



Unsettling Care Infrastructures: From the Individual to the Structural in a Digital Maternal and Child Health Intervention

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ABSTRACT

Information services for maternal and child health are increasingly being implemented at scale and integrated into public health infrastructures in Global South countries. These services often disseminate tailored health information and provide channels for families to ask questions to health workers. With increasing uptake, these services are intervening into a highly gendered space and shaping care work and information-seeking in new ways. We present a study of a patient education program and associated WhatsApp-based information service deployed across multiple states in India, drawing on observations, interviews, and analysis of chat records. Building on notions of “unsettling care” [63], we examine what it means to deploy such an intervention in inequitable, fragmented health systems. We find that even as the intervention focuses on *individual* behavior change, it also runs up against *structural* issues, such as the overburden of health workers, an illegible health system, and gendered power dynamics that extend beyond the realm of the home. We use our findings to unsettle notions of how the intervention provides care, and to reframe how we might think about the design and implementation of health information services to also engage with structural issues.

CCS CONCEPTS

• **Human-centered computing** → **Human computer interaction (HCI)**; **Empirical studies in HCI**.

KEYWORDS

care, future of work, maternal and child health, chat, India

ACM Reference Format:

Naveena Karusala, Victoria G, Shirley Yan, and Richard Anderson. 2023. Unsettling Care Infrastructures: From the Individual to the Structural in a Digital Maternal and Child Health Intervention. In *Proceedings of the 2023 CHI Conference on Human Factors in Computing Systems (CHI '23)*,



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CHI '23, April 23–28, 2023, Hamburg, Germany
© 2023 Copyright held by the owner/author(s).
ACM ISBN 978-1-4503-9421-5/23/04.
<https://doi.org/10.1145/3544548.3581553>

April 23–28, 2023, Hamburg, Germany. ACM, New York, NY, USA, 16 pages.
<https://doi.org/10.1145/3544548.3581553>

1 INTRODUCTION

Maternal and child mortality rates are highest among communities marginalized along class, caste, race and other dimensions across the world [68, 70, 89]. There are a number of entangled structural and individual factors that shape mortality rates, including poverty, remoteness from health facilities, a dearth of quality and culturally-sensitive health services, and prevalence of caregiving practices that contribute to complications [69]. Health sectors globally have invested in efforts towards information dissemination for behavior change—that is, counseling women and families to take up caregiving practices and seek health services that contribute to maternal and child health (MCH) and avoid complications [17]. Research in the fields of Human-Computer Interaction (HCI) and HCI for Development (HCI4D) has looked at mobile phone technology as a way to share tailored information directly to women and families, often alongside human infrastructures such as community health workers or patient education in clinics. A number of studies have examined the feasibility and usability of information dissemination through interactive voice response systems [15, 61], SMS [76, 77], video [45, 47], and more recently, personal chat apps [114, 115]. With increasing uptake of mobile phones, such information services have been one of few types of digital health interventions to scale [59]. For example, MomConnect [7], a text-based helpdesk in South Africa, mMitra [64], a voice-based information dissemination system in India, and Aponjon [1], a voice- and SMS-based service in Bangladesh, have scaled across regions within each country. In this paper, we study one such service for MCH that has been implemented across eight states in India by Noora Health, an established health non-governmental organization (NGO). The service has two components—a hospital-based patient education program and a WhatsApp-based health information service, through which families receive multimedia content about MCH and can ask questions to health workers.

Interventions like the WhatsApp service intervene into a highly gendered space, newly shaping paid and unpaid care work as they hire trained health workers, work to strengthen flawed public health systems, and create new opportunities for health information-seeking. However, most prior work on similar interventions focuses on behavior change goals by looking at reach and uptake of information,

health outcomes, and lessons learned for scale (e.g., [59, 94, 98]), with little in-depth work characterizing the larger significance of these interventions in terms of gender and care labor, despite how many people they engage. While HCI has long studied platforms that connect care recipients and care workers, such as “Ask the Doctor” services [53], chat-based support groups [39, 112, 114], telehealth platforms [10], and helplines [73, 75], a growing body of work has shown it is essential to consider the political economy of such interventions from a feminist perspective to fully understand their impact [27, 32, 38, 48, 49, 100]. This entails asking questions such as what incentives sustain systems, whom they ultimately serve, and how they engage with the politics of care, labor, and gender. By shifting to this line of inquiry, we contribute to a growing body of work centering care, gender, and the non-economic in futures of work.

In our study, we ask how a scaled MCH intervention is made meaning of by its different stakeholders within the material realities of healthcare and paid and unpaid care work in India. We draw on interviews with NGO staff, the medical support executives (MSEs) who respond to questions on the WhatsApp service, and parents who use the WhatsApp service. We also draw on observations of MSEs’ work and a hospital-based patient education session, as well as analysis of chat records. To present our findings, we take inspiration from feminist scholar Michelle Murphy’s provocation to “unsettle care” in technoscience [63], or in other words, to go beyond the positive valence of care to situate interventions in the always already uneven distribution of care across social groups. Despite the guarantee of public health services in India, converging forces of capitalism, colonialism, neoliberalism, and patriarchy have contributed to barriers to accessing relevant and timely health information, poor experiences at hospitals, and an overburdened and undervalued health workforce, with many of these factors reinforcing each other and impacting women the most [8, 83, 96]. The idea of unsettling care allows us to go beyond considering the “success” and “failure” of the intervention to outline how it configures relations within an already unjust health system that does not provide care equitably. Using this as a starting point, we describe how the intervention, despite its focus on individual behavior change, becomes entangled with structural issues across different sites. In its implementation, we find that sustaining the intervention requires addressing concerns such as the undervaluation of health workers and low trust in existing health services. In its uptake, we find that the WhatsApp service is used not just to implement behavior change, but to also make up for gaps in the health system’s provision of care for women and families.

The insights we offer into futures of care work and healthcare interventions are two-fold. First, we deepen understanding of how a scaled information service is sustained and appropriated in unexpected ways in service of paid and unpaid caregivers marginalized by the health system. Second, in efforts to unsettle care by going beyond neat and confined goals of health interventions, we reflect on how to approach the design of information services in light of the broader and more structural issues around labor, illegible health services, and women’s health that scaled interventions will likely encounter.

2 RELATED WORK

We situate our study in prior work on maternal and child health, healthcare infrastructures, and the politics of care.

2.1 Maternal and Child Health and Mobile Interventions

Interpretive work in HCI and beyond has sought to understand lived experiences of pregnant women, new mothers, and their families with MCH. Studies in South Asian contexts have shown how religious and cultural beliefs, the influence of elders like mothers-in-law, and lack of involvement of husbands can contribute to harmful practices, such as restricted diets for mothers [5, 44, 47, 65]. Prior work has also emphasized women’s own agency in caring for themselves [5, 36], and how they might be supported in their efforts to form habits and make sense of information [5]. In contrast, other studies highlight more infrastructural issues that make information and care-seeking difficult. Studies across multiple Global South countries show that women must interface with fragmented public and private institutions, creating disconnects in patient history and care advice [4, 14]. Patients and families may also have little time with providers to make sense of complicated language or discharge information [14, 55]. It can also be challenging to discuss intimate health issues, ask questions, or balance childcare with the navigation of care facilities [14, 110].

Technological interventions in MCH have largely focused on disseminating information to women and families beyond clinical settings, so as to cover the last mile, and to create information channels that offer alternatives to harmful health practices. Prior work in HCI has looked at tailoring content based on culture, familial power dynamics, and privacy [9, 45, 47, 76, 77]. However, there have been calls to go beyond information dissemination to look at the complex process of learning, evaluating information, practicing behaviors, and connecting partial perspectives of care providers and recipients [4, 5, 30, 46]. Reinforcing this need, research on Kilkari (a voice-based messaging service in India), for example, has found that exposure to information has been lower for the most marginalized users [59], and that families attend more to information they already agree with [92]. Studies have also offered design recommendations and built systems in some cases for supporting the contingencies of caregiving and infrastructural aspects of MCH, such as services to overcome challenges with breastfeeding [6, 104, 115], self-monitoring devices for detecting complications [110], and platforms for sharing experiences, social support, and follow-up questions about hospital care [4, 110, 114]. Our study expands this perspective by looking at a large-scale intervention that aims to improve learning opportunities for families within hospitals, and then support families through challenges in caregiving, allowing us to understand how it is appropriated and its impact. In a critical examination of a similar digital health intervention, Schneidermann’s ethnographic work on MomConnect [90] shows that clean narratives of high engagement gloss over the disconnect between messages that push respectable motherhood and the complex realities of unhappy or unwanted motherhood. These findings show how it is essential, then, to go beyond intended use and goals to understand how such interventions are situated within health infrastructures.

2.2 Healthcare Infrastructures

Beyond the domain of MCH, research in HCI is increasingly going beyond interactions between individual care recipients and providers to understand navigation of complex health infrastructures that do not always align with care needs. Gui and colleagues discuss the work of new or expecting parents in the United States to coordinate across fragmented medical and financial institutions for themselves or their newborn [27]. They highlight how it is essential to look at non-bodily work in health, political economy, and positionality of the individuals who must navigate them. To this end, they also discuss how design might support awareness of tacit knowledge, interdependencies between infrastructures, and possible disconnects that people might encounter. Other work in the US looks at challenges in transitioning home after discharge, finding that information needs to be tailored, retrievable, and gradual to support learning and self-efficacy [81], while its presentation should attend to the wear of illness, the role of intimate relationships, and reflection [80].

There have also been studies of how health infrastructures have been changing to support shifting needs, such as remote engagement due to the COVID-19 pandemic. Studies in the Global North largely focus on technologies such as telemedicine and remote monitoring to support management of chronic health conditions. For example, prior work discusses the challenges of health management over multiple and switching modalities, care providers' need for feedback, and the involvement of caregivers in addition to patients [23, 87, 102]. In the Global South, prior work has looked at the work of maintaining infrastructures, such as telehealth [10, 16] or community health [30, 108], despite challenges and rapidly changing contexts. For example, Bhat and Kumar discuss how telehealth platforms and online pharmacies are changing long-established relationships between patients and doctors, pharmacists, and support staff, including aspects like trust, payment norms, frequency of communication, and process of diagnosis [10]. Another focus has been the widespread use of platforms for more acute touchpoints with health workers, such as chat apps [19, 112, 114], helplines [74, 75], and question-and-answer platforms [53]. Ma et al. and Yadav et al. describe how "Ask the Doctor" platforms and chat groups respectively complement clinical care (for example, supporting preparation for in-person consultations) [53, 114]. Prior work has also described the accessibility and strengthening of patient-provider relationships over personal chat apps, but also issues with maintaining boundaries and privacy [19, 39, 112].

In our study, we bring attention to how the MCH intervention integrates with existing healthcare infrastructures and supports navigation of them. In particular, we foreground the work required to sustain the MCH intervention and the diverse ways it is appropriated, demonstrating how it must grapple with the inequities of the health system even as it seeks to strengthen it.

2.3 The Politics of Care and Technology

Feminist scholars Fisher and Tronto define care as "everything that we do to maintain, continue, and repair our 'world' so that we can live in it as well as possible" [22]. Glenn further specifies that caring labor involves maintenance of people, communities, and environments [26]. Scholarship on feminist political economy discusses

how this necessary labor is organized under capitalism, showing how care work is consistently pushed onto marginalized communities and devalued so as to secure it at low cost [12, 26]. Murphy brings this connection between care, capitalism, and other systems of domination to understandings of feminist health interventions [63]. She looks at feminist self-help movements to address cervical cancer in the Global North, showing how their politics ultimately does not align with the needs of women in the Global South without a reframing of self-help as unwaged labor for collective survival in the face of health inequities. Overall, Murphy suggests that unsettling care is about looking underneath the positive feelings it often elicits, to examine its meanings and histories across multiple sites and how it variously reproduces or interrupts inequities and for whom—all in service of moving towards more equitable politics of care.

In India, the resourcing of healthcare infrastructures, especially for women's health, has a fraught history. Its rapid privatization can be traced back to structural adjustment programs from international financial institutions (controlled by Global North countries) in the 1990s [83]. Since, the healthcare system has been characterized as a choice between an underfunded, overburdened public health system that may not always offer quality care, and a private health sector that can be costly or predatory [84]. Privatization coincided with national policies that narrowly equate women's health to global development priorities of reproductive and child health, motivated by the economic contributions of women's reproduction [96]. Within this narrow focus, policy has emphasized quality and community input but in reality, services such as patient education and follow-ups are not consistently provided and women still experience mistreatment [96]. This context points to the importance of accounting for how technological interventions shape not just physical health, but also the power dynamics around care, labor, and gender.

Prior work in HCI has increasingly looked at the politics of care and technology in domains like beauty work [2, 86], education [52], food delivery [97], elder care [49], frontline health [31], and home care [82, 106]. A core tension that this work points out is how technology can simultaneously improve material conditions for care workers (for example, offering opportunities for peer support, mobility, safety, and respect [2, 82, 86, 106]), while also potentially increasing work burden or doing little to fundamentally transform power dynamics workers are subject to [2, 86, 106]. Prior work has shown how personalized technology interventions in health especially lend themselves well to individualistic solutions, while justifying underinvestment in addressing structural causes of social problems [41]. Technology can also invisibilize or ignore the realities of racialized and feminized care labor, creating additional work or perpetuating ineffective interventions [49]. Singh and Park explicitly draw on notions of unsettling care to analyze how platforms collect invasive health data from food delivery workers in order to care for customers, perpetuating notions that low-wage workers are responsible for spread and must offer up data to appease customers [97]. Offering paths forward, Sciannamblo et al. describe how caring and commoning are concepts that help us highlight mutual responsibility and valuing of social relations within cooperative practices, which can then be infrastructured through design work [91]. Parker et al. suggest that health technologies can also

facilitate activism, collective action, and motivation to participate in changemaking [71]. In our work, we look at what forms the politics of care takes across multiple sites of an MCH intervention, with the domain of health offering insights into both public and private spheres of care work.

3 METHODS

Our study was conducted over the course of a year starting from March 2021. Our goal was to understand what work sustains the intervention and what impacts the intervention has on multiple stakeholders. The study was approved by institutional review boards in the United States and India.

3.1 Setting

The NGO (started in 2014) partners with state governments across eight states in India to conduct in-person patient education sessions across health condition areas, including antenatal care (ANC) and postnatal care (PNC). The design and implementation of sessions are especially targeted towards families marginalized on account of income, rurality, caste, and other factors. The sessions are conducted mainly at district hospitals, which provide tertiary care within a three-tier public health system. The NGO trains nurses and other allied health workers at district hospitals to conduct the sessions, teach other health staff how to as well, and overall champion conducting the sessions in their hospital. The NGO also provides educational materials to be used to conduct the sessions (e.g., flipcharts, videos, paper takeaways, demonstration tools). Nurses are instructed to tell families at the end of each session about the WhatsApp service (launched in fall 2019) and that they can register by placing a missed call to a number (which varies based on ANC or PNC content and language). The NGO places posters with the appropriate number in MCH wards for reference. The NGO also provides paper takeaways for families to keep with them, containing a summary of the information covered in the session and the phone number to register for the service.

Approximately 52,500 users had registered for the WhatsApp service by the time of the study in 2021. When a family member registers for the WhatsApp service, they receive automated messages in a one-on-one chat regarding ANC or PNC, approximately every other day, for approximately two months. The messages advise on lifestyle (e.g., nutrition), awareness of danger signs, and preparedness for delivery and postpartum caregiving. The messages contain a combination of text and emojis, and may sometimes link to animated or live action YouTube videos demonstrating caregiving practices or dramatizing family interactions around caregiving (also developed by the NGO). Families can also send questions to the WhatsApp service at any time, including after automated messages end. The WhatsApp service received approximately 30 to 40 questions a day; the year our study was conducted, approximately 13,200 questions were received. Questions are answered by MSEs, who are trained nurses in charge of monitoring and responding to questions via a backend system that allows them to view all registered users' chats at once. We note that they are distinct from the nurses who work at district hospitals and conduct trainings; MSEs are directly employed by the NGO. MSEs respond in the same language that the question was asked. In the process of answering

questions, MSEs collaborate with translators and doctors. Doctors approve or help write responses to families, which MSEs then send. Over the course of the study, the NGO employed six MSEs and two doctors. MSEs answer questions between 8am and 8pm, with one shift at 8am to 5pm and another at 2pm to 8pm, with three hours of overlap between MSEs.

3.2 Data Collection

We began data collection in March 2021. To establish data access, Naveena signed a non-disclosure agreement binding her to limited use of the data as laid out in the research plan with the NGO, and care in ensuring anonymization of any collected data (such as field notes). Upon registering for the WhatsApp service, a terms of service and privacy policy is made available to families in the group description panel of the chat (where group members, shared media, starred messages, and other features can also be found). Families can also ask any questions they have to the trainer who introduces the service. Recognizing that this data is still highly sensitive, we refrain from quoting chat logs, but rather use our understanding of them to inform and contextualize data from interviews at a high level.

We first analyzed a log of all questions received from families since 2019, amounting to approximately 11,900 questions. The log had been created by MSEs as they responded to families, and had been pseudonymized to exclude phone numbers, names, and images. Since each question was categorized based on its topic, we noted the most common categories to gain a high-level overview of what families asked. We also qualitatively analyzed a random sample of 150 questions. We noted down interesting characteristics such as affect, level of detail provided, and whether it was possible to tell if it was sent by a mother, father, or other caregiver.

Then, in order to get a sense of the range of interactions a given family might have with the service, we randomly selected 45 unique conversations, 15 each from three time periods: September to December 2019, February to April 2020, and March to May 2021. These time periods cover when the service first launched, the beginning of Indian lockdown measures due to the COVID-19 pandemic, and before and during the second wave of the COVID-19 pandemic in India. While the WhatsApp service sent a consistent set of automated messages, the number of messages from users and MSEs in each conversation varied from two to 40 messages depending on whether users had questions. We viewed the chat records directly in the chat interface that MSEs use to respond to families, as we wanted to avoid downloading any data when possible. The account used to access the chat interface was only active during the time of the analysis. We noted interesting characteristics of the conversations, such as topic, frequency of engagement, affect, and how families' questions were clarified or responded to, avoiding the recording of any personal information.

We then conducted observations and interviews to understand NGO operations. For all observations and interviews with NGO staff, we asked for verbal consent for participation, audio recording, and screenshots if applicable. We started with observation of MSEs' work over Zoom to understand their situated work practices. As almost all of MSEs' work is conducted on a laptop, they shared their screen for viewing. We periodically unmuted to ask questions as

needed, including to ask about any work done away from the laptop, such as making a phone call. We conducted approximately eight hours of observations, covering both morning and evening shifts, transitions between shifts, and shift overlaps. We noted observations about workflow and potential challenges and time-consuming tasks, sometimes taking screenshots (with identifiable information excluded) when needed. We also conducted semi-structured interviews with six MSEs and one doctor employed at the NGO. We asked about their approach to interacting with families remotely, challenges of their work, and motivations for their career path, for example, “How do you approach calls with families?” or “What is the most difficult part of your job?”. We probed further into examples provided, such as complex interactions with families or strategies for addressing challenges.

To understand how patient education sessions are conducted, we observed a session in a district hospital in northern Karnataka over Zoom. Local staff at the hospital involved in setting up the training notified families of the observation and offered the opportunity to address any concerns.

For an understanding of organizational priorities and experience with implementation of the intervention, we also interviewed two members of the NGO’s design team, one member of the research team, two members of the implementation team, and a member of the development team which works on fundraising for the NGO. We asked about motivations behind design decisions or strategy and challenges in implementation, with questions differing based on position. We probed into complexities such as tradeoffs required, how relationships with partners or donors shaped decisions, and how implementation challenges were addressed. All NGO staff had been working at the organization for two to four years and so had insight into operations before the COVID-19 pandemic as well as the launch of the WhatsApp service. The implementation team in particular helped gain insight into the challenges of scheduling and conducting training sessions. We were otherwise unable to interview nurses at district hospitals as the NGO could not easily facilitate access to them since nurses are employees of their hospital (and not of the NGO).

Finally, we conducted nine phone interviews with registered users of the WhatsApp service in rural and periurban Karnataka (three men, five women) and Maharashtra (one man). Informed by the goals of the WhatsApp service and the range of questions families sent, we asked about the division of caregiving work within the family, experiences seeking care, and experiences with the WhatsApp service. Example questions include “Has your spouse been involved during the pregnancy or with the newborn? How so?”, “What was your experience with the care you received during your hospital visits?”, and “Why did you sign up for the WhatsApp service?”. We started the phone call by explaining the purpose of the interview, offering information on compensation, and requesting consent for audio recording. Participants were compensated INR 300 for their time, which is what the NGO typically provides for research engagements. If participants preferred not being recorded, we took detailed notes. Men were 29 to 34 years old and women were 21 to 32. All participants had newborns except one woman who was expecting. Six participants had or applied for a ration card, which enables low-income households to receive subsidized grains. Two participants had bachelors degrees, while six had finished eight to

ten years of schooling. Occupations included drivers, construction workers, and housewives.

3.2.1 Limitations. The data we collected largely represents views and experiences of the NGO staff and families we interviewed, as well as a slice of online engagement with the service. Given the relatively large and growing user base, the importance of non-users in understanding interventions, and varying gender norms across regions of India, there are likely many experiences not represented in our findings. We do not present a comprehensive view of the intervention and its impacts—rather, we aim to highlight particular contrasts between the behavior change goals of the intervention versus its implementation and appropriation as a large-scale service in the wild.

3.3 Data Analysis

All data were collected by Naveena. Data included audio recordings of observations and interviews, handwritten notes (including when participants preferred not being recorded), and photos of MSEs’ work during observations. All interviews and observations with the NGO were conducted in English as participants were used to speaking English in work settings. The patient education session was conducted in Kannada and the video recording was translated and transcribed using a translation service. During interviews with parents, who spoke Kannada and Marathi, a translator translated in real time. All notes and recordings were written up or transcribed, anonymized, and shared within the research team. Participant names in this paper are anonymized.

Naveena analyzed the data using the inductive process described by Merriam [57]. She first coded the data, producing codes such as “cost of traditional nursing work”, “expectations of fast responses”, and “unexpected requests for navigational support”. She then considered the relationship between codes, including through discussion with Richard, creating themes that describe how the service was shaping experiences of care and care work. Examples include “revaluing care work”, “constituting perceptions of the service”, and “supporting navigation of health system”. It was in formulating these themes that we noticed the centrality of the politics of care, labor, and gender in understanding participants’ experiences, bringing us to center the idea of unsettling care in presenting our findings.

3.4 Positionality

Naveena and Richard are researchers based in the United States and together have significant experience conducting global digital health research, including in India. Victoria and Shirley work at the NGO and have several years of experience working in India in areas such as child welfare and public health. Through the research project, Naveena wanted to explore how the service was shaping gendered divisions of labor in caregiving, MSEs’ work and how it could be better supported, as well as what futures of work and wellbeing the intervention was ultimately supporting. Her prior research and personal experiences have sensitized her to care work as a site for understanding power dynamics around gender and capital, shaping her approach to data analysis. Staff at the NGO wanted to understand how MSEs’ work could be better supported and were interested in an external researcher’s perspective on their experiences and workflows. Naveena gained access to participants

through the NGO, which may have shaped what participants such as MSEs or parents were willing to share about their experiences, the service, or the organization.

4 FINDINGS

The mission of the NGO centered around the idea that family caregivers play a significant role in positive behavior change and reducing preventable complications that result in hospitalizations, but are currently not well supported in caregiving work due to no or low quality patient education. The NGO aimed to address this by supporting the provision of patient education in hospitals and continued information- and care-seeking within the home. Myra, a designer at the NGO, described how she thought that the NGO's mission uniquely motivated staff and also allowed them to relate to families who use their service: *"...every person, especially in an Indian context, would have taken care of somebody... They [staff] are able to dig deep and understand and connect to probable insecurities, to probable questions..."* In terms of tackling the problem, Eva, a researcher at the NGO, framed behavior change as *"low-hanging fruit"*, or an efficient approach where *"...if you just work on this one thing, it can create, you know, a fair amount of change for not a lot of costs and a lot of resources."* For many NGO staff we interviewed, seeing this discrete change was a key motivator. Shilpa, a doctor at the NGO, shared one such experience during fieldwork: *"...there was a visible difference... even like mothers who've got two children, how the first child was brought up and the second child, because they've now got a new piece of information, to be able to see that immediate change of behavior."*

The notion of supporting caregiving did work beyond the NGO as well. Eva described how the centrality of caregiving to the NGO's model has in part made it possible for the NGO to gain traction and do behavior change-focused work relatively easily. In comparison, she felt that areas like policy change around caregiving require more complex data and evidence. Peter, who worked on fundraising, confirmed how international donors could most easily relate to the idea of supporting caregiving, to the point that they often wondered why this work was not being done in the Global North as well. Throughout these examples, we see the circulation of emotions related to caregiving, a seemingly universal anchor that brings together people in very different contexts, from families in rural India to international donors. In the rest of this paper, we explore how care is situated within multiple sites of the intervention—in district hospitals where patient education sessions are held, in the human labor behind the WhatsApp service, and in the daily lives of families—and how it interacts with the material realities of healthcare in India.

4.1 Revaluing Care Work

In looking at what makes the NGO's health systems strengthening and behavior change goals possible in the first place, we find that significant, resource-intensive relational work is done to revalue care work amidst an overburdened and devalued health workforce. At district hospitals where education sessions were conducted, this involved work by the implementation team to ensure program buy-in from nurses. For MSEs, revaluation of care work was evident in their search for alternatives to traditional nursing work. Prior work

in HCI and beyond has established that nurses in Indian contexts (and the world over, to varying extents) are subject to hierarchical and challenging working conditions, with workplace technology often exacerbating these issues [40, 103, 111]. We extend this work by showing how even the success story of health interventions cannot, and should not, be separated from the valuation of care work.

4.1.1 Valuing Nursing Work. In the PNC ward of a district hospital in northern Karnataka, a trainer employed by the NGO to conduct patient education sessions has just started a session. For the next 20 minutes, she goes over six key behaviors that the NGO has determined are most strongly linked to avoiding health complications—a nutritious diet for postpartum women, skin-to-skin contact with their newborn, exclusive breastfeeding, handwashing with soap, dry umbilical cord care, and warning sign identification. The skills involved in conducting this session are notable. She seamlessly integrates materials provided by the NGO, such as a flipchart and a baby doll, as well as items around her like empty liter water bottles, to demonstrate each point. She addresses the contingencies of caregiving in the home and how it might go differently from their stay in the hospital. She asks quick, pointed questions to gauge women's understanding or challenge beliefs. In the process, the trainer refutes gender norms, for example ensuring that women know that fathers too can help with skin-to-skin contact with a newborn. At the end, she points to the NGO's poster on the wall behind her and says, *"Note down this WhatsApp number. Every one of you have phone in your home, right? You can type a message or give a missed call."*

Normally, nurses employed by district hospitals, not a dedicated trainer, conduct these sessions, and so nurses take on the work of setting up materials, gathering families, and conducting the sessions on top of their usual responsibilities. Also, as part of the NGO's monitoring efforts, nurses must share the attendee count and pictures of the session with the NGO's implementation team via WhatsApp. The sessions are also a *"key point of discoverability"* (Eva) for the WhatsApp service, contributing to its increasing adoption. Encouraging families to sign up for the service in the presence of the implementation team (when they observe sessions) also helps detect any technical issues and communicate them to the NGO's design team.

MCH education for mothers and families has been shown to be desired and to benefit health outcomes [101], but families do not always receive this education in hospitals, often due to uneven availability of healthcare workers in clinical settings. To support patient education, the NGO offers trainings and materials to enable the soft skills required to make information accessible to families in a constrained environment. Eventually, the NGO aims to shift standards of care at hospitals towards more effective patient education. For example, they would like to have the training that nurses receive written into state budgets, and ultimately reduce patient readmission rates within an already strained system. In talking to the implementation team, which supports hospitals in holding the sessions, we were told that the trainings and materials are important to nurses, as is the impact of patient education in general. However, the implementation team also worked hard to make nurses feel respected and have a sense of ownership over

the program, while also consistently monitoring the program. This is important because it created a contrast with how nurses and nursing work are ill-treated in many hospital environments. The training offered to nurses is itself a special event that nurses are invited to, and when the implementation team visits hospitals to check if nurses need support, nurses are treated especially well. Pavan, an implementation team member, described their interactions:

We'll call them 'madam', we'll take them to lunch or soft drinks, we'll offer them tea or coffee... in hospitals what happens, the administrators don't treat them like this... They used to scold them, blame them. [With the NGO] they don't see like that. Every time, even if they are not conducting sessions, then also we will call them as madam and sister... We are not ordering them [to do] anything... Whenever we visit, we sit with them, we listen to them... Whether she is having any challenges in the hospital, if you need any help, we'll help.

The “help” that Pavan refers to can be extremely impactful. He provided the example of a nurse who was having trouble transferring to another hospital. The implementation team was able to help her and later, the nurse was especially motivated to champion the program. In another case, the implementation team sought to support feelings of ownership among nurses. Near the start of the COVID-19 pandemic, the NGO provided N95 masks to partner hospitals and had the nurses do the handover to hospital administration, instructing them, “...tell them that this is because of you. And that because of [the training] program only, the masks have come to your hospital,” (Pavan).

Notably, despite the elevation of care work, the biggest challenge to actually getting nurses to conduct the sessions was widespread staffing shortages, especially due to the COVID-19 pandemic, which meant nurses were often reassigned to other wards. So we see that while respect and feelings of ownership are an essential part of how the NGO achieves health systems strengthening, this also has its material limits.

4.1.2 Turning to Alternative Forms of Care Work. The same wear and hierarchy of clinical nursing work was what brought many MSEs to leave nursing and work on the WhatsApp service, underscoring the impact of challenging working conditions on labor flows more broadly. Navya was an MSE who had been hired four months previously. As she reflected on her transition away from staff nursing, she explained:

“Staff nursing, I think it's a very good job... But the only thing is for me that I can't do shifting job because of some family issues. And after that, marriage also happened, I can't handle my family and everything... Night shift is twelve hours and evening and morning is six hours. But that six hours is very tough... So, the work and life balance is not maintaining... After shifting to Bangalore... I have very clear in mind that I don't want staff nursing job. So I'm ready to do any medical field job, but not shifting one.”

Most other MSEs we interviewed had similar stories. MSEs were required to have at least a Bachelors in Nursing, but they had all left staff nursing (or avoided it entirely) for adjacent careers. Many

described nursing work as physically and emotionally taxing, with a very hierarchical and abusive work culture. Mala shared how nursing was stigmatized, noting that she had observed attitudes that nurses are “overexposed”—that is, they interacted with too many other workers in the hospital—and were thus considered not marriagable. Further, as women who were married or were in charge of caring for their parents or siblings, the demands of nursing work interfered with family responsibilities, presenting a tension between paid work and the unpaid care work often placed onto women.

Working as an MSE was attractive due to the flexibility of the work and improved organizational culture. Because the work was technology-mediated, MSEs could work remotely (even before the COVID-19 pandemic). MSEs shared how remote work in particular supported the ability to balance family responsibilities, as some MSEs could take care of children, or live with their family in another city or town. It also involved less intense but still satisfying care work, which allowed stepping away from work concerns after one's shift, and less emotional labor. While specialized nursing or nursing education might have paid more, the relative flexibility, satisfaction, and the fact that MSEs had the financial and social support of their families or spouses made it a desirable position. The culture instilled at the NGO was also much less hierarchical. When asked about relationships with co-workers, MSEs explained how they are able to talk to the design and medical team whenever needed and they can also share about one another's personal lives. If MSEs made errors in workflows, they would be corrected in a more gentle and encouraging way.

Working as an MSE was also unique because of its technical components, such as using the chat software to answer families, logging questions in spreadsheets, and setting up the automated replies. This work appealed to MSEs for a few reasons. First, it aligned with interests in learning new skills, especially those that were very different from clinical and care work. The NGO was still growing and had a number of new projects related to building out the WhatsApp service, which further added variety to MSEs' technical work and areas for growth. Second, some MSEs felt that experience with new technologies would be useful in the future. Navya explained how she saw technology as central to the trajectory of healthcare and felt technical skills could help her navigate those changes: “Because in future nowadays, many things are online... If I want to consult a doctor, if I want to get any test done, then I'm going online only. So all these things, computers, they will help me in future...” We do note, however, that the requirements of being an MSEs, such as English fluency and familiarity with certain software, are not always accessible to nurses from all backgrounds.

4.2 Creating a Companion

“Welcome to your health service! Congratulations on your pregnancy! The time of pregnancy is not easy and we understand that. By sending messages about pregnant women's health, we will help you clear your doubts.” This is the first message that a caregiver gets when they sign up for the ANC WhatsApp service (the PNC version is similar). A few days into the message series, families are told that a nurse is also available to answer any questions they have. When the service is not online and a caregiver asks a question, an autoresponse is

sent explaining the service's hours and to go to a doctor in an emergency. An additional line says, *"Do not worry, we are here to support you!"*

Compared to the paper takeaways that the NGO used to rely on, the WhatsApp service was created as a more interactive avenue for guiding families after they left the hospital. The NGO wanted to position the service as supportive, reliable, and responsive with the aim of increasing families' confidence in caregiving. In this section, we describe how cementing these characteristics goes beyond feelings produced by the messages on chat. Rather, MSEs work to visibilize support, manage expectations, and offer a more reliable alternative to an illegible healthcare system, all while responding to the range of initial perceptions that families may have of the service depending on their experiences with the larger healthcare system.

4.2.1 Offering Support but Managing Expectations. There were a number of ways that MSEs produced a supportive and reliable service beyond the interactions on the WhatsApp service chat itself, including phone calls and timely responses. As part of answering questions through the WhatsApp service, MSEs' work involves making *follow-up calls and random user calls* to families. As an example of the former, if a family reports that their baby is having a fever, MSEs will advise them to see a doctor, continue breastfeeding, and not to give medications without consulting a doctor; they will follow up with the family after two days to ask if they went to the doctor and ask how the baby is doing. Random user calls on the other hand, are a way to check in on families, ask after the mother or newborn, and generally ask questions about their experience with the service. In both scenarios, MSEs establish rapport by speaking in a *"bold voice,"* mentioning that they are calling from the *"WhatsApp service"* (Deepika). Acknowledging the communication so far in the chat and the challenges or symptoms families are facing also helped establish familiarity and allow the MSEs to ask further questions. MSEs are also able to draw on the fact that families are registered for ANC or PNC information, asking after the mother or newborn as relevant. In MSEs' experience, families were generally happy to hear from them and calling over the phone helped to uniquely visibilize support from the NGO, as Navya described:

"If we ask them, how's your health? How's your baby? If you go to the doctor, if you're taking care, if you're having medicines, all these things kind of create a trust... So yeah I think they [calls] increase the trust that yeah, there is someone if we need anything."

It was more difficult to establish common ground for random calls when families had not interacted with the chat. Ensuring families know that MSEs are calling from the WhatsApp service required further explanation that they were connected to the service that had been sending health messages periodically.

Providing a reliable service also meant offering *timely responses* to questions. Families typically came to the WhatsApp service with questions and worries about ongoing caregiving work and wanted advice on a course of action—the most frequently asked questions at the time of the study had to do with how to address newborns' weight, symptoms experienced by the mother or newborn, breastfeeding, and nutritious diet. However, timely responses

were challenging given the large scale of the intervention compared to prior work on chat-based forums [39, 112, 114]. Because the WhatsApp service was deployed across multiple states, making information relevant to families and building rapport with them was dependent on using local languages and scripts, so MSEs needed to rely on translators to interpret questions or craft responses. Further, responses to families needed to be approved or finalized by the medical team. Wait times on translators and sometimes the medical team could be hours, especially since the translators are not full-time employees of the NGO. In one observation period, MSEs answered a question about 21 hours after receiving it due to translation bottlenecks. On the front end, MSEs manage families' expectations around response times, a dynamic which has been described in prior work on WhatsApp communities for maternal and child health [114]. Navya shared how one of the biggest challenges of being an MSE was the pressure from families to respond quickly. She found it understandable but felt helpless to address it, indicating how communication of the scope and ability of the service was not as simple as sending the right messages:

"Families, sometimes they are angry also. So that part is very difficult, how to reply them, they are asking again and again and again... I don't know how to react because one or two times you can say please wait, we've sent your query to medical team, but you can't say thrice or four times... That's a difficult part for me and they are also not wrong."

MSEs worked to visibilize support and be responsive, but in the end, how families perceived the WhatsApp service also had much to do with their initial introduction to it, adding to prior studies on the work of offering a good experience for chat-based health interventions [39, 112, 114]. Among parents we interviewed, due to being introduced to the service during a patient education session, most expected to learn about maternal and child health and to be able to ask questions to health workers about caregiving via the WhatsApp service. Those who had learned about the service from relatives or friends were similarly informed. In MSEs' experience serving more families, however, they felt that if families discovered the service through a poster or otherwise without a proper introduction from health workers, relatives, or neighbors, families' perception of the service could vary and become associated with the particular hospital at which they attended a patient education session. Shilpa felt that this negatively impacted perceptions of the service, particularly if the family had bad experiences at hospitals: *"...where the intent of the service is not communicated well enough, people assume that hospital's number so then they associate us with them and so then there's no trust."* Unclear intent could lead to questions about frustrating experiences, such as long wait times, financial issues, or seeking prescriptions, and add to negative perceptions of the WhatsApp service. Shilpa described one case where a father was not happy with the service he got from the hospital. He asked the WhatsApp service to prescribe the medication he needed instead, but the medical team had to explain that they cannot prescribe medication either, adding to the father's frustration.

4.2.2 Offering Navigational Support. In addition to fielding medical and behavioral questions, the WhatsApp service also served to fill the gaps in in-person care-seeking. In these cases, receiving

navigational support cemented the WhatsApp service's status as more reliable and caring in comparison to other parts of the health system. Similar to Yadav et al.'s study of WhatsApp-based support groups for MCH [114], families sent pictures of lab reports, doctors' notes, or medications they were ordered to take, asking for interpretation or how to follow the doctor's instructions, indicating miscommunication or lack of support during in-person care. In these cases, MSEs would generally take a look and reinforce or augment doctors' instructions for care. In the case of lab reports, the medical team would interpret the report, but regardless of the results, they would tell families to have it seen again by their doctor, who would know more about the patient's history.

Another category of questions covered the unfolding provision of care during hospital visits and why certain forms of care were being provided. Compared to prior work on forums for navigational support [53, 114], these cases were more emergent. For example, families asked why their baby was taken to the ICU, where their baby is, or where the doctor was after waiting for a long time. If warranted, MSEs reassured the family that their child is being taken care of and to follow the doctors' instructions. In other cases, where it was not clear what was happening, MSEs went as far as sharing the names and titles of people the family could contact at the hospital, or, if it was a partner hospital, had trainers reach out to the family. In an example of the financial impact that such navigational support could have, a family whose baby was moved to the ICU messaged the service saying the doctor was now asking for money. MSEs responded by explaining that services should be free at district hospitals, and to speak to hospital administration and utilize ration cards to apply insurance. In these situations, the WhatsApp service can offer information that enables patients to protect their time and resources and ask for updates they deserve.

Sometimes situations requiring navigational support could become complex and a call is needed to clarify what families are facing. Deepika explained how approximately one to two times a month, MSEs ended up calling families experiencing particularly difficult situations at hospitals. In one case, a pregnant woman was told by a government hospital that she could delay a scan that is typically done in the third month. Eventually receiving the scan revealed issues with the fetus' development, but the parents were not being given further advice or their medical reports in a timely manner. They went to another doctor at a private hospital, who advised that terminating the pregnancy may be the safest option for the mother. After hearing about this journey, Deepika counseled the mother over the phone, explaining what she can expect next, and sensed that the mother felt supported after the call, especially in comparison to her experience with the government hospital:

“The mother felt very happy because we spoke to her, because in government hospitals, they even doesn't care, and especially in this time [of the pandemic]. So she felt very happy and she thanked us for calling her... so in such cases we suggest them what is the next process, what will happen.”

Many state governments do have a helpline number for accessing health information and also submitting complaints about public health services, which are then followed up on. Nithin, an implementation team member, explained how when the Karnataka state

government started budgeting for printing the materials for the MCH program, they wanted the 104 helpline number printed, rather than the WhatsApp service number. The team wrote in the WhatsApp service number before handing them out. In interviews, most parents said that they had never heard of 104, suggesting that navigational support may be difficult to access without greater efforts to raise awareness (and that the WhatsApp service is where families turn instead).

4.3 Information and Gendered Dimensions of Care Labor

To achieve behavior change and the more overarching goal of supporting caregivers, the WhatsApp service engaged the whole family on the topic of caregiving. Eva noted that in the Indian context, men are often not provided avenues to participate in caregiving even if they would like to. Men and mothers-in-law also have decision-making power that can and must be leveraged if behavior change is the goal. The WhatsApp service thus aims to recruit family members into the learning process around caregiving within the home. Some messages, such as those related to diet or family planning, need buy-in from husbands and other family members, so they start with *“Today's message for the family is...”* Other messages that center the mother's experiences, such as being attentive to certain symptoms, start with *“Today's message for the pregnant mother is...”* The video content also included narratives demonstrating how men can be greatly involved in supporting the mother's diet or caregiving tasks like skin-to-skin contact or cord care. For example, in one video, a husband is shown explaining to his mother that her daughter-in-law is tired because she requires more nutritious food, and he purchases groceries and cooks a meal for her.

Interviews and the bulk of engagement over the WhatsApp service do indicate that parents, both mothers and fathers, were interested in learning more about caregiving, and had medical and behavioral questions around how to evaluate symptoms and troubleshoot caregiving challenges within the home. However, we also found that men's involvement in caregiving was often beyond the private sphere of the home, shaping some of their experiences with the WhatsApp service and desire for certain features or information. The service also received questions related to power dynamics in women's health, including beyond the private sphere, highlighting appropriation of the WhatsApp service for concerns beyond behavior change.

4.3.1 Potential of Quality Information and Men's Involvement in Caregiving. Prior work has discussed men's lack of involvement in caregiving and the emotional and physical impacts it can have on women [5, 114]. In our study, rather than a lack of involvement, we saw a gendered division of care labor. Mothers and other women in their household (often mothers-in-law) did a significant amount of caregiving and housework, but fathers accompanied on ANC and other hospital appointments (including when mothers were at their natal home), helped arrange transportation to hospital visits, coordinated care when needed, and purchased food and medications for mothers. Thus, our findings speak to the role of information in scenarios where there is involvement in caregiving, but often in different aspects and locations beyond the home.

Fathers expressed a strong interest in learning and asking questions about caregiving, reflected in their use of the WhatsApp service. For example, one participant Aadil described how the doctor told him that his wife was anemic and needed a blood transfusion and to eat more fruits and vegetables. Though he followed the doctor's recommendations, he said that he messaged the WhatsApp service to ask "...if anything was left by doctor, if additional info could help me to take care of my wife or diet or anything else." We also saw that information was not just a path to providing better care on one's own, but also greater ability to advocate for good care, especially in light of a strained health system. For example, Basavaraja, a father of three children, including a three-month old, noted that even though he had previously known to vaccinate his children, with the immunization schedule shared via the WhatsApp service, he now knew exactly what his child should be receiving at what age and could ask for the right vaccine if the health worker did not provide it. Beyond general information, being able to ask specific medical questions and get what parents knew to be "proper information" was impactful since they did not have to make time to go to the doctor to address an issue that could be taken care of at home. This was especially helpful for fathers in certain occupations such as driving or construction who could not afford to take too much time off or might be too far to make emergency visits—this is also why a few parents said it would be useful if the service could offer prescriptions as well. Most parents reported that community health workers, another potential source of information about MCH, visited periodically or not at all, making the WhatsApp service a way to address concerns more quickly and as often as needed.

Despite engaging with the WhatsApp service, barriers to fathers being extensively involved in direct caregiving (like in the video described above) were largely to do with structural factors. Paid work was one of the biggest barriers to being more present in the home, with all fathers in our sample working long hours as the sole earners for their family. Thus, most fathers were not highly involved in housework and were involved in baby care for small periods of time in the evenings or while the mother was eating. Mothers-in-law or other (often women) family members stepped in to help with housework or childcare before and after delivery.

Even if the level of involvement in caregiving did not change, parents we interviewed still noted the importance of sharing information. Most parents shared the information they received with their spouse, parents, or in-laws, especially if they had asked a question and wanted family members to know what the recommended course of action was. Sharing of information, and fathers' registration for the WhatsApp service in general, was a useful bridge in light of the ways that men can be excluded from learning about women's health. For example, mothers often went to their natal home right before and after delivery. Fathers would generally visit once a week if they were close enough, or less often. In these cases, registered mothers could not always consistently share what they were learning, and one mother expressed that she would want her husband to know more of this information when she went back to her marital home. Conversely, one father mentioned how he would share messages with his wife when he saw her every few weeks, as she has a feature phone. In another example, though many husbands accompanied their wives to the hospital, they were

not allowed to be present during ANC visits since government hospitals prohibited it. Both husbands and wives generally wished husbands could attend, largely because this would ease communication of what the doctor said during the visit. The husband could be updated on the progress of the pregnancy and help with following up on instructions, if any. One mother, Shanti, noted that having her husband informed would also lessen the labor of passing on information that would be good for her health: "There is advantage. Rather than me informing [what the doctor said], my husband will know I have to take rest." We note, however, that health information was not the only reason to attend, again highlighting roles that fathers noted they had in caregiving beyond the home—one father Srinivas shared that being able to go to visits also meant he could advocate more for his wife, for example if the doctor was being unreasonably slow in attending to her.

4.3.2 Confronting Power Dynamics in Women's Health. Prior work in HCI and beyond has discussed the challenges that women face in care-seeking within the home and hospitals and the importance of emotional support and agency [5, 65, 95, 109]. We describe how the WhatsApp service intervenes in some of these dynamics, as a way to build confidence, advocacy tool, safe space, and coping mechanism. On an individual level, we found that most mothers felt that the service offered a constructive path forward to learning about caregiving. Multiple women noted that the information they got from elders was fear-inducing, with many rules around what not to do in order to avoid health complications. In comparison, the WhatsApp service increased their confidence. One mother Devi explained that it demonstrated feasible courses of action: "Earlier others used to tell me lot of things that made me fear but after visiting the hospital, I took the training and using the WhatsApp, it has helped me a lot and I feel I can handle it... Others said these things are not to be done, don't eat this and that."

Another dimension of use was advocacy for the self. As described above, some messages sent by the WhatsApp service aim to address power dynamics within families that may result in restricted diet or other practices that can affect mothers' health. However, this does not mean information is always taken up. Prior work in HCI and beyond has discussed how authority of information can be leveraged by women to gain concessions in their care from family members [9, 36]. We found that two-way interaction also allowed the service to be used as a form of advocacy by mothers. Shilpa described how a woman told the service that her family had been restricting her diet and asked that the service talk to them. MSEs and the medical team made calls to the family, and Shilpa explained how she was able to leverage her authority as a healthcare worker to explain healthy caregiving practices: "So I would introduce myself as a doctor that's representing this service. There's automatically that, okay, I've got to listen to her... Then it's just about the problem that she's facing."

The WhatsApp service also served as a safe space from the power dynamics around women's health that come up in hospital settings. In a more common example, and aligning with prior work [114], women often asked questions about sex. For example, women asked whether it is okay to have sex during pregnancy or how long after delivery one should wait. In Shilpa's experience, this was a topic that many women have difficulty asking about in in-person settings

and to her, it indicated a level of comfort with the service. Comfort with the service is also what may have allowed women to approach it with issues of reproductive justice as well. Shilpa shared how there had been cases of women coming to the service with questions about intrauterine devices (IUDs), known as Copper Ts, being placed without their knowledge (also reflected in chat logs). Family planning in India has a long and contested history, with aggressive policies linked to development efforts and the poor being most targeted [113]. These questions to the WhatsApp service signal a need for support in such situations. Shilpa's approach in counselling the mother in these cases indicates how the informational nature of the WhatsApp service allows for triaging up to a certain point:

"I feel like we've at least been able to calm her down by letting her know what it is essentially, without her having to travel maybe 30, 40 minutes... We don't dwell into finding out whether consent was taken... You still want to give them information without triggering them and not having to create a mess out of things without fully understanding the situation."

5 DISCUSSION

Our findings described how flows of capital and labor and the struggles of families towards getting and providing good care converge in a digital health intervention for MCH. In unsettling care, we attend to its different meanings and challenges among the NGO, health workers, and families. We find that while tools and information for *individual* behavior change have a role in strengthening health systems, there is also much relational and navigational work that goes into addressing the *structural* power dynamics that paid and unpaid care workers face in inequitable health systems. Below, we discuss how this understanding of the intervention can inform conversations on futures of care work by reframing the sustainability, design, and impact of similar scaled digital health interventions.

5.1 From Sustaining Technology to Sustaining Worker Wellbeing

Few health interventions in the Global South have scaled despite the stated promise and proliferation of localized information and technology design. There has been a significant amount of research on what makes for appropriate design at the pilot stage, but less studied is how the impact of interventions is sustained in the wild, among a greater diversity of workers, working conditions, and workflows [24]. Attending to gendered care work in the implementation of the MCH program in our study offers a people-centered perspective on how exactly interventions add value.

The MCH program seeks to add value within a system where there is a shortage of workers and capacity to provide counseling. Through acts like asking after nurses' wellbeing and taking them to lunch, nurses are given greater respect and recognition of their broader lives and the value they provide through their care. Through coordinating performances, such as handing over masks to administration, the value of nurses' participation in the training program, as well as a sense of pride, are fomented. Thus, despite busy schedules and intermittent availability of nurses (especially during peaks of the COVID-19 pandemic), the implementation team

was able to ensure relatively more trainings were conducted. While we did not speak to nurses directly, it is difficult to separate the value of this relationship-building from the value of the trainings or educational materials provided to nurses. The monitoring work that the implementation team conducts then acts as a way to understand whether nurses are still motivated and available to conduct the trainings. The necessity of such relationship-building and follow-up to make an intervention work seems obvious when we contrast with the very real impacts of working conditions on labor flows more broadly. MSEs chose the flexibility of technology-mediated care work and improved organizational context over traditional nursing in service of their own wellbeing and familial constraints. Finding alternatives may not be an option for everyone though—barriers such as language skills or technical comfort may make it difficult to transition to other jobs. The rise of alternative options emphasizes the importance of improving working conditions for traditional nursing work. This phenomenon has also been seen in many other contexts. For example, health workers work with NGOs because of better pay or even just more consistent pay compared to government employers [79], bringing into question if the value is from interventions that the NGO supports, or improvements in working conditions. In a context where the politics of care are such that technological fixes are often preferred over investment in human resources [20], it becomes essential to acknowledge the role of not just well-designed technology, but also social support and working conditions in making interventions work at all. This requires asking not just how we can sustain technology, but also how we can sustain the care work that technology is amplifying [105].

There are a few implications for research and practice around health interventions at scale, particularly in the NGO sector. Prior work looking at women's role in community networks [13], or at beauty work in the gig economy [86], similarly demonstrates how the existence and maintenance of technological infrastructures, whether communal or capitalistic, is dependent on aligning in some ways with women's work and motivations. In the public health domain, however, there is a particular dynamic where interventions are supported by private actors such as NGOs and the goal is to integrate and eventually handover to public health actors such as state governments. Our findings, then, bring up the question of how such integration into public health systems could pan out, especially when working with health workers at the bottom of healthcare hierarchies, who are often mandated to use technology by the state regardless of its appropriateness [32, 100]. That is, if the goal is to handover implementation to government bodies and establish standards of care, as many NGOs aim to do, how might the work of maintaining not just material aspects of an intervention but also the social relations be centered? Perhaps more realistically is the question of whether they will continue to be centered at all—if health interventions centered on workers are folded back into existing regimes of care that undervalue women care workers, it may not be guaranteed that they will function in the same way. There is the question of what visibilizing the social relations required for efficacy of interventions looks like in practice. Studies of the relationship-building work of NGOs discuss how NGOs may need to reframe political options for state partners [3], and framing improved working conditions as part of theories of change might be a way to reinforce their importance in future implementation.

Prior work on codes of conduct for NGOs also suggest directly advocating for increased numbers and capacities of workers [79]. Finally, if we reframe to sustaining care workers' wellbeing over sustaining interventions, we might also think about designing for communities of practice that at least support uptake of open source interventions where capacity *is* available. For example, the MCH program's aims of having some nurses be champions of the sessions within their hospital contributes to bottom-up efforts to offer sessions, rather than relying solely on top-down implementation.

5.2 From Designing Agents to Designing Infrastructures

Another dimension of unsettling care is to consider how the WhatsApp service did not simply elicit trust through an interactive text-based persona. More so, it was an infrastructure that was embedded within a fragmented health system, which heavily shaped how families approached the WhatsApp service in the first place. For example, based on the medical team's experience, families might see the service as a question-answer system, but they might also see it as more of a helpline, depending on their experience at the hospital and how they understand the relationship between the service and the hospital. Additionally, it seemed that if the service consistently followed up with families or took more responsibility to explain information (experiences that may have been lacking in in-person care), this may have cemented the service as reliable and safe.

Prior work on conversational agents such as chatbots has largely looked at factors related to interacting with the bot itself, such as how anthropomorphism, response time, tone, and self-disclosure shape perceptions of the chatbot (e.g., [34, 35, 43, 50, 51, 56]). Similarly, work on localization of health information focuses on how it can be presented or visualized in ways that are relatable to local communities [99, 107]. Increasingly, studies show that characteristics such as gender or trust in a system are not necessarily inherent to the design of the system itself but rather rooted in the historical and cultural context that users are in [29, 37, 93]. Our findings show that by looking at the situatedness of the WhatsApp service within the health system, it may be generative to view such systems not just as agents, but as infrastructures. This becomes especially important in light of how the design of novel technologies for care often overlooks the messy, situatedness of care [31, 40]. This shift in thinking about agents prompts questions about what *produces* relationships with the service over time, such as where it was introduced, what it does in comparison to other services, users' relationships with those other services, and if/where humans are in the loop. Aligned with prior work on human infrastructures in technology and health interventions [45, 60, 88], this framing also necessarily brings attention to the human labor required to present an agent in a particular way—in our case the work of the MSEs in constructing response time, building rapport, or managing expectations.

This shift from agents to infrastructure has a few implications for the design of similar information services. One consideration is how to position the service within health systems. For example, if families perceived the service to be related to the hospital they were visiting, that seemed to greatly affect the perceived scope of the

service, regardless of what, say, posters or the automated messages indicated. Thus, users' relationship to other, related institutions is important to consider in the introduction of services, particularly for the increasingly sensitive use cases that conversational agents are being proposed for, such as sexual health [85] or addressing the aftermath of sexual violence [54]. Another consideration is the reframing of the concept of "scope" for a conversational agent. When building digital care infrastructures for vulnerable populations who may turn to them for "unexpected" concerns, prior work has noted it is important to explain the scope of the intervention upfront [115]. However, despite the WhatsApp service having multiple channels to explain scope (e.g., messages, posters, trainers), there were still a wider range of concerns that users turned to the service for. Thus, it is especially important to have meaningful and trauma-informed responses to the inevitable questions that will arise, as in the case of emergency scenarios or a mother asking for support in addressing diet within the family. Principles of trauma-informed computing and design recommendations for equitable mental health technologies may be helpful here [18, 75]. In the case of conversational agents, principles such as trust, safety, or intersectionality could be formalized in many ways, such as in training of question answering teams, automation of messages (including those communicating wait times), and construction of responses. Finally, if systems exist within a larger healthcare system, another consideration is how to connect people to other existing services that might meet their needs, particularly when there is less awareness of them, as in the case of local helplines for navigational support. However, given the context that digital health interventions operate in, we caution that there will still likely be power dynamics to contend with. In the case of MomConnect, the system accepts and passes on feedback to hospitals, but other work has demonstrated that this only adds to existing accountability channels [62], creating conditions for bureaucratic compliance rather than enabling health workers to improve care [66].

5.3 From Patient Literacy to Patient Rights

Our findings also unsettle the ways that the WhatsApp service was intended to care for families. The service did not just support individual behavior change within the home, it also addressed questions about how treatments, hospitals, finances, and other aspects of care function, in order to support navigation of these opaque processes and structures. Amidst calls to go beyond health literacy in women's health [4, 5, 46], this allows us to reframe possible roles of information services in inequitable health systems from literacy to rights.

In HCI, research in health has often drawn on the idea of patient empowerment, which makes inroads into the concept of rights. Broadly defined as increased patient participation in decisions that affect their health [21, 67], a focus on patient empowerment helps shift away from paternalistic relationships between care workers and care recipients. This approach has informed channels for patient education, peer support and knowledge exchange [72, 116], greater engagement in treatment [58], and advances in personal health tracking and information management [33, 42]. In Global South contexts, there has been additional nuance. For example, information channels might be designed to help care workers and

care recipients, sometimes from very different socioeconomic backgrounds, better understand each others' goals and realities [30]. More information may not be empowering at all, with patients preferring to defer to the physician's expertise [11].

Developing this space further, the navigational and sensemaking questions sent to the WhatsApp service point to patient rights as another aspect of patient empowerment. Specifically, our findings point to moments where care is about to or has already broken down, and where an understanding of what patients deserve and how they can cope might be of support. Patient rights in the Indian context have been defined as not just having a say in one's treatment, but also respectful treatment, access to records, confidentiality, appropriate updates on diagnoses and treatment, and choice and consent [25]. Considering information needs in this space may be particularly relevant to populations most marginalized by the health system, who may experience greater levels of mistreatment and have lower levels of trust in health services. Information needs related to patient rights may also be another avenue to engage with gender relations beyond the home, which are often overlooked with the focus on behavior change. Our findings demonstrated how class and gender norms mediate men's involvement in caregiving activities beyond the home, such as coordinating and paying for care, which can require navigational support. Meanwhile, issues of consent and choice are especially sensitive in the realm of women's reproductive health. This potential for information is especially important to highlight in light of critiques that vertical health initiatives have come to equate women's empowerment with maternal and child health and women's ability to become better mothers, without recognizing issues such as bodily autonomy, reproductive justice, and mistreatment from healthcare workers [96]. Thinking about how information can engage with patient rights can be another foray into contributing to health equity agendas that focus on the structural and not just individual [71]

We found that information could be oriented towards patient rights in a few ways. One is that health information could reorient care-seeking towards greater awareness of what healthcare providers should be offering. For example, one father already knew the importance of vaccines, but after receiving WhatsApp messages detailing and recording the vaccine schedule, felt he could now make sure his newborn received the appropriate vaccines even if healthcare workers did not. So the impact was not just "increasing demand" for healthcare as many information dissemination interventions seek to do with ANC appointments, vaccines, or institutional delivery [78]. Rather, this information offered detail that can be used to support agency and decision-making when seeking care. Another way the WhatsApp service supported families was by protecting their time and resources. For example, MSEs responded to cases of families being asked for payment when they should not have been, ensuring that families knew this was not required of them. By providing the ability to ask questions at any time and (sometimes) get a response quickly, the WhatsApp service could offer a trusted and authoritative source that could at least ensure awareness of rights, if not intervene in the interaction. Finally, we also saw that information on what to expect from medical interventions or courses of treatment could be a (limited) way to cope with and way-find through highly stressful and unjust scenarios such as in the case of emergency deliveries or IUD placements. In

these cases, information was a powerful form of emotional and navigational support, which prior work has shown is crucial to wellbeing [27, 28]. Further understanding and designing for the role of information in patient rights could be a fruitful area for future work.

6 CONCLUSION

In this paper, we presented an in-depth qualitative study of a large-scale MCH intervention in India that supports in-hospital patient education and a WhatsApp-based information service. By locating the politics of gendered care work in multiple sites of implementation and use, we unsettle neat theories of change and intended use. We uncover how the revaluation of care work, stitching together of fragmented infrastructure, and diverse appropriations of the service are key to making sense of how digital health interventions are situated in inequitable health systems. Drawing on these findings, we described three shifts in thinking about large-scale, public-facing digital health services: 1) centering the sustainability of more decent work rather than sustainability of technologies, 2) going beyond information services as agents to center their infrastructural qualities and the labor involved in creating a cohesive service, and 3) the role of information in not just literacy or learning but also patient rights.

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