Dialogic Imagery for Care

Visual Mediation of Complex Conversations in Alternative Prenatal Caregiving

Marcie Laird

Department of Graphic Design and Industrial Design
College of Design | North Carolina State University

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Submitted in partial fulfillment for the degree of Master of Graphic Design

Kermit Bailey, Committee Chair
Associate Professor of Graphic Design

Helen Armstrong, Committee Member
Professor of Graphic Design

Deborah Littlejohn, PhD, Committee Member
Associate Professor of Graphic Design

Program Statement on the Master of Graphic Design Final Project

This document details a final project, which in design is commonly referred to as a graduate "thesis," at North Carolina State University. The work was defined in a 3-credit course in a fall semester, and executed in a 6-credit course in the following spring semester. The Master of Graphic Design is a terminal professional degree with a research orientation, but like the MFA and MDes, it is not a primary research degree. This is a discovery-based investigation. Cash (2018) describes the process of building scientific knowledge as a cycle between theory building and theory testing. The theory building mode includes (1) discovery and description, (2) definition of variables and limitation of domain, and (3) relationship building (pp. 88–89). This investigation is restricted to the theory building mode. The theory testing mode includes (4) prediction, testing, and validation, and (5) extension and refinement (p. 89). While experts may have been consulted, this investigation does not entail any testing with human subjects, and it does not endeavor to prove anything; all assertions are tentative and speculative.

See: Cash, P. J. (2018). Developing theory-driven design research. Design Studies, 56, 84–119.

Abstract

Of all developed nations, the U.S. leads in the maternal mortality rate, with large disparities in risk across race, socioeconomic status, and geography. In rural areas, many pregnant people seek out midwives as their access to traditional hospital obstetrics services diminishes. However, midwives often lack tools to stay connected to their patients across long distances and social strata, making it difficult to provide effective prenatal care. Additionally, it is increasingly critical that patients and their midwives build a meaningful relationship to facilitate information-sharing, particularly around the social determinants of health. However, these topics may often be highly personal and difficult to verbalize, requiring tools that mediate conversations in a patient-centered way. This investigation explores how visual aids and prompts in a collaborative digital platform might improve communication between the patient and midwife and build mutual understanding of the patient's unique needs. Visual tools are used as a storytelling device through which the patient gains agency during care visits and reflects on their pregnancy journey over time. By learning from the patient's lived experiences, midwives are better equipped to provide holistic care and patients are empowered and celebrated.

Thank you

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And to Mom, Dad, Lucy, and Pete, for helping me become everything I am, and for reminding me that this too shall pass.

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Statement on Inclusivity

I recognize that not all people who experience pregnancy identify as women and therefore choose to use gender-neutral pronouns for the sake of inclusivity. If the subject's gender identity has been indicated in the text, the appropriate pronouns will be used.

CHAPTER 1

Introduction

Hundreds of people die due to preventable causes related to childbirth in the United States every year. Of all developed nations, the U.S. leads in the maternal mortality rate (MMR), despite declining numbers globally. According to the Centers for Disease Control and Prevention's (CDC) most recent report, the U.S. MMR was 17.4% in 2018, a figure that has been steadily increasing since the late 1980's. However, this statistic can't be taken at face value; there are large disparities in risk across race, socioeconomic status, and geography. For example, black people are more than twice as likely to die from pregnancy-related causes than white people, with an MMR of 37.1% (CDC, 2019). People in rural communities fare worse than their urban neighbors. Not only do they suffer higher rates of chronic conditions like hypertension, obesity, and mental health disorders, but also have poorer education systems and increased feelings of isolation or loneliness (Iglehart, 2018). Additionally, rural communities are quickly losing access to the care they need; hospitals and clinics are disappearing at an alarming rate and often obstetrics are the first to go because of the high cost of childbirth (Kozhimannil et al., 2018). Less than half of all rural counties in the U.S. still offer hospital-based obstetric services (Shah, 2018).

The maternal health crisis is not only the tragic loss of a loved one, but an issue of human rights. Therefore, this investigation will strive to discuss it as such. As design plays an increasing role in the resolution of complex problems, there is a need to continually place those affected at the center of change-making. Every person's knowledge and experiences can inform design processes as well as our socio-political systems. By capturing experiences and transforming them into fuel for action and understanding, the design process places value on people as participants inseparable from the design itself. This investigation is situated in the idea that understanding must precede reform, and that the process of design is uniquely suited to build that understanding. Admittedly, all that follows represents but a small slice of the maternal health crisis. However, it ultimately envisions a world in which no one suffers from the tragic loss of a mother, partner, or friend.

CHAPTER 2

Problem Space

2.1 Problem Statement

As access to prenatal care in rural communities continues to diminish, patients must travel increasingly far distances for doctor's visits, which adversely affects perinatal outcomes (Grzybowski et al., 2011). This is particularly problematic for those without reliable access to transportation. With few family doctors practicing locally due to clinician shortages, hospitals are sometimes the only access-point to advanced care. When they close, there is an increase in out-of-hospital births, both in home and at birthing centers (Shah, 2018), many of which are likely less than ideal for expectant mothers. However, people choose alternatives to the traditional prenatal care model for a variety of reasons, including fear, comfort and increased perceptions of risk associated with hospital births (Boucher et al., 2009). Traveling midwives are one type of alternative caregiver who practice outside of hospitals, therefore filling an important gap in care and choice for people in rural communities. Research shows that when midwives are integrated into health systems, maternal-newborn health outcomes improve (Vedam, et al., 2018), although it remains difficult for them to establish strong systems for referrals due to various financial, legal, and political barriers (Maloni, et al., 1996).

Preventative care is the most effective way of improving MMR; according to the CDC, about 60% of recorded MMR deaths were preventable. However, in order for preventative care to function properly, change needs to occur across multiple contributing factors (CDC, 2019), taking into account barriers that affect rural communities like physical distance and social determinants of health (SDoH). These social factors have generally been underestimated in primary care settings, although research now demonstrates their importance in combating mortality rates (Haslam, et al., 2018). When maternal health-care providers are able to recognize the role of SDoH in their patients' lives they provide more effective care through deepened understanding and improved communication (ACOG, 2014). An increased awareness of SDoH enables a shift towards patient-centric care that addresses inequity (ACOG, 2018) and provides opportunities for health interventions to embrace social complexity (Katz et al., 2018).

Typically, information regarding SDoH is obtained through the use of health screenings, which are recognized as an important tool for preventative care. However, these tools are often limited in their scope, and can exclude important risks like intimate partner violence (IPV) (Foley et al., 2019).

Additionally, health screenings are not routine across maternity care settings (Mccauley et al., 2019) and patients may not always feel comfortable sharing private information with their care provider. Research shows that patients may sometimes "choose to remain ignorant of potentially important health risks if they believe that powerful audiences can use that information to harm them" (Lipsey & Shepperd, 2019).

In this sense, providers have power over patients in the information they choose to share, which may hinder a patient's ability to be a participant in the health decision-making process. The dynamics of the sharing and withholding of information directly influences the experiences of women during pregnancy and birth, in particular women of color, who are often subject to inherent bias and judgment (Altman et al., 2019). Improving information-sharing and communication may encourage patient disclosure of SDoH (Hegarty & Taft, 2001) and empower women in autonomous health decision-making (Altman et al., 2019).

It's important to recognize how difficult information-sharing may be for women in vulnerable situations; when collected inappropriately, SDoH disclosure may lead to increased negative outcomes for the patient experience (Garg, Boynton-Jarrett, & Dworkin, 2016). Women may fear being labeled as "uncooperative" or "disrespectful" when expressing differences of opinions or declining care, causing injury to their relationship with their provider. This most often affects minority women, who reported more instances of poor treatment based on race and ethnicity (Attanasio & Hardeman, 2019). Patients may feel unheard, judged, or misunderstood, affecting their trust in their provider and the provider's ability to provide effective care.

2.2 Justification

Due to these persistent barriers to equitable maternal care, there is a clear need for a more human-centered approach to understanding the complex issues of maternal mortality. Effective information-sharing around SDoH is key, but these platforms must involve patients and their families in decision making and strive to listen to and learn from the experiences of people in need of prenatal care (Garg, Boynton-Jarrett, & Dworkin, 2016), especially those who are socially and economically disadvantaged.

Digital interfaces allow healthcare providers to connect with their patients remotely, both synchronously through video chats and asynchronously through secure messaging, but might also be important means for mediating synchronous health information-sharing. As opposed to typical health screenings which take the form of surveys and questionnaires, a digital interface affords a wide range of visual forms that allow for increased interaction, participation, and collaboration. By incorporating visual affordances into the design of information-seeking tools, participants gain agency over the dialogue, making them feel heard and understood. Image generation, specifically, encourages self-reflection and helps patients articulate their experiences that may be difficult to verbalize (Liebenberg, 2009). Additionally, alternative forms of information-sharing may allow for more filtering and prioritization to take place, mitigating the harmful effects of information overload on the patient.

Visual aids, when used to mediate a conversation, may prevent care providers from overlooking key aspects of the patient's circumstances. When the patient is able to present information in the form of a narrative, it more closely represents their "actual" context, including their relationships and lived experiences. Contextual accuracy heightens the validity of the information (Leibenberg, 2009) shared between patient and caregiver, allowing the caregiver to form a more complete picture of their patient's circumstances. Empowering the patient as a participant mitigates harmful power dynamics, allowing the patient and caregiver to "co-design" a plan of care that effectively meets the unique needs of the patient. In co-design, the combined skills and knowledge of the patient and provider become "woven together" (Mattelmaki, 2008), building trust and empowering both individuals in their health decision-making.

2.3 Annotated Bibliography

Complexities of Maternal Healthcare

The motivations for a person to become pregnant and seek prenatal care are varied and complex, especially considering disparities across socioeconomic or marital status, location, and race. While midwives fill an important gap in care for rural people who have dwindling access to hospital obstetric services (Vedam et al., 2018), people also seek out alternative care per their concern for safety, control, and comfort (Boucher et al, 2009). Additionally, people may be influenced by previous negative experiences in hospitals, especially people of color, who experience increased discrimination and disrespect during childbirth hospitalization (Attanasio & Hardeman, 2019). The practice of midwifery values and celebrates equitable care, cultural competence, and the celebration of every new mom as unique and powerful (Midwives Alliance of North America, 2011) which may be an appealing alternative to traditional care practices.

The Social Determinants of Health

An important element of maternal mortality prevention is the effective recognition of the role of the social determinants of health in a patient's life (ACOG, 2018) although they remain ubiquitously underestimated by healthcare providers (Haslam, et al., 2018). Many traditional screening methods fall short in acquiring an accurate depiction of the patient's lived experiences (Foley et al., 2019) and because they are not a routine procedure, providers miss out on potentially important information (Mccauley et al., 2019). Data about the role of social determinants in a patient's life is difficult to gather, especially when it relates to sensitive or uncomfortable subjects. Therefore, tools for acquiring such information should carefully consider how to avoid unintended, harmful consequences (Garg et al., 2016).

Health Information Disclosure

As discussed, health information extends beyond that of physical metrics to the social and emotional. In order to encourage patients to freely share relevant health information with their caregiver, data collection tools should center around empowerment and increased trust (Hegarty & Taft, 2001). The provider-patient relationship is inherently unbalanced, as the medical professional holds the power of expertise upon which the patient relies for direction (Altman et al., 2019). This power dynamic can harm the patient's sense of autonomy and result in information avoidance, a phenomenon in which the patient chooses to "remain ignorant of potentially important health risks if

they believe that powerful audiences can use that information to harm them" (Lipsey & Shepperd, 2019). The effects of power imbalances on health information disclosure are compounded for people of color, who are already subject to inherent bias and judgment at the hands of healthcare providers (Altman et al., 2019).

Tools for Conversation

Health information is often informally discussed in conversation with the healthcare provider, especially with midwives, who rely heavily on building interpersonal relationships with their patients. Tools that mediate such conversation increase the validity of the information shared, particularly when the participants are separated by a figurative boundary (i.e., the power imbalance between patient and midwife) (Liebenberg, 2009). Issues of disclosure and truthfulness bring the question of validity to the forefront, but when it comes to unobservable behaviors and representations of identity, conversation is the most effective and most human device available for gathering this type of data (Lamont & Swidler, 2014). Patient-Centered Communication Theory is an approach to patient-provider interactions that uses high-context communication to gather unspoken, implicit information by focusing on the patient's perspective and experiences (Littlejohn et al, 2017). This framework strives to mitigate the negative effects of poor communication on health outcomes and is particularly relevant to the midwife-patient relationship.

Approaches in Visual Narrative

When tools for conversation employ the use of visuals, a participant's articulation of their own thoughts and feelings is improved, giving them increased agency over the discussion at hand (Leibenberg, 2009). Foss' Theory of Visual Rhetoric explores how visuals are transformed into communicative artifacts and offers a framework for the use of imagery as symbolic, storytelling devices (Foss, 2005). Conversations, when intentionally mediated to make room for storytelling, can shift and equalize power but may increase expectations around the narrative itself making the dialogue feel less natural. For this reason, tools that aid participants to "speak in their own ways" (Riessman, 2008, pp 24) are critical. Visuals simply offer yet another form through which information can be shared, yielding more opportunities for insight through narrative analysis. (Riessman, 2008). Narrative Theory in healthcare contexts is a paradigm for making mutual understanding the goal of health communication, and positions storytelling as an empowering device for patients. Narratives help patients make sense of their experiences, assert control, construct identities, and justify decision-making (Littlejohn et al, 2017), all of which could be further supported with the known affordances of visual aids.

Table 2.3.1

Literature referenced by topic

Topic	Title	Citation
Complexities of Maternal Healthcare	Declined care and discrimination during the childbirth hospitalization	Attanasio & Hardeman, 2019
	Staying home to give birth: Why women in the United States choose home birth	Boucher et al., 2009
	Transforming prenatal care: Reflections on the past and present with implications for the future	Maloni et al., 1996
	MANA Statement of values and ethics	MANA, 2011
	Mapping integration of midwives across the United States: Impact on access, equity, and outcomes	Vedam et al., 2018
The Social Determinants of Health	Importance of social determinants of health and cultural awareness in the delivery of reproductive health care	ACOG, 2018
	Primary care women's health screening: A case study of a community engaged human-centered design approach to enhancing the screening process	Foley et al., 2019
	Avoiding the unintended consequences of screening for social determinants of health	Garg et al., 2016

	Social cure, what social cure? The propensity to underestimate the importance of social factors of health	Haslam et al., 2018
	I just wish it becomes part of routine care: Healthcare providers' knowledge, attitudes and perceptions of screening for maternal mental health during and after pregnancy: a qualitative study	Mccauley et al., 2019
Health Information Disclosure	Information and power: Women of color's experiences interacting with health care providers in pregnancy and birth	Altman et al., 2019
	Overcoming the barriers to disclosure and inquiry of partner abuse for women attending general practice	Hegarty & Taft, 2001
	The role of powerful audiences in health information avoidance	Lipsey & Shepperd, 2019
Tools for Conversation	Methodological pluralism and the possibilities and limits of interviewing	Lamont & Swidler, 2014
	The visual image as discussion point: Increasing validity in boundary-crossing research	Liebenberg, 2009
	Theories of human communication	Littlejohn et al., 2017

Approaches in Visual Narrative	Theory of visual rhetoric	Foss, 2005
	The visual image as discussion point: increasing validity in boundary-crossing research	Liebenberg, 2009
	Theories of human communication	Littlejohn et al., 2017
	Narrative methods for the human sciences	Riessman, 2008

2.4 Definition of Terms

Any technical terms used throughout this document that may benefit from clarification or elaboration are compiled below.

Table 2.4.1

Definition of relevant terms

Term	Definition
Affordances	the quality or property of an object that defines its possible and intended uses
Information-Sharing	the voluntary disclosure of meaningful qualitative health data through conversation and other devices
Low-Risk Pregnancy	a pregnancy with no active complications nor factors that may increase the risk of complications
Maternal Death	the death of a person during pregnancy or within 42 days of termination of a pregnancy, either through birth or any cause related to pregnancy or pregnancy management. This does not include accidental or incidental causes (World Health Organization, 2004)

Maternal Mortality Rate (MMR)	the number of maternal deaths per 100,000 live births in a given area
Mediation	an intervention into an existing communication process that acts as an intermediary
Midwife	a qualified professional who works in partnership with women to give the necessary support, care and advice during pregnancy, labor and the postpartum period (Midwives Alliance of North America, 2011)
Narrative	a spoken, written, or visual account of a set of consequential events or ideas to communicate meaning
Obstetrics	the branch of medicine that deals with pregnancy, childbirth, and postpartum care
Prenatal Care	care provided by an obstetrician or midwife for the duration of pregnancy up until birth, generally including wellness and prevention services
Social Determinants of Health	conditions in social, cultural, and physical environments that affect health outcomes

2.5 Assumptions and Limitations

Assumptions

Because it would be impossible to address every facet of such a complex issue, I make several assumptions for the purposes of scoping my investigation. Firstly, while I define my primary user group as rural, I assume that both the patient and midwife have access to the internet and either a smartphone, tablet, or desktop computer. Additionally, I assume that both parties speak proficient English and are able to communicate without difficulty, despite a significant rural population being Spanish-speaking. Furthermore, I assume that the patient and midwife are both willing participants in their care relationship and that the midwife is reputable and well-known in the local community. I assume that the patient is "ready to know" (See Figure 2.5.01) and will actively participate in reflection activities outside of care visits. Moreover, I assume that the patient will not be placed under significant financial stress in obtaining the care they need. Finally, I assume that the midwife is legally integrated into the local healthcare system and has a reliable network for referrals to hospitals or other physicians during an emergency.

Limitations

Because of the constraints surrounding my investigation, any conclusions that can be drawn from it are limited to the experience of prenatal care between a patient and midwife and cannot be directly applied to other contexts of caregiving. Additionally, this investigation is limited in its ability to serve all of the many diverse perspectives and experiences within the problem space. The personas and scenarios I create draw on the imagined experiences of a black woman in rural North Carolina and do not represent a universal experience. As a white woman, I am limited in my ability to accurately capture and understand the experiences of people of color, so all choices I make to represent them are sourced from secondary research in an effort to illuminate the injustices they face in the maternal healthcare space. It is also important to recognize that I am not a healthcare professional and have not experienced pregnancy myself. While the purpose of this investigation is to evaluate the potential for design intervention in the problem space, I rely heavily on secondary research to inform content and decision-making. All design artifacts are purely speculative and would require further investigation and testing to be validated. Finally, design interventions cannot stand alone; affecting positive change in maternal healthcare requires the cooperation of healthcare professionals and policy-makers alike.

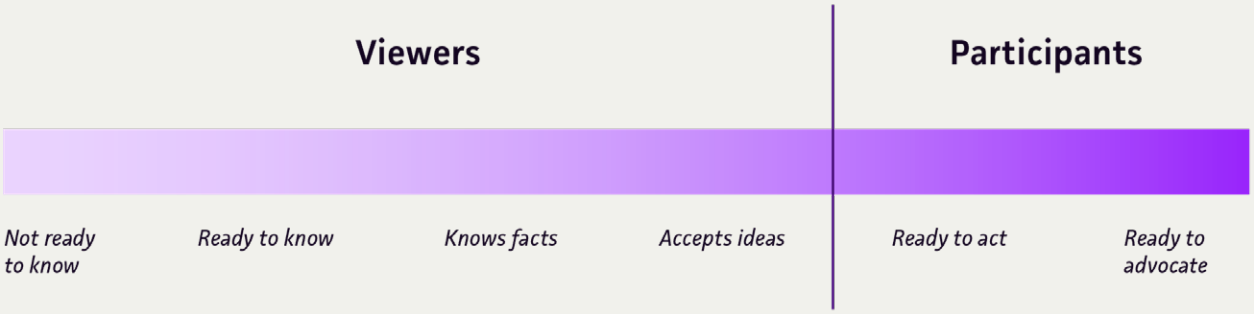


Figure 2.5.1 *David Rose's Receptivity Gradient*

Those who are "Ready to know" are characterized by an openness and willingness to learn new information.

2.6 Precedents

The purpose of a precedent study is to explore the landscape of existing design interventions within the problem space and illuminate gaps or potentialities for new work. Some key takeaways from precedents in maternal healthcare and remote caregiving are as follows:

- Due to limited access to technology, interventions must carefully consider the affordances of various platforms. In low-income countries, interventions rely heavily on mobile phones and feature push notification-based systems via SMS.
- Content is generally educational or reminder-oriented.
- When geographically isolated, patients often take care into their own hands. Design interventions should recognize and respond to this problem.
- Knowledge empowers patients in autonomous health decision-making and frees them from relying entirely on far-off doctors for support.
- Educational content is often one-directional; there are limited avenues for patients to seek or share new information with their care provider.
- Many of the interventions rely on typical pregnancy timelines to inform content, limiting patient customization and personalization.

- Interventions that are provider-facing are generally centered around instructional content. However, these materials are finite and static, only going so far in emergency situations.

- There are few examples of community-building features. Pregnancy is framed as an individualized experience.

- Networks of care are critically important. Some interventions took into consideration the role of family, friends, and other non-medical professionals in holistic caregiving.

Mahmee: Postnatal Care Management

Mahmee is a web and mobile application for new mothers that places a strong emphasis on creating and connecting a patient's care network. It recognizes the important role of non-medical professionals and connects new moms with each other via forums and chats. However, the platform seems most appropriate for mothers who have a traditional birth experience, and doesn't consider those outside the physical and economic reach of the healthcare system.

Bloomlife: Data Collection for Personalized Care

Bloomlife is a women's health company developing a wearable device for expectant mothers that collects health data directly from the patient in order to provide customized care. Patients gain ownership over their health data and are encouraged to continually self-educate as their pregnancy progresses. However, this dataset leaves out key qualitative information, including social and behavioral determinants of health.

Mothership: Redefining Expert Knowledge

Mothership is a non-profit organization that provides new parents access to a community of health experts who are also parents in an effort to reduce information overload, judgment, and isolation. The organization also provides healthcare providers with empathy and empowerment training that aims to enable more personalized caregiving.

Maternal Health Interventions in Developing Nations

Many interventions around access to care for expectant or new moms in developing nations center around education and empowerment, as technology is severely limited. Content to help moms manage their pregnancy remotely is delivered via text or mobile app but is not interactive. The interventions I reviewed include: GiftedMom (Cameroon/Nigeria), Zero Mothers Die (Ghana/West Africa), maymay (Myanmar), MAMA (Bangladesh/India), Safe Delivery (Ghana/Ethiopia), Mobile Midwife (Ghana), Safe Pregnancy and Birth, (Ethiopia/Latin America).

Mothers School: Practical Education for New Moms

Mothers School, a program developed by the city of Santos, Brazil, offers in-person educational classes for new and expectant mothers around a variety of prenatal health topics. The program aims to better prepare women for motherhood by providing them with practical knowledge and building community around the experience of motherhood.

Talkspace: Online Therapy

Talkspace is an entirely virtual therapy platform that allows users to communicate with their therapist any time of the day or week through messaging or video chats. Users are encouraged to freely share their thoughts and feelings, even if their therapist can't respond right away.

Dr. On Demand: Virtual Doctor's Visits

Dr. On Demand provides patients with remote access to physicians and therapists via video chat on a secure platform. They take on a preventative and holistic care approach that takes into account each patient's variety of needs.

Figure 2.6.1

Mahmee's patient care portal

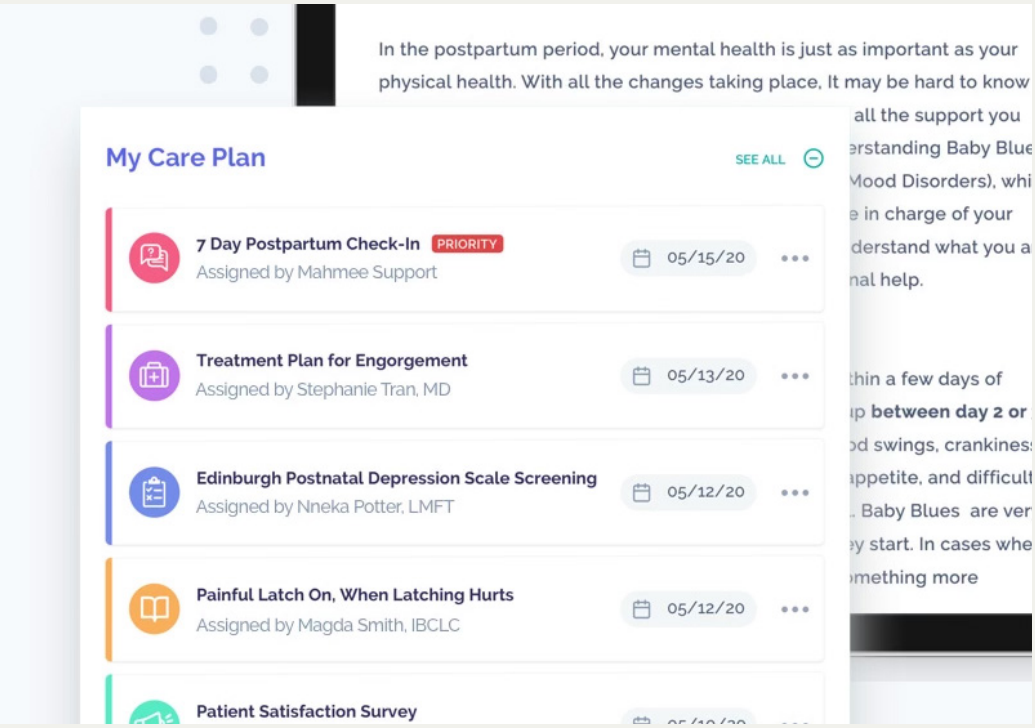


Figure 2.6.2

Bloomlife wearable device

Figure 2.6.3

Mothership participant portal

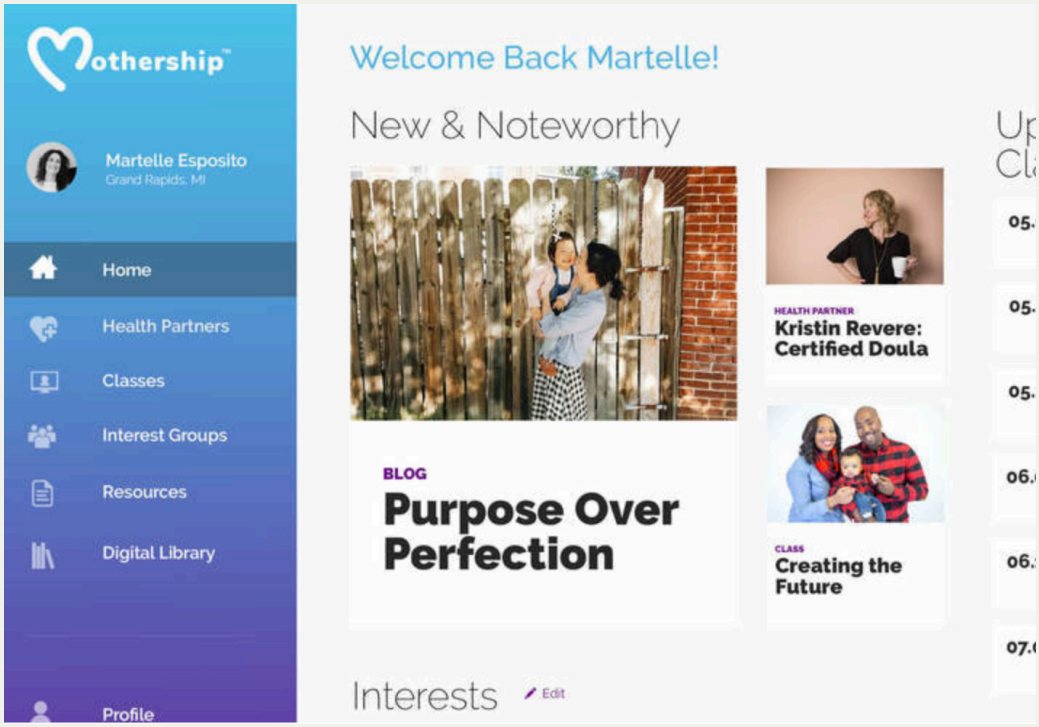


Figure 2.6.4

MayMay mobile app

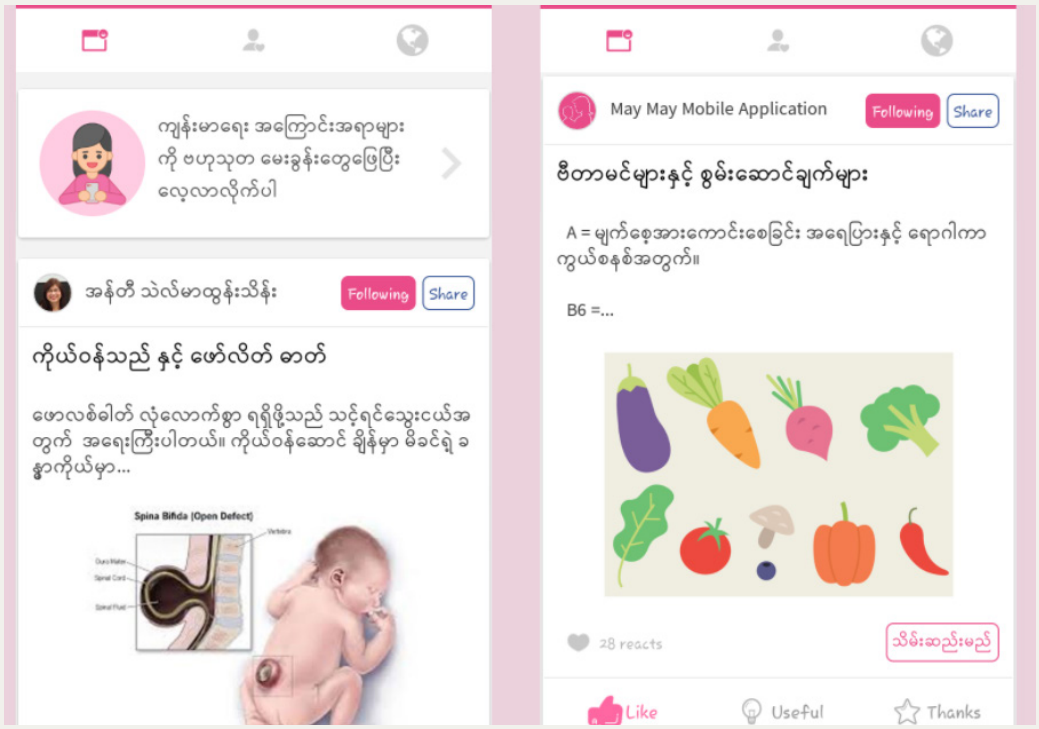


Figure 2.6.5

Mothers School hands-on education

Figure 2.6.6

Talkspace user flow

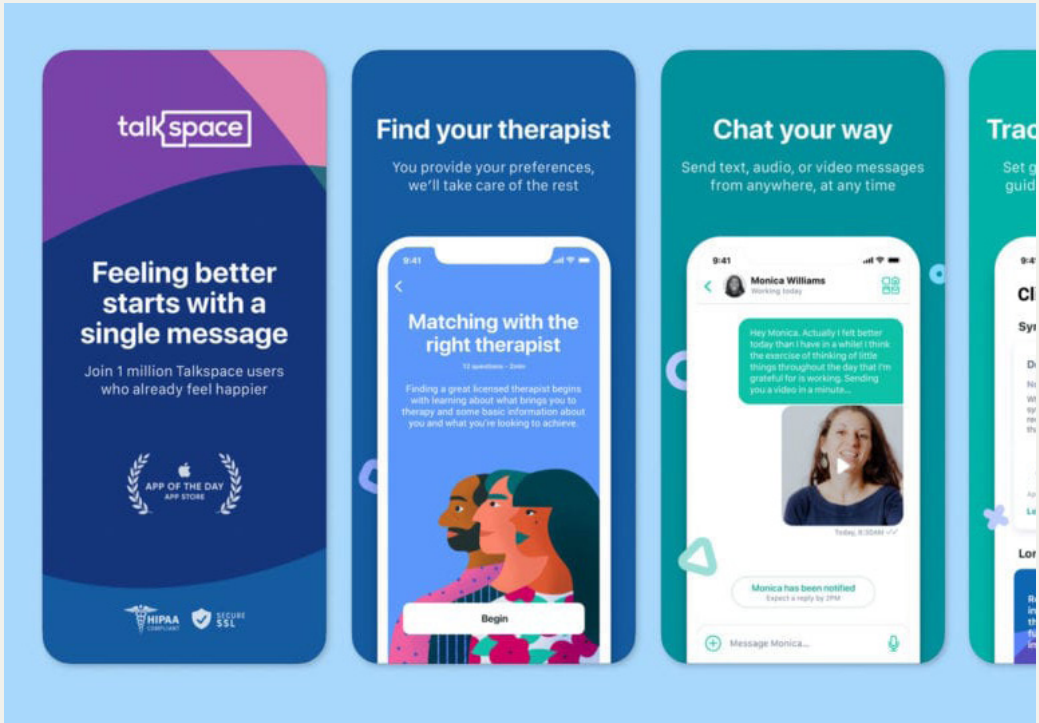
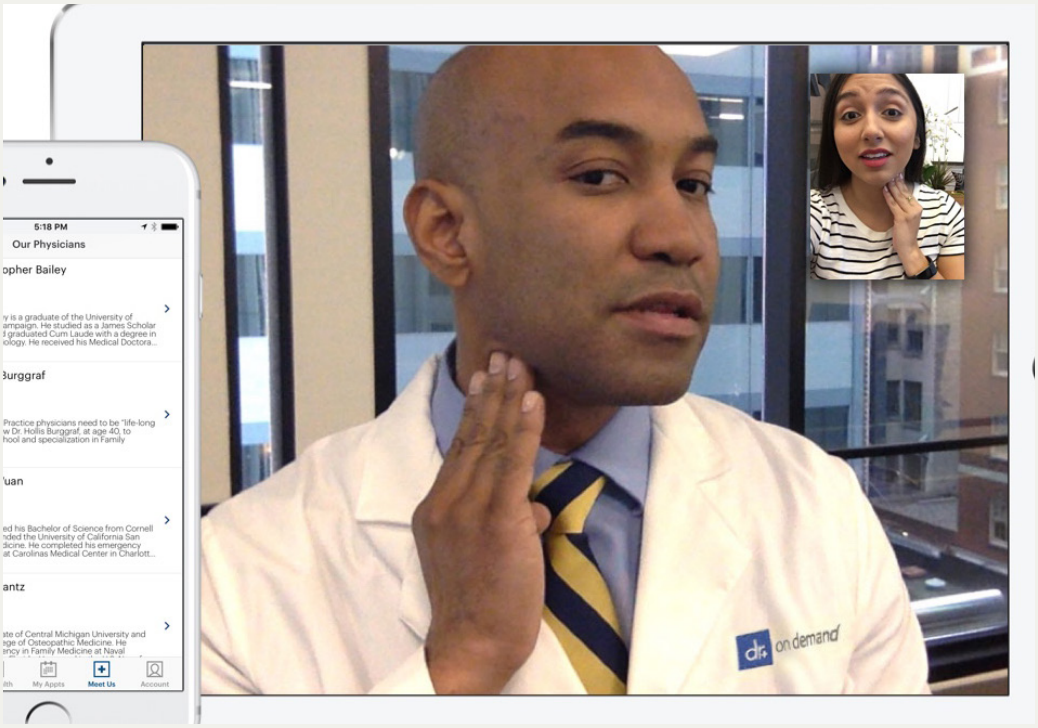


Figure 2.6.7

Dr. On Demand virtual visit



CHAPTER 3

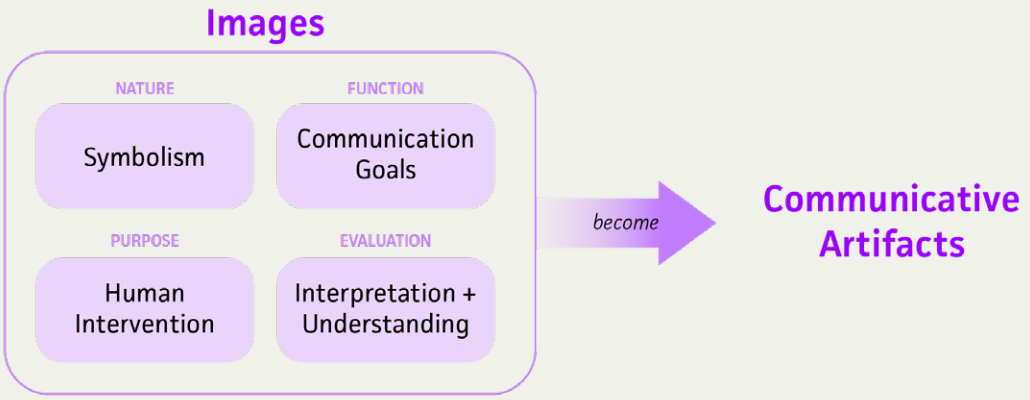
Investigation Plan

3.1 Conceptual Framework

For the purpose of this study, I identified and synthesized relevant theory to explore how visually-mediated storytelling might yield greater insights and shared understanding between a patient and caregiver.

Figure 3.1.1

Foss' Theory of Visual Rhetoric

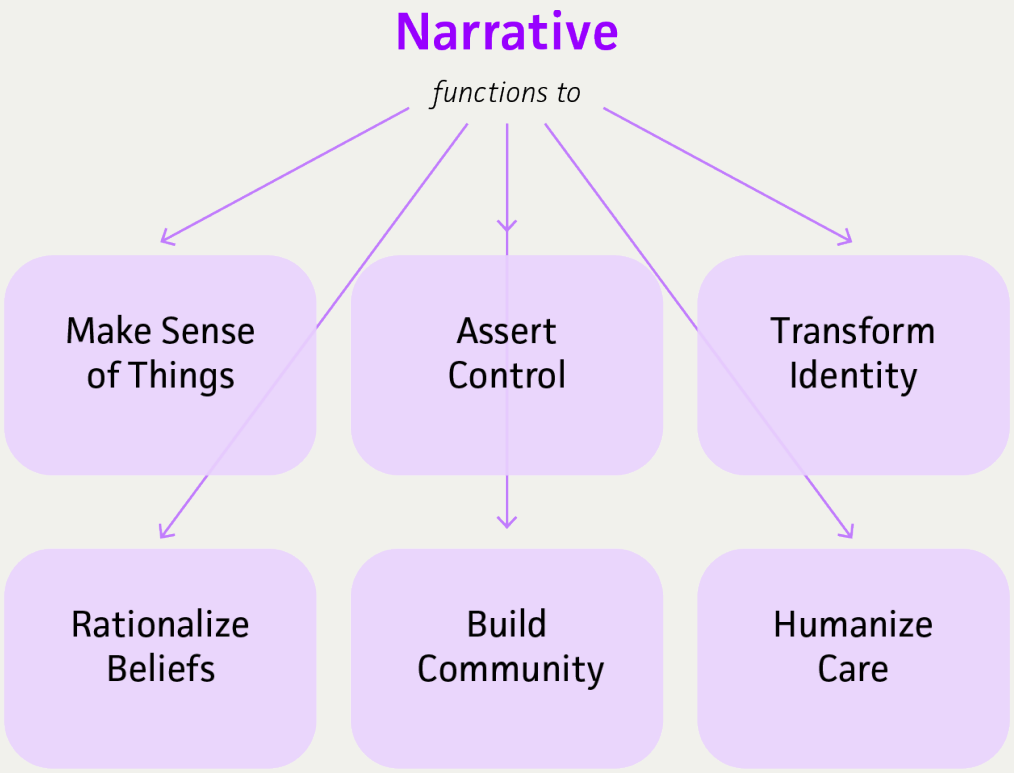


Theory of Visual Rhetoric

Visual rhetorical theory is a framework for understanding how people use visuals to communicate. Sonja Foss' theoretical perspective argues that visual rhetoric concerns itself not only with visual objects themselves, but also asks how they are transformed into communicative artifacts. She suggests that in order for this transformation to take place, images must be symbolic in nature, involve human intervention, and be presented with the purpose of communicating (Foss, 2005). Human intervention usually takes the form of creation or interpretation. She stipulates that in order for visual rhetorical devices to be studied, one must also consider its evaluation (i.e., the way it is received and understood). The nature of an image is its form and content. An image's function is the way the image performs in the world while its purpose is the intended effect of the creator of the image.

Figure 3.1.2

Narrative Theory in Healthcare



Narrative Theory

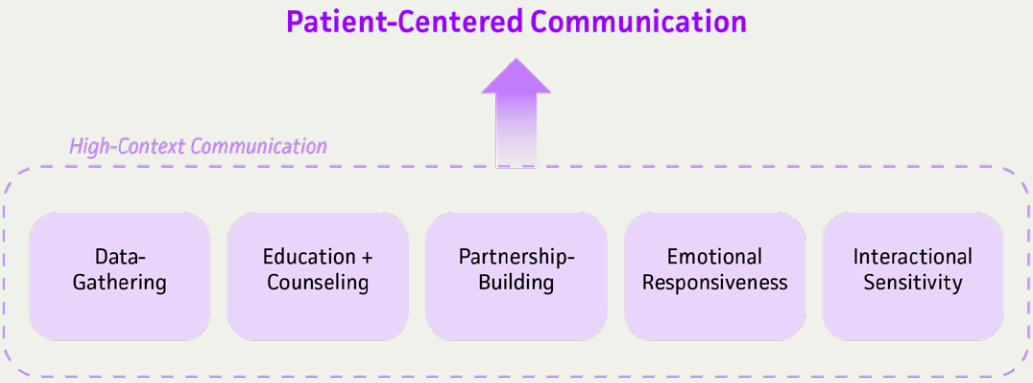
In Walter Fisher's narrative paradigm, he suggests that the act of storytelling is a universal human function through which people identify mutual understanding. Health Communications researchers have since applied Narrative Theory to the healthcare context to explore how stories function in care-provider relationships.

- ***Sense-making.*** Narratives help patients identify what is meaningful to them in their healthcare journey and cope with uncertain circumstances.
- ***Control.*** Many patients experience a loss of control over their bodies or experiences, and narratives can serve to re-establish a sense of agency.
- ***Identity.*** Changes to health can often affect the way patients perceive themselves or shift their roles at home or work. Narratives can help patients understand their new position and recreate their identities accordingly.
- ***Rationalization.*** Narratives elucidate the values and belief systems of the storyteller, giving insight into their decision-making process and healthcare preferences.

- ***Community.*** Shared narratives create a sense of kinship and familiarity between people with similar healthcare experiences.
- ***Humanity.*** While healthcare shifts towards purely clinical approaches, narratives offer an opportunity to humanize patients in the eyes of their providers and foster connections between them (Littlejohn et al., 2017).

Figure 3.1.3

Patient-Centered Communication Theory



Patient-Centered Communication Theory

Patient-Centered Communication (PCC) predicates that communications across all kinds of patient-provider interactions focus on understanding a patient's perspective and preferences. Models of PCC focus on nonverbal or implicit messages, or high-context communication, and propose a set of key elements that make up successful PCC. Data gathering is the ability of the provider to support the patient in disclosing information they feel is relevant. Education and counseling allows the patient to work with their provider to make sense of their health condition and act accordingly. Partnership-building involves intentional shifting of power to the patient as they make care decisions by making space for questions and opinions. Emotional responsiveness is the ability of the provider to appropriately reflect and respond to the patient's emotional state without judgment. Finally, interactional sensitivity is the ability of the provider and patient to collaboratively address conflicts or changing situations (Littlejohn et al., 2017).

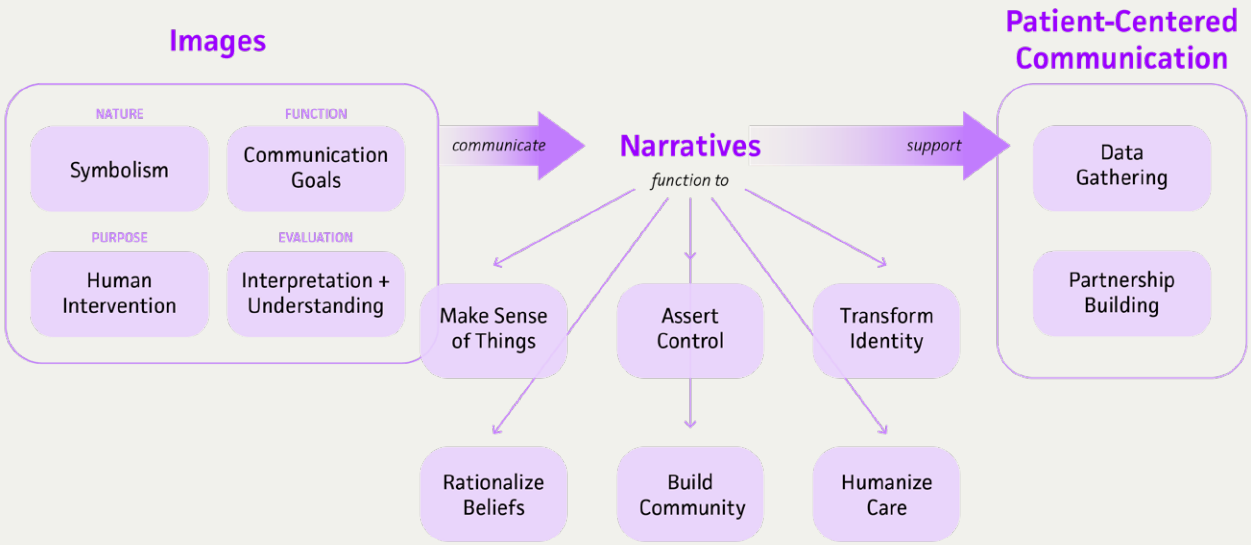


Figure 3.1.4 *Conceptual Framework*

Reading the Framework

Using elements from all three theories explored, the conceptual framework presents a model for how communicative images might be used as narrative devices and fulfill the possible functions of narrative in a healthcare context. These various narrative functions play a supporting role in the fulfillment of 2 of the key elements of successful patient-centered communication, data gathering and partnership-building. All the rhetorical criteria for images remain, as this investigation specifically explores how they function to communicate data embedded within them.

3.2 Research Questions

Primary Research Question

How can a collaborative digital platform mediate health information-sharing between a rural, first-time expectant mother and their midwife over the course of their pregnancy in order to augment effective prenatal care and improve the patient experience?

Sub Questions

1. How can visual aids encourage storytelling of a patient's lived experiences in order to increase agency and improve patient-midwife communication?

2. How can interactive visual prompts mediate a conversation between a patient and midwife to reach a shared understanding of key social and emotional health determinants?

3. How can participant image production guide asynchronous self-reflection to create continuity between visits and heighten the validity of information shared with their midwife?

3.3 Investigation Model

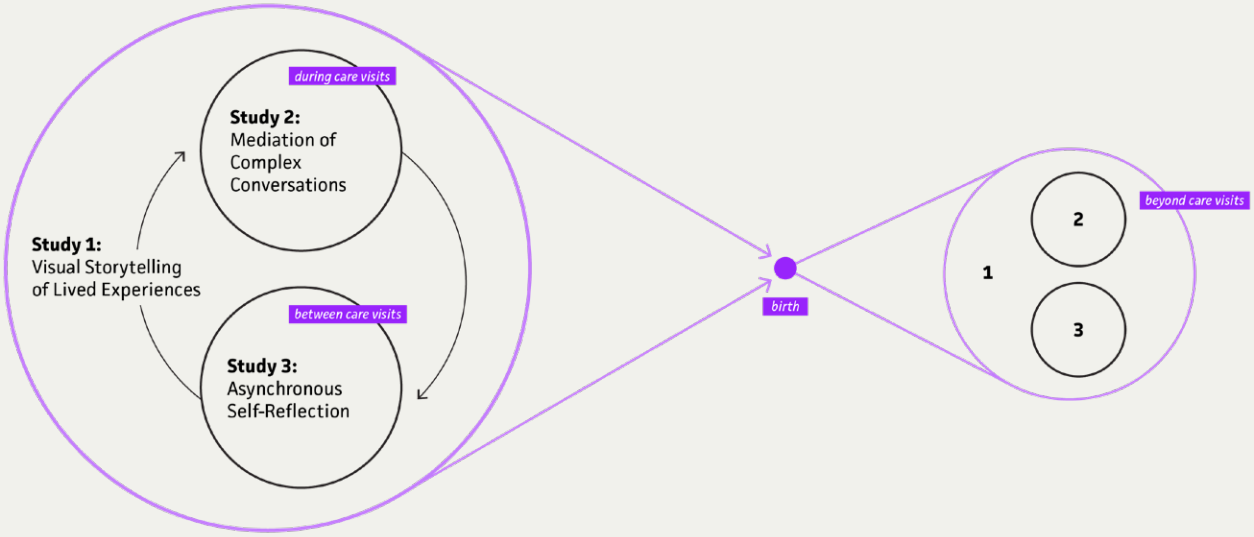


Figure 3.3.1 *Investigation Model*

The investigation model visualizes how the intended studies relate to one other. Study 1, having implications for those that follow, encapsulates Studies 2 and 3 and is foundational. Studies 2 and 3 are grounded in discrete contexts of care but build off of each other continuously over the course of a pregnancy. They coexist as equally critical elements of the care experience leading up to the birth event, although they remain applicable for postnatal care and beyond.

3.4 Users and Scenarios

This section will provide some supplementary information to help position the design studies in the context of a typical patient-midwife relationship. User personas and scenarios, although imaginary, help orient design exploration towards the needs of real people and ground the studies in human experience.

The Pregnancy Journey

A typical pregnancy is about 9 months long, or 40 weeks, and can be segmented into three trimesters, each between 13 and 14 weeks long. Usually, the patient doesn't discover they're pregnant until about Week 4 or later and due dates are calculated based on the first day of the previous menstrual cycle. In the first trimester, the pregnant person experiences an onslaught of symptoms like hormonal mood swings, morning sickness, and cravings. During this time, some people also experience a "pregnancy glow." The beginning of the second trimester marks some relief from these ailments, but as the baby bump grows, the patient will begin to have increased aches, pains, and weight gain. Towards the end of this time, the patient will also begin to feel their baby kick. During the first two trimesters, they usually visit their care provider every 4 weeks to monitor healthy progress. Finally, the third trimester begins the countdown to birth and the patient might have trouble sleeping until that day arrives. Here, care visits are increased to monitor potential complications.

Alongside physical symptoms, the pregnant person experiences a variety of complex emotions and stressors. As their pregnancy progresses, they may experience constantly shifting hopes and fears as they learn new information, manage their symptoms, and embrace motherhood, especially if it is their first time becoming pregnant. *See Figure 7.1, Appendix A: Journey Maps for a visualization of the complete pregnancy journey.*

The Midwifery Care Model

A midwife takes on many roles as a caregiver. According to the International Confederation of Midwives (ICM), a midwife is a "responsible and accountable professional who works in partnership with women to give the necessary support, care and advice during pregnancy, labour and the postpartum period, to conduct births on the midwife's own responsibility and to provide care for the newborn and the infant" (MANA, 2011). Like a doctor or obstetrician, midwives provide preventative and emergency medical care, but they also become important figures of support for the patient, their family, and their community through emotional and social care. They may even offer educa-

tional counseling on pregnancy, sexual health, and parenting. As much as their role is to monitor their patient's health, they also spend time building trusting, caring relationships to empower and celebrate them.

Midwives subscribe to an alternative philosophy of childbirth that centers normal birth (i.e. without excessive technological intervention) as a natural, powerful process with sacred cultural implications. The Midwife Association of North America details this approach in a statement of values and ethics in which they recognize a patient's rights to healthcare autonomy, their unique "life-giving" abilities, and "birth as a personal, intimate, internal, sexual and social experience" to be shared as the patient sees fit. Therefore, a principal facet of their caregiving is to instill patients with confidence in their natural abilities based on intuition and healing (MANA, 2011). This paradigm is strikingly different from that of a traditional care model which is almost exclusively concerned with the physical experience of pregnancy and birth.

Design Scenario

The design studies in this investigation explore the relationship between a first-time expectant mother and her midwife over the course of their pregnancy. Because the patient lives in a rural area, she often connects with her midwife remotely across a digital platform for both synchronous care visits and asynchronous dialogue. Together, they use visual aids and prompts to facilitate continued discussion across a variety of topics over time. These topics are centered around the social determinants of health and are supplementary to the normal physical health data the midwife might collect.

During their first visit, the midwife introduces the patient to the visual tools as they begin talking about her personal life. As they talk, the visuals mediate their conversation to help the midwife gain meaningful insight and the patient to feel comfortable sharing. Following the visit, the patient accesses the shared platform to reflect and continue the dialogue in their own home. Over time, the imagery created during and between visits become essential to their interactions and create a full picture of the patient's lived experiences. The tools transform over time as they build trust, confidence, and familiarity. Their use of the tools helps create an egalitarian and personalized care experience.

User Personas

Figure 3.4.1

Freda, a 26-yr old expectant mother

Persona 01: Patient. Freda is a 26-year-old black woman who lives in King, NC, with her husband, Ed. She has just discovered she is pregnant for the first time and is excited to start their family. However, she has concerns about their preparedness for parenthood and how she'll manage pregnancy with her work schedule and limited access to a hospital. Most days, Ed drops her off at the store where she works part-time as a manager before he heads to his office while they share a car to help save money. Freda has made a couple close friends in the area through church and work, but her family is all a couple of hours away and she's nervous about navigating pregnancy without much help. Since it's her first time, she doesn't really know what to expect and is looking for a midwife who can be both her medical provider and personal supporter. In the past, she has felt judged and dismissed by doctors when she had questions or concerns, so she knows she needs someone she can trust. She wants to feel confident that she's doing everything right and not let fears of the unknown get to her. Above all, she hopes to cherish her journey through pregnancy safely and happily with the people she loves.

Figure 3.4.2

CJ, a 57-yr old certified nurse midwife

Persona 02: Midwife. CJ is a 57-year-old black woman who works as a visiting midwife for rural communities in the surrounding area and has just taken on Freda as a new patient. She knows it's hard to maintain strong relationships over long distances and social strata, especially with new patients, who are slow to trust. Many are often hesitant to share personal information, so CJ uses a collaborative digital platform to mediate those sometimes difficult discussions and keep the conversation going between visits. While she is a medical professional, CJ's approach is holistic, and she invests time in caring for her patient's mental and emotional wellbeing as well. She makes occasional home visits and prefers to meet all the close family and friends in the patient's life, as they too make up her network of care. Ultimately, CJ's top priority is ensuring a safe birth for Freda and her baby, but also instilling in her confidence and joy as she steps into motherhood.

CHAPTER 4

Studies

4.1 Visual Storytelling of Lived Experiences

How can visual aids encourage storytelling of a patient's lived experiences in order to increase agency and improve patient-midwife communication?

In an effort to enable patients to best communicate their unique needs to their caregiver, this study explores how varying visual aids can assist the patient in telling their own story and give them increased agency in conversations with their midwife. In this study, I use snippets of real stories told by new moms during an interview series by Health-talk.org. Positioning these narratives alongside my visual explorations illustrates how through visual aids, patients are empowered in their storytelling. The stories I chose contain rich, meaningful information that could be useful to a midwife in providing the most appropriate care. Ultimately, the goal is to leverage the power of these stories to improve the patient and midwife's communication, making it easier to share sometimes difficult-to-articulate thoughts and feelings.

Approach

Study 1 strove to uncover a multitude of visual forms that might enable the patient to tell stories about their lived experiences. My approach was exploratory in nature, focusing more on the breadth of visual opportunities than their practicality as grounded to a particular scenario for interaction. To guide my exploration, I created a framework for making (See Figure 4.1.1) that structured discrete topic areas paired with visual explorations, varying on a spectrum from representational to abstract. The hopes and fears associated with pregnancy are loosely arranged chronologically; one might ask, "Am I even ready to be a mom?" when first discovering they're pregnant, while issues around planning for the birth event might come much later in the pregnancy. This framework helped guide me towards rich areas for discovery that might have otherwise been overlooked.

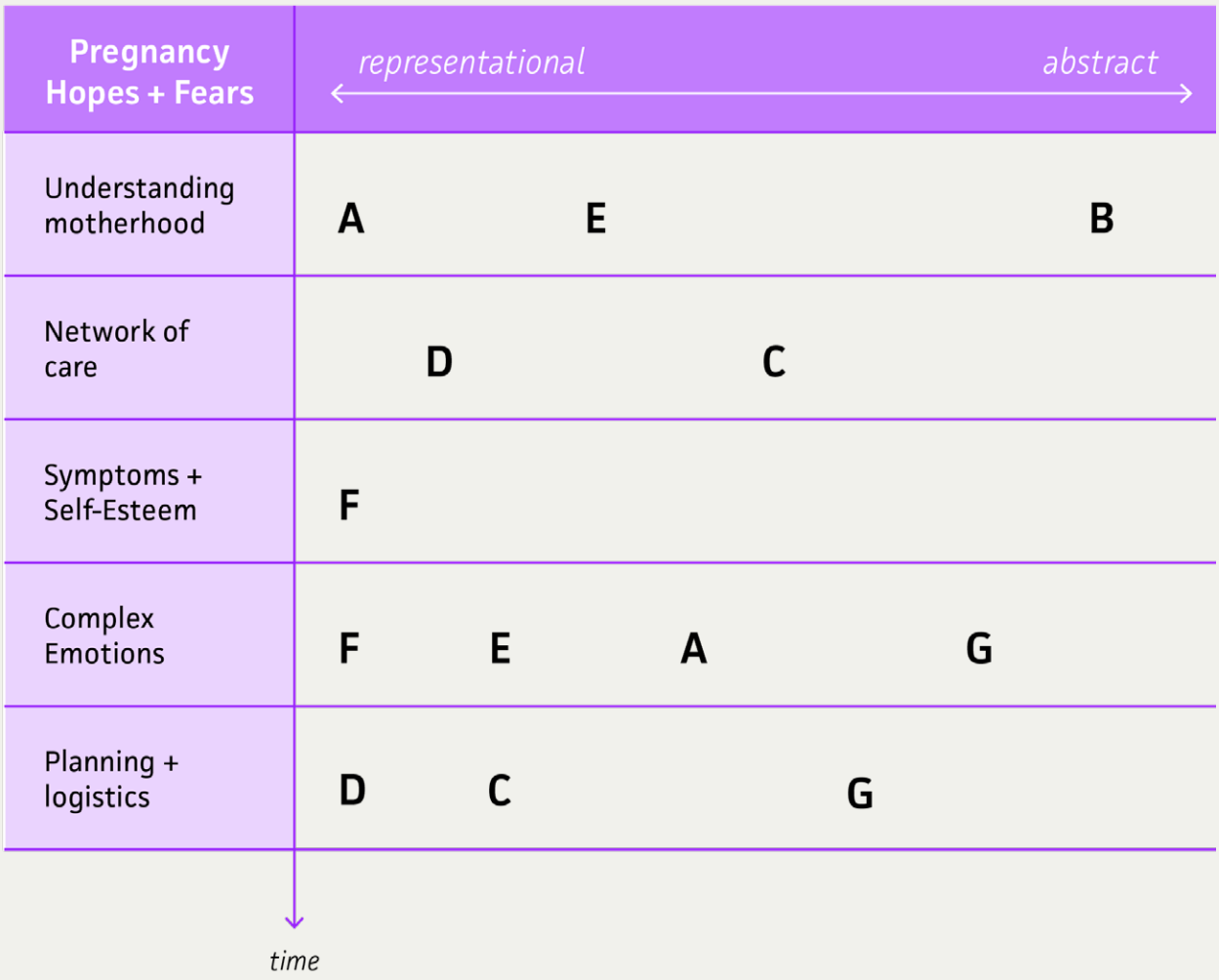


Figure 4.1.1 *Study 1 Framework to guide making*

Explorations A - G are plotted on the table to denote their topical relevance and visual strategy.

Later studies are more explicitly tied to a contextual scenario like an in-person visit, so in order to situate my explorations for Study 1, I imagined them as playing out in one of three realms of influence (see Figure 4.1.2). Some are more suited to private, personal reflection while others could be appropriate for collaboration with the midwife. It was important for me to consider the role that the presence of an authority figure (the midwife) might play in the patient's storytelling, especially as it might contribute to power imbalances and be counterproductive to the goals of this study.

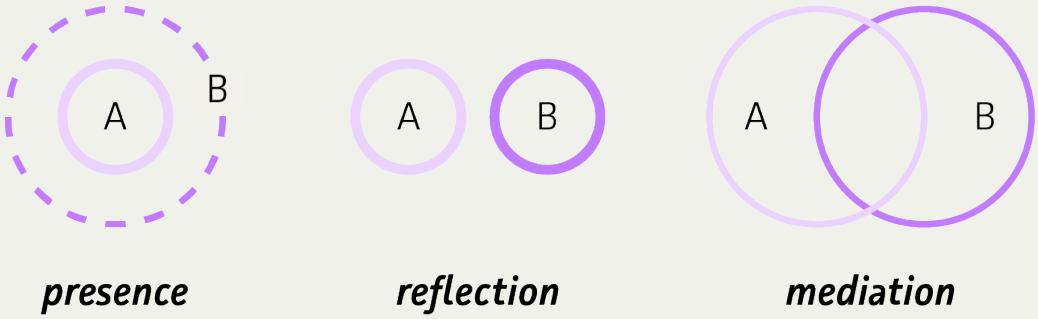


Figure 4.1.2 *Realms of Influence*

Two human collaborators are represented by "A" and "B". Presence illustrates how the midwife might have influence on the patient without being physically present. In reflection, the patient and midwife's experiences are disconnected and independent. In mediation, the patient and midwife's experiences intentionally intersect in a collaborative moment.

Design Explorations

Image Sorting. I began my explorations by investigating how the patient might uncover what motherhood means to them as a way of reconciling feelings of unpreparedness. Exploration A asks the patient to categorize imagery associated with the practices of motherhood, eliciting short narratives as they go. The system prompts the patient with photographs to which they can respond verbally, through textual annotation, or spatial arrangement (see Figure 4.1.3). The emphasis on practices like breastfeeding or changing diapers is intentionally straightforward, asking the patient to imagine tangible scenarios in their future as a new mom. For this exploration and many of the others, I sourced real narrative content from a series of interviews with new moms (Healthtalk, 2017) to demonstrate how the interactions could enable storytelling.

Metaphorical Construction. Exploration B asks the patient to reflect on defining what a "good" mom is by constructing chains of meaning with user-input words or phrases (see Figure 4.1.4). Although it lives in a similar topic area, Exploration B takes on a more abstract visual approach, relying on a simple metaphor to elicit a narrative.

Cognitive Mapping. Exploration C explored how the patient could communicate the important people in their life through a cognitive mapping tool. The patient constructs a representation of their network of care through spatially arranging key locations or associated people around their home (see Figure 4.1.5). Through touch interactions

on the interface, the patient can add meaningful information to the display like travel time, captions, and emojis that serve as visual mnemonic devices. Through this process, the patient can construct a complete image of their network, including varying levels of personal, professional, and medical relationships that might prove important over the course of their pregnancy. This visual aid could be used in both the reflection and mediation spaces. Finally, I explored how the midwife and patient could use the map as a planning tool for discussing "what-if?" scenarios. The midwife gains valuable insight into the patient's perceptions of those in their support network and how they might fulfill differing needs during their pregnancy.

Dialogic Sourcing. Exploration D builds off earlier ideas, but reimagines the role of the technology as a conversational agent to aid in storytelling (see Figure 4.1.6). Instead of asking the patient to play the role of artist, a map is generated through customized question and answer prompts. The system accesses the patient's camera roll or connected apps to utilize personal imagery of the patient's life in real time as the narrative unfolds. As more and more content is generated, the patient can manipulate the display through spatial arrangement, annotation, or associative grouping. A base map could be added to contextualize the narrative content in a familiar interface and serve as common ground for subsequent discussions with the midwife. The midwife can remotely manage the patient's interactions with the conversational agent and view the results of the mapping exercise once it's shared with them.

Visual Imagining. When transitioning to Exploration E, I began to think about other technological affordances that could be explored as storytelling tools. Using AR filters on their mobile device, the patient moves about their home and can begin to imagine what life will be like once their baby arrives. One such filter features the image of a newborn that is virtually placed next to loved ones as a mechanism for envisioning parenthood (see Figure 4.1.7).

Self-Annotation. Similarly, the patient can turn the camera around and use filters or other augmented reality tools to document their physical and emotional journey. In Exploration F, the patient is documenting their mood using filters at benchmark moments of their pregnancy. They can record video or snap a photo, caption it, and save it to an archive or diary (see Figure 4.1.8). Alternatively, the patient can annotate the image of themselves through drawing on the screen as a mode of self-expression. In either form, this method of storytelling could tie to discrete health factors like symptom management, body changes, and emotional wellbeing, and allow the midwife to maintain familiarity with the patient's experience.

Responsive Visualization. My final exploration for this study envisioned how the patient could construct a picture of their daily life using a time-based, prompted visualization. Exploration G uses a conversational schema to prompt the patient to talk about aspects of their routine. For example, "how does your day begin?" might afford a more narrative response than, "what time do you wake up?" As the patient answers questions, the system generates a display of their day in the background, giving the patient and midwife something to respond to as the conversation continues (see Figure 4.1.9). As the patient speaks, the system recognizes events and activities in their speech and drops pins on the visualization to denote them. This embeds potential points of interest in the display to facilitate later conversations. The midwife might also intervene in this activity if pertinent topics arise, causing the system to drop a flag to denote cause for attention. Exploration G illustrates how visual aids can assist the patient in communicating their unique needs and lay the groundwork for continued conversations throughout the care experience. The complete visualization is both rich in content and opportunity; it now serves as a boundary object between the patient and midwife as they discuss expected changes to the patient's routine. The display could also be manipulated to build scenarios with changing values in mind, adding in more family time in the evenings or trips to daycare before and after work.

Observations

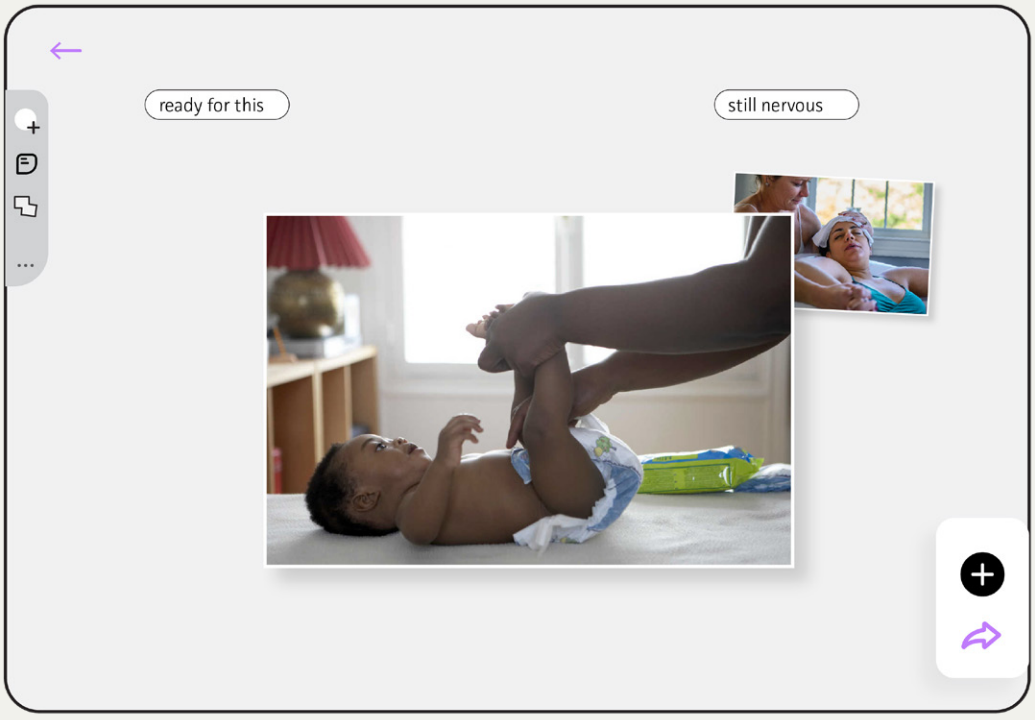
Through making, I gained valuable insight into which type of visual aid is most appropriate for the different realms of influence. Explorations B,D,E, and F feel more private and less conducive to collaboration with the midwife, although some still have potential for post-creation sharing. For example, the map of loved ones created in Exploration D could be an empowering tool for the patient when explaining to the midwife their logistical concerns, although the process of its production is deeply personal. Exploration B, although the most abstract, bears heavy implications based on the patient's choice of words, which could make them feel self-conscious or even judged. Explorations A and E, however, provide the structure and pacing conducive to a mediated experience with the midwife. Both ask the patient to speak on their experiences, albeit A more abstractly than E, but don't require much prior reflection.

The explorations range in how much is being asked of the patient; some require active content generation, like B,C, and F, while others allow the patient to be prompted and respond to the visuals presented, as in A,D and G. The latter serves as a jumping-off point for Study 2. While some are more successful than others, it seems important to strike a balance and not ask the patient to play the role of artist, perhaps becoming overwhelmed or disengaged. The visual aids should strive to meet the patient halfway in their effort to communicate and leverage smart technological affordances to do so.

Formally, I worked with imagery that ranged from photographs to pie charts, and can now identify how the more representational or abstract strategies lend themselves to certain types of content (see Figure 4.1.1). As in Explorations A, E, and F, photographs feel much more human and concrete, and work well for enabling discussion around emotional topics. On the other hand, more abstract approaches like that of Explorations C and G seem appropriate for less emotional topics like planning and logistics. Each has their affordances, however. The use of emojis in Exploration C gives the interaction a playful, lighthearted feeling, while the imagery of loved ones in Exploration D takes on a more serious, practical tone. All these considerations I will keep in mind when designing for in-person mediated interactions in Study 2.

Figure 4.1.3

Exploration A: Image sorting



"And that's what my mum was telling me, 'There's no such word as can't, so don't be saying you can't do it. Try. Try and change a nappy, try and make the bottle', do you know what I mean? But, as my mum said, 'You should know.' I should know all this anyway because I used to babysit for my mate and she..." (Healthtalk.org, 2019).

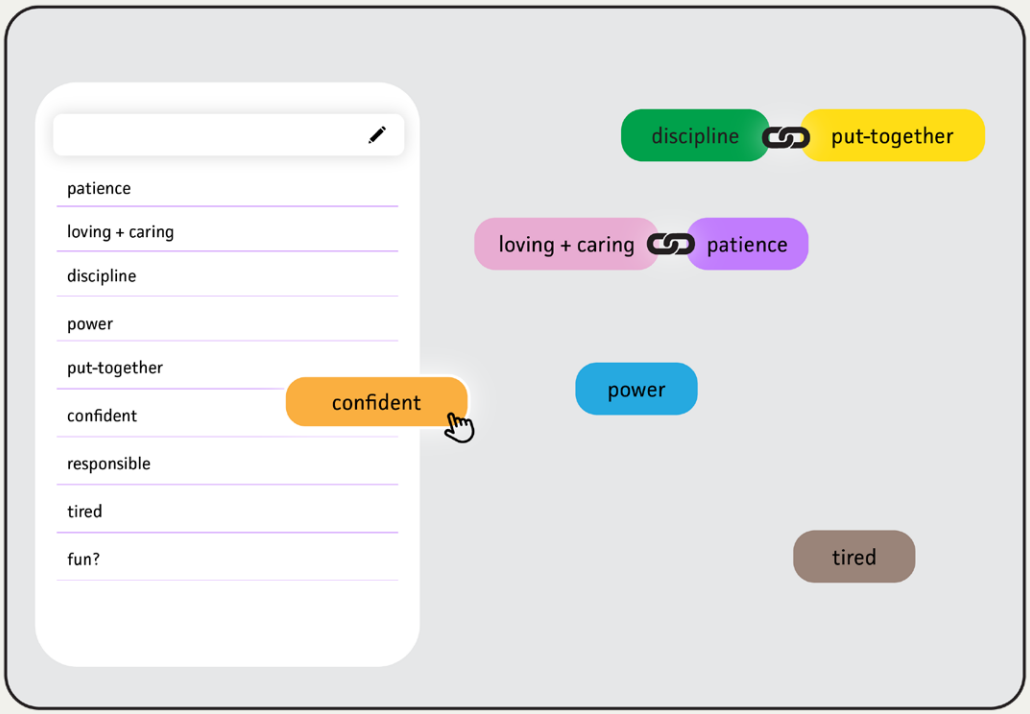
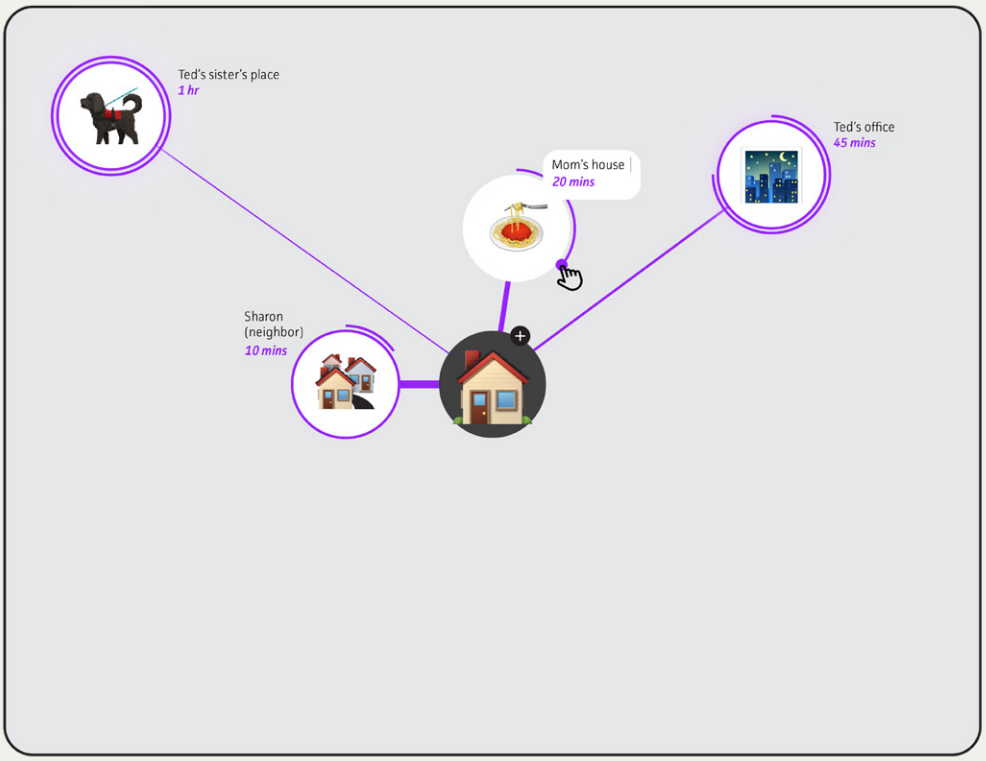


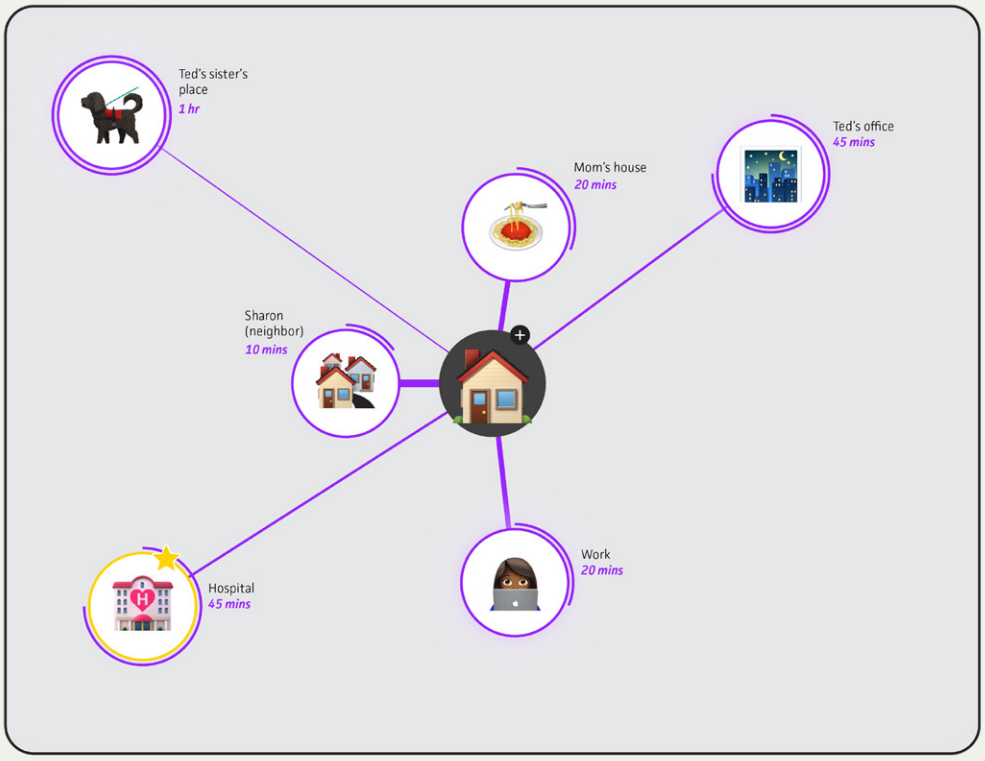
Figure 4.1.4

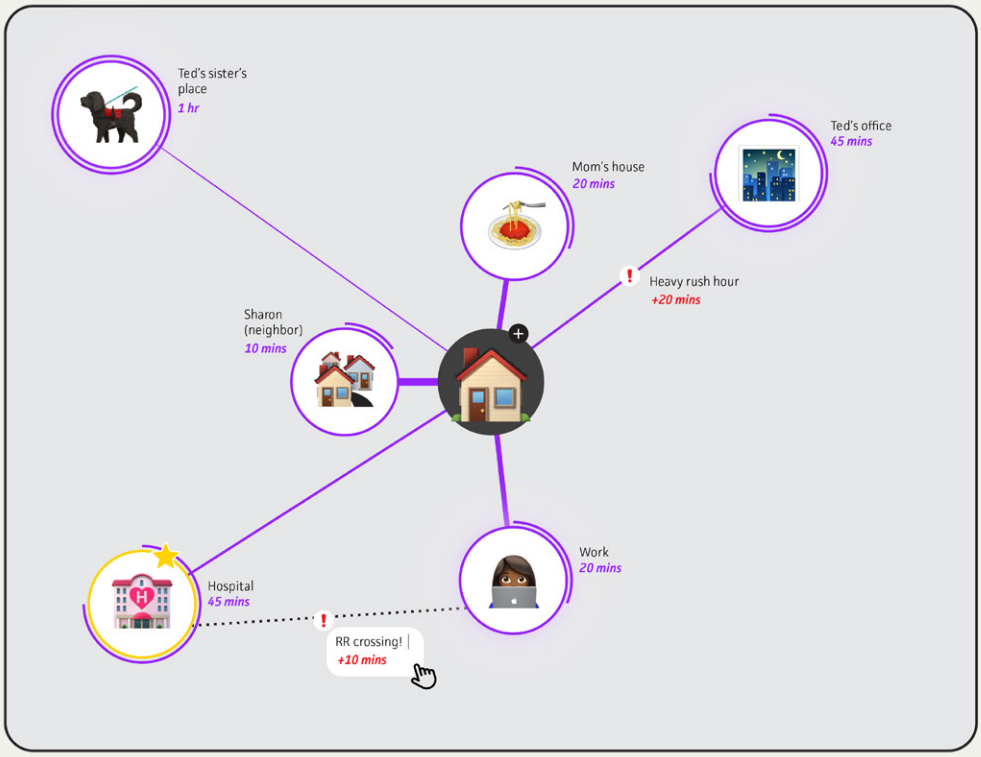
Exploration B: Metaphorical construction

Figure 4.1.5

Exploration C: Cognitive mapping



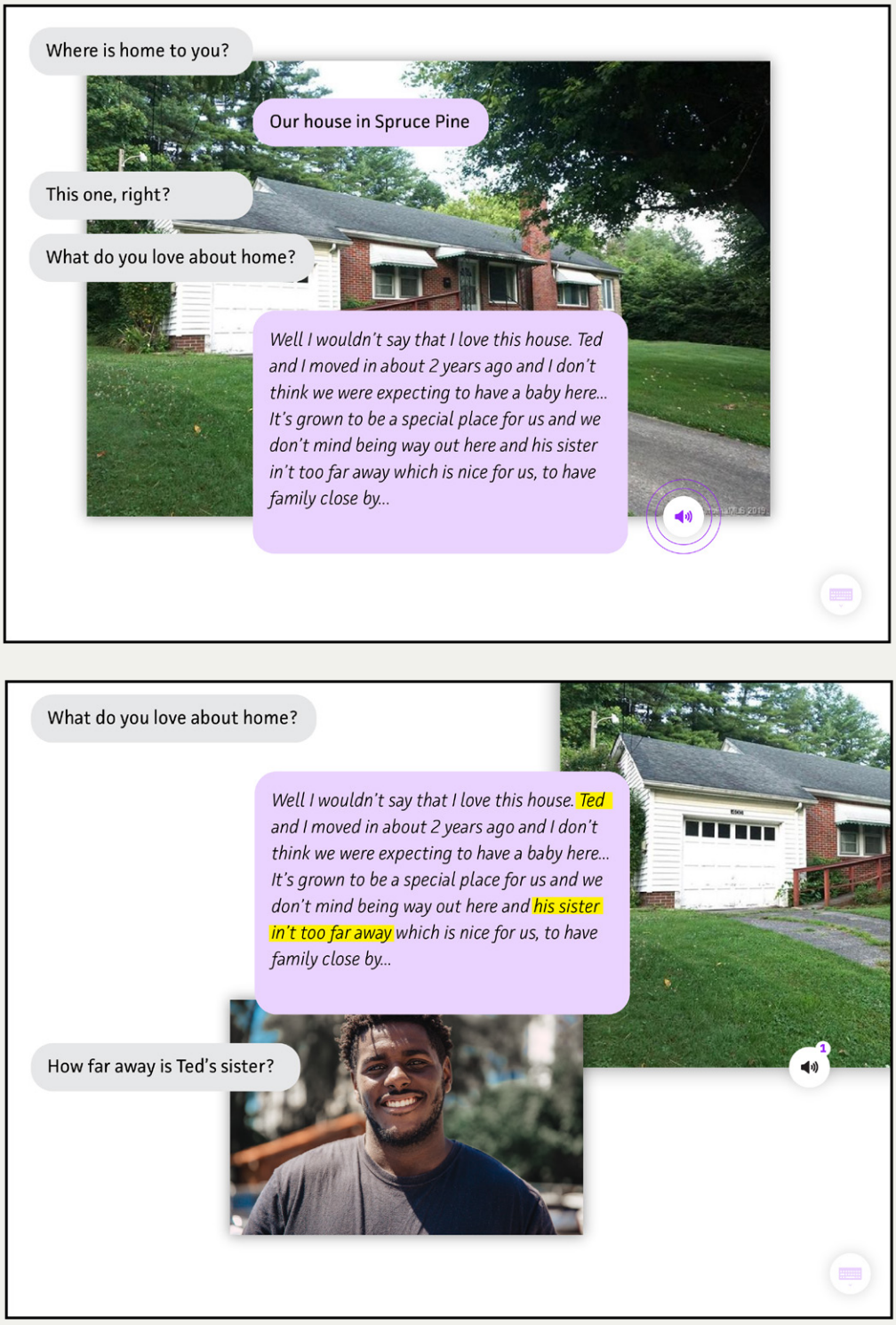




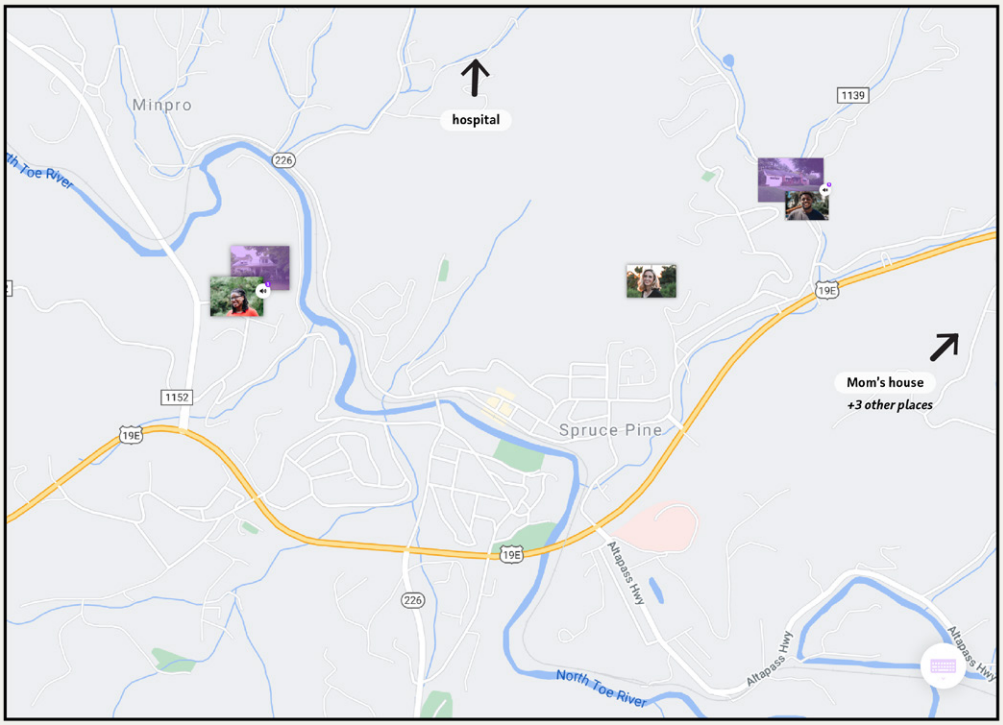
"And I really [don't] want to give birth in a hospital — they are dirtier, they are busier, they tend to have more C-sections and more pressure on mothers to use medication. I [do] not want to have to give birth in a hospital if I [don't] have to"(Healthtalk.org, 2019).

Figure 4.1.6

Exploration D: Dialogic sourcing



Images collected and arranged through dialogue are situated on a geographic map to provide a context for ongoing discussion.


Minpro
hospital
1139
226
North Toe River
19E
1152
Spruce Pine
Mom's house
+3 other places
Altapass Hwy
North Toe River

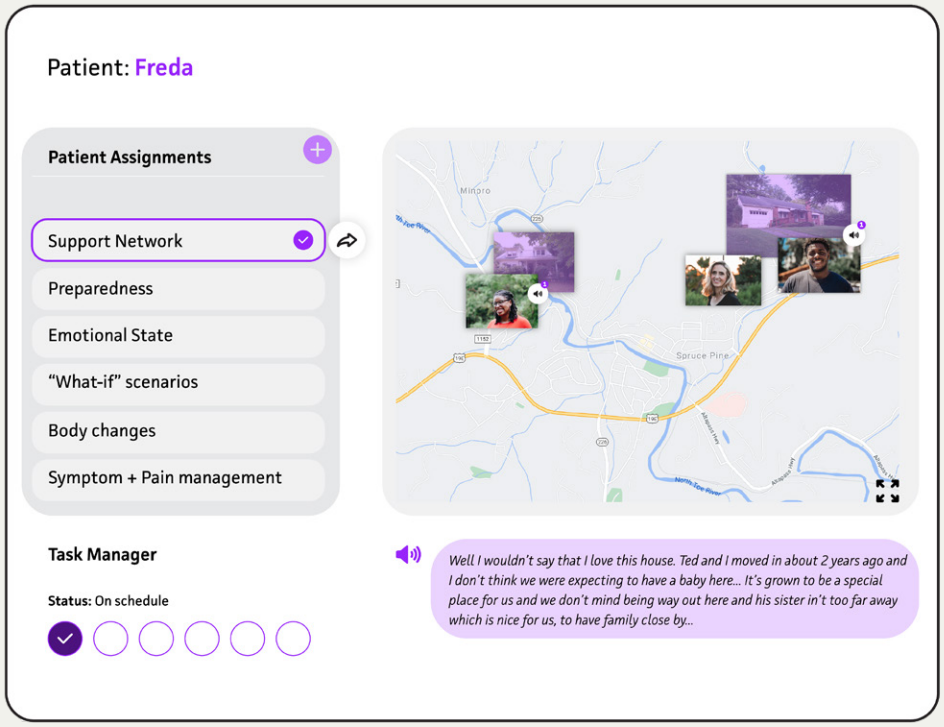
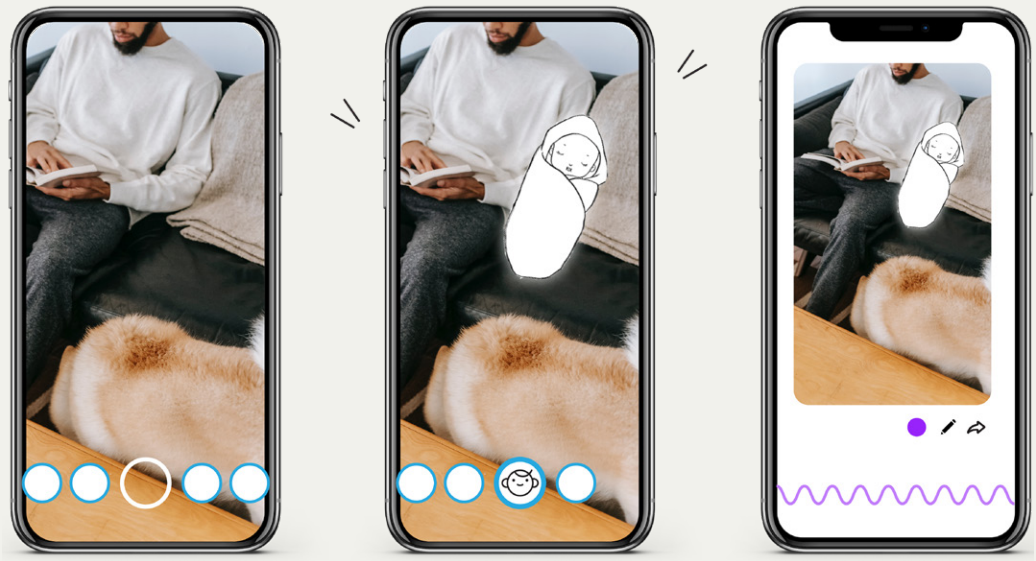

Patient: Freda
Patient Assignments
Support Network
Preparedness
Emotional State
"What-if" scenarios
Body changes
Symptom + Pain management
Task Manager
Status: On schedule
Well I wouldn't say that I love this house. Ted and I moved in about 2 years ago and I don't think we were expecting to have a baby here... It's grown to be a special place for us and we don't mind being way out here and his sister in't too far away which is nice for us, to have family close by..

Figure 4.1.7

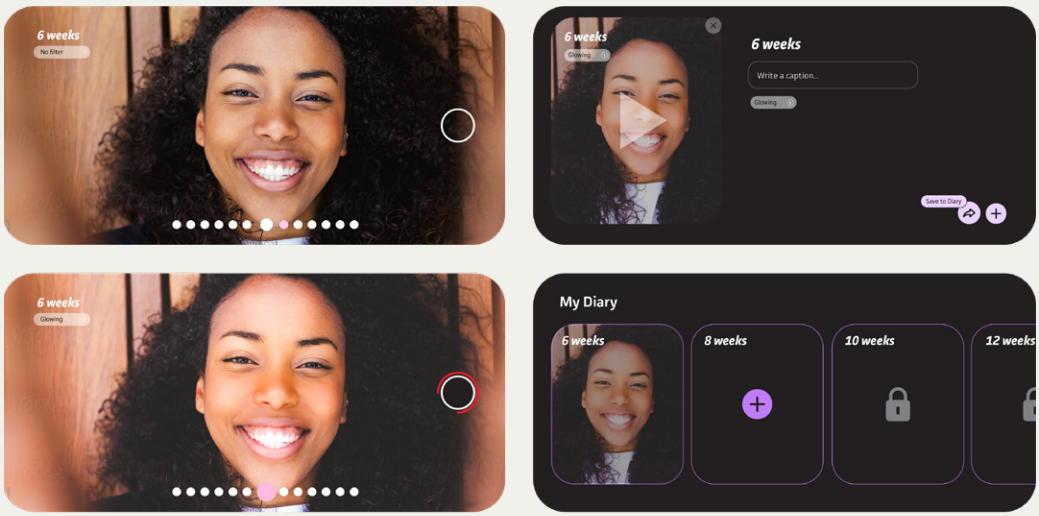
Exploration E: Visual imagining



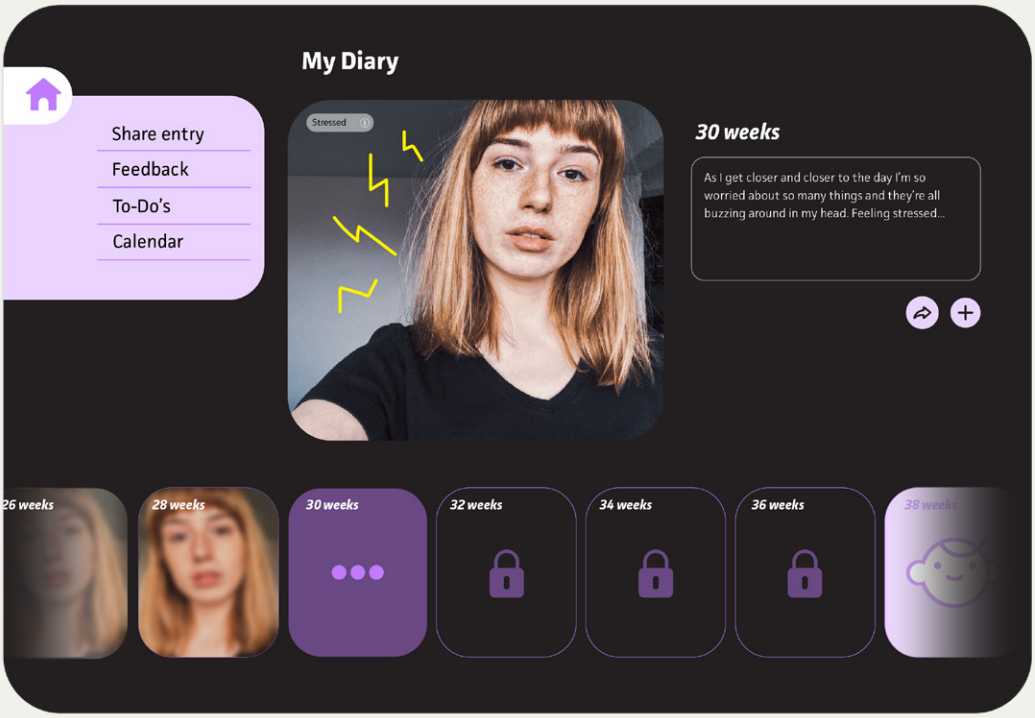
Envisioning parenthood through an AR filter in the home.

Figure 4.1.8

Exploration F: Self-Annotation



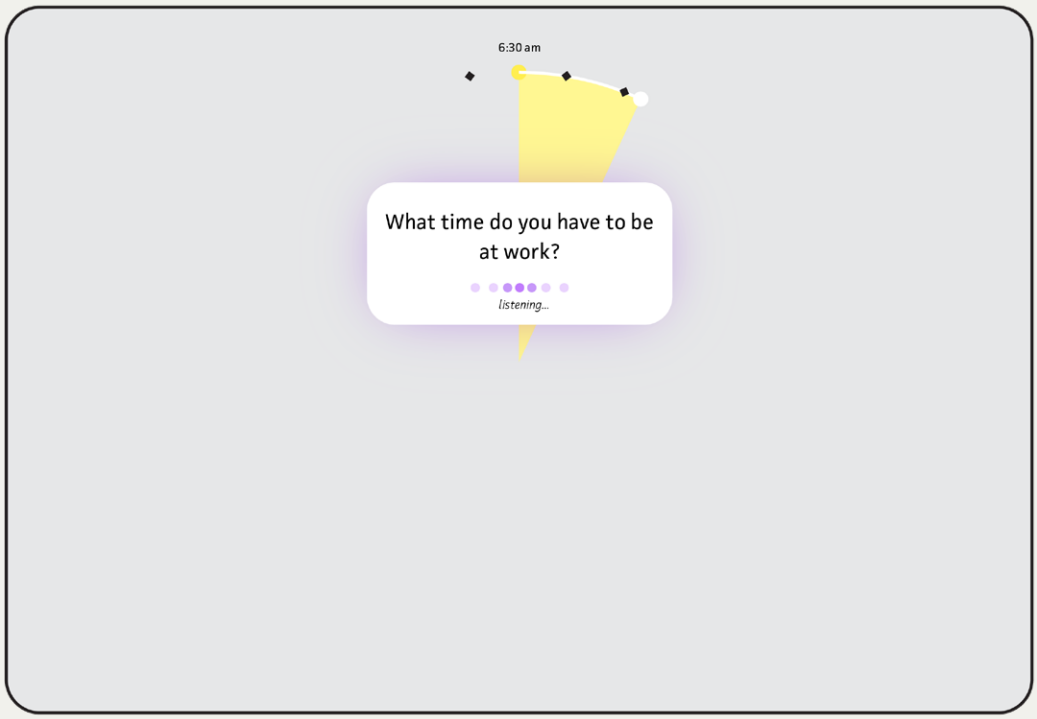
Capturing the physical and emotional journey through archived recordings augmented with filters



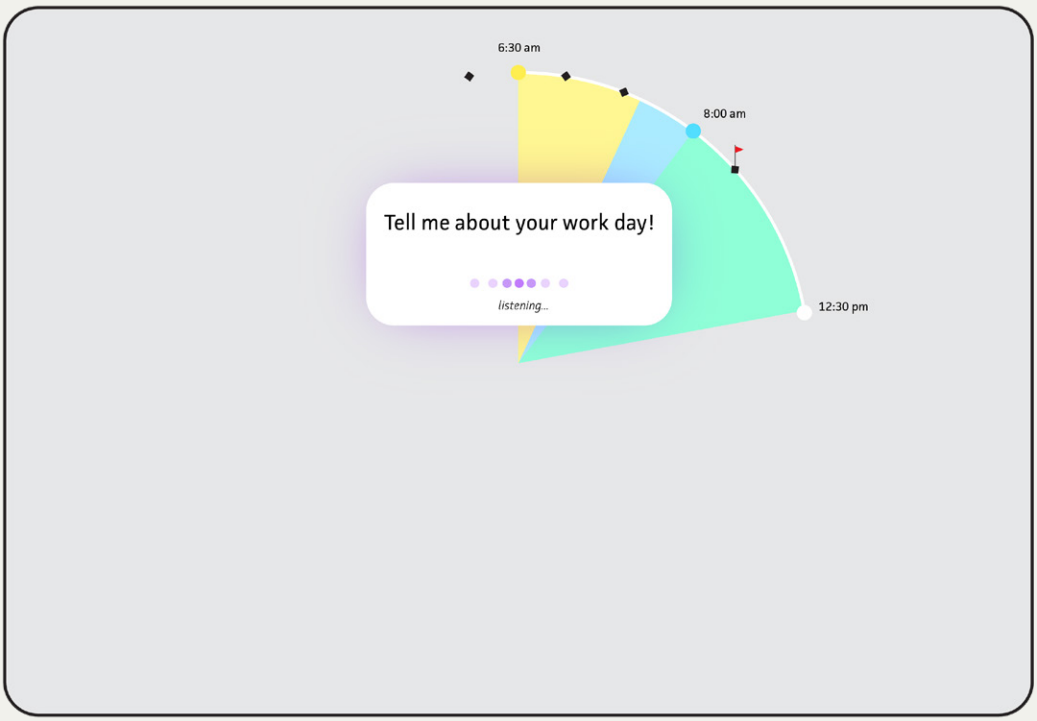
Annotating oneself through digital drawing to accurately capture the emotional journey.

Figure 4.1.9

Exploration G: Responsive Visualization

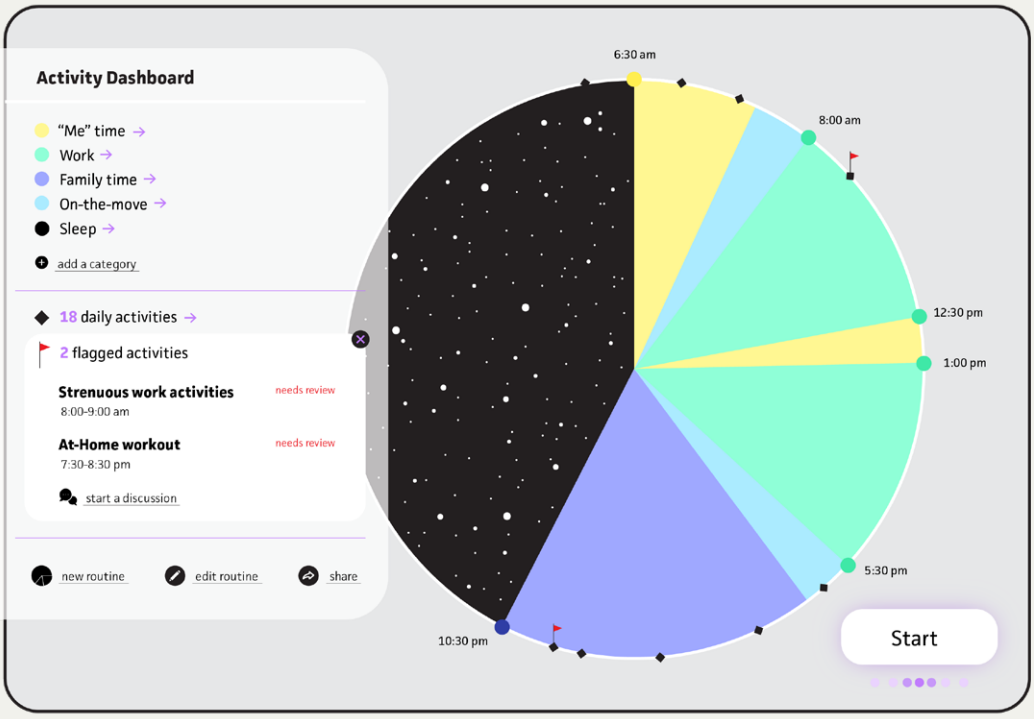


Patient: “I typically get up around 6:30. Ed leaves for work earlier than me and it’s hard to sleep in when he’s already up, plus the cat likes to wake us up around 5 anyway. I take a shower and grab breakfast for the drive to work...”



Patient: “I’m usually on the floor right when we open, but we don’t usually see our first customer till around 10, so that first hour I spend unpacking boxes and restocking products...”

Midwife: “Does that require any heavy lifting? Are you doing lots of bending over and stuff like that?”



A complete visualization of the patient's routine to serve as a catalyst for continued discussions.

4.2 Mediation of Complex Conversations

How can interactive visual prompts mediate a conversation between a patient and midwife to reach a shared understanding of key social and emotional health determinants?

The purpose of Study 2 is to investigate how visual prompts, some of which were explored in Study 1, engage the midwife and patient in meaningful discussions during a care visit, both in-person and remote. While the previous study was centered around the facilitation of storytelling, Study 2 is situated around collaborative activities that require the two participants to negotiate their different perspectives and reach consensus. To enable true collaboration, I designed activities that require participation from both the midwife and patient, challenging typical provider-patient interactions in which the patient provides information while the caregiver passively receives it. There is also a third presence at play in Study 2: that of the smart-technology system. Many of the explorations rely on generative prompts that respond to the user's input and are outside their control.

Approach

In order to understand the complexities of these interactions while embedded in a conversation, I constructed a set of user-journey maps detailing the experience of both participants *(See Figures 7.2 and 7.3, Appendix A).* One plays out a patient's initial visit with their midwife early in their pregnancy and is set in the patient's home. The second journey map details a telehealth visit that takes place during the third trimester. Keeping in mind how these two experiences are vastly different in terms of the patient-midwife relationship and the nature of health information presented helped me consider how the interactions I designed would play out through time, creating an ecosystem of visual materials that are dynamic, cumulative, and iterative.

The interactive visual prompts I explore in this study function in two primary ways; they are either generative, prompting new avenues of discussion, or responsive, building upon previous threads. Generative prompts are divergent in nature and serve to broaden the conversation and help the patient and midwife arrive at topics that might have otherwise been missed. In contrast, responsive prompts are convergent in nature and serve to deepen discussion around a particular topic. Additionally, I categorized imagery as either found or made as a way of exploring content generation and user motivation. Found imagery, although varying in form, already exists in the world and is pushed at the users as a prompting mechanism. On the other hand, some explorations in this study require

the participants to actively create visuals, although the form and fidelity of this imagery is not as important as the act of making itself. Recall that when participants construct imagery, the information embedded within it is more contextually representative of that person's actual experiences (Liebenberg, 2009). There is a gray area between found and made, in which the participants generate portions of, contribute to, or alter existing imagery. The appropriate balance of participant content generation amidst a conversation is delicate, as the patient and midwife must also self-regulate their behaviors as social beings.

Structuring the visual explorations around these two variants paired with the discussion content yielded a framework that guided my making throughout this study. Each exploration can be categorized as a pairing of generative or responsive and found or made, and address some combination of physical, social, and emotional conditions that the patient and midwife might discuss.

	(Form) **Interactive Visual Prompts**			
(Content) **Social Determinants of Health**	*Generative*		*Responsive*	
	Found	*Made*	*Found*	*Made*
Physical	**B**	**D**	**C**	**C**
Social	**B**	**D**	**B**	**D**
Emotional	**A**	**D**	**A**	**D**

Figure 4.2.1 *Study 2 Framework to guide making*

Explorations are plotted based on their formal and contextual strategy

Design Explorations

Visual Metaphor. Exploration A (see Figure 4.2.2) uses a visual metaphor to facilitate discussion around the patient's fears. Many anxieties in this context can be associated with the fear of the unknown, as the birth is always approaching and is a completely unfamiliar experience for a first-time patient. The interaction in Exploration A is structured as a narrative with intermittent verbal prompts to guide the user's input. The patient is asked to give names to sharks that represent distinct fears they're experiencing, then collaborate with the midwife to build a "plan of attack" for each respective shark. This exploration is intended to generate discussion, and is the only exploration in this study that has one-directional interaction with the visuals; the midwife participates solely through conversation. Because it is so patient-facing, it places more pressure on them to divulge information and does not go far enough to address that implicit power imbalance.

Image Interpretation. Exploration B (See Figure 4.2.3) explored how image prompting could elicit associated experiences from the patient. Imagine the midwife is interested in learning more about the relationship between the patient and her partner. By prompting the patient with an image of a bouquet of flowers, the midwife might receive a response like "he never gives me flowers", "we're not big gift givers", or "he's been pampering me a lot during the pregnancy". The flowers, although devoid of any personal context, serve as a proxy to a larger idea of relationships, practices, and emotional health and are meant to trigger more personal narratives.

While thinking about the nature of prompts in this study, I explored how these image prompts could be either convergent or divergent. Imagine the patient is prompted with an image of an unmade bed. Consider this dialogue between the patient and midwife:

> *Midwife: "It doesn't sound like you two have many problems!"*
> *Patient: "Well, no that I think about it, he is a bed hog..."*
> *Midwife: "Oh really? What do you think you'll do when the baby comes? Who will get more sleep?"*
> *Patient: "Definitely him. Not that I don't think he'll help out, but anytime the dog whines, I'm the one that gets up. He just sleeps like a rock!"*

In a convergent responsive system, the patient would then be shown images of a dog, to elicit deeper elaboration on that topic. I then explored how the use of multiple images might allow the patient to more accurately represent themselves by choosing among a selection of images to denote which they most identify with. This decision-making process adds a level of specificity to the interaction that can help the midwife more

closely align spoken narratives with the images on the screen. The variety in images of dogs, for example, might yield hints about an active or sedentary lifestyle, conceptions of family, and household routines, but ultimately, the patient's unique interpretation of the images creates a picture of their value systems and experiences.

Visual Scenarios. Exploration C utilizes an existing narrative to engage the midwife and patient in joint decision-making (See Figure 4.2.4). Prompted with an initial scenario, the two are tasked with choosing the next event in a sequence based on options presented to them. Based on the "choose your own adventure" model, each choice yields a different outcome, and so together, the patient and midwife can explore a multiplicity of scenarios to define plans, reach shared understanding, and mitigate fears of "what-if's." By playing out possibilities with their midwife, the patient might feel reassured in their preparedness. Similarly, I explored how this activity could be more guided and interactive through the use of sticker annotations that allow the participants to add thoughts, feelings, and actions to the existing narrative. As they progress through the activity, both are asked to put themselves in the shoes of the character. In this way, the midwife is building empathy for the patient's experience and the patient is getting more in touch with her own feelings by asking the question "what would I be thinking/feeling if this were me?" This annotation might take place for each scene in the narrative scenario, coalescing into a storyboard of the event that could lead to extended discussions around that topic.

Narrative Construction. In Exploration D, (See Figures 4.2.5) I investigated how the patient and midwife could co-create a narrative in real time using participant-made imagery and a call-and-response interaction. The patient is prompted first to "set the scene" with a blank artboard. Using a variety of available tools, the patient can construct the first scene in a narrative yet to unfold, based on a particular scenario or event they feel warrants some discussion. The participant can use digital drawing, photo collaging, and text boxes to create their scene while the midwife awaits their turn, after which they can view their collaborator's work and respond by creating the next scene in the narrative. The participants can also recycle assets created by each other, and build off of previous scenes to create continuity and reduce redundancy in the activity. In this particular exploration, I considered the temporal constraints of the scenario and how, in response, the design should encourage quick, low-fidelity sketching. By allowing the user to work across a variety of mediums, they are empowered to make choices that communicate their ideas in the most efficient way. The imagery generated in this activity is by no means polished; I intentionally kept my production loose and rapid in an effort to accurately capture how the users might use the tools in situ. The visuals serve only to capture basic ideas, which can be further elaborated upon through in-the-moment dialogue. It's unlikely that many of the users have artistic training or skill, which may

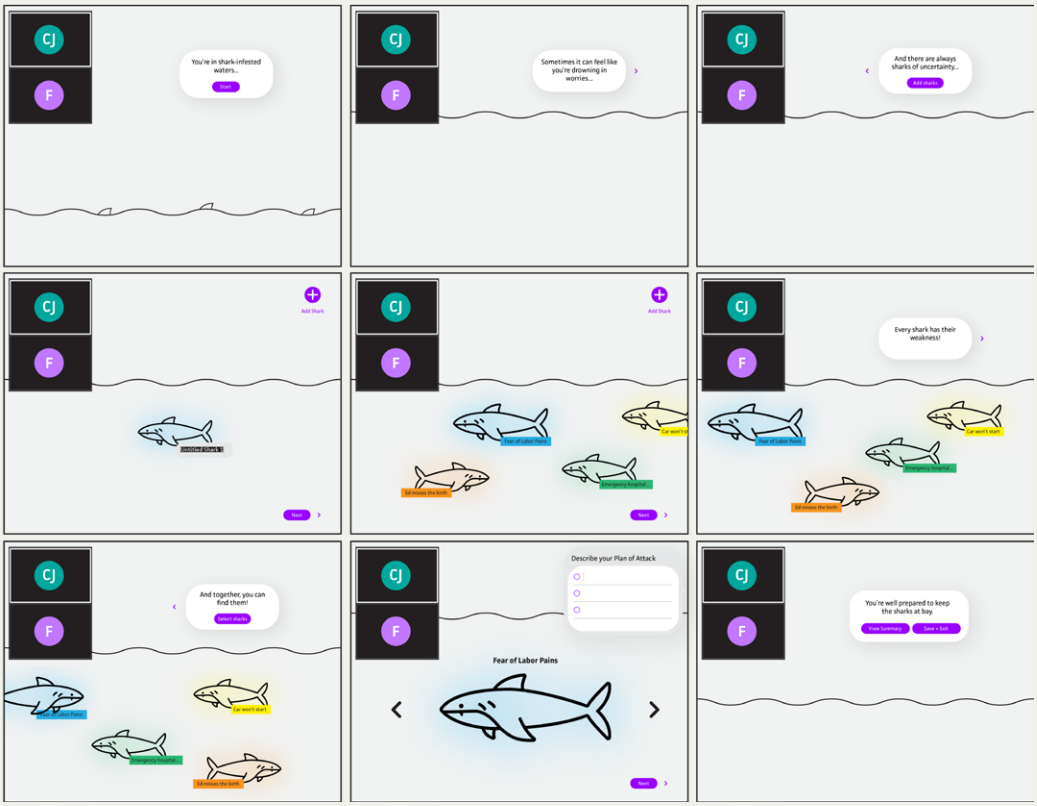
cause them to feel a lack of confidence when creating their scene. Therefore, they might create images that are reductive or symbolic in nature that rely heavily on discussion and explanation to uncover meaning. Because the narrative is one of their own making, this activity could be completed again and again, providing a new experience each time as the conditions of their relationship evolve over the course of the pregnancy.

Observations

The constraint of the synchronous visit forced me to heavily consider the barriers to participation for each activity I designed, the most obvious of which was time. Therefore, the explorations created for this study ask the user to generate or interact with imagery in a rapid cycle with their midwife. Because of the time constraints, the imagery sacrifices detail or finesse, but when supplemented with real-time dialogue, they effectively communicate ideas. In contrast, Study 3 will examine the affordances of slow making with regard to the depth and meaning embedded in user-generated imagery. Many of the activities from Study 2 could be framed as part of a more integrated system of tools that span across both synchronous visits and asynchronous self-reflection. This relationship between Studies 2 and 3 could be articulated as connected and cyclical; what the patient discovers through independent self-reflection informs the content of real-time collaboration with the midwife, and vice versa. Some explorations are better suited for particular phases of the patient's care and map directly to changing concerns or events. Therefore, activities that take place earlier in their engagement lay the foundation for what occurs in the coming visits, creating a responsive, personalized system that acknowledges and welcomes changing factors over time.

Figure 4.2.2

Exploration A: Visual Metaphor

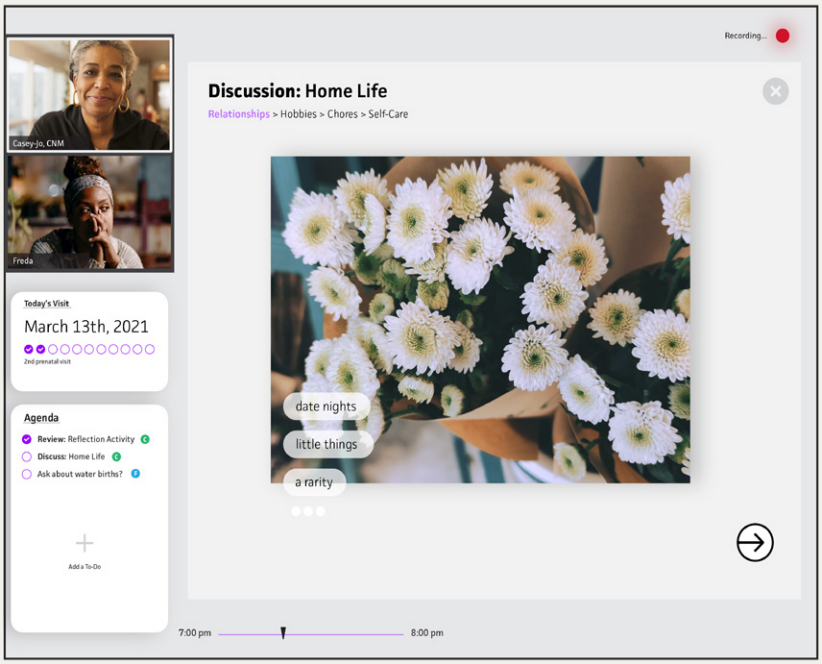


The patient is prompted to give names to their fears using shark-infested waters as a metaphor. Together, the patient and midwife construct action plans to mitigate those fears and take steps towards confidence and reassurance.

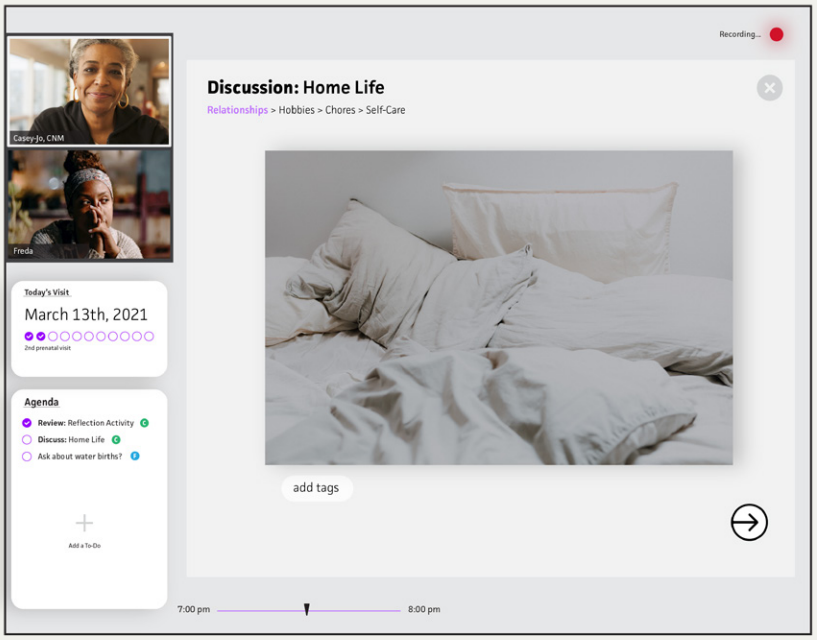
Figure 4.2.3

Exploration B:
Image Interpretation

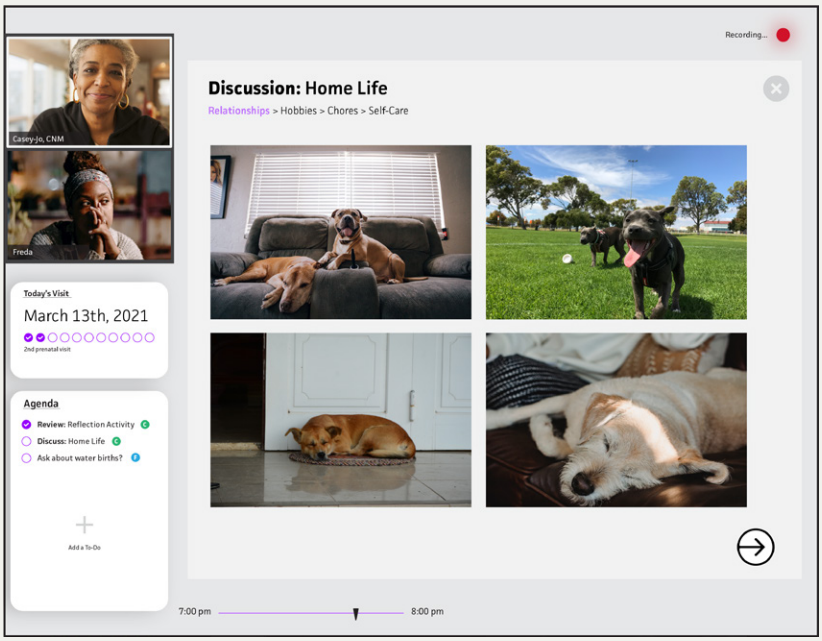
The image of a bouquet of flowers prompts discussion between the patient and midwife around intimate partner relationships, serving as a proxy to practices associated with dating and relationships to elicit responses.



The image of an unmade bed is an open prompt through which the patient could discuss a variety of interpretations based on what's relevant to their life.



The responsive system picks up on the word “dog” in the patient and midwife’s discussion, prompting them to continue that conversation with a collection of images from which they can obtain more detailed information.



Rather than presenting the participants with a single image, the system presents a variety of images from which the patient can identify which, if any, are best representative of their lived experiences, and allow them to articulate why.

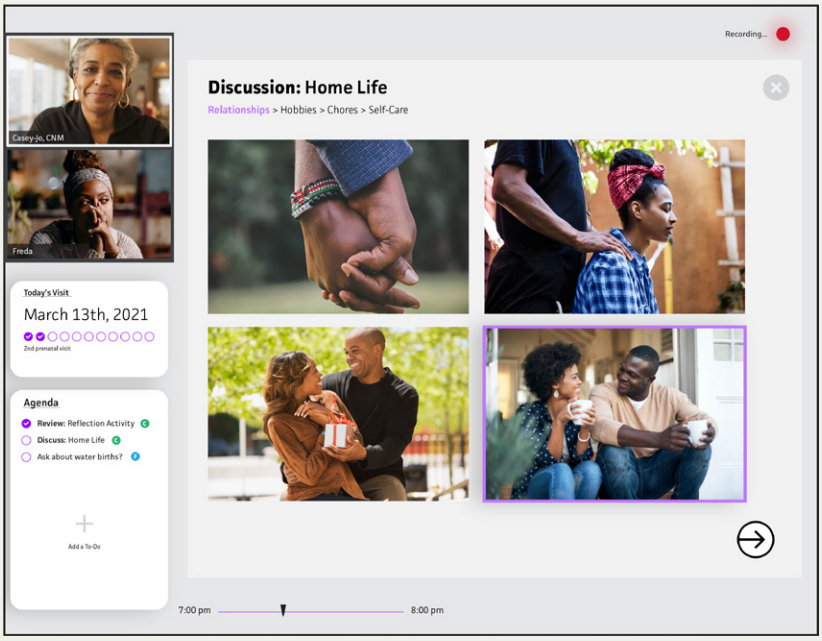
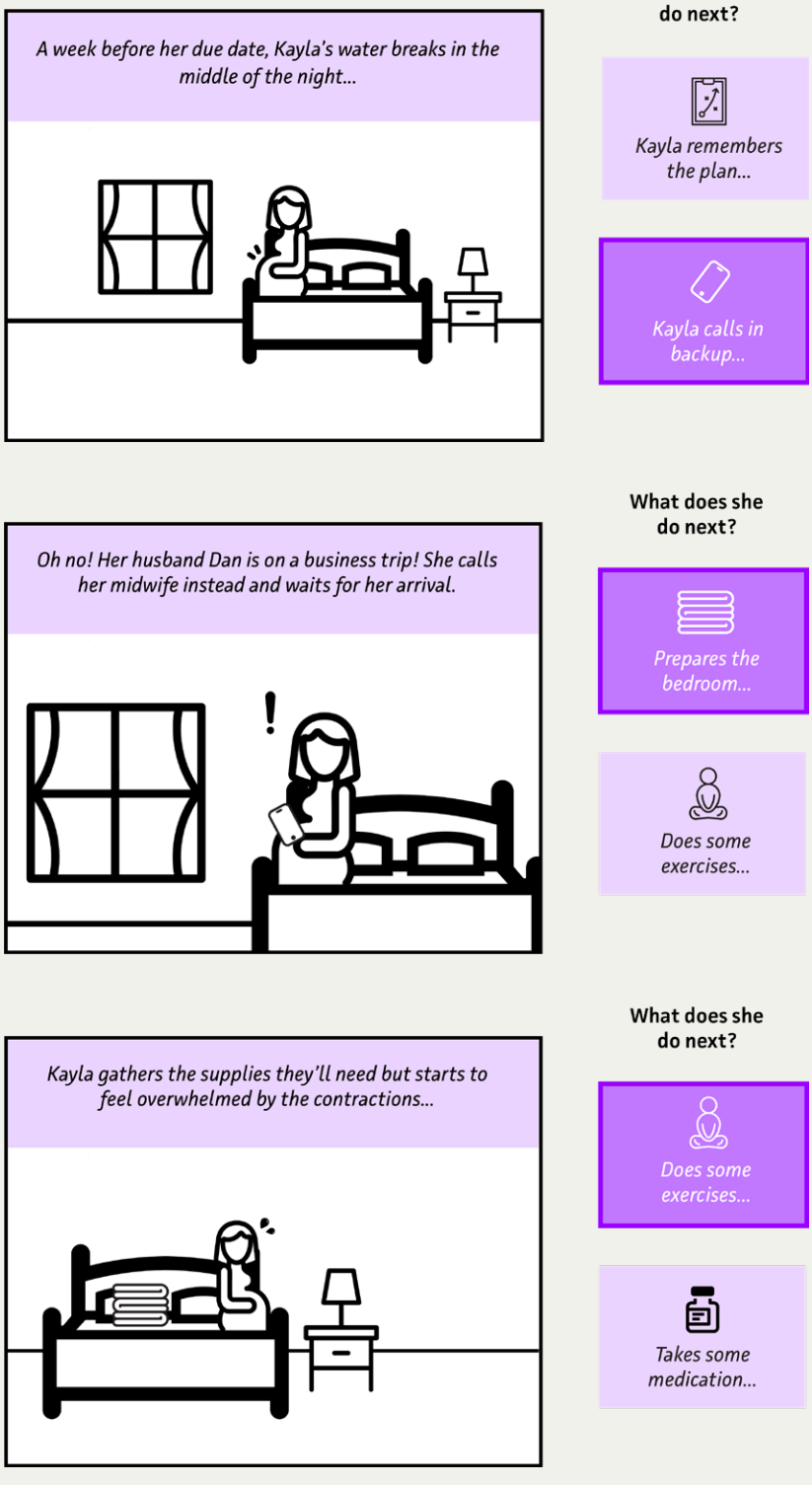


Figure 4.2.4

Exploration C:
Visual Scenarios

Together, the patient and midwife navigate a "choose your own adventure" pregnancy scenario in which they must reach consensus about a plan of action. Later discussions might center on further understanding those choices and playing out other scenarios to feel confident and prepared.



Presented with a scenario, the patient and midwife are guided through a series of prompts that allow them to input what the character would be thinking, feeling, and doing in that moment.

After annotating the first scene, the patient and midwife can move on to the next scene in the narrative, creating a highly detailed story that helps the patient investigate their own thoughts and feelings about the scenario.

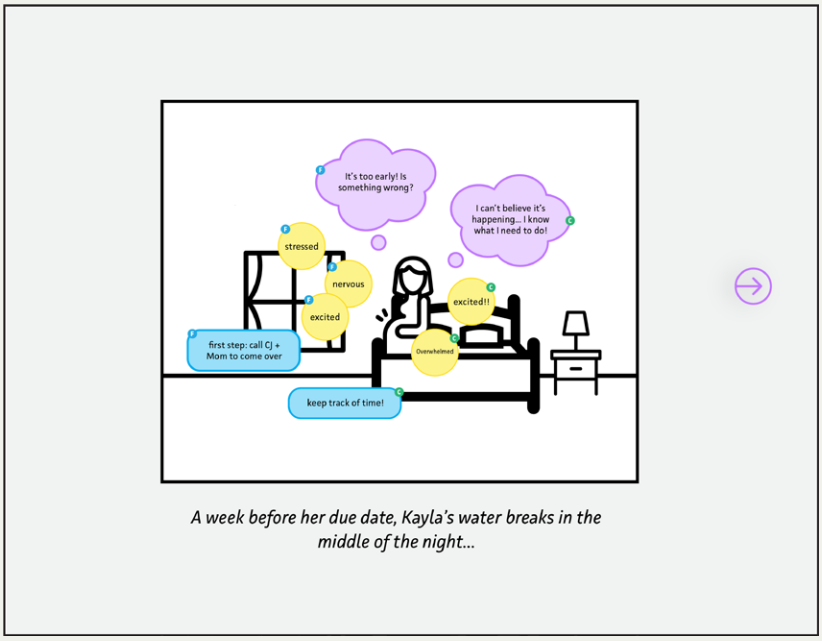
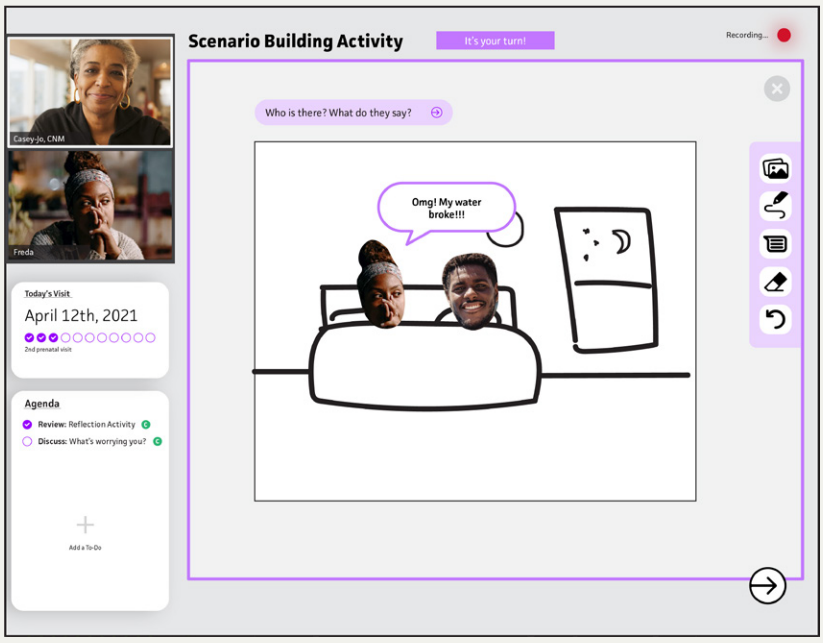


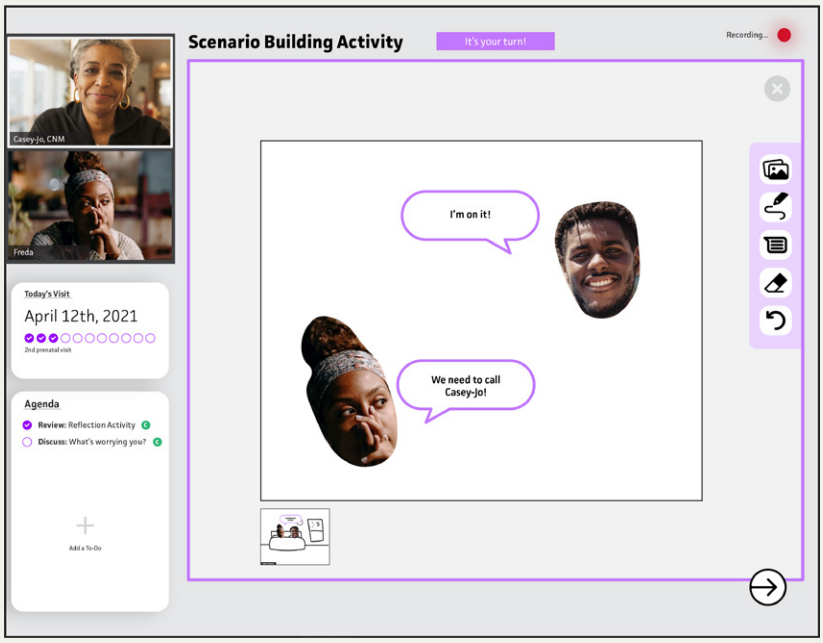
Figure 4.2.5

Exploration D: Narrative Construction

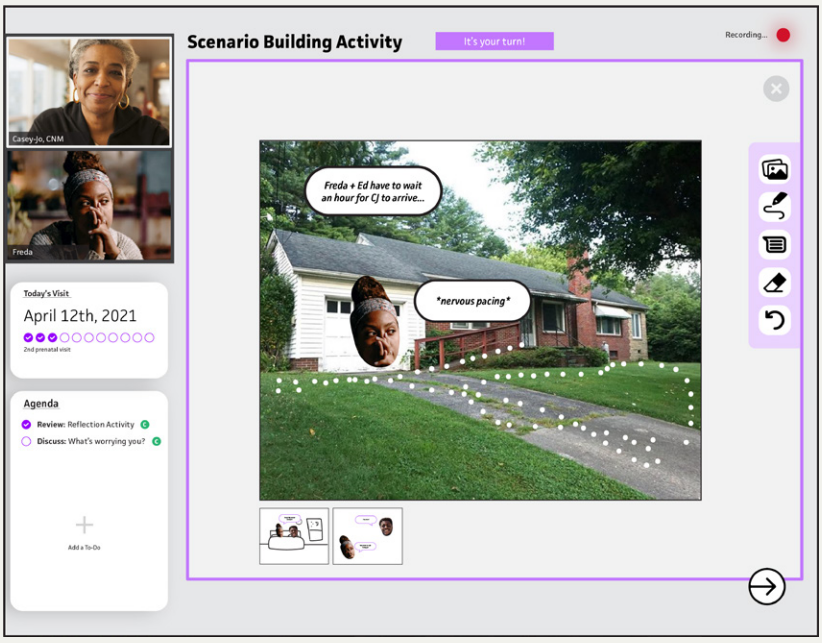
The patient is prompted to "set the scene" for the initial moment in the narrative they wish to construct. They choose to create the image of a scenario they are anxious about in hopes that discussing it will bring them some comfort.



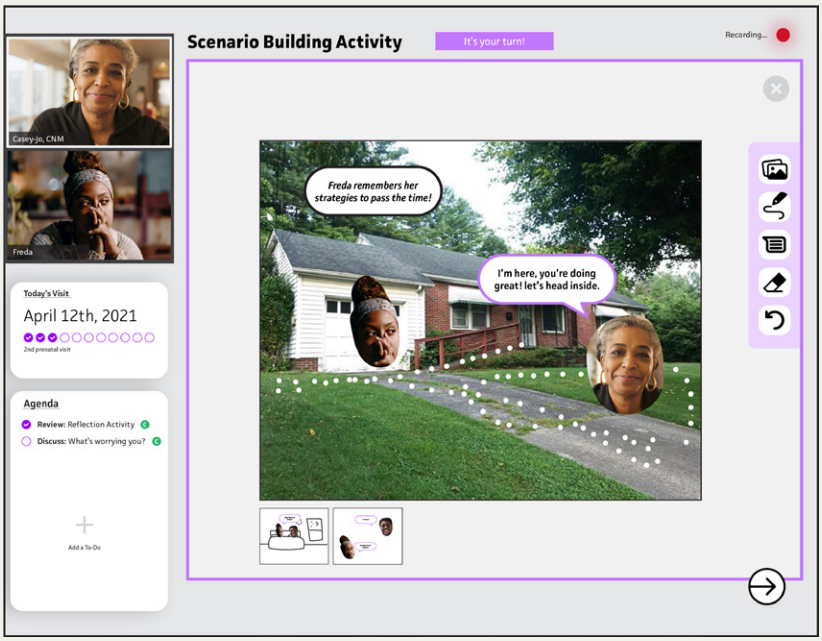
Taking turns, the midwife creates the next image in the story, inputting what she believes would happen next. The perspectives of both the patient and midwife are present throughout this process allowing them to see where the other stands.



The participants can use a variety of tools to create their scenes, including photographs from their camera roll, digital drawing, textual annotations, and digital “stickers”.



The participants represent themselves and their environment through simplified imagery that efficiently communicates thoughts and feelings within the scenario.



4.3 Asynchronous Self-Reflection

How can participant image production guide asynchronous self-reflection to create continuity between visits and heighten the validity of information shared with their midwife?

This study shifts focus from conversational mediation to the slower, more intentional process of self-reflection, giving the patient space to acknowledge their thoughts, feelings, and experiences without the presence of their midwife. Self-reflection is generally thought of as the way people meditate on past experiences and behavior, but it is also a form of self-awareness in which someone processes the present moment with intention and openness. It is this latter definition of self-reflection that I center Study 3 around to keep the patient and their journey as the focal point of this project. In this study, I explore how the patient can be guided through varying self-reflective activities over the course of their pregnancy to help them make sense of new experiences, acknowledge their emotions, and build confidence in their readiness for birth and parenthood. In doing so, patients are continuing conversations from synchronous care visits with themselves and perhaps their loved ones, creating a sense of continued dialogue between visits. Self-reflection plays an important role in allowing participants to return to the dialogue at hand and speak to their own reality on topics that they deem important (Liebenberg, 2009). These reflective activities are also designed to help the patient discover new topics of conversation they'd like to discuss with their midwife, giving them increased agency over their next care visit.

The second goal of this study is to heighten the validity of information the patient shares with their midwife, which might typically include anecdotes about their situation at work, the state of things at home, or the nature of their relationship with their partner. Validity in this context can be understood as the extent to which the information embedded in such anecdotes is thoroughly and accurately articulated, and to which both the patient and midwife have reached a sound, mutual understanding of its meaning and implications. Using image-making as a method for validating data comes from its ability to allow participants to transcend preconceptions of their lived experiences and literally show what they mean. Images serve as signifiers of complex social, cultural, and emotional values that become embedded in them through the process of making; (Liebenberg, 2009) transforming them into a powerful tool for revealing health data in an empowering manner. In this way, the images the patient creates through self-reflective activities between visits become referential and evidentiary assets to them in conversations with their midwife.

Approach

Based on observations drawn from Study 2, I situate my design explorations for this study around different phases of the patient experience. During each trimester, the goal of the patient and midwife's interactions will inevitably shift as the pregnancy evolves, and in an effort to demonstrate how the nature of reflective activities will respond accordingly, I structure the explorations around distinct moments in each trimester. Explorations set in the first trimester center around the goal of building trust between the patient and midwife and investigate how imagery created in periods of self-reflection could lay a foundation of understanding during early care visits. Those set in the second trimester have the goal of helping the patient build confidence in themselves and capture their physical and emotional journey. Finally, explorations set in the third trimester address the building sense of anticipation as the due date approaches.

This study also marks a shift in my process in which I move from creating discrete visual explorations to thinking about the design of a coherent system in which the explorations live together. I designed a platform for the user to move through guided self-reflection activities structured as topical modules that strategically become available as their care journey progresses. These modules contain sets of activities that vary in form, content, and complexity as appropriate for both the moment in time (stage of pregnancy) and the dialogic topic (e.g. home life). I created visual explorations for 5 schemas for self-reflection activities that establish consistency and structure across content modules so that the patient might gain proficiency, comfort, and confidence in their use of the tools over time. Those schemas include documentation, collection, expression, interpretation, and storyboarding. The system also imagines that the patient's self-reflection takes place across two primary channels. One is the structured modules and the other is a routine journaling practice that remains constant across time and space. The journal space is devoid of content-based prompts, allowing for open-ended and continuous access and creation. While the modular activities strive to collect information across varied, yet specified topics of interest, the journal is essentially a blank slate, offering an opportunity for the patient to construct a narrative that is strictly their own. Its form remains constant, increasing its potential to effectively showcase changes in the patient's experience as they reflect on their pregnancy journey.

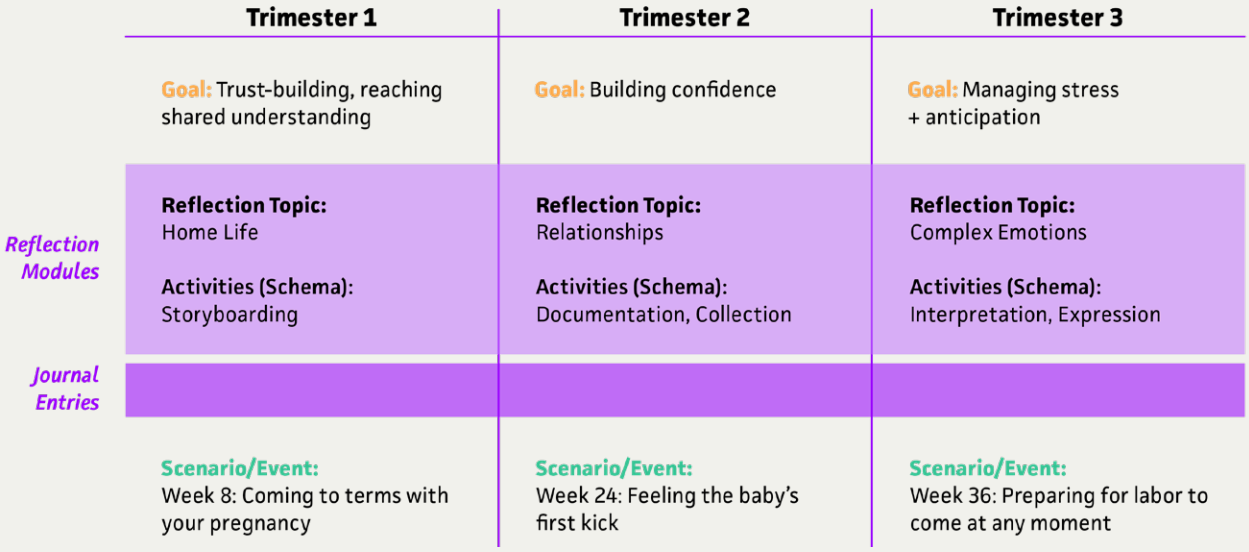


Figure 4.3.1 *Study 3 Explorations framework*

The explorations are situated around events that might take place at 8 weeks, 24 weeks, and 36 weeks to represent how the use of tools would respond to the changing patient experience. Not every activity schema is shown at every stage, as some are more conducive to the goals of specific trimesters.

Design Explorations

Dashboard. To begin my design explorations for this study, I created a visual system and patient portal to contextualize the reflection activities within that space. The patient dashboard (See Figure 4.3.2) allows them to access their remote visits with their midwife and participate in a suite of self-reflection activities. On their homepage, they can view recent activity, including that of the midwife, as they interact with artifacts that the patient makes available. The patient can also view and edit agendas for their upcoming visits, including adding artifacts from various reflection activities as desired topics of discussion. The presence of a clean, understandable dashboard allows the patient and midwife to remain connected between visits and engage in continuous dialogue in a shared interface. From their dash, the patient can access both of the channels through which they can engage in self-reflection (their weekly journal and modules).

Multimedia Journal. The first channel through which the patient can self-reflect allows them to build a weekly self-portrait through digital collaging, annotation, and drawing (See Figure 4.3.3). In this space, they can make as many entries for a given week as they

choose, and the form is entirely open-ended. Tools are provided that allow the patient to access their camera roll and create photographic stickers, draw with varying brushes, annotate with text captions or speech bubbles, or insert icons and other existing imagery. The outcome of this activity will inevitably vary greatly as the patient experiences all the highs and lows of pregnancy, but will capture those moments in time, allowing the patient to one day return to them for viewing and reflect on such a meaningful journey. The journal offers an opportunity for the patient to focus on their image of self and articulate emotional or physical subtleties without the expectations associated with more detailed prompts.

Topical Modules. The second channel for self-reflection is a collection of modules through which the patient engages in more guided activities related to particular topics of interest. While self-reflection is of immense value to the patient as they grow throughout their journey, the topical modules allow the midwife to receive information from the patient that supports effective caregiving in an unobtrusive way. All the reflection modules can be accessed through the patient's dashboard (See Figure 4.3.4), and are categorized by topic (e.g. home life, emotions, or routines). The patient can move through the modules at their own pace and in any order they choose, giving them the power to designate which topics they feel most comfortable discussing at a given time. Topics that the patient intentionally avoids as the pregnancy progresses might prove illuminating to the midwife as well. The midwife, while only viewing content that the patient shares with them, can control which modules become available for access and when, helping to structure the patient's experience in a way best suited for their unique needs. The patient can also store activities across modules as favorites; this allows them to curate their own self-reflection regimen upon identifying certain activities within modules they find rewarding or enjoyable.

Storyboarding. Imagine that the patient has had their initial visit with their new midwife. This experience is all new to them, and they're only just beginning to get to know one another and build trust. Therefore, it may be easier to begin conversations around less sensitive topics, like routines or life at home. So, in their first self-reflection session, the patient chooses to start with the "Home Life" module (See Figure 4.3.5). They are presented with a collection of activities, and choose to complete the storyboarding activity. While the content of each activity's prompt will change across the topical modules, the structure of the activity itself remains the same. Exploration A demonstrates one possible version of the storyboarding activity schema with content for the Home Life module. The prompt reads:

> *"Tell a tale of your life at home during pregnancy, real or imagined. Consider each scene as an event, and think about how you might think, feel, and behave in that moment."*

Alongside the written prompt, the patient is given an estimated completion time and enters the activity when they're ready. In this scenario, the patient chooses to tell the story of the day she discovered she was pregnant. Using digital drawing and speech bubbles to denote thoughts and feelings, the patient creates a low-fidelity screenplay of that special event in which she recalls where she was, what took place, and what the outcome was. After creating as many scenes as needed, the patient gives their story a name and description and sets sharing settings.

Documentation. It is now Week 24 of the patient's pregnancy, and they have since completed both the "Home Life" and "Routines" modules. They are now nearing the end of their second trimester and have gained comfort and trust with their midwife in the past few months. Imagine now that they begin to work on more personal content modules like "Relationships" or "Emotions" (See Figure 4.3.6). Exploration B demonstrates how a documentation activity would play out within the relationships module. As opposed to some of the other schemas, the documentation activity is all about capturing moments in real time. The prompt reads:

> *"This activity is all about capturing the moment: Over the course of your pregnancy, take snapshots of good times between you and your partner that you'll want to remember later. Attach narration to the photos so you don't lose the memories."*

The patient is prompted to begin by uploading or taking a photo and adds two photos from earlier that day that capture a joyous moment in her pregnancy journey. They are prompted to name the moment, give it a description, and attach a narrative audio recording of the event. Imagine that the patient had just felt the baby kick for the first time that day. They might record something like:

> *"Today, I felt the baby kick for the first time while Ed and I were watching our show. He got so excited he decided to make us something special for dinner, which was just spaghetti, but we had such a good night hanging out in the kitchen with Rocket having fun."*

Over time, all the moments that the patient documents are displayed together as a stream of photos that can be explored chronologically to empower joyful remembrance.

Collection. While similar formally to the documentation exercise, the collection activity shifts focus from capturing moments as they happen to capturing meaning through intentional curation. Collection asks the participant to observe objects and events in their lives that have shaped their experiences thus far (i.e. historically) and reflect on how they connect to their present and future selves (See Figure 4.3.7). Upon beginning the exercise, the patient is prompted with:

> *"Collect and document objects that are meaningful to you and your relationships. Find things in your home that have history and will continue to hold value to you throughout your pregnancy journey and beyond."*

In Exploration C, the patient names their collection "Family Heirlooms" and uses the activity as an opportunity to collect items that are special to their family that they might one day want their child to have or know. Using photographs to capture images of each item helps contextualize it and make it tangible for other viewers. The patient takes a photo of a stuffed bear with which she can embed a narrative through spoken word:

> *"Buddy is the name of this bear. I got him from my grandpa when I was little and I always imagined that if I ever had kids I would want to pass him on..."*

As the collection grows, the objects are stored for viewing as a body of rich narratives that give insight into the patient's values and lived experiences. Both the documentation and collection activities support the goals of the second trimester as they prompt the patient to focus their attention on themselves, being mindful of their emotional state and reflecting on who they are. This support is intended to help the patients grow in confidence as they become more connected to their bodies, their emotions, and their partner.

Expression. At 36 weeks, the patient's due date is right around the corner and lots of anxieties and last-minute preparations come bubbling to the surface. In anticipation of those concerns, the activities in the third trimester place an emphasis on the identification and release of stresses. By then, the patient has likely become comfortable in their use of the reflection activities and has identified which ones they enjoy and continually come back to. Exploration D demonstrates how an expression activity might play out within the "Emotions" module (See Figure 4.3.8) with the prompt:

> *"Using abstract shapes and colors, create a picture of how you feel today. Express your pain, frustrations, and joys in a quick, no-sweat activity."*

This activity is meant to enable the patient to make their thoughts and feelings known to themselves and to their midwife through abstract image-making. It relies entirely

on basic formal elements of color, texture, and shapes, which is a sharp contrast to the approach of the other activities which center heavily around photographs to convey meaning. This exploration is also the quickest among the activities and is designed to assist the participant in free, loose creation. It takes on many of the same attributes as the "stream of consciousness" narrative strategy. The tools the participant is provided with are limited and leverage the affordances of the digital interface to increase variety and expressiveness through color and texture. Every choice the participant makes in constructing their image could be either intentional or impulsive, but both approaches carry significant data about the patient's emotional state at the time of creation. Therefore, the use of the expression activity is twofold; a careful pronouncement of oneself and a space to release tension through making. Both of these uses are valid, and could offer an unusual form of self-reflection that is less deterministic and more spontaneous.

Interpretation. The final schema I explored for a self-reflection activity was interpretation, in which the patient revisits imagery that was viewed during a visit and addresses it anew. While viewing images with their midwife, the patient was asked to speak freely about associations they make with the image, but now, with more time to reflect, the patient is asked to transform that response into concrete representations of those interpretations. The prompt reads:

> *"View images you discussed in your last visit and reflect on your interpretations of them. Capture your own version of the image and the emotions it evokes."*

While viewing the original image, the patient can listen to that visit's recording to orient themselves (See Figure 4.3.9) and then capture their own image to juxtapose it. The participant can then supplement their photo with a recorded narration of its meaning and tag the image with the emotions it evokes. This activity offers the patient an opportunity to refine their initial response to the image prompt through continued self-discovery and gives them agency to elaborate with examples from their own life, making their perceptions even clearer to the midwife.

Observations

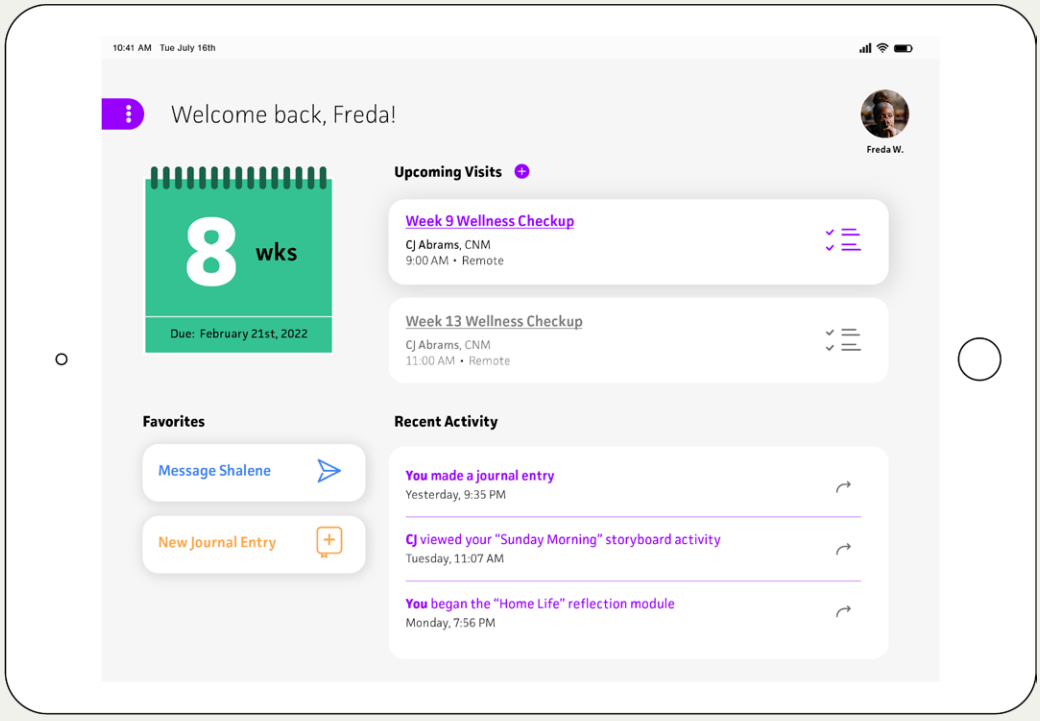
The system I designed in Study 3 suggests a relationship between the synchronous mediation aids from Study 2 and asynchronous self-reflection prompts, creating a picture of how they might build off of and respond to each other over the course of a pregnancy into a cohesive experience. Additionally, the manner in which the visual material created in these studies is collected and archived has implications for the longevity of this system. It suggests usefulness beyond the care relationship and into

parenthood, as the visual material is then transformed into a tool for joyful remembrance. All of the visual materials could be packaged and stored as a time capsule, shared with friends and family, or revisited during a second pregnancy, becoming experiential artifacts that are rich with meaning. Although the patient is creating images as a storytelling device, it's the combination of varying forms, both visual and textual, that make the work valuable as a collection. The visual data heightens the usefulness of the textual data, and vice versa, creating a dense body of information for the midwife and a powerful representation of the patient's experience. If the system relied heavily on one type of imagery, some information would inevitably be lost, suggesting an important form-to-content relationship.

The schemas for interaction I developed in this study create a visible structure and lend a logic to the system that allows the participants to track change over time. The schemas are a constant while the content is dynamic, lending a sense of consistency to the user experience and supporting new user learnability. This also might offer a sense of stability and familiarity for the patient after some initial hesitation regarding creative activities.

Figure 4.3.2

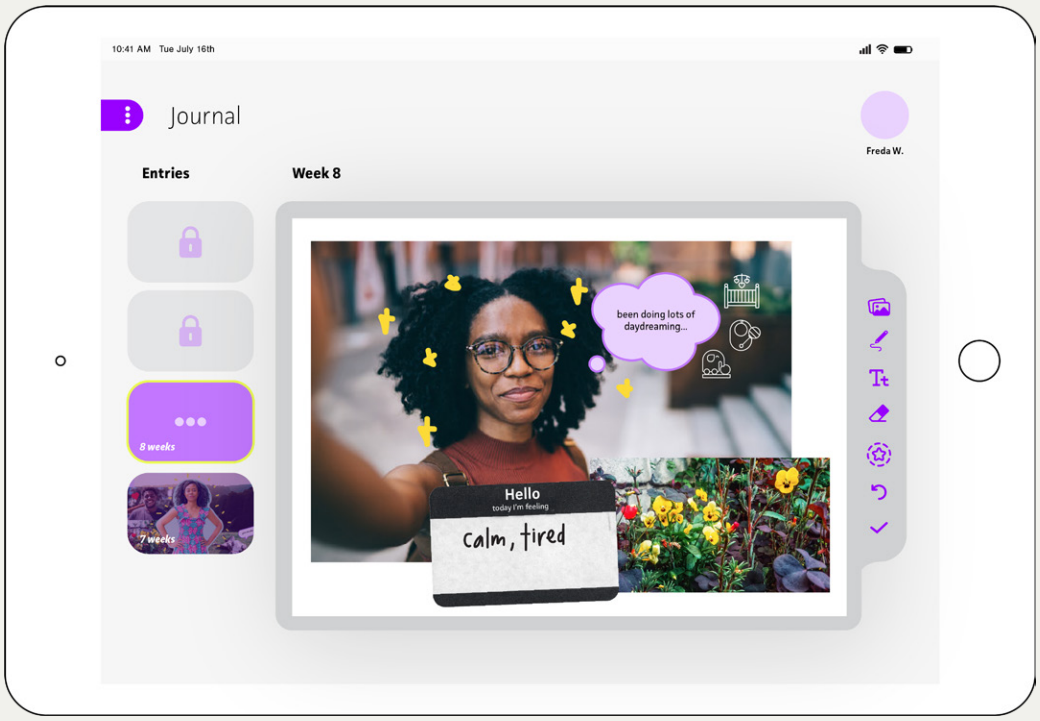
Patient Dashboard



The patient can access and manage all their reflection activities and remote visits with their midwife from the dashboard.

Figure 4.3.3

Multimedia Journal

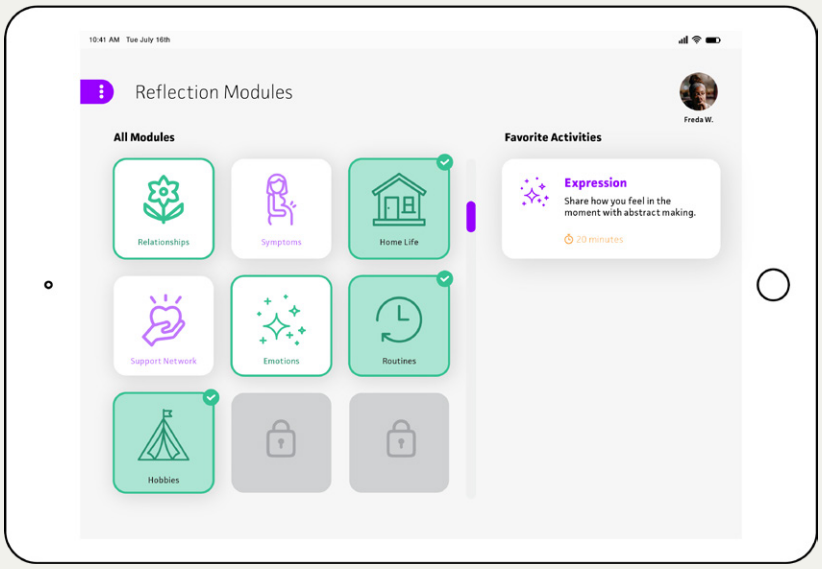


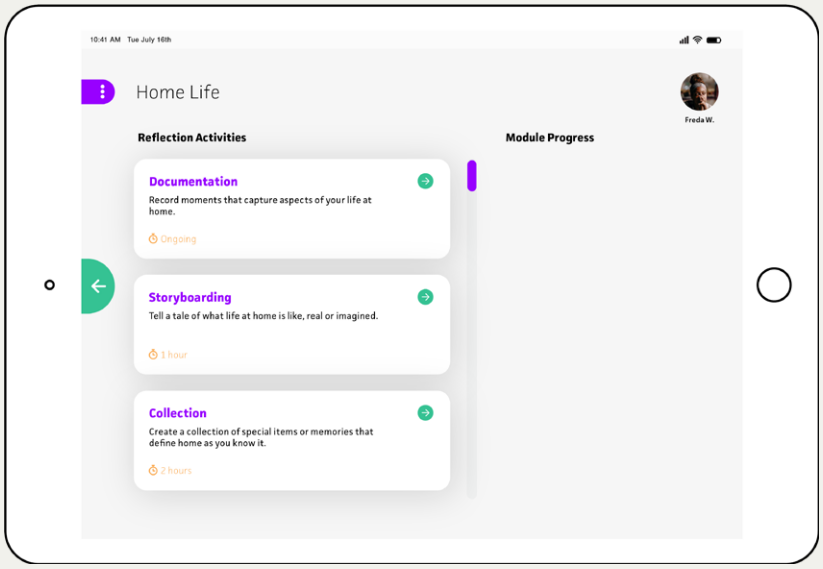
Over the course of their pregnancy, the patient creates a weekly multimedia self-portrait as a way to reflect on their present experiences and attitudes.

Figure 4.3.4

Topical Modules

A collection of guided self-reflection activities are structured as a series of topical modules in which the patient can navigate freely. The midwife can control which modules become available to the patient and when, in order to support the most appropriate care plan.

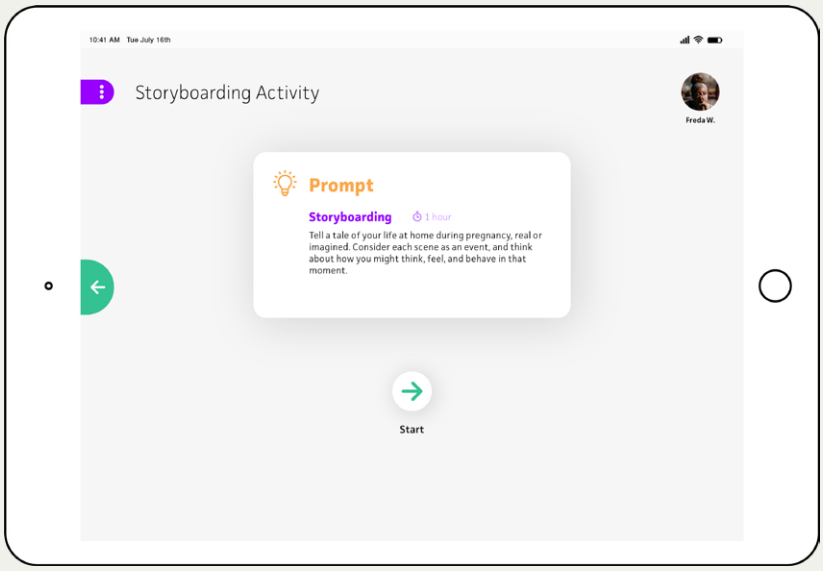




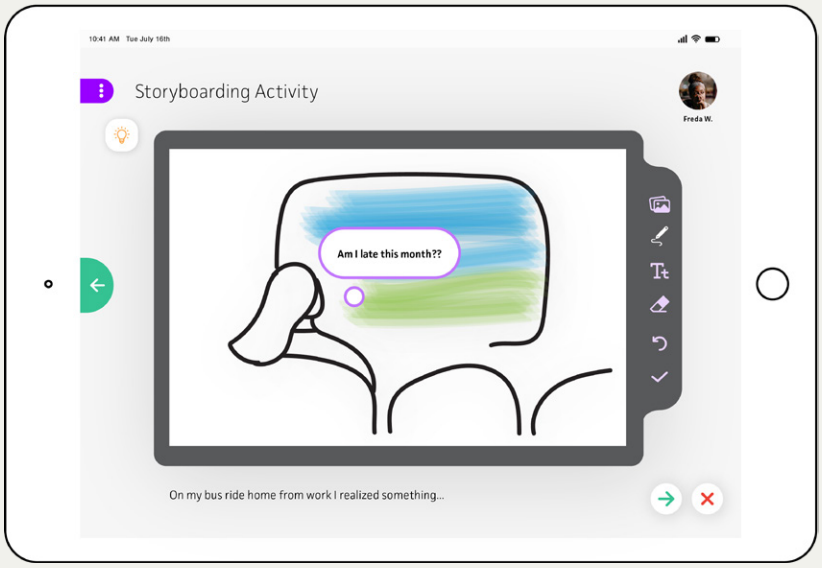
Upon beginning a given reflection module, the patient can choose between a variety of activities that address that topic. The schemas (documentation, collection, interpretation) remain constant across all the modules but content of the prompts change accordingly.

Figure 4.3.5

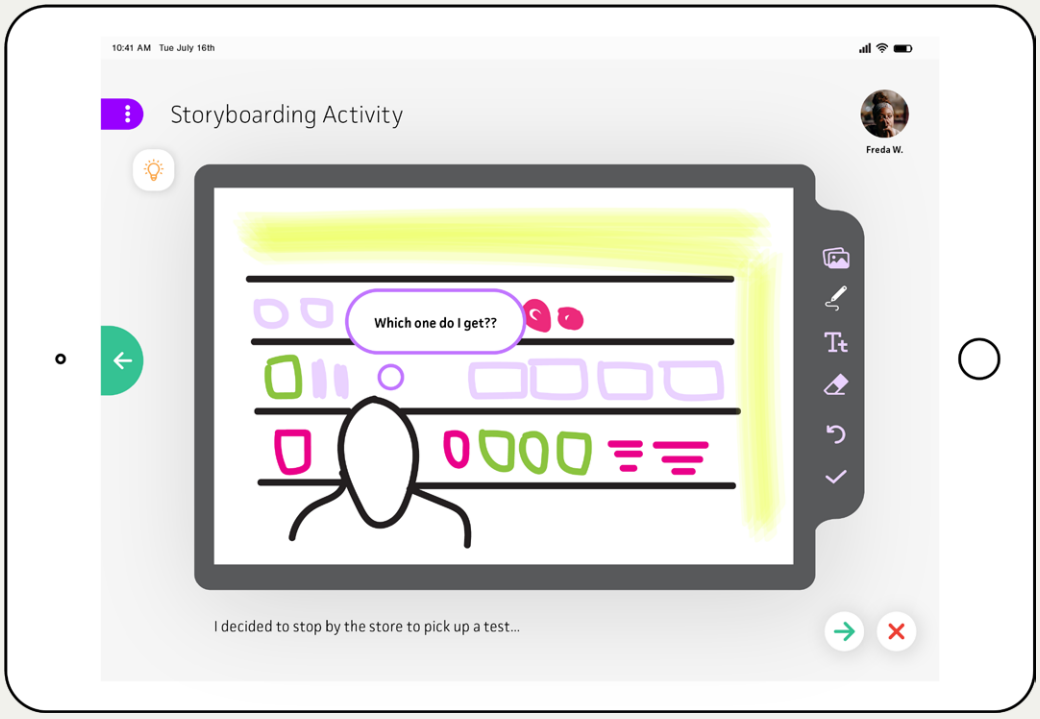
Exploration A: Storyboarding

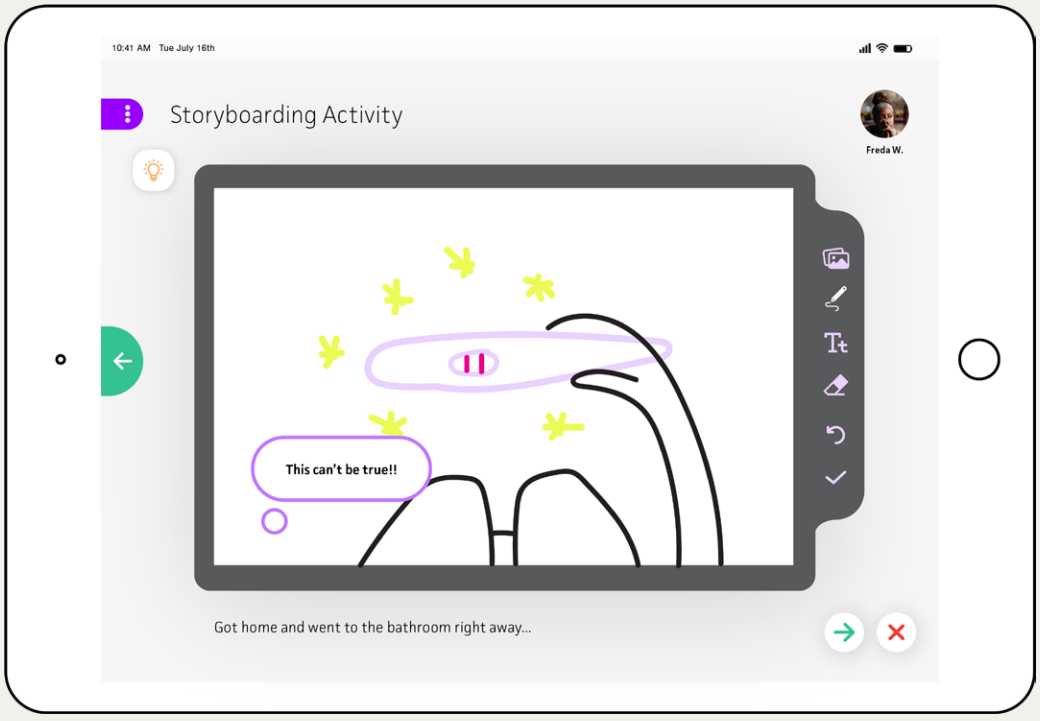


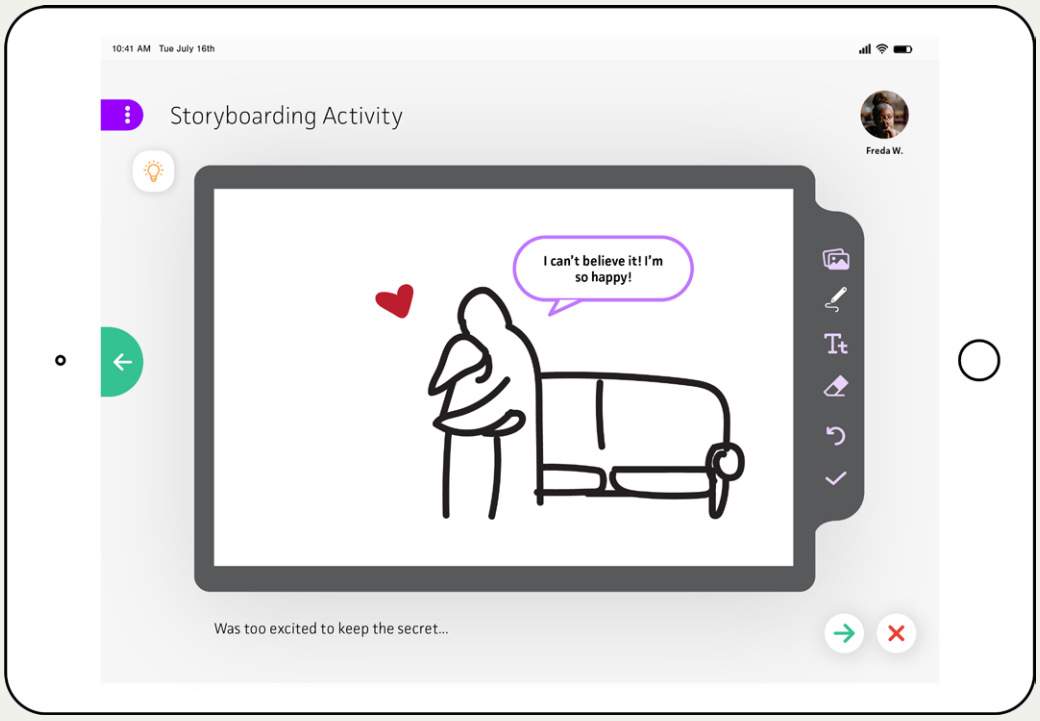
The activity prompt for the “Home Life” module asks the patient to tell a story of their lives at home and think about how they were thinking and feeling in that moment.



The patient recounts the day that she discovered she was pregnant and uses a combination of simple digital sketches and captioning to construct a storyboard of that event.


10:41 AM Tue July 16th
Storyboarding Activity
Freda W.
Which one do I get??
I decided to stop by the store to pick up a test...


10:41 AM Tue July 16th
Storyboarding Activity
Freda W.
This can't be true!!
Got home and went to the bathroom right away...



Upon completing any of the self-reflection exercises, the patient can add supplementary information like a title and description, as well as toggle sharing settings. The midwife can view any of the materials the patient shares with them, and the patient can even add a particular activity to their next visit's agenda for discussion.

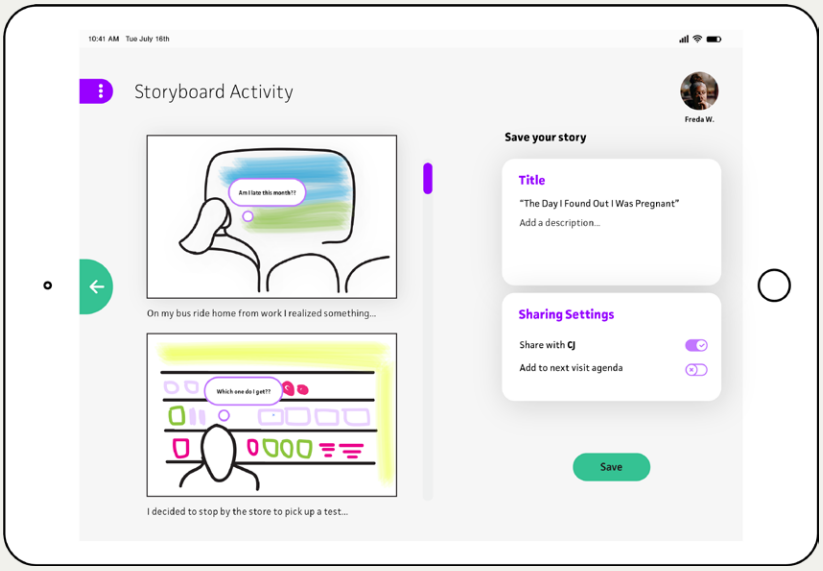
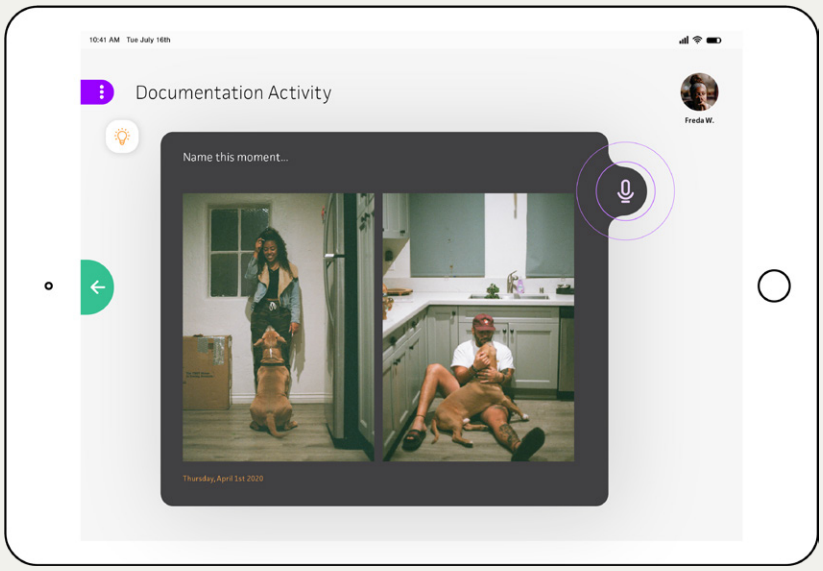
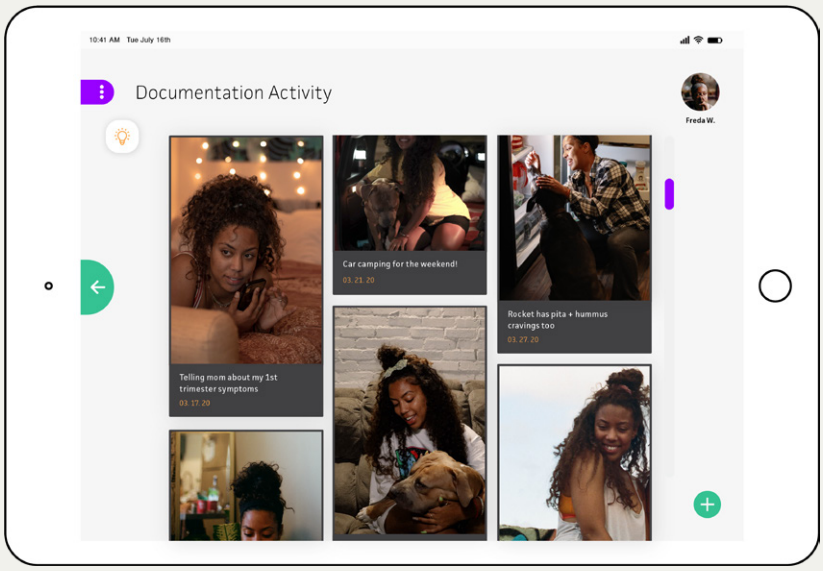


Figure 4.3.6

Exploration B: Documentation



At this moment in her pregnancy, the patient feels the baby kick for the first time and documents the joyous evening with her husband. She documents the moment with images and a voice recording.

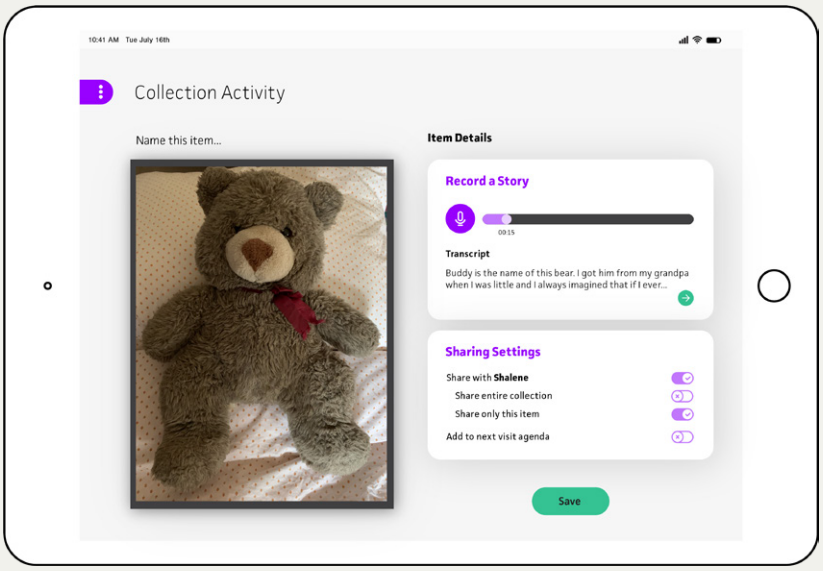


The documentation activity is ongoing and is a tool the patient can continually use to capture moments as they arise, yielding an archive of memories that could be revisited and reflected upon.

Figure 4.3.7

Exploration C: Collection

The patient chooses to respond to the prompt by collecting family heirlooms that they one day hope to share with their child. After capturing a photo of the object, they tell a story to embed with it.



As the collection builds, the patient and midwife can view all the items in turn and listen to the narratives attached to them.

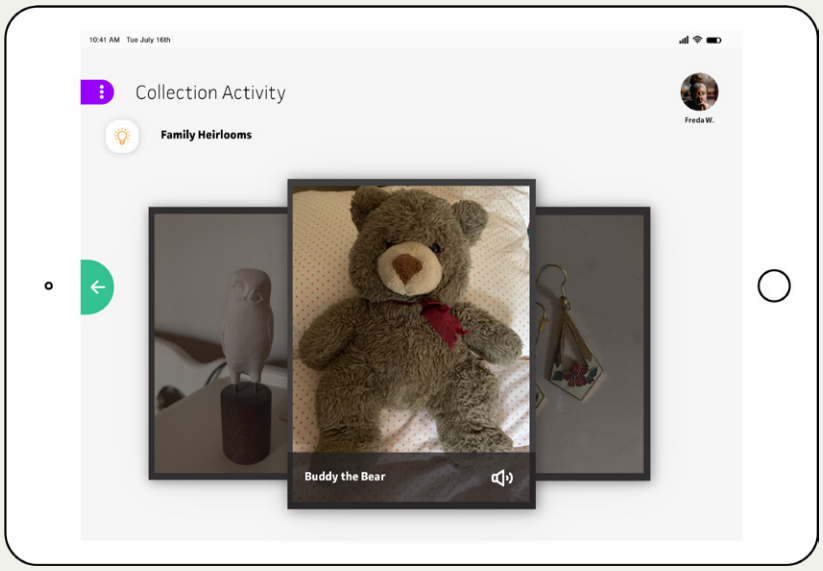
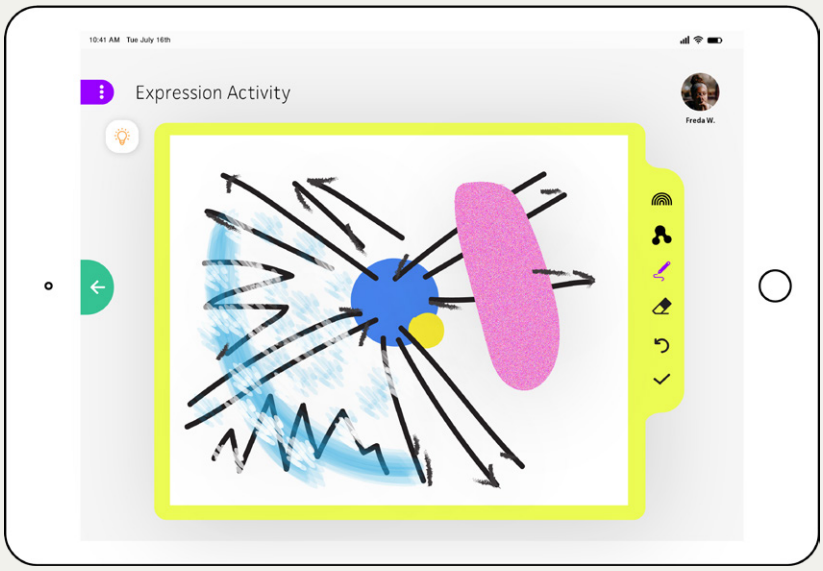


Figure 4.3.8

Exploration D:
Expression

Using simple tools for brush width, texture, shapes, and color, the patient creates an expressive, impromptu image that represents their emotions in that moment.



In lieu of providing an explanation of all their decision-making, the patient can tag their image with emotion tags and add a title. This removes any pressure to invest more time than needed into the exercise.

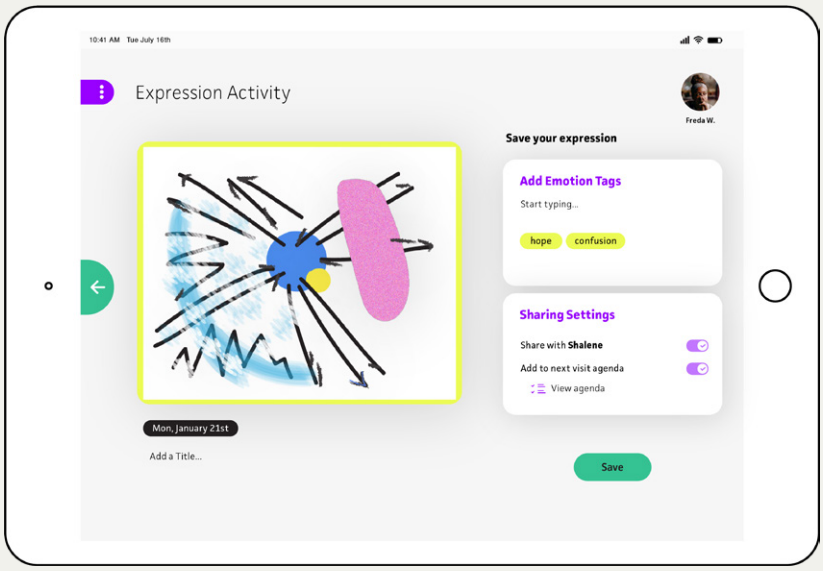
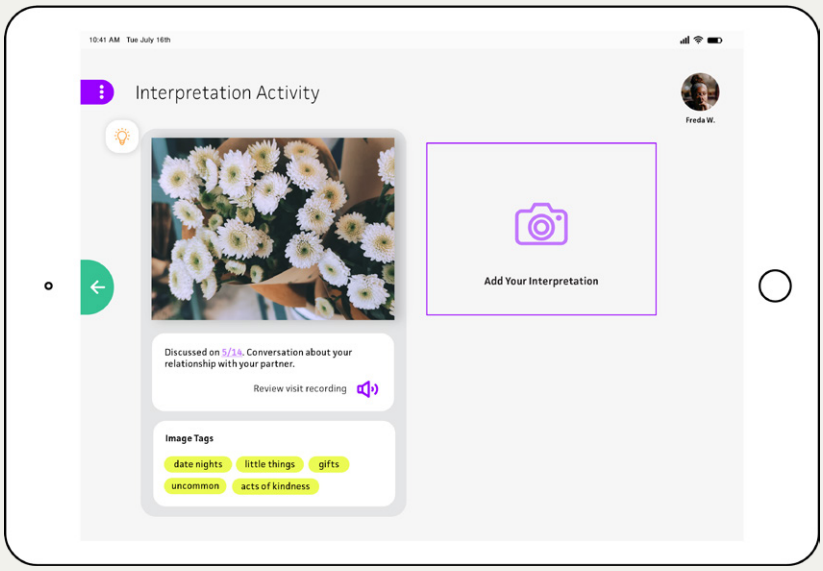


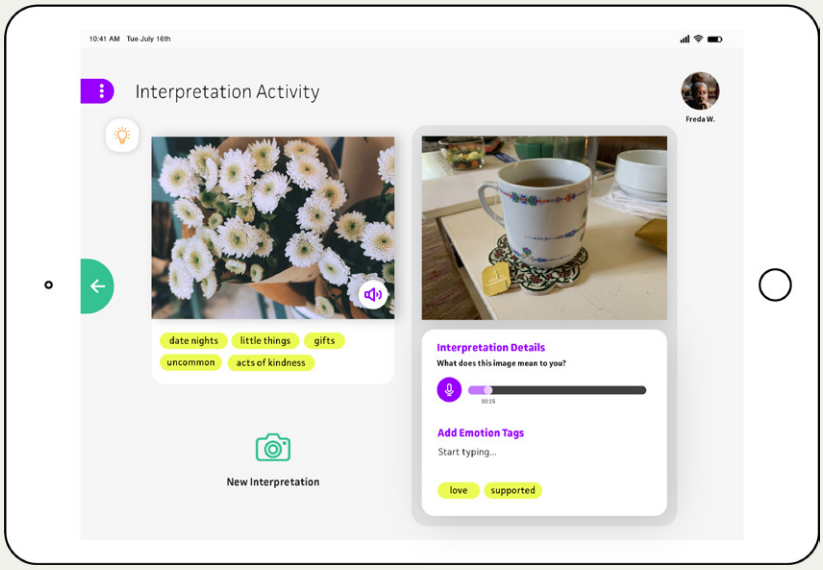
Figure 4.3.9

Exploration E: Interpretation

The patient can review the conversation they had previously associated with the image prompt, and then add a new interpretation by photographing it within their own life.



Remembering their conversation about how their partner makes acts of kindness, the patient chooses to document the cup of tea her husband made for her, and elaborates on that interpretation of the original photo's meaning through audio captioning.



CHAPTER 5

Discussion

5.1 Design Principles

Visual Disclosure

The formal qualities of visual aids affect the perceived privacy of the information embedded within them.

Images become communicative artifacts when they function as symbolic devices for the user, allowing them to embed information in the visual medium. Throughout this investigation, I explored how the use of images can alleviate the pressures of information disclosure for the patient as they build a relationship with their midwife and navigate pregnancy for the first time. The conversations between caregiver and patient may often involve highly sensitive or personal information, so it was important to consider privacy and trust-building. However, the formal qualities of some images appear to be more revealing of the participant's experiences than others, which may have implications for the perceived privacy of the information implicitly embedded within them.

Visual aids that are abstract in nature lend a heightened sense of control to the user, as their true meaning is difficult to ascertain without supplemental explanation. As a participant, they can exercise discretionary disclosure, making decisions about what is included in the image and what is left out. For example, when the patient constructs a cognitive map of their support network using emojis in Figure 4.1.5, this representation of their life is undoubtedly derivative. Their choice of emoji still carries information about their perceptions and emotional attachments, but this data is essentially inaccessible to the midwife without explanation. While all types of imagery are subject to the interpretation of their viewer, abstract forms are especially so, creating a sense of security for the participant.

On the other hand, as images approach more realistic impressions of the participant's life, the window for interpretation narrows, reducing their sense of privacy. The photographs used to capture memories between the patient and their partner in Figure 4.3.6 put all the subtleties of their reality on display, making it difficult to 'hide' behind abstract forms that muddle intention. These images demand a higher level of vulnerability on the part of the participant, in which they actively choose to sacrifice privacy for

a more accurate representation of self. If a participant is asked to disclose information they perceive to be private too soon, their relationship with the caregiver may suffer. Therefore, the relationship between the form of visual tools and information disclosure should be carefully considered when employing imagery as a dialogic mediator.

Visual Appropriateness

The form of imagery used to mediate dialogue should reflect the tone and content of the information shared.

Across all three studies in this investigation, I explored a wide range of image types to examine how they might be utilized as communicative devices between the patient and midwife. However, the choice of which type of imagery to use should not only consider its communicative potential but also its appropriateness with respect to the specific content being shared. Photographs, for example, are highly revealing (as discussed in "Visual Disclosure") and therefore emotional, personal, and evocative. This suggests that the formal qualities of photographs make them an appropriate choice for content that is very human. They are rich with information, but this may too come at the expense of maintaining the desired tone of the patient-midwife interaction. If the planned discussion for that care visit is around planning or logistics for the birth, photographs may be more derailing than useful as they may be too emotionally charged to cleanly distill important material from them. On the other hand, more abstract image types seem appropriate for these more clinical topics and have a focusing effect. When the patient is asked to portray their daily routine using an interactive pie chart in Figure 4.1.9, they are forced to look at their life in a very objective, unemotional way and the midwife can more easily seek out the information they need.

Collaborative Presence

In a shared digital space, a participant's use of visual tools is influenced by the perceived presence of their collaborator.

This investigation has considered the relationship between patient and midwife and the implicit power imbalances that exist between them. While collaboration in a digital space is a means to balance the scales, the studies' explorations reveal that any design intervention should still consider how its use is affected by interpersonal dynamics. When interacting with one another synchronously, both the patient and the midwife are actively managing their appearance and behaviors as they navigate a new relationship. Therefore, the design of visual aids used during care visits should not create conflict with the image of themselves they are trying to present, especially early on in the relationship.

Otherwise, the patient may feel put on the spot or even attacked. For example, when the patient is asked to construct their definition of motherhood using chain linkages in Figure 4.1.4, they may choose specific words or arrangements to idealize their response while the midwife is present. If this tool were to be used for asynchronous reflection, the patient's response might look quite different, and even include non-generic words or phrases. If the participant's every move is witnessed in real-time by their collaborator, they may feel judgment, pressure, or a sense of urgency. Therefore, the tools should allow the patient to maintain control over their image while in the presence of the midwife and relinquish that control over time as they gain confidence and build trust.

Creative Acts

The design of visual aids should consider the barriers to entry of perceived creative activities.

One of the ongoing considerations of this investigation has been the quantity and quality of labor the patient undertakes when participating in content generation using visual tools. The nature of imagery and image-making is that it is often perceived as a creative or artistic activity, making it feel unattainable for many people who don't consider themselves to be either. Therefore, many of the tools I designed that rely on drawing or collaging (See Figures 4.3.3 or 4.3.5) may feel highly intimidating to many participants. Even if a low-fidelity image is acceptable and encouraged for their communicative purposes, the design should consider ways to mitigate self-deprecating behavior, embarrassment, or low engagement resulting from the quality of the imagery. That being said, visual aids that require low levels of creative decision-making (See Figure 4.2.4) on the part of the patient may increase their engagement and allow them to focus on the content rather than the form. As the pregnancy progresses, the system could rely on confidence-based motivation, increasing the level of engagement as the participant gains familiarity with the tools themselves and with their midwife. It should also provide a multimodal approach, offering multiple ways across levels of engagement for the patient to express the same content, allowing them to decide which level of creativity they feel comfortable with.

5.2 Future Work

Testing and Validation

The design principles derived from this investigation are purely based on informed inferences and observations of the work. To prove their validity, user testing and more in-depth exploration of each topic is needed. Both patient and midwife involvement is crucial to accurately testing the designs and gaining further understanding of their potential use in situ. The work remains speculative until design choices can be directly informed by user insights.

Systemic Integration

The explorations in this investigation are situated as supplementary tools to current care models and did not address how they might fit in with existing digital caregiving platforms. An extensive study on the use of telemedicine tools within the problem space would be needed to do so, which was beyond the scope of this project. To achieve systemic change, visual aids and prompts should be integrated into existing healthcare platforms and build off of the resources and expertise of the healthcare community. Further work is needed to implement and integrate the design concepts from this investigation into that space.

Diverse Experiences

While this investigation focuses on the experiences of a single user persona, it is important to remember that diverse groups of people are affected by rising maternal mortality rates in different ways. This project could not capture such a diverse range of experiences, even within the rural community alone, and further exploration is needed to represent the needs of other populations. While black people are the most at-risk of maternal mortality, the experiences of other people of color should be made visible and addressed through design interventions. Pregnancy is a highly personal, emotional journey that simply cannot be generalized when creating solutions. The intersection of race, geography, socioeconomic status, marital status, age, and more should be carefully considered and explored in turn to create a robust picture of the problem space.

Outcomes Metrics

In order to definitively demonstrate how the designs explored in this investigation yield the intended outcomes like improved patient-midwife communication, impact metrics should be implemented. The decisions I made while designing were informed by research but the relationship between those interventions and their intended outcomes cannot be solidified without additional testing.

User-generated content

All of the visual explorations of this study relied on the imagined participation of their users, often in the form of visual content generation. To effectively communicate the ideas, I played the role of both designer and participant, creating mock user content and accompanying narratives. While the purpose of this investigation was centered around idea generation and formal approaches, the content I created was merely representative of what could be. However, true testing of the designs put forth in this document would require a highly participatory and engaging approach in which the form of the content is ultimately decided by the users themselves. Naturally, this sort of study would yield dramatically different results than I could have imagined or portrayed here, and certainly have implications for the design principles I derived.

5.2. Conclusion

The maternal health crisis in rural America is deeply rooted in systemic problems that are economically, politically, and racially motivated. Naturally, it has no one solution, although its urgency is profoundly felt by those affected by it. An experience that should be one marked by the joy of a new life, all too often becomes one of loss and hardship, especially for people of color. Maternal health advocates recognize that while many facets of this crisis seem immovable, change can be initiated at even the smallest human scale. Each patient should be recognized as the foremost expert of their experiences and be empowered to lead conversations with their caregivers. This investigation questions how to best support the relationship between a patient and their midwife through this unfamiliar, emotional journey and explores issues of trust, privacy, and empowerment. The use of imagery as a tool to mediate difficult discussions can help patients tell their own story, giving them the power to communicate authentically and purposefully while growing closer to their own experiences. The information embedded in the images they create and use contains meaningful data about social health determinants that are invaluable to their midwife as they provide effective prenatal care. By illuminating health factors that may have otherwise gone unnoticed, midwives are not only better prepared to manage their patient's physical health but their socio-emotional health as well. Facilitating improved communication between the patient and midwife helps them reach a shared understanding of the patient's unique needs and gives them confidence in their decision-making. By collaborating with visual tools, they support the patient's ideal health outcomes and foster a joyful pregnancy experience.

CHAPTER 6

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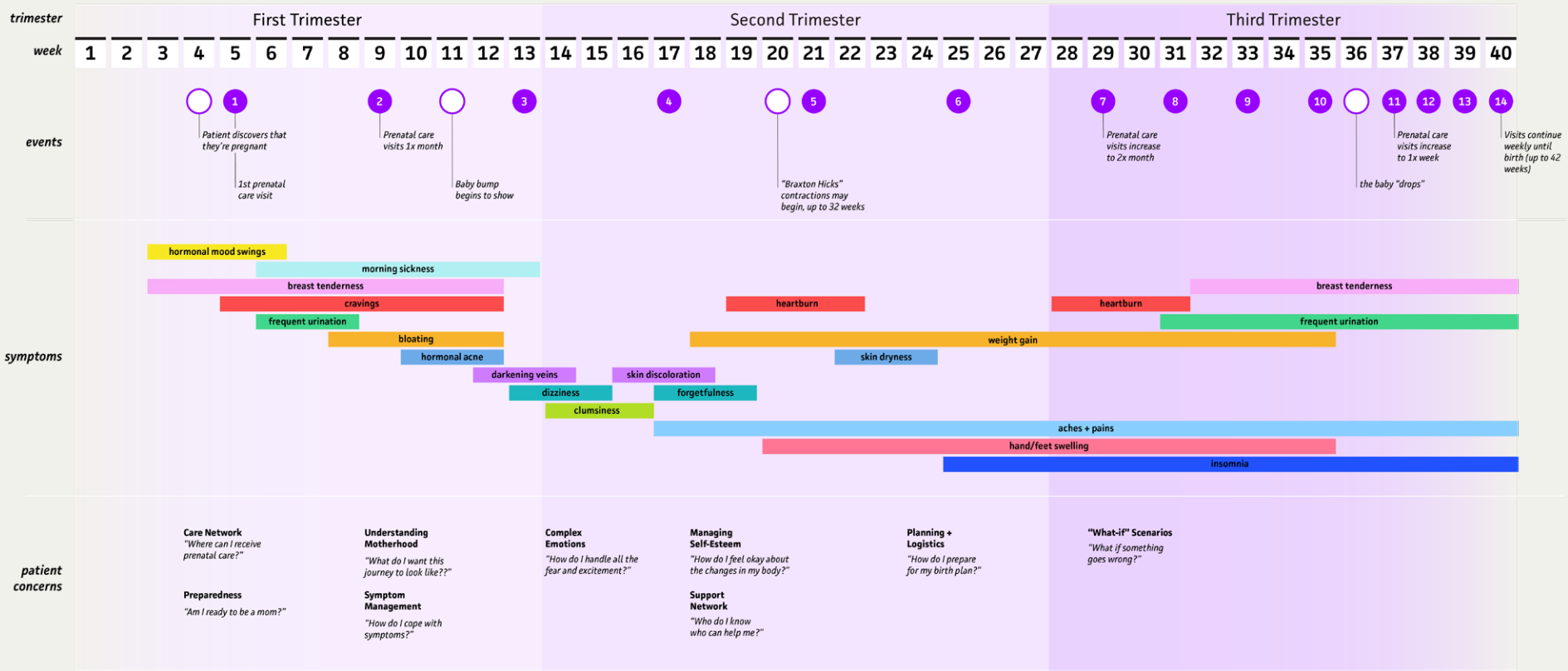
Figure 7.1 *A journey through pregnancy*

The Pregnancy Journey Map



*Typical of a patient with a low-risk pregnancy.

Figure 7.2

Freda meets CJ for the first time

1st Prenatal Care Visit

Casey-Jo visits Freda in her home for her first visit. Her goal is to build trust with her and start to create a picture of Freda's life to best move forward in their care plan.

time	6:00 pm	6:15 pm	6:30 pm	6:45 pm	7:00 pm
activity	**Freda (Patient)** Freda arrives home from work shortly before 6 and gets ready for Casey-Jo to arrive. **Casey-Jo (Midwife)** CJ pulls up to Freda's house and gets her materials together. She sees the house is small but well-managed and is looking forward to getting to know Freda.	**Freda (Patient)** Freda welcomes CJ inside and the two sit down in the living room. Freda offers her a glass of water, and begins to tell her some basic information about herself; how old she is, how they hadn't planned on getting pregnant, and about her husband, Ed. **Casey-Jo (Midwife)** CJ is struck by how easy Freda is to talk to, but can tell she's a little guarded, so she begins the conversation with some basic questions about her living situation and how she became pregnant.	**Freda (Patient)** Freda agrees to try out using one of the visual aids during their conversation, and finds it not too intimidating as it's pretty easy for her to discuss her daily routine. **Casey-Jo (Midwife)** Seeing that Freda is receptive to the idea, CJ suggests that they try out a short visual activity together that will help her understand her daily life and identify potential complications.	**Freda (Patient)** While talking with CJ, Freda uses the iPad to visualize her day-to-day. **Casey-Jo (Midwife)** As Freda uses the visual aid, CJ listens intently and asks questions as they go to get more meaningful information.	**Freda (Patient)** At the end of their activity, Freda is excited by the visual in front of her, and reflects on what it suggests about her life. **Casey-Jo (Midwife)** CJ explains to Freda how they'll stay connected remotely and between visits using visual aids. She stresses that her biggest priority is providing care that's best for Freda and wants to make sure she feels heard.
feelings	**Freda (Patient)** nervous, excited, a little frazzled from work that day, doesn't know what to expect **Casey-Jo (Midwife)** cautiously optimistic, excited, open-minded	**Freda (Patient)** vulnerable, cautiously trusting, interested to see where the conversation will take them **Casey-Jo (Midwife)** patient, open-minded	**Freda (Patient)** surprised at how different the interaction feels from a typical doctor's visit, feels like she can take her time explaining things **Casey-Jo (Midwife)** interested, happy with how things are going	**Freda (Patient)** feels heard and comfortable, although unfamiliar with this type of activity **Casey-Jo (Midwife)** receptive	**Freda (Patient)** understood and optimstic **Casey-Jo (Midwife)** satisfied and optimistic

Figure 7.3
Visual aids in use

8th Prenatal Care Visit

Casey-Jo connects with Freda online to talk about how she's feeling as they grow closer to her due date.

time	7:00 pm	7:15 pm	7:30 pm	7:45 pm	8:00 pm
activity	**Freda (Patient)** Freda has just entered her third trimester and logs on to her portal to speak with CJ. **Casey-Jo (Midwife)** CJ logs on to her and Freda's online meeting space, and begins a video call with her.	**Freda (Patient)** Freda tells CJ she's nervous about all the things that could go wrong, and shares a visual reflection she had created after their last visit. **Casey-Jo (Midwife)** CJ listens as Freda uses the visuals to tell the story of her fears.	**Freda (Patient)** After sharing, Freda asks CJ about how to manage these anxieties. **Casey-Jo (Midwife)** CJ uses a visual aid to help the two of them reach a shared understanding of the actual risks.	**Freda (Patient)** As Freda is prompted to respond with visuals, she's able to articulate just how she's feeling. **Casey-Jo (Midwife)** As they talk, CJ is able to create a log of Freda's concerns and makes adjustments to her post-visit recommendations.	**Freda (Patient)** After sharing her concerns, Freda understands how to move forward without fear and reflects on their conversation privately after CJ logs off. **Casey-Jo (Midwife)** CJ assigns Freda one new task for the week in hopes it helps her find some joy in the journey, and logs off until their next visit.
feelings	**Freda (Patient)** nervous to tell CJ about some of the things she's worried about as her due date grows closer **Casey-Jo (Midwife)**	**Freda (Patient)** vulnerable yet prepared, ready to be heard **Casey-Jo (Midwife)** attentive and patient	**Freda (Patient)** open-minded, engaged, vulnerable **Casey-Jo (Midwife)** attentive and engaged	**Freda (Patient)** confident in the way she feels and her nerves melt away as CJ is receptive to her responses **Casey-Jo (Midwife)** open and attentive	**Freda (Patient)** feels closer than ever with CJ, glad she can trust her to give good advice **Casey-Jo (Midwife)** pleased with Freda's progress