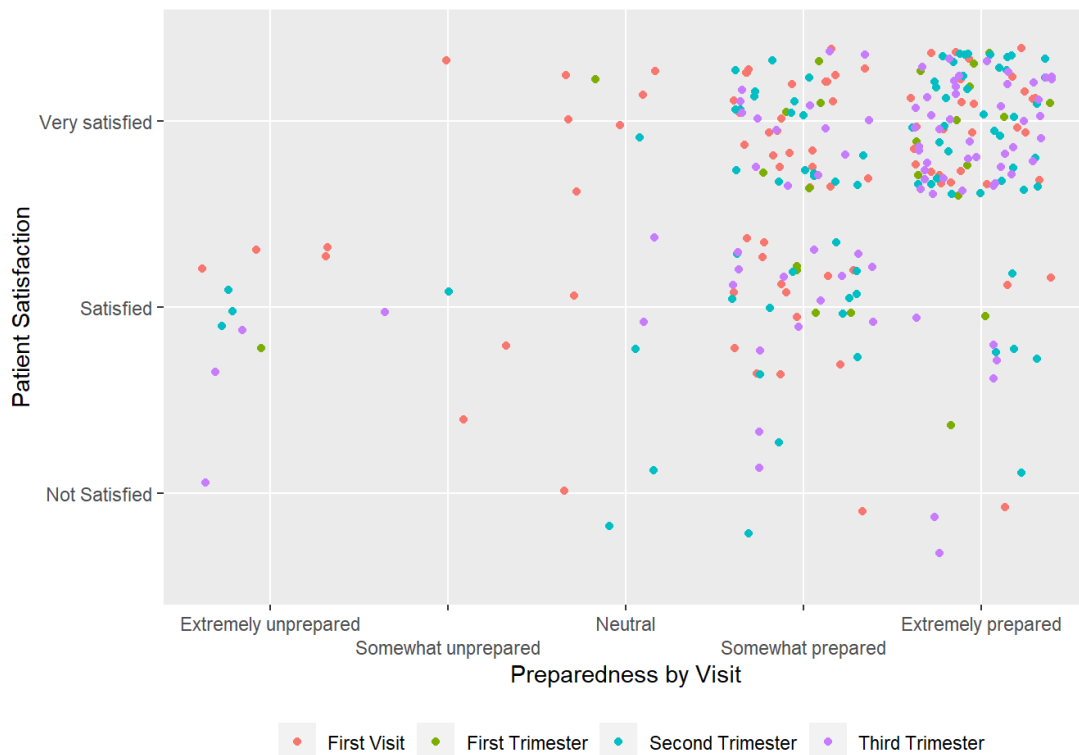
4.3.8 Patient Preparedness Evaluation

A graph of how prepared patients felt by visit is shown in Figure 6. Patients started off their pregnancy feeling least prepared and became more prepared throughout their care journey with 93% of patients reporting that they felt somewhat or extremely

prepared for their visits during their 3rd trimester while only 65% of respondents feeling

prepared for their visits while being cared for by their primary care provider.

Figure 6

Participant Preparedness by Visit
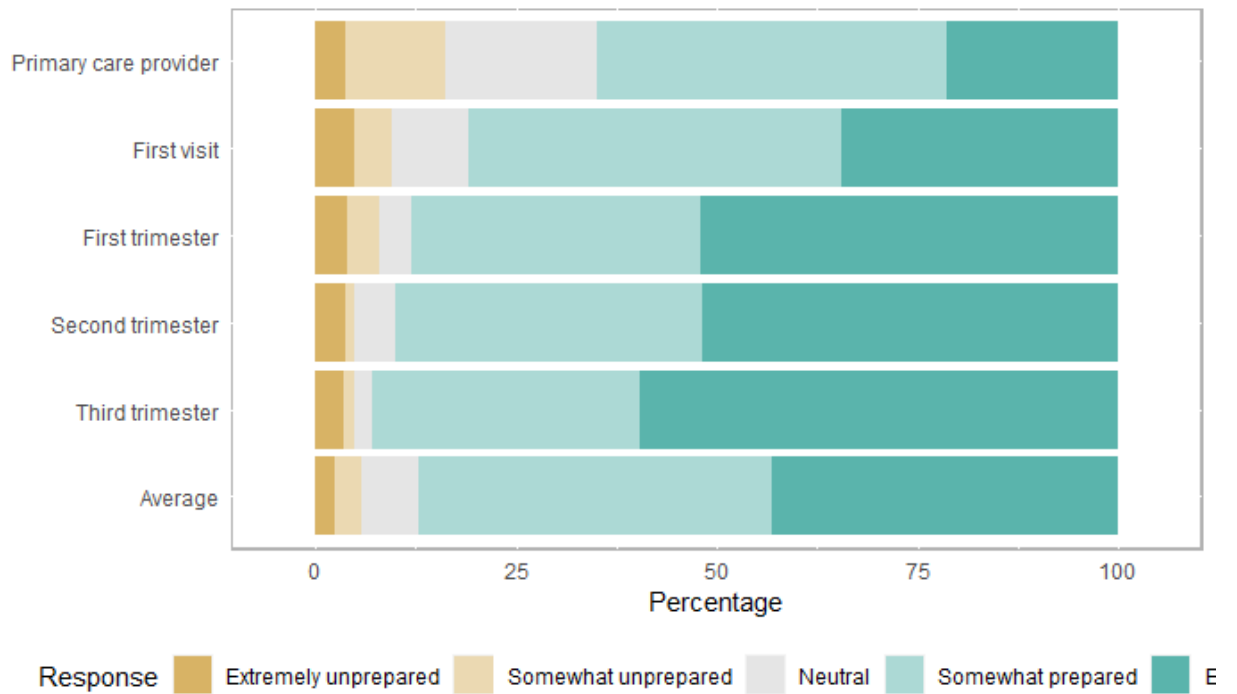
Strong correlation in preparedness was seen across obstetrical visits as shown in

Table 15.

Table 15

Correlation of Visit Preparedness Across Visits

Spearman's Rho (p-value)	First Visit	First Trimester	Second Trimester
First Trimester	0.853 (<0.001)		
Second Trimester	0.651 (<0.001)	0.575 (0.003)	
Third Trimester	0.482 (<0.001)	0.533 (0.006)	0.865 (<0.001)

4.3.9 Predictors of First Visit Preparedness

Demographic and patient characteristics were evaluated as predictors of first visit preparedness using the Kruskall-Wallis test and are tabulated in Table 16.

Table 16

Predictors of First Visit Preparedness

Variable n (%)	Category	Extremely Unprepared	Somewhat Unprepared	Neutral	Somewhat Prepared	Extremely Prepared	p
Age in 2022 (years) n = 74 (85.1%)	Under 25	0 (0.0)	0 (0.0)	0 (0.0)	4 (10.5)	2 (8.0)	0.659
	26 to 30	0 (0.0)	1 (33.3)	2 (33.3)	12 (31.6)	6 (24.0)	
	31 to 35	1 (50.0)	1 (33.3)	3 (50.0)	17 (44.7)	8 (32.0)	
	36 to 40	1 (50.0)	1 (33.3)	1 (16.7)	4 (10.5)	9 (36.0)	
	Over 40	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.6)	0 (0.0)	
Education n = 83 (95.4%)	High school or equivalent	1 (25.0)	1 (25.0)	0 (0.0)	4 (10.3)	5 (17.9)	0.870
	College, CEGEP or other non-university certificate or diploma	1 (25.0)	1 (25.0)	4 (50.0)	16 (41.0)	12 (42.9)	
	Undergraduate degree or some university	1 (25.0)	1 (25.0)	1 (12.5)	11 (28.2)	5 (17.9)	
	Post-graduate degree or professional designation	1 (25.0)	1 (25.0)	3 (37.5)	8 (20.5)	6 (21.4)	
	Employed	1 (25.0)	3 (100.0)	8 (100)	33 (91.7)	24 (88.9)	0.376

Variable n (%)	Category	Extremely Unprepared	Somewhat Unprepared	Neutral	Somewhat Prepared	Extremely Prepared	p
Employment Status n = 78 (89.7%)	Not Employed	3 (75.0)	0 (0.0)	0 (0.0)	3 (8.3)	3 (11.1)	
Marital Status n = 81 (93.1%)	Not married	1 (25.0)	0 (0.0)	0 (0.0)	0 (0.0)	4 (14.8)	0.242
	Married	3 (75.0)	3 (100.0)	8 (100)	39 (100.0)	23 (85.2)	
Identify as Visual Minority n = 76 (87.4%)	Yes	0 (0.0)	0 (0.0)	1 (14.3)	6 (17.1)	4 (15.4)	0.519
	No	4 (100.0)	4 (100.0)	6 (85.7)	29 (82.9)	22 (84.6)	
Household Income n = 74 (85.1%)	≤ $49,999	0 (0.0)	2 (50.0)	0 (0.0)	3 (9.4)	6 (22.2)	0.627
	$50,000-$99,999	2 (66.7)	1 (25.0)	4 (50.0)	15 (46.9)	11 (40.7)	
	≥100,000	1 (33.3)	1 (25.0)	4 (50.0)	14 (43.8)	10 (37.0)	
Physical Health Self Assessment n = 83 (95.4%)	Excellent	0 (0.0)	1 (25.0)	2 (25.0)	3 (7.7)	8 (28.6)	0.517
	Very good	1 (25.0)	2 (50.0)	3 (37.5)	19 (48.7)	9 (32.1)	
	Good	2 (50.0)	1 (25.0)	3 (37.5)	13 (33.3)	8 (28.6)	
	Fair / Poor	1 (25.0)	0 (0.0)	0 (0.0)	4 (10.3)	3 (10.7)	
Mental Health Self Assessment n = 83 (95.4%)	Excellent	1 (25.0)	1 (25.0)	3 (37.5)	1 (2.6)	8 (28.6)	0.892
	Very good	1 (25.0)	1 (25.0)	2 (25.0)	18 (46.2)	7 (25.0)	
	Good	2 (50.0)	1 (25.0)	3 (37.5)	15 (38.5)	10 (35.7)	
	Fair / Poor	0 (0.0)	1 (25.0)	0 (0.0)	5 (12.8)	3 (10.7)	
First Pregnancy n = 81 (93.1%)	Yes	2 (50.0)	4 (100.0)	6 (75.0)	20 (54.1)	8 (28.6)	0.003
	No	2 (50.0)	0 (0.0)	2 (25.0)	17 (45.9)	20 (71.4)	
Frequency of Pregnancy Research n = 79 (90.8%)	Every day	1 (25.0)	1 (25.0)	1 (12.5)	5 (13.5)	6 (23.1)	0.219
	A few times per week	1 (25.0)	3 (75.0)	6 (75.0)	15 (40.5)	7 (26.9)	
	Weekly	0 (0.0)	0 (0.0)	0 (0.0)	12 (32.4)	5 (19.2)	
	Less than weekly	2 (50.0)	0 (0.0)	1 (12.5)	5 (13.5)	8 (30.8)	
	Not sure	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	

Participants who had had previous pregnancies were more likely to be prepared for their first visit. Among multigravida participants, 90.2% reported being somewhat or extremely prepared as compared to 70.0% among primigravida participants. No other factors were found to be statistically significant predictors of visit preparedness.

4.3.10 Current Preparation Practices

Of the 87 participants in the study, 40 responded to the open-ended question about visit preparation. The results, including a breakdown by primigravida and multigravida pregnancies are shown in Table 17.

Table 17

How Patients Prepare for their Prenatal Visits

Category	Total n (%)	Primigravida n (%)	Multigravida n (%)
Prepare questions	22 (55.0)	10 (55.6)	12 (57.1)
Research	11 (27.5)	8 (44.4)	3 (14.3)
Complete inter-visit activities	10 (25.0)	3 (16.7)	7 (33.3)
Knowledge from previous pregnancy	4 (10.0)	not applicable	4 (19.0)
No preparation	3 (7.5)	2 (11.1)	1 (4.8)
Other	6 (15.0)	2 (11.1)	3 (14.3)
Total participants	40 (100)[4]	18 (45.0)	21 (52.5)

Of the 22 respondents that indicated that they prepare questions ahead of their prenatal visit, 9 (40.9%) indicated that they write questions down, 2 (9.1%) indicated that they make mental notes with the balance of 11 respondents (50.0%) not specifying how they kept track of their questions. Of the 11 participants who indicated that they conduct

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[4] One participant preferred not to indicate whether they were primigravida or multigravida and is included in the total summation.

research ahead of their visit, 5 (45.5%) indicated they conducted their research online or through a mobile application while the balance of 6 participants (54.5%) did not specify what resources they used for research. The category of inter-visit activities encompasses doing required tasks e.g. (ultrasound imaging), self-assessment of their maternal health (e.g. blood pressure) or ensuring that they adhered to best care practices (e.g. staying hydrated). Of the 10 participants that reported inter-visit activities, 4 (40.0%) reported completing required tasks, 4 (40.0%) reported conducting maternal health self-assessments and 2 (10.0%) reported adhering to best care practices.

4.3.11 Research and Sources of Information

Participants reported conducting frequent research on their pregnancy with the majority (56.8%, n=46) conducting research at least a few times per week. Results are shown in Table 18.

Table 18

Frequency of Patient Research

Frequency of Research	n (%)
Every day	14 (17.3)
A few times per week	32 (39.5)
Weekly	17 (21.0)
Less than weekly	18 (22.2)
Total	81

Participants reported extensive use of digital sources of information – particularly websites and mobile health applications. A majority of participants reported relying on friends and family as sources of information. The full results are shown in Table 19.

Table 19

Information Sources Used in Pregnancy

Source of information	n (%)	Specific Digital assets	n (%)
		Digital Sources of Information	
Websites	58 (66.7)	whattoexpect.com	9 (33.3)
		babycenter.ca	7 (25.9)
		Google / No specific site	5 (18.5)
		Bump.com	3 (11.1)
		Medical Centre Sites	2 (7.4)
		Other	6 (22.2)
Mobile health application (app)	35 (40.2)	Baby Center	12 (50.0)
		What to Expect	9 (37.5)
		Ovia Pregnancy	5 (20.8)
		The Bump	4 (16.7)
		Pregnancy+	3 (12.5)
		FLO	2 (8.3)
		Other	5 (20.8)
Social media content creators / influencers	25 (28.7)	Instagram	6 (50.0)
		TikTok	2 (16.7)
		Facebook	1 (8.3)
		Other	4 (33.3)
Peer group on social media	21 (24.1)	Facebook	8 (80.0)
		Instagram	1 (10.0)
		Other	3 (30.0)
		Traditional Sources of Information	
Friends & family	57 (65.5)		
Books	24 (27.6)		
Prenatal class	16 (18.4)		
Other	4 (4.6)		

Of the 23 participants that specified which mobile health applications they are

using, 16 (69.6%) identified a single application while 7 (30.4%) identified using 2 or

more.

4.4 Discussion

4.4.1 Expectations

Reported expectations generally aligned with how care is delivered in the clinic.

Participants indicated that they expected prenatal visits to not last long which aligns with

clinic practice of booking visits which are short relative to the midwifery standard of care.

Patients also reported strong expectations for personalized care which corresponded to

positive quantitative and qualitative feedback about their experience. Although this may

be considered an expected outcome under the Consumer Model of Satisfaction whereby

the consumer has an experience that is within their "zone of tolerance" and their

perceived experience became their expected experience, there is an element of recall bias

introduced by asking participants to assess their expectations after having their

experience. Recall bias confounds this conclusion as suggested in other similar studies

(Gregory et al., 2020; Omar et al., 2001).

One surprising finding was that 76% of participants expected that the provider

they routinely saw would deliver their baby. With the exception of booked caesarian

sections which happen infrequently, the standard of care for obstetricians in the Niagara

region is that the obstetrician on call would provide perinatal care. This disconnect

between expectation and practice, could have a detrimental impact on patient satisfaction

at delivery if their expectations were not met and therefore this should be addressed by the clinic.

4.4.2 Satisfaction

Overall satisfaction was high as expected from the literature (Galle et al., 2015; Gregory et al., 2020). The ranking of satisfaction by domain, whereby participants ranked provider care, staff interest, information and system characteristics from highest to lowest satisfaction, aligned with similar studies (Galle et al., 2015; Gregory et al., 2020). The finding that the potential covariates of age, education, household income and marital status were not statistically significant predictors of overall satisfaction were in line with similar studies (Galle et al., 2015; Gregory et al., 2020).

The association between satisfaction with prenatal care and emotional health described by Tough et al. (2004) was not observed in this study. The Tough et al. study surveyed postpartum patients about their prenatal care up to three months after discharge from six Alberta hospitals between 1999 - 2000 and over-sampled women who delivered low birth-weight or preterm infants (Tough et al., 2004). The potential postpartum recall bias, combined with the difference in sampling methodologies and the use of differing survey instruments make direct comparison between the two studies challenging.

As anticipated patient preparedness was found to be associated with higher satisfaction and supports the case that an intervention that helps patients prepare for their visits may also increase satisfaction. Patients reported high levels of satisfaction with provider care, which was echoed in their qualitative feedback about what went well with

their care: patient-centred care, courtesy and emotional support and communication & information.

Patients reported relatively low satisfaction with system characteristics: being able to see their provider earlier, office wait times and flexibility in scheduling appointments were cited as the biggest pain points in both the quantitative and qualitative sections of the survey.

Communication & Information was a prevalent domain in both the positive and negative sections of qualitative feedback. On one hand, patients were very satisfied with how their provider created space during their visit to ask questions and how their questions were answered by the physician without judgement; this was reflected in the high degree of satisfaction with these questions in the quantitative survey results. On the other hand, participants reported wanting a better understanding of their prenatal journey, additional pregnancy resources, access to their results ahead of their upcoming visit and the ability to have questions efficiently answered between visits.

Interestingly, although patients reported a high degree of satisfaction with the physical clinic facility and the technical care they received, they were mentioned the least in the qualitative sections of the survey. Application of the Consumer Model of Satisfaction would suggest that these aspects of care were delivered within "the zone of tolerance."

4.4.3 Preparedness

Patients reported feeling the least prepared at the start of their pregnancy with preparedness increasing as their pregnancy progressed. There is a strong, statistically significant correlation across visits, which implies that a patient who starts off feeling less prepared continues to feel that way over the course of their visits. The only statistically significant predictor of preparedness is whether it is the participant's first pregnancy or not whereby multigravida patients reported greater preparedness. Notably, frequency of research was not found to be a predictor of preparedness.

Visit preparation practices varied between primigravida and multigravida groups. Primigravida patients reported conducting research significantly more than multigravida patients, while multigravida patients were able to leverage knowledge from previous pregnancies to prepare for their visits. This finding suggests that a primigravida patient may have different informational needs than a multigravida patient. Multigravida patients were also more likely to be focused on completing inter-visit activities to prepare them for their upcoming visit. In the context of a digital pre-visit intervention, the needs of each group may therefore be slightly different: primigravida patients may benefit more from informational resources while multigravida patients may benefit more from functionality that helps them keep track of their inter-visit activities.

4.4.4 Current Preparation Methods & Information Sources

Most participants prepared for an upcoming obstetrical visit by thinking through questions to ask their physician, although fewer than half (40.9%, n=9) reported writing

their questions down. Participants also reported conducting frequent research on their pregnancy with the majority (56.8%, n=46) conducting research at least a few times a week.

Participants were heavily reliant on digital sources of information – predominantly websites, apps and social media for information regarding their pregnancy. This is consistent with other studies showing that pregnant women supplement their prenatal care with technology (e.g. Google & mobile applications) – particularly in early pregnancy when they have the fewest number of visits with their care provider (Kraschnewski et al., 2014). The fact that pregnant women are already using technology lends support for the feasibility of digital interventions to prepare them for their visits.

4.4.4.1 Websites

The information sources being accessed on the web are more disparate than other resources. The most frequently cited websites were WhatToExpect.com and BabyCenter.com which have been described in the literature as "birth month clubs" – which are forums tailored to the patient based on their birth month (Graseck & Leitner, 2021). Given that the forums go beyond peer support and into health topics, researchers have expressed concern over the potential for inaccurate or dangerous information to be shared on these sites (Wexler et al., 2020).

Other than theses websites, the resources accessed by participants were highly disparate with 29.6% of participants reporting the use of a site that was not used by others

and 18.5% reporting that they did not have a specific site or would use a search engine for research.

Of the three website resources promoted by the physicians in the practice, none were cited as a resource used by the participants.

4.4.4.2 Apps

After websites and friends & family, mobile health applications were cited as the most frequently used sources of information in pregnancy. This is consistent with the literature. An Australian study that showed that 73% of pregnant women had used a mobile health application and these were primarily used to understand foetal development and obtain information about changes to the body during pregnancy (Lupton & Pedersen, 2016). The same study showed that although 92% of respondents that had used a pregnancy application found them useful, 74% reported that they had not checked the sources of information and only 35% rated mobile applications as completely or very trustworthy (Lupton & Pedersen, 2016) underscoring the need for patients to have digital access to reliable and trustworthy sources of information.

4.4.4.3 Social Media

Participants reported using social media to connect with peers as well as to follow content creators and influencers.

Facebook was identified as the predominant way of connecting with peers, with a private local mom's group cited most frequently. Instagram was cited as the predominant

way of following influencers. Participants reported having a wide range of influencers that they follow for information on their pregnancy.

4.4.5 Strengths & Limitations

A strength of this study is the methodology that allowed the patient population to be sampled before infant birth, which eliminates the potential bias of their birth experience. The inclusion of qualitative feedback also allowed for a deeper understanding of the patient experience and ensured that no dimensions of care were missed through the use of standardized questionnaires.

The study was limited by the sample size of patients and the limited number of care providers, given that it was implemented at only one obstetrics practice.

Despite implementing methodology to ensure that patients were aware that the survey was optional and anonymous (with the exception of where participants expressed interest in participating in Phase II), participants were recruited at a location where they were receiving care. It is therefore possible that participants felt obligated to participate and/or respond favourably to the survey.

Of the five participants who rated their overall satisfaction as neutral, dissatisfied or very dissatisfied, only one answered qualitative questions on what they liked or would improve about their care. The study is therefore limited in its ability to definitively understand the needs and concerns of patients who had a negative experience with their prenatal care.

Incorporation of additional practices and larger sample sizes would provide more generalizable information and allow for a deeper understanding of diverse pregnancy journeys such as those with high-risk pregnancies and racialized or marginalized populations. Participants were also asked to assess their entire course of care near the end of their prenatal journey which has the potential to introduce recall bias, particularly as it relates to forward looking constructs like expectations. This could be addressed in future studies by asking participants to assess their expectations prior to their first visit. A well-designed future study could also strengthen support for the applicability of the Consumer Model of Satisfaction in prenatal care by checking in with patients along their pregnancy journey and better aligning expectation questions with satisfaction questions which address slightly different aspects of patient care.

4.5 Conclusions

Patients showed a high degree of satisfaction with their overall care, particularly when it came to their relationship with their care provider.

An intervention designed to prepare patients ahead of their first visit has the potential for the greatest impact – both because it is the visit that patients feel least prepared for and because it has the potential to increase preparedness and satisfaction in subsequent visits. The high adoption rates of technology among pregnant patients suggest that a digital pre-visit intervention is feasible.

Patients were least happy with the system characteristics of their care, specifically how early they are seen by their provider, office wait times and flexibility in scheduling.

Patients also reported information deficits related to understanding their care journey, additional pregnancy resources and access to results prior to their visit. According to the Consumer Model of Satisfaction, increasing satisfaction can be accomplished by either improving the actual experience or by increasing the "zone of tolerance" by shaping patient expectations in specific dimensions of care.

The patient journey is different for patients who are in their first pregnancy. Specifically, primigravida patients spend more time doing research and in general feel less prepared for their visits.

Finally, when conducting research, patients frequently use pregnancy forums, internet search, mobile applications and social media as resources. There is a risk that, in using these resources, patients may be exposed to incorrect or potentially dangerous information.

The ideal solution to be created in Phase II would therefore 1) leverage digital technology 2) prepare patients for their first visit, 3) set realistic expectations on what they can expect in their care at the clinic – particularly as it relates to the system characteristics of care, 4) account for the differences in the pregnancy journey between primigravida and multigravida patients and 5) connect the patient to reliable resources.

5. PHASE II: SINGLE VISIT PROTOTYPING

5.1 Objectives

The objective for Phase II was to co-design digital intervention prototypes to aid prenatal patients in preparing for their first obstetrical visit.

5.2 Methods

5.2.1 Introduction to Design Thinking

The concept of Design Thinking emerged in the late 1990s at Stanford University as an effective and efficient way to develop human-centred solutions (Auernhammer & Roth, 2021) and has been shown to be effective for the development of healthcare solutions (Altman et al., 2018).

The methodology, as taught at the Stanford d.school, is a 5-step process that entails: 1) developing empathy with end-users, 2) defining the challenge to be solved, 3) ideating, 4) rapid iterative prototyping and 5) testing of the solution as illustrated in Figure 7 (Kelley & Brown, 2018).

Figure 7

Stanford d.School Design Thinking Process (Kelley & Brown, 2018)
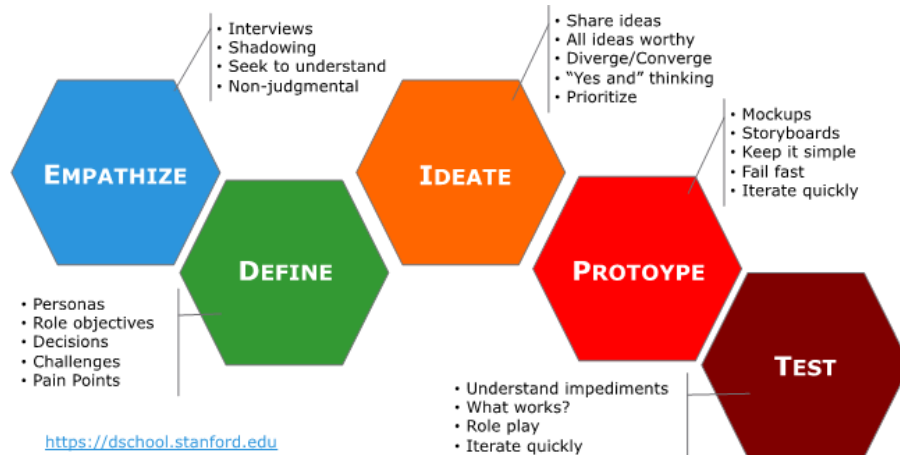
Design Thinking is an outcome-oriented process with success defined by how efficiently one can arrive at a prototype product or service that meets a user's wants and needs. The process is therefore inherently flexible to accommodate specific applications and constraints including those identified in the study setting.

5.2.2 Design Thinking Methodology

For Phase II of this study the prototypes were developed through a series of patient interviews and a design workshop as outlined in Table 20. Due to infectious disease protocols in place, all meetings occurred via Zoom videoconference. While conducting the interviews by phone may have limited the ability of the researcher to pick up on non-verbal communication from the participants, it had the advantage of allowing patients, potentially with newborn children at home, to participate in the study. After

obtaining consent, the interviews were recorded and transcribed to ensure that the notes from the interview were captured accurately.

Two major constraints were identified that could impede the effectiveness of the Design Thinking approach in this setting. First, the unequal power in the patient-care provider relationship has been identified as an impediment to co-design (Dimopoulos-Bick et al., 2018). To address this, direct participant contact was limited to the primary researcher, who acted as a conduit of feedback to the design team. The design team included 4 physicians, 2 office managers, a medical secretary and a nurse who work at the clinic. Owing to the limited availability of clinic staff, prototyping was conducted by the research team.

Table 20

Design Thinking Methodology for Prototype Creation

Step	Design Thinking Step	Desired Outcomes
Step1: Patient Interviews	Empathize	• Deep understanding of the patient prenatal journey – particularly as it relates to their first visit
Step 2: Design Thinking Workshop	Empathize Define Ideate Prioritize	• Review qualitative patient feedback (questionnaire + interviews) • Develop patient personas • Brainstorm potential prototype ideas • Affinity grouping and prioritization
Step 3: Prototype Development	Prototype	• Low-fidelity prototypes based on prioritized staff workshop concepts
Step 4: Patient Interviews	Test	• Feedback from patients on prototypes created
Step 5: Prototype Refinement	Prototype	• Refined prototypes to be iterated and/or implemented in clinical practice

5.2.2.1 Step 1: Building a Basis of Empathy Through Patient Interviews

Establishing empathy is a cornerstone of the design thinking process. It allows the design team to fully understand the patient needs, their emotional and mental state, what they do and why, all of which are critical to defining the challenge that the designed solution needs to address (Kelley & Brown, 2018; Roberts et al., 2016). At its best this step is done through a combination of "user" interviews, contextual observations, self-documentation and extreme user stories (Roberts et al., 2016).

Because members of the design team were providing clinical care to the participants, a methodology that included contextual observations would not be appropriate given the nature of the clinician-patient relationship. Also, due to time and recruitment constraints, self-documentation was not feasible. Participant interviews were thus selected as the most appropriate means to collect data on the patient's experience.

Participants that expressed interest in providing additional feedback in the Phase I survey were contacted by email to determine if they would be willing to participate in Phase II of the study. The participants that indicated interest were provided a secure Zoom link and scheduled for video conference appointments with the primary researcher. Given the possibility that participants may have recently given birth and may need to attend to their newborn, a 30-minute start window was provided to accommodate maternal needs. Participants were provided with a $50 electronic gift card for their time.

Participants were asked open-ended questions about their first visit experience and their prenatal experience in general: what was happening in their life at the time, how

they prepared for it, what sources of information they used and what could have been done to improve their experience. The interview guide is included in Appendix E. Interview recordings were then transcribed manually and analyzed deductively applying an empathy map using the themes outlined in Table 21. The concept of an empathy map was originally conceived by Dave Gray as a tool to foster a "deep shared understanding and empathy for other people" and are widely used in design (Gray, 2017).

Table 21

Empathy Map Dimensions Used in the Study

Theme	Description
Doing	Any activity the participant was engaged in.
Expecting	Anything the participant was expecting to happen or not happen.
Thinking	Anything that the participant was actively thinking about.
Feeling	Any emotion or physical sensation that the participant was experiencing.
Pain Points	Any uncomfortable, inconvenient, annoying or unpleasant experience that the participant experienced during their journey.
Moments that Matter	Any "high stakes" point during their pregnancy that the participant pointed to that, if handled well, made the experience significantly better and, if handled poorly, made the experience significantly worse.

5.2.2.2 Step 2: Empathize, Define and Ideate in a Design Thinking Workshop

Developing Empathy and Aligning on Users to Design for Through Patient Personas

A workshop was held with the design team to review both the qualitative feedback from Phase I participants about their experience as well as the empathy maps created from Phase II participants. Unfortunately, no primigravida patients were available to be interviewed in Phase II. To ensure that their needs were considered in solution design, an

additional Empathize step was undertaken in the workshop, specifically the creation of

patient personas for both primigravida and multigravida patients. Patient personas are

fictional characters based on real world patients and are widely used in Design Thinking

practice to build empathy and align the design team around defining and creating

solutions with a specific user in mind (Friis Dam & Teo Yu, 2022).

To develop the patient personas, two subgroups were created and randomly

assigned to create a patient persona for either a primigravida or multigravida patient

based on the information shared as well as their own personal knowledge and experience.

Each group was asked to consider a patient's demographic details, goals, challenges,

habits, and current visit preparation habits and to complete the Persona Template outlined

in Figure 8.

Figure 8

Persona Template Used in Workshop

Defining the User Problem in the Design Workshop

A key step in Design Thinking process is the definition of a question or problem statement from the "point-of-view" that is the crux of what is being designed for (Kelley & Brown, 2018). In this study, part of the problem statement was defined in Phase I: that patients feel least prepared for their first visit. The second part was defined based on the perspective of the personas, considering how a primigravida persona and a multigravida persona view the problem.

Ideation in the Design Workshop

Once the challenge has been defined, the next step in the Design Thinking process is to ideate to create a long list of possible solutions (Kelley & Brown, 2018). This process involves brainstorming many different concepts that could solve the problem statement with a focus on creating the highest number of ideas without discussion of the merits or feasibility. There are several facilitation techniques that can be employed to foster idea generation including encouraging building on each other's ideas, discouraging premature discussion of the merits of an idea, and the introduction of constraints to expand the range of possible ideas.

After sharing their personas and defining the problem, the design team was once divided into the same sub-groups as before and were asked to brainstorm solutions to the question "How might we better prepare our patients ahead of their first visit with us?" The design-team sub-groups were asked to ideate based on the perspective of the persona they developed earlier in the workshop. An office manager acted as a facilitator in each

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sub-group and coached each group on focusing on quantity over quality and ensuring that ideas were being built on and not evaluated in the brainstorming session. When the stream of initial ideas slowed, the facilitators introduced two constraints: "What could we do if we had only one dollar" and, once the ideas slowed again, "What could we do if we had one million dollars."

Prioritization in the Design Workshop

The brainstormed ideas were then combined, grouped based on their affinity to come up with a short list for prioritization. Using guidance from Kelley and Brown (2018) on prioritization, each workshop participant was then given three votes and instructed to allocate them based on 1) the idea that would be most likely to delight, 2) the idea that is the rational choice and 3) the most unexpected idea. To avoid biasing the process, the two facilitators abstained from voting. After voting, the prioritized list was discussed and finalized for prototyping.

5.2.2.3 Step 3: Initial Prototyping

The purpose of the prototyping step in Design Thinking is to create a "low-fidelity" or quick and cheap product that can be experienced by users and quickly refined. In Design Thinking a prototype can be anything that a user can interact with although the understanding is that a more realistic simulation will lead to more realistic user reactions and therefore better feedback (Kelley & Brown, 2018). A fast, low-cost prototype allows the team not only to test possible solutions, but also to start a conversation with a user that

can lead to deeper insights, communicate an idea and allows the idea to fail quickly and cheaply if the solution is not a good one.

Given that the prototypes would be reviewed by videoconference, digital prototypes were considered to be sufficient. The highest priority ideas that also had the potential to be implemented as a digital solution were then prototyped using Microsoft Excel (Microsoft, 2023). Excel was chosen because it is a fast and cost-effective means to organize data in a format that would encourage focus on the content rather than visual aesthetics.

5.2.2.4 Step 4: Patient Feedback on Prototypes

The final step in Design Thinking is to test prototypes with users with the aim of getting feedback both on the solution as well as the users themselves. Ideally this is done in the context of the user's life, with minimal guidance from the observer and with multiple prototypes so that the user can form a basis of comparison (Kelley & Brown, 2018). To accomplish this, participants were given minimal prompting as they reviewed the prototypes and where possible, different versions of the prototype were shared.

Feedback on the prototypes was obtained through a 30-minute follow-up interview with participants. Interviews were conducted using Zoom and were scheduled with a start time window of 30 minutes to allow for maternal needs. Participants were provided with a second $50 electronic gift card in exchange for their time.

Participants were asked to provide their feedback on the prototypes including content that would be provided, the timing and the best medium to communicate. With participant consent, sessions were recorded and manually transcribed.

5.2.2.5 Step 5: Additional Prototyping

The Design Thinking process is an iterative one with feedback on the prototype leading to better insights about the user and better prototypes. Due to time and resource constraints, the prototype solutions were refined once by the primary researcher based on user feedback.

5.3 Results

Out of the 87 participants in Phase I, 19 indicated they would be interested in participating in Phase II. Of those, 3 responded to the email and 2 were ultimately interviewed. Both participants were multigravida and saw different physicians for their prenatal care.

5.3.1 Empathy Maps

Although both participants had other children, the prenatal experiences the participants had were very different. The participant under the pseudonym Thelma was very hands-on and proactive with respect to her care, whereas the participant under the pseudonym Elektra tended to be more passive, generally deferring to her physician on aspects of her care. Themes with evidentiary verbatims were identified for both participants and included in the empathy maps as shown in Tables 22 & 23.

Table 22

Empathy Map for Thelma

Theme	Supporting Evidence (Verbatim)
	Doing
Home-school	*Well, we were trying to get pregnant, and then not get pregnant and then we did. We pulled our son from school and put him in virtual school so it was a little chaotic at that time…but we made it work and it was all good. Just in terms of what I was doing at that first appointment, I think I just kind of I don't know…**flying by the seat of our pants a little bit.***
Pre-visit prep	***I would keep a "Note" on my phone**. Anytime I thought of something during the week I would add it in there. Maybe sometimes by the time my appointment came up I had already answered it or maybe I wasn't concerned about it anymore. But any time I had a question I would add it into the app so that when I got there **I wasn't scrambling being like "do I have questions" and then forgetting to ask when I was there** and having to call in and they're not available or I feel like it's stupid.*
	Expecting
To be seen earlier	*I think [we] **assume that our first visit with an OB will be sooner** and they don't see you until a certain number of weeks so that's like "what do I do between now and then?"*
	Thinking
Keeping track of tasks	*I felt like if I didn't know and didn't do my own research, **I would be sort of collecting scraps of information to determine**, ok how many ultrasounds did I have? They're asking if I've done this bloodwork yet and I'm asking I don't know is that something I should have already done and then you worry that something might get missed a little bit but I think it's because they have so many*
	Feeling
Early pregnancy anxiety	***The hardest part is that at the beginning – when you have the most anxiety and the most things that could go wrong, your appointments are 4 weeks apart.** There's a lot of stress in between that. You could go for an ultrasound 1-2 weeks in and still have to wait another 2 weeks or whatever or wait for a call and you're sitting there thinking really stressed out thinking "I just really want to know exactly what's going on"*
Rushed during visits	*I always **feel a little rushed because I don't want to waste people's time** because I can get quite anxious so I would try and fly through things [during the visit] very quickly.*
	Pain Points
Understanding the care journey	***I like knowing what's going on and how things are going to play out**, especially having come from midwives and it being a different experience*

Theme	Supporting Evidence (Verbatim)
Reliable sources of information for patients in Canada / Ontario	*You don't want to bother your OB but **there are so many mixed answers online**. For someone like me I tend to go generally go to something like the NHS [UK] site and stuff like that because it's a bit more reliable. There are some websites that are like "you can't have peaches because they're a hot fruit" and I'm like what does that mean?* *"**Things are different in the states as well** and they're like "you haven't done this? You haven't done all of these?" And I'm like "no, it's different here, my OB doesn't do the ultrasound and we don't get the results immediately we need to go out to a clinic." **So I need to find resources that are specific to Canada as well.***
Keeping track of inter-visit tasks	*You forget some things the minute to leave** as well. "Oh, what did they tell me – what do I have to do?" unless I have paperwork you don't really know what to expect over the course of the visits.* *It always felt like **I had to kind of prep myself or figure out what was going on**. They talked about GB strep as an example and I was like "I don't know the answer to these questions."*

<div align="center">Moments that Matter</div>

Answering questions	*At every appointment [my doctor] was very calming. She did **take the time to answer my questions.*** *I know there were a couple issues where I would contact the front desk and there was a disconnect between her [doctor] and the front desk or **I wouldn't get a call back for days** or at one point one of my appointments was canceled.*
Managing complications	*I ended up having a [complication]. **It could be nothing or it could just destroy everything** so I was like "oh my god." So a lot of the time it was me being like "what's happening, what's going on, what should I do" but the appointments are so spaced apart. I think at one point she actually said "**let's move your appointments up** to every 2-3 weeks whereas they normally would be spaced further out" just to make sure I was feeling calmer so she did move them up for a couple of weeks.* *Until it resolved and even a little while after that it was very stressful. **You can't see it, You don't know what's going** on unless you're going into for an ultrasound. And then you are wondering is it still going on? I was on pelvic rest and almost bed rest - not supposed to be lifting things and you get very nervous I think until closer to the final trimester, I was just neurotic about caffeine and what I was eating and all of those other things and it's hard to get reassurance when everyone is sort of busy too. You don't want to bother every 5 seconds - "hey, can I have a hot pepper"*

Table 23

Empathy Map for Elektra

Theme	Supporting Evidence (Verbatim)
	Doing
Taking care of other child	***I'm running after my toddler all day***
	Expecting
Similar experience as the first child	*Because this is **my second pregnancy, I kind of know** what I'm dealing with.* *It's a different pregnancy or a different child **so I didn't have those same symptoms with the first baby.***
	Thinking
Not about long-term pregnancy goals	*Yeah, in the beginning. If I would have thought about it back then but I wasn't to be honest so it's not something I would have brought up to doctor. It's not something she did wrong because **it's not something that was on my mind**. So if she had asked me what's on your mind, it's not something I would have thought of at that time* *****I wish I was asked more about that**: "Are you trying to lose weight, maintain weight, maybe not gain so much"*
How to coordinate childcare and visits / tasks	***Sometimes I can leave my son with an aunt or dad's work** for a few minutes and get that bloodwork that my doctor so wanted, but I don't have the lab [requisition]. I left it at home or it's in the wrong car or anything like that, you know? If there's a way that I could have gone and not had the requisition in my hand, it would have been easier for the patient.*
	Feeling
Nauseous	*Because this baby is a girl**, I threw up so much** in the first…with my first child, it was a boy, I didn't really throw up. I didn't have any morning sickness.*
	Pain Points
Scheduling	*I think the only issue I've ever had at GROW Niagara is that **I might set a time and sometimes they can't take me in at that time**. They'll take me in an hour later or something. **I have a toddler at home now and I have someone taking care of him** – that's the only inconvenience I've had.*
Reliable sources of information for patients in Canada / Ontario	*Right now I have some apps that I track my pregnancy on, but a lot of them are more American so they have **different resources or information than Canada**. Their maternity leaves, etc. Their information is different than our information so it's hard to find out, like when I should apply for my maternity leave or when I should – like **I can't ask that on my app because I'd get the American information** and then that wouldn't work for me. It's probably not something I should be asking my OB but it's something I should be looking into. I wish there were more resources in terms of that – like at what points I should be doing certain things during my pregnancy.*
Keeping on top of non-medical pregnancy tasks	***You need to apply [for diaper redemption / pickups] the month befo**re so they're picking them up every week and not every other week.* *I'm applying for daycare for my son. He has been on a waiting list for 4 months! **I wish I had known about this sooner**! Because now I have another baby coming and I'm like "uh-oh" - wondering if I need to get a babysitter for him because I can't get him in anywhere in town a least that I know of.*

Theme	Supporting Evidence (Verbatim)
Managing requisitions	*I booked my 34 week ultrasound at like 20 weeks. I booked it 2 months in advance because I heard it was going to be busy. And then **I couldn't find the requisition the day I left** – obviously. I thought they must have it there, or they can call the office for one. So I rushed there. **She called GROW Niagara and they said they'd send it.** Then 15 minutes later she had to call back and say "we never got it" so you have to send it again. Technically I was waiting for half an hour. And **you have to wait with a full bladder. And you know at 34 weeks pregnant, you cannot take that anymore.***

	Moments that Matter
Achieving pregnancy goals	***I wish I was asked more about that**: "Are you trying to lose weight, maintain weight, maybe not gain so much"* *I always gain a lot of weight in my pregnancy. In my first pregnancy I gained about 45 pounds. And I think in this one I've already gained 30-35 pounds. **I wish there was something they could do from the very beginning** – I want to say in that first visit like a meal plan or something in that sense to kind of keep you on track without looking back at the very end of your pregnancy and saying "alright, I've already gained 35 pounds, what do I do doctor, help me!"* *This time around I didn't think about until my 30-34 week visit – that's when I mentioned to her - "hey, I'm starting to gain a little bit more than what I want – **what can I do?" That's when she was super helpful and told me what I should do***

5.3.2 Design Thinking Workshop

5.3.2.1 Patient Personas

The personas that were created by each subgroup are shown in Figure 9.

Figure 9

Workshopped Primigravida and Multigravida Patient Personas

Group A: Primigravida Pregnancy

Persona Name: Kavitha Stevens

PHOTO <DO THIS LAST>	**GOALS** enjoy pregnancy healthy first baby + mom vaginal delivery	**WHERE SHE STARTS** (when preparing for a visit) the bump what to expect facebook yogapn/ teacher friends group family
DEMOGRAPHICS Age: 28 Location: Niagara Falls Marital Status: Married First Pregnancy?: Y Other Kids (Ages):N/A Job: Teacher	**CHALLENGES** Anxious little access to reliable information/ sources family support difficulty making appointments	**HABITS** anxious writes things on iPhone manymanyquestions researches a lot

Group B: Multigravida Pregnancy

Persona Name: Stephanie Jones

	GOALS - Get in and out quickly - Minimal investigations - Managing weight gain	**WHERE SHE STARTS** (when preparing for a visit) - Flying by the seat of her pants - Inconsistent prenatal care - Gets to appointment first and figures out the rest later
DEMOGRAPHICS Age: 31 Location: Welland Marital Status: CL First Pregnancy?: No Other Kids (Ages): 4 and 1.5yrs Job: Nurse for LTC	**CHALLENGES** - Loses reqs - Organizing time - Child care - Getting to appointments - Remembering appointments - Balancing work/pregnancy/family	**HABITS** - Being late/canceling appts - Consistently doing investigations late/needing reminders - Putting off addressing concerns/minimizing

5.3.2.2 Brainstorming & Prioritization

A total of 37 ideas were brainstormed between the two groups. After grouping common ideas together, a total of 9 ideas remained – five of which could be digitally implemented. The prioritized ideas from the workshop are summarized in Table 24.

The top idea from the workshop, with 5 prioritization votes out of a possible 18 votes, was a prenatal package which would be available at or ahead of the patient's first visit. This could be provided digitally or as a physical package. This package would include a roadmap of their prenatal journey that would identify when appointments would happen and what would happen during each one, set expectations for clinic processes, provide basic information about the clinic location and address any frequently asked questions.

The second highest ranked idea was a busy board or activities to engage the young children of prenatal patients and allow the patient to more fully engage with the physician during their visit.

Tied for third place in prioritization were online informational videos that would allow patients to prepare for their upcoming visit and a service that would send personalized email or text-based notifications ahead of their next visit with relevant information to allow the patient to better prepare.

The next ideas involved providing patients with resources in the waiting room, having a nurse reach out to patients ahead of their first visit to answer any questions they

might have, creating or sourcing a mobile phone application with relevant Canadian

resources, developing a social media presence and ensuring the proper bloodwork and/or

ultrasounds were completed ahead of the patient's first visit.

Table 24

Prioritized Solutions from Design Thinking Workshop

Idea	Prioritization votes[a]	Digital Implementation
First visit prenatal package	5	Yes
Busy board or activities for children	4	No
Online informational videos	3	Yes
Personalized notifications (email / text) based on where the patient is at in their journey	3	Yes
Resources in the waiting room	1	Maybe
Have nurse see patients prior to their first visit to answer any questions they may have	1	No
Mobile application with Canadian resources	1	Yes
Social media presence	0	Yes
Missing bloodwork and/or ultrasounds ordered prior to patient visit	0	Maybe

[a]Clinic managers facilitated the workshop and did not vote to avoid skewing the prioritization process.

5.3.3 Prototyping

As the top-ranked idea with the potential for digital implementation, the pre-first

visit prenatal package was selected for prototyping. Some of the elements of the package

– such as directions to the clinic were considered straight forward and therefore did not

require additional work to define. As such, prototyping was focused on the development

of a prenatal roadmap as well as developing a list of "frequently asked questions" that

would help set patient expectations in their prenatal care with the clinic given the important role of expectations in patient satisfaction.

5.3.3.1 Prenatal Roadmap Prototypes

Alberta Health Services has developed a comprehensive guide outlining the obstetrical care journey for an average risk patient (Alberta Health Services, 2020). The guide provides details on what the patient should expect at each obstetrical visit in two formats, which can be found in Appendix F. One guide is in a simple "bullet-point" style and another that is tabulated and contains additional resources that patients and care providers can reference for more details. A simplified, roadmap prototype that outlines the same information in a more general, structured way was also developed in Microsoft Excel for testing and is shown in Figure 10.

Figure 10

Simplified-Structured Roadmap Prototype

Visit (# of weeks)	Number of visits	Care Provider	Visit Objectives	How you should prepare	Samples to Bring to the Office	Lab Reqs Provided	Imaging Reqs Provided	Other Actions
10-12	1	Family Doctor	Maternal Assessment Identify potential risk factors Patient education Discuss maternity care proviers			Routine antenatal bloodwork Serology (tests for infection) Prenatal screening	Dating ultrasound (12 wk)	
13-20	1	Obstetrician	Review risk factors & create management plan Maternal Assessment Fetal Assessment	Ensure that all bloodwork and dating ultrasound is complete. Write down any goals, concerns and questions that you have for your upcoming visit		Prenatal screening (if not done previously)	Anatomy Scan Ultrasound (20 wk)	Amniocentesis (if required)
21-27	3-4	Obstetrician	Maternal Assessment Fetal Assessment Patient education Review VBAC as needed Review anatomy Ultrasound results			Glucose Challenge Test Other bloodwork as required	Biophyiscal Profile and Growth Ultrasound (32-34 wks)	Rhogam bloodwork at hospital (Rh - patients)
28-32	3-5	Obstetrician	Maternal Assessment Fetal Assessment Registration package for hospital provided		Urine (if required)	Other bloodwork as required		Rhogam treatment at hospital (Rh-patients) Immunizations - dTap, Influenza
35-38	Every 2 weeks	Obstetrician	Maternal Assessment Fetal Assessment Review Biophysical/Growth Ultrasound		GBS culture	Serology (tests for infection)		
40-42	Every week	Obstetrician	Maternal Assessment Fetal Assessment					Book induction

5.3.3.2 Frequently Asked Questions Prototype

The prototype for the frequently asked questions was developed in Microsoft Excel based

on feedback from Phase I and is shown in Figure 11.

Figure 11

Frequently Asked Questions Prototype

Q. How do I book an appointment with a doctor GROW Niagara?
A: We require a referral from your family physician. Referrals can be made to any individual physician or all of the physicians within our practice. If we have availability we will advise your family doctor and reach out to you with an appointment time.

Q. When can I expect to see my obstetrician for my first visit?
A. We typically see patients for the first time at 13-20 weeks. Prior to that, your family physician will provide you with your care and the requisitions that we need to conduct a full maternal and fetal assessment when we meet for the first time.

Q. How flexible are your appointments?
A. Because our physicians split their time between obstetrics, gynecology, call shifts on labour and delivery and surgery, each physician will schedule one obstetrical clinic day per week. Our staff will always do their best to accommodate your specific needs.

Q. How should I prepare for my upcoming appointments?
A. Please ensure that your required bloodwork and/or ultrasounds are completed a few days ahead of your appointment as there are occasionally delays in processing results. Based on our patients' feedback, we also recommend keeping a running list of questions that you want to ask the doctor during your visit.

5.3.4 Patient Feedback

Feedback sessions were scheduled by the primary researcher with the same two

participants that participated in the original interview. Time constraints prevented a

detailed discussion of Roadmap Prototype #2 (the AHS table format) and what the ideal

timing would be to receive it. The feedback was categorized into dimensions of content,

medium and timing and is summarized in Tables 25 and 26 with applicable attribution denoted by the first initial of their pseudonyms.

5.3.4.1 Roadmap Prototype – Feedback on Content

Thelma preferred the simplified-structure roadmap prototype created by the research team as it showed the number of visits, separated the activities at and around the visit by category and identified when the hand-off from her family practitioner would happen. She recommended linking to additional resources (if information was provided in a digital format), including additional details on physical examinations, particularly where they could be considered invasive. She also suggested improving the aesthetics. Elektra found the prototypes similar and suggested incorporating more relevant and specific resources into the package.

5.3.4.2 Frequently Asked Questions Prototype – Feedback on Content

Both participants agreed with the questions included in the list and commented on the importance of keeping a running list of questions as a key practice for prenatal patients, particularly for primigravida patients. Both participants provided suggestions for additional FAQs that would be relevant to patients throughout their prenatal journey.

Table 25

Participant Feedback on Prototypes - Content

Prototype	Feedback on Content
Roadmap Prototype #1 (AHS bullet-point format)	Visually overwhelming (T)
	Contains a lot of data but is concise (T)
	Uses complicated technical terms (e.g. symphysis fundal height) (T)
	Would like more colour (T)
	Better preparation for examinations / tests (e.g. Group B strep screen) (T)
	Good for first time moms (E)
	Would be good to link to additional resources for more detail (E)
	Connecting the information to more actionable information (e.g. a take home, detailed meal plan or a link to prenatal classes) would be helpful (E)
Roadmap Prototype #2 (AHS table format)	Too technical (T)
	Likes that it shows how many visits you'll have in each trimester (T)
Roadmap Prototype #3 (Simplified-structured table format)	Preferred version (T)
	Likes that it shows the number of visits in each trimester (T)
	Likes the care provider part as it causes confusion for some on the hand-off from GP to obstetrician (T)
	Likes the column structure that separates the different categories (T)
	If the information is provided digitally, include links to more information (T)
	Include information on what will physically be happening to the patient in the visit – e.g. listening to baby's heart beat, cervical check, getting a sweep, etc. (T)
	Aesthetics need to be improved (T)
	Likes the categories – knowing what you leave with and what you come back with (T)
	Simpler than the AHS version (E)
	Similar to the AHS version (E)
Frequently Asked Questions Prototype	Liked the suggestion of keeping a running list of questions (T,E)
	Suggested additions:
	• Where can I find information about my pregnancy?
	• Where can I sign up for prenatal classes?
	• What should I do if I have questions between my appointments?
	• Links to reliable, relevant resources
	• Forms (e.g. kick-count forms)
	• Is the baby moving or not? What qualifies as a movement?
	• Is this spotting normal or not? How much bleeding is normal?
	• How much weight gain is acceptable / normal?
	• How much more should I be eating?
	• Will I need to provide urine samples?
	• What should I be watching out for ahead of my first OB visit?

5.3.4.3 Prenatal Package – Feedback on Medium and Timing

The participants were divided about the optimal way to deliver the prenatal package to patients. Elektra felt that a physical copy of the package would get lost and add to clutter and would prefer electronic communications. Conversely, Thelma preferred to have a physical version of the package citing concerns that an email would get lost. Both participants agreed that the clinic website would serve an important function as an on-demand resource for relevant clinic information, more detailed resources and frequently asked questions.

Table 26

Participant Feedback on Prenatal Package – Medium & Timing

Aspect of Delivery	Option	Feedback
Medium	Physical Package	Would like it in a physical version and electronically (T)
		Would prefer an electronic copy – does not want more clutter and organizes her life with her phone (E)
	In-clinic information display	Would prefer not to do this because it would be difficult to capture information from the screen. (E)
	Email	Might get lost (T)
		Strongly supports email with relevant documents attached(E)
	Website	Would like a physical copy but would also like the information on a website so she can refer to it when physical copy is not accessible (T)
		Opportunity to host resource information for patients (E)
		Good place to host FAQs for patients to find information between visits (e.g. what the "definition" of a baby movement is, what is acceptable, etc.) (E)
Timing		Electronic version of the package would need to be sent out ahead of time. The physical package could be provided at the first visit (T)

5.3.5 Revised Prototypes

Based on patient feedback, a revised prototype was ideated: an e-mail will be sent to patients upon referral to the clinic that links them to a section of the GROW Niagara website. This contains information for new obstetrical patients. Elements of that website are included in Table 27.

Table 27

Prenatal Preparation Package – Website Content

Element	Description
Welcome	A section congratulating them on their pregnancy and welcoming them to the care team with links to the care team profiles.
Prenatal Roadmap	Prototype Prenatal Roadmap with the following columns: • Visit (# of weeks) • Number of visits in each category • Care provider • Visit objectives (with links to resources providing more information) • Physical examinations that will take place (with links to resources providing more information) • Requisitions provided (with links to resources providing more information) • Samples to bring to the office • Other activities (with links to resources providing more information) Information on complicating factors that will change your journey (e.g. gestational diabetes, preterm labour, etc.) Must also include a link to a PDF version for printing

FAQs	Answers to frequently asked questions broken into the following sections:
	 • Information on how to become a patient (e.g. referral info)
	 • Information about what to expect with their care with the clinic
	 • Information on how to best prepare for an upcoming visit
	 • Links to resources
	    ○ Informational (e.g. pregnancyinfo.ca)
	    ○ Service oriented (e.g. prenatal classes)
	 • Common questions in pregnancy with links to resources (e.g. kick counter)

Clinic location	Link to map, address, contact information

5.4 Discussion

The output of the Design Thinking process is a customer-reviewed prototype solution that has the potential to better prepare patients for their first visit and their entire prenatal journey.

The primary output of the holistic design thinking process – a prenatal package to be distributed to patients at or before their first visit - has the potential to address many of the unmet needs outlined in Phase I. As shown in Table 28, six of the seven primary pain points are addressed by the solution, either by filling informational gaps or setting patient expectations to match the reality of their experience.

Table 28

How Patient Pain Points are Addressed by the Prototype Solution

Patient Pain Points	How it is addressed by the solution (approach)
Long period without care provider guidance before my first visit	Prenatal roadmap (expectation setting) FAQs (filling information gap)
Long office wait-times	FAQs (expectation setting)
Flexibility of appointments	FAQs (expectation setting)
Better understanding of prenatal journey	Prenatal roadmap (filling information gap)
Additional pregnancy resources	FAQs / prenatal roadmap (filling information gap)
Ability to have questions answered between visits	FAQs (filling information gap)
Access to results prior to visit	Not directly addressed

5.4.1 Adherence to Design Thinking Principles

The Design Thinking process was created as a malleable framework. As described by Kelley & Brown (2018), "The process presented here is one suggestion of a framework; ultimately you will make the process your own and adapt it to your style and your work".

Although objective evaluation of how closely the process used in this inquiry matched best practices is impossible, it is nonetheless prudent to subjectively evaluate how closely each step followed the principles of Design Thinking and where improvements could be made in future projects.

5.4.1.1 Empathize

The combination of the patient survey and patient interviews provided a solid foundation of patient understanding with which the design team could empathize. In particular, the combination of quantitative and qualitative feedback allowed the team to understand what patients were feeling, and hear it in their own words. In addition, four members (50%) of the design team had lived experience as pregnant women and six members (75%) worked directly with pregnant moms on a daily basis. This combined experience means that the baseline understanding of the prenatal experience and therefore the capacity to empathize with users was quite high and in alignment with the principles of empathy in Design Thinking.

That said, future work could be improved by information at the time of interest (prior to their first prenatal visit) and by combining interviews with ethnographic research (Roberts et al., 2016).

5.4.1.2 Define

The need for better preparation, particularly prior to the first visit, was well understood and accepted by the design team. The need for preparation aligned well with

the design team's personal and clinical experience with pregnancy. Using the point-of-view of the developed patient personas, the principle of defining the problem and point-of-view in Design Thinking was effectively met.

5.4.1.3 Ideate

While the effectiveness of a brainstorming session is difficult to evaluate, the generation of 37 ideas which were distilled down to 9 ideas suggest that the session was effective, especially given the challenges of conducting these sessions in a relatively short virtual session. All workshop participants participated actively and collaboratively.

Future brainstorming sessions could be improved by helping team members learn about practices in other sectors or other parts of the world. This practice suggested by Roberts et al. (2016) has the potential to broaden the teams thinking on what is possible and could lead to additional innovative ideas.

5.4.1.4 Prototype

Excel was used as a tool to rapidly develop prototypes as it was postulated that this would keep participants focused on the content rather than the visual aesthetics in the testing phase. The prototypes were developed extremely quickly and met the definition of "low-fidelity", in alignment with Design Thinking principles.

During testing, participants did require more prompting than expected on how the prototypes would be deployed, what they would ultimately look like, etc. While they did

focus on content as planned, they did also comment on the need for better visual aesthetics.

The prototypes did meet the Design Thinking principles of being "quick and cheap" however, they were not intuitive enough for users to understand how they would use them without the provision of context and asking the participants to ignore the aesthetics for the time-being. Future studies would benefit from using slightly higher-fidelity tools such as wireframes and/or mock emails to demonstrate exactly how the prototype works. This could be accomplished with only minor additional time and cost requirements.

5.4.1.5 Testing & Iteration

One round of user testing was conducted with two multigravida patients. The participants were asked to review the prototypes based on how it would have impacted their experience 16-24 weeks ago. While it did align with the principles, the approach taken in this step had the weakest link to the principles of Design Thinking, which are rooted in testing the prototypes with real world users without prompting to get a realistic response to it.

Testing in future projects could be improved in three ways. First, the prototypes could be tested with participants who have just found out that their referral has been accepted at the clinic – which is the realistic timing for the survey. Second, although having a large number of participants to conduct testing is unnecessary (Krug, 2006), having 3-4 participants including 1-2 primigravida patients to test the prototype with

would be ideal to ensure diversity of feedback. Finally, conducting at least 2-3 iterations of development would help strengthen the final prototype.

5.4.2 Strengths & Limitations

The strength of Design Thinking is in its ability to create human-centred solutions based on empathy, rapid-prototyping and user feedback. With limited resources, a prototype was developed that has the potential to help patients prepare for their first obstetrical appointment and increase satisfaction with their care.

One limitation is that none of the participants that participated in Phase II of the study were primigravida, which was the group that would see the largest benefit from the intervention. Phase I showed that primigravida patients conducted more research between visits, which may indicate that primigravida patients would find the intervention even more useful. However, future research and evaluation should explore the impact of the prototype and refinements that may be necessary for primigravida patients.

Another potential limitation is whether interview participants provided more favourable answers because a gift card was being offered as an incentive for participation. To mitigate this risk, Phase I participants were not informed of the incentive when initially asked if they would be interested in participating in further research. In addition, interview participants were informed that they would receive the incentive regardless of whether they completed the full interview. Given the study design and that the final prototype is a starting point for future evaluation, the impact of this risk on the findings of the study are minimal.

Finally, the results of Phase II have limited generalizability due to the small patient sample size included in the study. Because patients were being interviewed near the end of their prenatal journey, their ability to objectively recall and evaluate their early prenatal needs may be constrained.

5.5 Conclusion

Using the principles of Design Thinking, a pre-first visit prenatal package was co-designed with prenatal patients and clinicians. Phase II demonstrated that Design Thinking is a feasible option to efficiently develop digital interventions with the potential to improve patient preparedness and satisfaction. While the employed methodology adhered generally to the principles of Design Thinking, the development process for future solutions could be improved by creating more intuitive and realistic prototype, testing them with the target patient population at the time that they would be using them and incorporating additional iterations.

6. DISCUSSION - OVERALL

This study was conducted to determine how to best prepare patients ahead of their obstetrical visits with the objective of increasing their overall satisfaction with their care. A statistically significant association between preparedness and satisfaction was found, reinforcing the opportunity to focus on preparedness to improve satisfaction. Based on the Consumer Model of Satisfaction, setting more realistic expectations with patients about the care that they will receive, particularly as it relates to how early they will be seen by their provider, office wait times and flexibility in scheduling has the potential to increase patient satisfaction with care by expanding the "zone of tolerance." The study also uncovered that patients feel the least prepared ahead of their first visit, a time at which they receive the least amount of formal guidance from a health care professional. Patients reported overall information deficits, specifically as it relates to their care journey, reliable pregnancy resources and access to results prior to their visit. Taken together these unmet needs represent an opportunity to better set expectations about what to expect and to connect patients to reliable resources in the context of their prenatal journey. These may help increase preparedness for visits and improve patient experience.

A Design Thinking methodology was utilized to co-design the prenatal preparation package. Initial studies show that the Design Thinking process shows promise in the design of healthcare applications as compared to traditional processes despite challenges in evaluating the approach (Altman et al., 2018). Part of the challenge in assessing the efficacy of the approach is the difficulty in objectively evaluating how well

the principles of Design Thinking were adhered to. For example, it is impossible to measure how well the design team empathized with the user or whether the optimal user was selected, making it an enigmatic process to study. Ultimately the strength of the Design Thinking process is in its flexibility and adaptability to specific cases and is best evaluated based on is efficiency and the efficacy of its outputs.

The prototype prenatal preparation package incepted in this study has applicability for all providers of prenatal care including obstetricians, family physicians and midwives. Although not the focus study, differences between models of care among prenatal care providers exist and should be thoroughly evaluated against the incentives they create and the impact they have on patient experience.

7. CONCLUSION - OVERALL

The purpose of this study was to design a digital intervention that has the potential to better prepare patients for their obstetrical visits. The project was divided into two phases: the objective of Phase I was to build a baseline understanding of the current patient experience that could be leveraged in Phase II to co-develop a digital intervention with patients using a Design Thinking methodology.

In Phase I it was determined that patients in the study had a high overall level of patient satisfaction, which is consistent with comparable studies (a normalized satisfaction score of 86% as compared to 80% in a Manitoba study (Gregory et al., 2020) and 82% in a Belgian study (Galle et al., 2015)). Patient preparedness was found to be positively associated with satisfaction with care, reinforcing the focus of this inquiry. Participants reported high support needs early in the pregnancy, a time when prenatal visits are less frequent. To supplement their informational needs, participants reported using the internet, social media and mobile applications, which may expose them to incorrect and potentially harmful information about their pregnancy. There is therefore an opportunity to create a digital intervention for patients prior to their first prenatal visit to both prepare the patient for their prenatal journey with their care provider and connect them with reliable sources of prenatal information.

To account for only two participants (both multigravida) being recruited in Phase II, extra time was spent in the Design Thinking workshop establishing patient personas

for both primigravida and multigravida patients, leveraging the research from Phase I as well as the first-hand knowledge of the design team.

In Phase II, a prototype prenatal package was co-developed between patients and clinic staff that could be sent out via email and would better prepare patients for their first visit and their entire prenatal journey. To account for the fact that only two participants (both multigravida) were recruited in this phase, extra time was spent in the Design Thinking workshop establishing patient personas for both primigravida and multigravida patients leveraging the research from Phase I as well as the first-hand knowledge of the design team.

The prenatal package has the potential to improve patient satisfaction by improving preparedness. This package also has the potential to increase adherence to prenatal care as well as to mitigate malpractice risk and exposure to pregnancy misinformation. These may all positively impact the patient experience.

Although the study completed its primary objective of designing a digital intervention to better prepare patients for their first obstetrical visit, it also raises several questions for future research:

1) Does the proposed intervention better prepare patients for their first visit?

2) Does implementing an intervention that increases preparedness cause increased satisfaction with prenatal care improved adherence to

prenatal care, mitigate malpractice risk or decrease pregnancy

misinformation?

3) Does setting more realistic expectations about prenatal care in the

clinic lead to higher patient satisfaction?

4) What is the feasibility, usability and acceptance of the digital solution

as proposed and how might the prototype be improved further?

5) What other areas of medicine would benefit from digital interventions

designed to prepare patients for their care?

8. IMPLICATIONS FOR CLINICAL PRACTICE

8.1 The Early Pregnancy Information Gap

The study shows that patient preparedness is correlated with patient satisfaction. Patient preparedness, particularly for primigravida patients, is lowest at the start of their care when visits with their prenatal provider are less frequent and their informational needs are highest. This represents an opportunity to introduce an intervention to improve preparedness. During this time, patients are supplementing information from their care providers with other sources, particularly in early pregnancy and between visits when they can not reach their care provider. A majority of participants reported using digital tools during their pregnancy with the most prevalent being "birth-month forums" offered through websites and applications such as WhatToExpect.com and BabyCenter.com. Given the peer-generated nature of these forums, there is the potential for misinformation which could lead to behaviours that could harm the patient or their baby. Participants also reported a lack of available information that is reliable and/or relevant to common care practices in Ontario. Connecting patients to reliable, relevant sources of information prior to their first visit has the potential to reduce patient anxiety, decrease the informational power imbalance between patients and their care provider (Joseph-Williams et al., 2014) and create more time during the patient visit to address their psychological and emotional needs.

Providing patients with a digital early pregnancy onboarding package that connects them to clinically appropriate resources and guidance on their course of care has the potential to address this informational gap.

8.2 Setting Expectations for Care

Participants were least satisfied with system characteristics of their care. These included flexibility in booking appointments, how long it took to be seen for their first visit and long clinic wait times. Where the experience itself cannot be changed due to practice constraints, the Consumer Model of Satisfaction would suggest that better matching patient expectations to their actual experience would increase satisfaction.

By including an overview of the patient journey and including frequently asked questions about what to expect during their care, the digital on-boarding package prototyped in this inquiry would help to anchor expectations closer to the reality of their care.

8.3 Design Thinking in Community Based Specialty Practices

The importance of involving users in designing system processes has been recognized as essential to transforming the healthcare system. Ideally this is done with patients being equal-partners or co-designing the process (Bate & Robert, 2006). Design Thinking is a well-established innovation framework used outside of healthcare and has been proposed as an effective means of co-designing healthcare solutions (Roberts et al., 2016). Challenges to the approach include finding effective methods for gathering patient experiences, the power differential between patient and providers and the amount of it

takes to implement (Dimopoulos-Bick et al., 2018; Rahemi et al., 2018). This study

demonstrates that these challenges can be addressed through a combination of a patient

survey, patient surveys and staff workshops utilizing a Design Thinking Methodology.

Design Thinking is best practiced with an agile mindset, which can be summed up

as "when you face uncertainty, try something you think might work, get feedback, and

adjust accordingly" (*What Is Agile?*, n.d.). When implemented iteratively and across

multiple domains of care, Design Thinking has the potential to be a building block of a

Learning Health System (*About Learning Health Systems*, 2019).

Insofar as they use an iterative approach to improve the quality of care, Design

Thinking is similar to process improvement processes such as the "Plan-Do-Study-Act"

approach used in healthcare quality improvement. The main difference between the two

approaches is that Design Thinking starts from a place of empathy and incorporates

iterative prototyping (Altman et al., 2018). An analysis by Roberts et al. (2016) highlights

the differences between the two approaches and is shown in Table 29.

Table 29

Differences between Process Improvement and Design Thinking (Roberts et al., 2016)

Process Improvement Orientation	Design Thinking Orientation
Prioritizes evaluation of limited set of possible solutions	Prioritizes comprehensive understanding of underlying problems
Well suited to address problems that have predictable solutions	Well suited to address problems that have unpredictable solutions (wicked problems)
Promotes consensus building (convergent)	Promotes opposing ideas and debate (divergent)
Aims to uncover what is important to consumers within a particular experience	Aims to uncover what is important to consumers in their everyday lives
Empathy research focuses on what people *think* to reveal improved outcomes	Empathy research focuses on what people *feel* to reveal new/disruptive outcomes

While process improvement is suitable for incremental improvement to existing and known parameters of care, Design Thinking is better suited to develop solutions for problems that have unpredictable or untested solutions.

9. DISCLAIMERS

BORN Ontario

Parts of this thesis were created using data provided by BORN Ontario. All inferences, opinions, and conclusions drawn in this publication are those of the author, and do not necessarily reflect the opinions or policies of BORN Ontario.

Statistics Canada (https://www.statcan.gc.ca/en/reference/licence)

Parts of this thesis were creating using data provided by Statistics Canada. This does not constitute an endorsement by Statistics Canada of this product.

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APPENDIX A: COMPARISON OF MIDWIFERY AND FEE-

FOR-SERVICE PHYSICIAN CARE

Although current midwifery compensation agreements are not publicly available, a compensation review commissioned by the Association of Ontario Midwives and the Ministry of Health and Long Term Care and conducted by the Courtyard Group provides a range of $3,205 - $4,021 as a full compensation package as calculated in Table A1 depending on the experience level (Level 1-6) of the midwife and amounts paid for travel disbursements (Courtyard Group, 2010).

Table A1

Ontario Midwifery Course of Care Compensation (Courtyard, 2010)

Element	Course of Care Compensation	
	Lower Range	Upper Range
Course of Care Fee (Experience Level)	$1,984 (Level 1)	$2,564 (Level 6)
Operational Fee	$744	$744
Travel Disbursement	$80	$200
Benefits Coverage (20% of Course of Care)	$397	$513
Total Compensation per Course of Care	$3,205	$4,021

The compensation calculations do not include grants or malpractice insurance premiums which are paid by the government of Ontario.

Midwifery compensation is based on a holistic approach to care in that it includes prenatal, perinatal and postpartum care. A study by Walters et al. (2015) estimated that the perinatal portion of midwifery compensation for a low-risk vaginal delivery was 48% of the course of care. The remaining 52% can therefore be attributable to prenatal and postpartum care or $1,666 to $2,091 per course of care. Based on an estimated 17-18

midwifery visits across the course of care (*Midwifery Care | AOM*, n.d.), compensation is approximately $92.58 to $122.99 per visit.

Prenatal care by obstetricians for low-risk pregnancies encompass a similar number of visits as midwifery in addition to the first 1-2 visits are completed by the patient's family physician prior to referral to the obstetrician. According to the Physician Services Agreement, an antenatal preventative health assessment (P003) is payable only once per course of care (MOHLTC, 2022) and is often billed by the family physician prior to referral. Unlike midwifery patients, obstetrical patients with uncomplicated pregnancies receive a single postpartum visit approximately 6 weeks postpartum to assess patient recovery, address any outstanding medical or psychological issues and receive contraceptive counselling. The 2022 Schedule of Benefits was used to calculate the average obstetricians compensation of $45.45 - $50.22 per visit as outlined in Table A2.

Table A2

Obstetricians - Calculation of Average Visit Compensation per Course of Care (2022)

Number of services per course of care	OHIP Billing Code	Fee
1	Initial Obstetrical Consultation (A205)	$111.70
1	General Assessment – Major prenatal visit (P003)	$77.20
0-1	Antenatal preventative health assessment (P005)	$45.15
9	Minor prenatal assessment (P004)	$36.85
1	Postnatal care in office (P008)	$36.85
	Average compensation per prenatal and postpartum visit	$45.45 - $50.22

The compensation calculations do not include health benefits or malpractice insurance premiums which are partially subsidized by the Government of Ontario.

Combination of these results suggests that midwives are paid 1.8x to 2.6x more than obstetricians for prenatal and postpartum visits.

APPENDIX B: LITERATURE APPRAISAL

Critical Appraisal of Systematic Review by Kinnersley et al. (2009)

CASP
Critical Appraisal
Skills Programme

Paper for appraisal and reference: nterventions before consultations for helping patients ac ➕

Section A: Are the results of the review valid?

1. Did the review address a clearly focused question?

Yes ✔
Can't Tell ☐
No ☐

HINT: An issue can be 'focused' In terms of
- the population studied
- the intervention given
- the outcome considered

Comments:

2. Did the authors look for the right type of papers?

Yes ✔
Can't Tell ☐
No ☐

HINT: 'The best sort of studies' would
- address the review's question
- have an appropriate study design (usually RCTs for papers evaluating interventions)

Comments: 33 randomized control trials

Is it worth continuing?

3. Do you think all the important, relevant studies were included?

Yes ✔
Can't Tell ☐
No ☐

HINT: Look for
- which bibliographic databases were used
- follow up from reference lists
- personal contact with experts
- unpublished as well as published studies
- non-English language studies

Comments: Non-randomized clinical trials and prospective cohort studies were not included. These were originally included in the protocol, but were excluded after their literature search revealed that there were sufficient RCTs. The authors argue that they were able to raise the level of evidence by including only RCTs. Given the prevalence of cohort studies and non-randomized clinical trials in eHealth interventions, I would be concerned that they were overly exclusive.

CASP
Critical Appraisal
Skills Programme

4. Did the review's authors do enough to assess quality of the included studies?

Yes ✔
Can't Tell
No

HINT: The authors need to consider the rigour of the studies they have identified. Lack of rigour may affect the studies' results ("All that glisters is not gold" Merchant of Venice – Act II Scene 7)

Comments:

5. If the results of the review have been combined, was it reasonable to do so?

Yes ✔
Can't Tell
No

HINT: Consider whether
• results were similar from study to study
• results of all the included studies are clearly displayed
• results of different studies are similar
• reasons for any variations in results are discussed

Comments: Meta-analyses of 5 outcomes:
Question asking
Anxiety
Patient satisfaction
Knowledge
Consultation length

Section B: What are the results?

6. What are the overall results of the review?

HINT: Consider
• If you are clear about the review's 'bottom line' results
• what these are (numerically if appropriate)
• how were the results expressed (NNT, odds ratio etc.)

Comments: Small and statistically significant improvements (95% CI)
Question asking: SMD 0.27 (0.19 to 0.36)
Patient satisfaction SMD 0.09 (0.03 to 0.16)
Anxiety before consultation WMD -1.56 (-7.1 to 3.97) --> notable but not statistically significant
Anxiety after consultation SMD -0.08 (-0.22 to 0.06) --> small and not statistically significant

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CASP

Critical Appraisal
Skills Programme

7. How precise are the results?   HINT: Look at the confidence intervals, if
                                                                                given

Comments: Very precise

Section C: Will the results help locally?

8. Can the results be applied to   Yes ✔   HINT: Consider whether
   the local population?   • the patients covered by the review
                                         Can't Tell   could be sufficiently different to your
                                                               population to cause concern
                                         No   • your local setting is likely to differ much
                                                               from that of the review

Comments:

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9. Were all important outcomes   Yes ✔   HINT: Consider whether
   considered?   • there is other information you would
                                         Can't Tell   like to have seen
                                         No

Comments:

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10. Are the benefits worth the   Yes ✔   HINT: Consider
    harms and costs?   • even if this is not addressed by the
                                         Can't Tell   review, what do you think?
                                         No

Comments:

Critical Appraisal of Systematic Review by Gholamzadeh et. al (2021)

CASP
Critical Appraisal
Skills Programme

Paper for appraisal and reference: Applied techniques for putting pre-visit planning in clinical +

Section A: Are the results of the review valid?

1. Did the review address a clearly focused question?

Yes ☐
Can't Tell ✔
No ☐

HINT: An issue can be 'focused' In terms of
- the population studied
- the intervention given
- the outcome considered

Comments: pre-visit planning is not well-defined in this context. Scope includes pre-visit and pre-care and there's a random framework included?

2. Did the authors look for the right type of papers?

Yes ☐
Can't Tell ☐
No ✔

HINT: 'The best sort of studies' would
- address the review's question
- have an appropriate study design (usually RCTs for papers evaluating interventions)

Comments: Inclusion criteria includes "improve patient-centred care"!? This is already biased. Shows a listing of what has been done, but not what generalizable evidence can be drawn from them.
The review is more of a best practices review than a systematic review.

Is it worth continuing?

3. Do you think all the important, relevant studies were included?

Yes ☐
Can't Tell ☐
No ✔

HINT: Look for
- which bibliographic databases were used
- follow up from reference lists
- personal contact with experts
- unpublished as well as published studies
- non-English language studies

Comments:

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Critical Appraisal of Full Text Articles Using the Mixed Methods Appraisal Tool

Table B1

Screening Questions and Overall Evaluation of Evidence

			SCREENING QUESTIONS	
First author	**Year**	**Strength of Evidence**	**S1. Are there clear research questions?**	**S2. Do the collected data allow to address the research questions?**
Myers	2020	Poor	Yes	Can't tell
Versluijs	2021	Good	Yes	Yes
Lindfors	2019	Good	Yes	Can't tell
Prakesh	2018	Poor	Yes	No
Sepucha	2019	Good	Yes	Yes
Bruinnsen	2016	Poor	Can't tell	Yes
Wolff	2014	Excellent	Yes	Yes
Unnithan	2021	Good	Yes	Yes
Albada	2014	Good	Yes	Yes
Zanini	2016	Good	Yes	Yes
Vo	2019	Good	Yes	Yes
Stankowski	2019	Poor	Yes	Yes

Table B2

Evaluation of Qualitative Studies Using the Mixed Methods Appraisal Tool

First author	Year	1.1. Is the qualitative approach appropriate to answer the research question?	1.2. Are the qualitative data collection methods adequate to address the research question?	1.3. Are the findings adequately derived from the data?	1.4. Is the interpretation of results sufficiently substantiated by data?	1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?
Zanini	2016	Yes	Yes	Yes	Yes	Yes

Table B3

Evaluation of Randomized Control Trials Using the Mixed Methods Appraisal Tool

First author	Year	2.1. Is randomization appropriately performed?	2.2. Are the groups comparable at baseline?	2.3. Are there complete outcome data?	2.4. Are outcome assessors blinded to the intervention provided?	2.5 Did the participants adhere to the assigned intervention?
Myers	2020	Can't tell	Can't tell	No	No	Yes
Versluijs	2021	Yes	Yes	Yes	No	Yes
Lindfors	2019	Yes	Yes	Can't tell	Yes	Yes
Sepucha	2019	Can't tell	Yes	Yes	No	Yes
Bruinnsen	2016	Can't tell	No	No	Yes	Can't tell
Wolff	2014	Can't tell	Yes	Yes	Yes	Yes
Albada	2014	Yes	Can't tell	Yes	Yes	Can't tell
Vo	2019	Yes	Can't tell	Yes	Yes	Yes
Stankowski	2019	Can't tell	No	No	Can't tell	Can't tell

Table B4

Evaluation of Non-Randomized Studies Using the Mixed Methods Appraisal Tool

First author	Year	3.1. Are the participants representative of the target population?	3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?	3.3. Are there complete outcome data?	3.4. Are the confounders accounted for in the design and analysis?	3.5. During the study period, is the intervention administered (or exposure occurred) as intended?
Unnithan	2021	Can't tell	Yes	Yes	Can't tell	Yes

Table B5

Evaluation of Quantitative Descriptive Studies Using the Mixed Methods Appraisal Tool

First author	Year	4.1. Is the sampling strategy relevant to address the research question?	4.2. Is the sample representative of the target population?	4.3. Are the measurements appropriate?	4.4. Is the risk of nonresponse bias low?	4.5. Is the statistical analysis appropriate to answer the research question?
Lindfors	2019	Yes	Can't tell	Yes	Can't tell	No

APPENDIX C: RESEARCH ETHICS CERTIFICATE OF

CLEARANCE

McMaster | Research Ethics
University | Board

McMaster University Research Ethics Board (MREB)
c/o Research Office for Administrative Development and Support
MREB Secretariat, GH-305
1280 Main St. W.
Hamilton, Ontario, L8W 4L8
email: ethicsoffice@mcmaster.ca
Phone: 905-525-9140 ext. 23142

CERTIFICATE OF ETHICS CLEARANCE TO INVOLVE HUMAN PARTICIPANTS IN RESEARCH

Today's Date: Apr/11/2022

Co-Investigator: Dr. Uthra Mohan, Dr. Elaina Orlando
Supervisor: Dr. Norm Archer
Student Investigator: Mr. Vernon Schneider
Applicant: Mr. Vernon Schneider
Project Title: Digital Visit Preparation to Increase Patient Satisfaction with Prenatal Care
MREB#: 5866

Dear Researcher(s)

The ethics application and supporting documents for MREB# 5866 entitled "Digital Visit Preparation to Increase Patient Satisfaction with Prenatal Care" have been reviewed and cleared by the MREB to ensure compliance with the Tri-Council Policy Statement and the McMaster Policies and Guidelines for Research Involving Human Participants.

The application is cleared as presented without questions or requests for modifications. The above named study is to be conducted in accordance with the most recent approved versions of the application and supporting documents.

The application protocol is cleared as revised without questions or requests for modification. The above named study is to be conducted in accordance with the most recent approved versions of the application and supporting documents.

If this project includes planned in-person contact with research participants, then procedures for addressing COVID-19 related risks must be addressed according to the current processes communicated by the Vice-President (Research) and your Associate Dean (Research). All necessary approvals must be secured before in-person contact with research participants can take place.

Ongoing clearance is contingent on completing the Annual Report in advance of the yearly anniversary of the original ethics clearance date: Apr/11/2023. If the Annual Report is not submitted, then ethics clearance will lapse on the expiry date and Research Finance will be notified that ethics clearance is no longer valid (TCPS, Art. 6.14).

An Amendment form must be submitted and cleared before any substantive alterations are made to the approved research protocol and documents (TCPS, Art. 6.16).

Researchers are required to report Adverse Events (i.e. an unanticipated negative consequence or result affecting participants) to the MREB secretariat and the MREB Chair as soon as possible, and no more than 3 days after the event occurs (TCPS, Art. 6.15). A privacy breach affecting participant information should also be reported to the MREB secretariat and the MREB Chair as soon as possible. The Reportable Events form is used to document adverse events, privacy breaches, protocol deviations and participant complaints.

Document Type	File Name	Date	Version
For Information Only	tcps2_core_certificate	Feb/03/2022	1
Response Documents	Summary of Revisions V1 20220325	Mar/25/2022	1
Recruiting Materials	APPENDIX A V2 20220325 - Recruitment - Email Script (for Phase II)	Mar/25/2022	2
Recruiting Materials	APPENDIX B V2 20220325 - Recruitment - Medical Secretary Script	Mar/25/2022	2
Interviews	APPENDIX C1 V2 20220325- Interview guide - Initial Interview	Mar/25/2022	2
Interviews	APPENDIX C2 V2 20220325 - Interview guide - Follow up Interview	Mar/25/2022	2
Test Instruments	Patient Satisfaction Survey V2 20220325	Mar/25/2022	2
Test Instruments	Patient Follow Up Signup Form V1 20220325	Mar/25/2022	1
Test Instruments	Patient Contact With Study Findings Form V1 20220325	Mar/25/2022	1
Consent Forms	APPENDIX D4 - V1 20220325 - Oral Consent Log	Mar/25/2022	1
Consent Forms	APPENDIX D3 - V1 20220325 - Oral Consent for Interviews	Mar/25/2022	1
Consent Forms	APPENDIX D1 V2 20220325 - Letter of Information - Survey	Mar/25/2022	2
Consent Forms	APPENDIX D2 V2 20220325 - Letter of Information - Interview	Mar/25/2022	1
Consent Forms	APPENDIX E V1 20220203 - Consent Preamble	Mar/25/2022	1
For Information Only	APPENDIX F V2 20220325 - Study Protocol	Mar/25/2022	2
Letters of Support	Prenatal Resources Handout	Mar/30/2022	1

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APPENDIX D: SATISFACTION WITH PRENATAL CARE

SURVEY

Patient Satisfaction Survey 2

Record ID	1

DIGITAL VISIT PREPARATION TO INCREASE PATIENT SATISFACTION WITH PRENATAL CARE

This study is being conducted by Vernon Schneider, Student Investigator in the eHealth program at McMaster University.

The purpose of the study is to understand prenatal care experience and identify opportunities to better prepare patients for their prenatal visits. Information gathered during this study will be written up as a thesis and a journal article. People participating in this study must be at least 36 weeks pregnant, have had at least 4 visits at GROW Niagara Health (without a transfer of care from another OB or midwife office), and be able to read and complete a survey in English.

The survey should take approximately 7 minutes to complete. To learn more about this study, particularly in terms of any risks or harms associated with the study, how confidentiality and anonymity will be handled, and helpful resources should any questions or tasks make you uncomfortable or upset etc., please consult the Letter of Information, which is linked below. If you would like a copy of the Letter of Information, there is one available from the receptionist.

YOUR DECISION TO PARTICIPATE IN THIS SURVEY IS OPTIONAL AND WILL HAVE NO IMPACT ON THE QUALITY OF CARE YOU RECEIVE.

This study has been reviewed and cleared by the McMaster Research Ethics Board (MREB#).
If you have any concerns or questions about your rights as a participant or about the way the study is being conducted, please contact:
McMaster Research Ethics Board Secretariat
Telephone 1-(905) 525-9140 ext. 23142
E-mail: ethicsoffice@mcmaster.ca

Would you like to participate in the Study?

◯ Yes (Proceed with survey)   ◯ No (Please return tablet to reception)

During my prenatal care at GROW Niagara Health, I expected:					
	Strongly disagree	Disagree	Agree	Strongly agree	N/A
To be seen sooner for my first prenatal visit	◯	◯	◯	◯	◯
To have my prenatal visits take a long time	◯	◯	◯	◯	◯
To get more from my prenatal visits than being weighed and having my baby's heart checked	◯	◯	◯	◯	◯

The time the staff spends talking about things of interest to me	○	○	○	○	○
The interest and concern the staff have shown me	○	○	○	○	○
The way the staff deals with all my medical problems	○	○	○	○	○
The amount of time I wait to be seen by my provider	○	○	○	○	○
The total amount of time I spend at the office/clinic	○	○	○	○	○
The waiting room facilities of the office/clinic	○	○	○	○	○
The examination room of the office/clinic	○	○	○	○	○
My ability to schedule or reschedule prenatal visits at a time convenient for me	○	○	○	○	○
How easy it was to get prenatal care early in my pregnancy (that is, before the fourth month)	○	○	○	○	○
Having all the recommended tests	○	○	○	○	○
The number of prenatal visits I made during the first six to seven months	○	○	○	○	○

How satisfied are you with the prenatal care that you received at GROW Niagara?

○ Very dissatisfied   ○ Dissatisfied   ○ Neutral   ○ Satisfied   ○ Very satisfied   ○ Unsure

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On a scale of 0 to 10, where 0 is extremely unlikely and 10 is extremely likely, how willing would you be to recommend GROW Niagara Health?

○ 0   ○ 1   ○ 2   ○ 3   ○ 4   ○ 5   ○ 6   ○ 7   ○ 8   ○ 9   ○ 10

Thinking about your prenatal care at GROW Niagara, what went well? Please explain what happened, how it happened, and how it felt to you.

Thinking about your prenatal care at GROW Niagara, what do you wish had gone differently. Please explain what happened, how it happened, and how it felt to you.

To receive information during my visits without having to ask a lot of questions	○	○	○	○	○
To have one provider that I routinely see for my prenatal visits	○	○	○	○	○
To have the provider that I routinely see deliver my baby	○	○	○	○	○
To receive information about parenting a newborn.	○	○	○	○	○
My provider to address how I felt mentally as well as physically	○	○	○	○	○
My provider to be gentle during my physical exam	○	○	○	○	○
Someone to listen to my concerns	○	○	○	○	○

Thinking about my prenatal care at GROW Niagara Health, I am satisfied with:

	Strongly disagree	Disagree	Agree	Strongly agree	N/A
The explanation my provider gave to me of what was going to happen during my prenatal visits	○	○	○	○	○
The explanation my provider gave to me about medical procedures	○	○	○	○	○
The information my provider gave to me about how things are going with my pregnancy	○	○	○	○	○
The way my provider has prepared me for labor and delivery	○	○	○	○	○
The respect that I am shown by my provider	○	○	○	○	○
The quality of care that I receive from my provider	○	○	○	○	○
The way I am made to feel that I am not wasting my provider's time	○	○	○	○	○
Being able to ask questions without embarrassment	○	○	○	○	○
Not having to repeat my story every time I come in for a visit	○	○	○	○	○

REDCap®

When was your first visit at GROW Niagara?

◯ First trimester
◯ Second trimester
◯ Third trimester

How prepared did you feel for the following prenatal visits during your pregnancy?						
	Extremely unprepared	Somewhat unprepared	Neither prepared nor unprepared	Somewhat prepared	Extremely prepared	N/A
Your visits with your primary healthcare provider prior to your first visit at GROW Niagara	◯	◯	◯	◯	◯	◯
Your first visit with your GROW Niagara physician?	◯	◯	◯	◯	◯	◯
Your third trimester visits with your GROW Niagara physician?	◯	◯	◯	◯	◯	◯

How often did you research information about your pregnancy?

◯ Every day   ◯ A few times per week   ◯ Weekly   ◯ Less than weekly   ◯ Not sure

How do you prepare for your visits at GROW Niagara? Please be as descriptive as possible

What types of resources did you use to help you with your pregnancy?
Please check all that apply:

☐ Websites
☐ Peer group on social media
☐ Social media content creators / influencers
☐ Books
☐ Mobile health application (app)
☐ Friends & family
☐ Prenatal class
☐ Other: _____

What is your year of birth?

_____

Is this your first pregnancy that has progressed to at least 28 weeks?

◯ Yes   ◯ No   ◯ Prefer not to say

In general, how would you rate your overall physical health?

○ Excellent
○ Very good
○ Good
○ Fair
○ Poor
○ Prefer not to say

In general, how would you rate your overall mental or emotional health?

○ Excellent
○ Very good
○ Good
○ Fair
○ Poor
○ Prefer not to say

How would you describe your marital status?

○ Single (never married)
○ Married or in a domestic partnership
○ Widowed
○ Divorced
○ Separated
○ Other
○ Prefer not to say

What is the highest grade or level of school that you have completed?

○ 8th grade or less
○ Some high school, but did not graduate
○ High school or high school equivalency certificate
○ College, CEGEP or other non-university certificate or diploma
○ Undergraduate degree or some university
○ Post-graduate degree or professional designation
○ Prefer not to say

Do you consider yourself to be a member of a visible minority?

○ Yes
○ No
○ Prefer not to say

What is your current employment status?

○ Employed full time (40 or more hours per week)
○ Employed part time (up to 39 hours per week)
○ Unemployed and currently looking for work
○ Unemployed and not currently looking for work
○ Student
○ Retired
○ Homemaker
○ Self-employed
○ Unable to work
○ Prefer not to say

What is your household income in a typical year?

○ $0
○ $1 to $9 999
○ $10 000 to $24 999
○ $25 000 to 49 999
○ $50 000 to 74 999
○ $75 000 to 99 999
○ $100 000 to 149 999
○ $150 000 and greater
○ Prefer not to answer

Would you be willing to participate in an additional study to help prepare patients for their obstetrical visits? (OPTIONAL)

⊗ Yes   ○ No

Follow Up

To participate in the follow up study, we will need your first name and email address.

If you are selected, we will contact you by email in a few weeks.

First Name:

_____

Email Address:

_____

If you would like to to receive details on the study findings, please click here to provide your contact information: [hyperlink to be inserted here]

APPENDIX E: INTERVIEW GUIDES

Interview Questions: Initial Interview

Thank you for your interest in participating in the study. As was mentioned in the email that you received from me, we are exploring how we can better prepare patients for their prenatal visits.

The format for the study is 2 x 30 minute interviews. The goal for the first interview, is to get a deeper understanding of your experience ahead of your first OB visit. We'll use your feedback, combined with feedback from other patients to describe what that experience looks like for typical prenatal patients.

We'll take that information away and use it to develop a prototype communication, which could be an email, text message or something totally different that could help patients for their first visit.

Our second interview, which will take place in 2-3 weeks time will be to review the prototype that has been developed to get your candid feedback on it.

Sound good?

Before we begin, I do need to get your informed consent.
[SWITCH TO ORAL CONSENT FORM]

[IF PERMISSION PROVIDED]: We'll now start the recording.

1) Review key findings from the survey.
    a. Patients who felt prepared for their visits were overall more satisfied with their care.
    b. The least prepared patients felt was for their care with their family doctor and their first OB visit.
    c. On average, patients who had been through pregnancy previously felt a lot more prepared than patients that are on their first pregnancy.

2) ~~On your survey, you mentioned that you felt least prepared for your first OB visit. Can you walk us through your experience during that period? What were you doing, thinking, feeling and expecting?~~
    RESEARCHER NOTE: Neither of the interviewed participants indicated a low preparation score for their first visit. This question was therefore omitted.

3) What could we have done to better prepare you for that visit / those visits?

4) If we had sent out additional information / links to resources ahead of that visit / those visits, how would that have changed your experience? (e.g. a link to pregnancyinfo.ca that has information directly related to your upcoming visit).

5) If we had set expectations in advance of that visit / those visits, how would that have changed your experience? (e.g. what the physician will be evaluating in your upcoming visit)

6) If we had assigned you specific homework to do ahead of that visit / those visits, how would that have changed your experience? (e.g. asking you to write down 3 questions you want to ask the doctor at your upcoming visit)

7) How else could we have improved your experience at that time?

8) Is there something important we forgot? Is there anything else you think I need to know about your experience – whether it is related to your first visit or any other aspect of your care?

END

Interview Questions: Follow Up Interview

Hi [PARTICIPANT NAME]

Thank you for agreeing to follow up with me.

After our conversations with prenatal patients like yourself, we were able to put together a prototype communication that I'd like to get your perspective on.

Do you have any questions before we begin?

[IF PERMISSION PREVIOUSLY PROVIDED TO RECORD]: Would it be alright if we recorded today's session again? Recording our conversation will let me more accurately capture our conversation. The recording will be destroyed once I have a chance to transcribe it. Transcription will be under a pseudonym, will be encrypted and stored on a McMaster site and deleted on completion of the study.

Information about these interview questions: This gives you an idea what I would like to learn about digital visit preparation. Interviews will be one-to-one and will be open-ended (not just "yes or no" answers). Because of this, the exact wording may change a little. Sometimes I will use other short questions to make sure I understand what you told me or if I need more information when we are talking such as: "*So, you are saying that …?*"), to get more information ("*Please tell me more?"),* or to learn what you think or feel about something ("*Why do you think that is…?").*

Based on the feedback of you and several other patients, we came up with a few communications that we believe could have helped with your visit preparation.

[FOR EACH PROTOTYPE COMMUNICATION]

1) How would you have used this?

2) How would it have changed your experience?

3) How would you change it?

[AFTER REVIEWING EACH PROTOTYPE]

1) What would be your preferred choice?

END

APPENDIX F: ALBERTA HEALTH SERVICES – EXCERPTS

FROM THE ALBERTA ANTENATAL PATHWAY

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Overview

Early identification and management of prenatal risk factors is crucial for optimizing pregnancy, maternal, and newborn outcomes. A prenatal visit that occurs as soon as possible following the time of positive pregnancy test would help to identify women with added risk factors and enables the health care provider to tailor prenatal care accordingly. Evidence suggests that 8-10 prenatal visits is sufficient for uncomplicated pregnancies, and improvement in outcome indicators does not increase with greater than 10 prenatal visits in the absence of increased risk. Virtual prenatal visits appear to be as safe as in-person prenatal care, associated with high patient satisfaction, and result in improved access to regular and specialized care for women in rural and remote areas.

Maternal Fetal Assessments – Schedule of Appointments

A recommended pattern of prenatal visits for the woman of average obstetrical risk is 8-10 visits. Generally visits are recommended at – 10, 16, 20, 24, 28, 34, 36, 38 and 41 weeks. The nulliparous woman should have additional assessments at 31 and 40 weeks. Identify women who may need additional care based on risk factors and plan pattern of care for their pregnancy accordingly. The following provides an example of visit patterns for an **average risk** patient- additional visits are based on risk factors identified and management plans.

1. **10 week or initial booking appointment**
   - Identify women with risk factors who may require an alternate pattern of care for pregnancy.
   - Lab/diagnostics: hepatitis B surface antigen, syphilis, HIV, rubella susceptibility, Varicella IgG, blood group, screen for haemoglobinopathies, anemia, red cell alloantibodies, screening for pre-eclampsia, urine for proteinuria as indicated, screening for type 2 diabetes with A1C, or fasting glucose if A1C not reliable such as with haemoglobinopathies (If this is not diagnostic of type 2 diabetes, then the patient should have the usual screening done at 24-28 weeks), ultrasound for multiples and gestational age assessment and offer ultrasound for structural anomalies.
   - Genetic screening: Does genetic testing align with patient values and preferences? If yes, schedule 1st trimester aneuploidy screen
   - Screen for and develop plan to manage chronic disease
   - Measure BP, height, weight and calculate BMI.
   - Consider need of ASA for at risk patients for hypertensive concerns
   - Discuss healthy weight and weight gain goals.

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- Consider a Dietitian referral for all women pregnant with multiples in the first trimester or as early as possible.
- Recommend prenatal vitamins and folic acid.
- Provide education about safe behaviors, exposures, hyperemesis-identification and management and significance of bleeding in the first trimester.
- Ask about anxiety/depression and any past or present mental illness or psychiatric treatment,
- Ask about the patient's occupation to identify potential risks.
- Provide link or access to Healthy Families, Healthy Children on-line resource

2. 16 week appointment
- Review results of screening tests, reassess planned pattern of care. Investigate HB below 110g/L and consider iron supplementation if required.
- Patients with ongoing risk for syphilis, will be re-screened throughout pregnancy
- BP and Urine for proteinuria as indicated.
- Discuss healthy weight gain goals,
- Ask about anxiety/depression.
- Discuss pregnancy topics and offer prenatal classes.

3. 20 week appointment
- Ultrasound for detection of structural/placental anomalies.
- BP, Urine for proteinuria as indicated,
- Patients with ongoing risk for syphilis, will be re-screened throughout pregnancy
- Fetal heart sounds/movement.
- Information on pregnancy,
- Healthy weight gain discussion,
- Assess fetal heart sounds,
- Assess for anxiety/depression.

4. 24 week appointment
- Initiating precautions for preterm labor,
- Consider risk for preeclampsia, Urine for proteinuria as indicated,
- Discuss Anti-D prophylaxis to rhesus- negative women
- Fetal heart sounds/movement
- Screen all women without known diabetes for GDM between 24-28 weeks of gestation
- Patients with ongoing risk for syphilis, will be re-screened throughout pregnancy
- Healthy weight gain discussion
- Assess for anxiety/depression

- Assess for social support networks.

5. **28 week appointment**
    - Screening for anemia and atypical red cell alloantibodies. Investigate Hemoglobin below 105 g/L and consider iron supplementation if indicated.
    - Anti-D prophylaxis to rhesus- negative women
    - Patients with ongoing risk for syphilis, will be re-screened throughout pregnancy
    - BP, Urine for proteinuria as indicated
    - Measure and plot symphysis fundal height,
    - Fetal heart rate and movement,
    - Healthy weight gain discussion,
    - Ask about anxiety/depression.
    - Begin discussions about infant feeding choices and contraception considerations following birth

6. **34 week appointment**
    - 2nd dose of anti-D to rhesus negative women if bleeding or ECV,
    - BP, urine for proteinuria as indicated,
    - Patients with ongoing risk for syphilis, will be re-screened throughout pregnancy
    - Plot symphysis fundal height, fetal heart rate and movement,
    - Review and discuss results of screening tests,
    - Discuss healthy weight gain,
    - Assess anxiety or depression,
    - Reassess planned pattern of care.

7. **36 week appointment**
    - BP, urine for proteinuria as indicated, GBS culture,
    - Patients with ongoing risk for syphilis, will be re-screened throughout pregnancy
    - Symphysis fundal height, position of baby, fetal heart rate and movement
    - Discuss healthy weight gain,
    - Assess for anxiety or depression.
    - For women with breech presentation may offer external cephalic version

8. **38 week appointment**
    - BP, Urine for proteinuria as indicated,
    - Patients with ongoing risk for syphilis, will be re-screened throughout pregnancy
    - Measurement and plotting of symphysis fundal height, fetal heart rate and movement.
    - Offer membrane sweep.

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9. **41 week appointment**
   - Symphysis Fundal height, fetal heart rate and movement.
   - BP and Urine for proteinuria.
   - Patients with ongoing risk for syphilis, will be re-screened throughout pregnancy
   - Offer induction of labor, as indicated.

Routine Antenatal Care

Routine antenatal care that will assist in the early identification and subsequent management of obstetrical risks are outlined in by trimester in the following table:

Trimester	Primary Care Physician/Midwife	PCN Nurse/Clinic nurse-anticipated guidance

1st Trimester 10-12 weeks
 	
1st visit
	First Visit- following confirmed pregnancy – Initiate prenatal record/risk assessment
	• History- Medical, Maternal, Neonatal
	• Maternal Assessment
	  o Height, weight, (BMI) identify and discuss healthy weight gain for pregnancy, BP, Breast, Pelvic Exam- cervix, position, uterus
	  o Anxiety/ depression
	  o Pap smear if not completed in last three years in accordance with Alberta guidelines
	• Lab
	  o Complete Blood Count
	  o Platelets
	  o ABO/Rh (*if patient is Rhesus negative; Repeat ABO/Rh at 26weeks, if still negative, give WhinRo at about 28 weeks*)
	  o Red cell antibodies (*if red cell antibody screen is positive, continue testing q4weeks*)
	  o HBsAG
	  o Rubella Immunity
	  o Varicella immunity
	  o Syphilis screening
	  o HIV
	  o Chlamydia
	  o Gonorrhea
		Counselling (1st and subsequent visits):
		• Provide link to Prenatal Resources by zone: ahs.ca/prenatal
		• Provide link to HPHC resource
		• Healthy Mothers, healthy babies questionnaire https://www.albertahealthservices.ca/frm-20590.pdf
		• Information about prenatal classes
		• Healthy Weight Gain during pregnancy: Pregnancy Weight Gain Calculator https://healthyparentshealthychildren.ca/resources/tools/weight-gain-calculator
		• Nutrition and supplements
		• Food quality / safety-Discuss food safety and implications of food borne infections
		• Management of symptoms: Nausea & vomiting
		• Educate regarding safe behaviors, exposures
		• Hyperemesis- identification and management,
		• Significance of first trimester bleeding
		• Exercise / sleep
		• Work / environmental concerns / seatbelt use
		• Smoking, Alcohol, Cannabis and drug use
		• Intimate partner violence / relationship stability

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- ○ Urine Culture and sensitivity
- ○ TSH in women with known thyroid disease or symptoms of thyroid disease.
- Diabetes – is it present (pre-existing Type 1 or Type 2?), for Type 2 check Netcare, if no previous testing and high risk do A1c
- Genetic screening – Does genetic testing align with patient values and preferences? If so- schedule 1st trimester aneuploidy screen
- Schedule dating ultrasound- 12 weeks
- Initiate prenatal vitamins and counsel re: folic acid in the prevention of neural tube defects, oral clefts and heart defects
- Consider need for ASA for at risk patients
- Screen for and manage chronic disease
- Educate regarding safe behaviors, exposures, hyperemesis- identification and management, significance of first trimester bleeding
- Recommend and provide influenza vaccine prior to and during flu season.

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- Mental Health
https://www.healthyparentshealthychildren.ca/im-pregnant/overview-of-pregnancy/mental-health/#depression-and-anxiety

- Sexuality
https://www.healthyparentshealthychildren.ca/im-pregnant/overview-of-pregnancy/taking-care-of-your-relationships/

Refer to HPHC content specific to 2nd trimester
https://www.healthyparentshealthychildren.ca/im-pregnant/second-trimester

Birth Preferences
https://admin.healthyparentshealthychildren.ca/wp-content/uploads/2018/11/Birth-wishes.pdf

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13-20 week visit
- Review antenatal risk factors
  - ○ Discuss screening results, Identify place of birth, birth preferences and maternity care provider. Consult/Refer as indicated by risk factors identified.

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| 2nd Trimester 13-27 weeks (3-4 visits) | • Maternal Physical assessment:
  ○ Weight- Healthy weight gain discussion
  ○ Blood pressure
  ○ Symphysis - fundal height in cm to assess fetal growth.
  ○ Urine for protein to assess risk of preeclampsia as indicated
  ○ Red cell antibody titres every 4 weeks if antibody screen positive
  ○ All pregnant women will be screened for syphilis in the first trimester. If there is ongoing risk, women will be re-screened throughout pregancy
  ○ Early Diabetic screening if risk factors present
  ○ Anxiety/ Depression?
• **Fetal Assessment**
  ○ Fetal heart sounds
  ○ Presence of fetal movements >20 weeks
  ○ Assign gestational age and EDB based on 12 week U/S results
• **Diagnostics**
  ○ Quad Screen: genetic screening for spina bifida, Down Syndrome, Trisomy's (if 1st trimester screen missed)
  ○ Amniocentesis
  ○ Ultrasound for anatomical & fetal growth | |
| | 21-27 week visit
• **Maternal Physical Assessment**
  ○ Weight-healthy weight gain?
  ○ Blood pressure | **Counselling:**
• Fetal movement awareness and maternal response to a decrease in fetal movement
• Healthy Weight management
• Nutrition |

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○ Anxiety/depression
○ All pregnant women will be screened for syphilis in the first trimester. If there is ongoing risk, women will be re-screened throughout pregacy

Fetal Assessment

○ Symphysis – fundal height in cm
○ Fetal heart sounds
○ Presence of fetal movements

Diagnostics

○ Urine for protein to assess risk for preeclampsia as indicated
○ Red cell antibody titres every 4 weeks if antibody screen positive
○ Hemoglobin
○ Diabetic screening
▪ GCT followed by GTT if indicated
○ HIV screening / rescreening
○ Assess need for Pertussis immunization
○ Discuss risk for preterm labour – signs & symptoms
○ Obtain VBAC consultation / documentation as needed

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Diphtheria, tetanus, pertussis (dTap) immunization is available through public health or community pharmacies – ideally given between 27 and 32 weeks gestation
Mental well being
https://www.healthyparentshealthychildren.ca/im-pregnant/overview-of-pregnancy/mental-health/#depression-and-anxiety
Exercise/activity
https://www.healthyparentshealthychildren.ca/im-pregnant/overview-of-pregnancy/physical-activity/

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<td>3rd
Trimester
28-41 weeks

3-5 visits</td>
<td>
28-32 weeks

Maternal Assessment

○ Weight- healthy weight gain?
○ Blood pressure
○ Anxiety /Depression?
○ All pregnant women will be screened for syphilis in the first trimester. If there is ongoing risk, women will be re-screened throughout pregacy

Fetal Assessment

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Third Trimester content from HPHC resource:
https://www.healthyparentshealthychildren.ca/im-pregnant/third-trimester

Counselling

Healthy Weight Gain
Nutrition
Mental Well Being
Exercise
Plans for feeding baby
Link to "Deciding how to feed your baby" antenatal worksheet

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- o Symphysis - fundal height in cm o Urine for glucose & protein as indicated o Fetal heart sounds o Presence of fetal movements - **Diagnostics** o Red cell antibody titres every 4 weeks if antibody screen positive o Syphilis Screen - **Actions:** o Send prenatal record to birth hospital o Give Rh immune globulin if indicated o Immunizations- dTap, influenza	https://admin.healthyparentshealthychildren.ca/wp-content/uploads/2018/11/Options-for-feeding.pdf - Breastfeeding https://www.healthyparentshealthychildren.ca/im-a-parent/feeding-your-baby - Signs of Labor- when to go to hospital https://www.healthyparentshealthychildren.ca/im-pregnant/labour-and-birth/knowing-what-to-expect/ - Begin discussions about contraception strategies to consider following birth Return TofC
35-38 week visit - **Maternal Assessment** o Weight- healthy weight gain? o Blood pressure o Anxiety / depression o All pregnant women will be screened for syphilis in the first trimester. If there is ongoing risk, women will be re-screened throughout pregancy - **Fetal assessment** o Symphysis – fundal height in cm o Fetal heart sounds o Presence of fetal movements o Fetal presentation at > 36 weeks - **Diagnostics** o Chlamydia and gonorrhea o Syphilis rescreening at 35 weeks or time of delivery o GBS culture	**Counselling** - Admission and Discharge to hospital - Child care - Circumcision - Contraception - Maternal Vaccinations - Membrane Sweeping - Mother-Infant Interaction - Newborn vaccinations - Postpartum care and support - Postpartum/parenting classes - Reasons to go to hospital - Skin to skin care - Vitamin D supplement - Safe infant sleep - https://www.healthyparentshealthychildren.ca/im-a-parent/newborn-birth-2-months/safe-sleep-preventing-injuries/

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40-42 weeks	Counselling

• **Fetal assessment**
  ○ Symphysis - fundal height in cm
  ○ Fetal heart sounds
  ○ Presence of fetal movements
  ○ Fetal presentation
  ○ NST Biophysical profile
• **Diagnostics**
  ○ Syphilis & HIV screening / re-screening
• **Book induction**
	• Induction of labor – what to expect
	https://www.healthyparentshealthychildren.ca/im-pregnant/labour-and-birth
	• Plan for follow-up after birth
	• Contraception
	https://www.healthyparentshealthychildren.ca/im-pregnant/postpartum
	
	• Postpartum Depression
	https://www.healthyparentshealthychildren.ca/im-pregnant/postpartum/mental-health-2/

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Content was extracted from the Alberta Antenatal Pathway

(https://www.albertahealthservices.ca/assets/about/scn/ahs-scn-mncy-antenatal-

pathway.pdf) developed by Alberta Health Services and Maternal Newborn Child &

Youth SCN and was used with permission.