

Careful Devices

A design manifesto for humane domestic healthcare technology

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ABSTRACT

This short paper offers a rationale and manifesto for a design-led research project called *careful devices*—domestic healthcare technologies that seek to bridge the gap between the lived experience of a person and the abstracted medical knowledge of a health practitioner. The rationale places careful devices at the intersection of contemporary trends in self-tracking and health care technology, and explains how and why this intersection is relevant for future interaction design. This is followed by a manifesto that articulates design goals for producing devices linking these trends, creating a space for interaction design research. We end with a discussion of *Ovum*, an example of a careful fertility tracking device.

CCS CONCEPTS

• Human-centered computing • Human computer interaction (HCI) • Interaction devices

KEYWORDS

Health; care; research through design; futures; speculation; interaction

Introduction

Careful Devices is a design-led research project designing humane approaches to bodily self-tracking and in-home healthcare technology. This project looks to reframe contemporary understandings of that technology as being part of a *practice* of health that centers on personal experience and judgement rather than medicalized definitions of sickness or disease. We believe that design research offers a set of techniques that can join different disciplinary threads to create novel care devices.

This project operates at the intersection of two major trends in technology and health care. The first is growing interest in gathering health data through consumer technologies that offer biosensing, sleep tracking, fertility tracking and more. A disparate group of people participate in this trend: some are motivated by simple curiosity, some seek a sense of control and optimization, and some need to manage chronic conditions [10,14]. The second is a shift towards at-home medical practices such as telemedicine and eHealth. In these, the site of medical care moves into private space, and gathering health data is initiated and analyzed by doctors while being managed and possibly interpreted by patients [1].



Figure 1: Foodmarble's Aire (left) measures qualities of digestion and informs a user of any potential digestive issues. AliveCor's Kardia Mobile is an EKG monitor for when you need to know your heart's status on the go.

Both trends are rooted in the possibilities that come with cheaper and more widely available sensor technology. We already see some convergence in how domestic healthcare technologies are designed. Current designs are limited in terms of their variety of *use* (their ability to meet the many different types of users/patients), in their variety of *aesthetics* (either gray plastic and steel or Apple's sleek take on devices), and in their ability to let data *travel* from the private sphere to the medical profession regardless of where or how it was initially collected (among private self-tracking technologies, the data is seldom recognized by doctors [12]; in medical devices the data is seldom interpretable by patients). How these technologies and the infrastructures that accompany them are designed going forward will have an extensive impact on larger healthcare systems, and could fundamentally reframe how we understand our bodies and their health.

This confluence of health care concerns, smart technologies, and infrastructural investment calls for a careful and critical exploration in order to shed light on the many ways they can impact everyday life. This topic is not a new one in HCI—the intersection of technological advancement and health care techniques has been approached from many different perspectives across the broader subject of health informatics, specifically in participatory and critical approaches to home health-care [6,17,18,24] and self-monitoring [4,23]. Our approach builds from these ideas, emphasizing the role of design in integrating broader contexts and personal idiosyncrasies, and has led us to focus on the capacities of design to address two challenges in the already burgeoning field of domestic health tracking and reporting.

We see a challenge *in use* when the person whose data is being measured is excluded at both the data gathering stage, when their body is simply *a* body, as well as when interpreting their data, where specific knowledge is needed to understand *what is happening* there. Medical professionals are trained to assess the condition of a patient based on a combination of experience and training to recognize how illnesses present through both clinical tests and bodily indicators—producing what Foucault called the *medical gaze* [7]. When medical practices enter private sphere, personal data is more likely to be understood through a correspondingly narrow perspective [2]. In keeping with this reductive tendency, as health and care become part of a growing personal relationship with domestic technology, a fear of overdiagnosis is not unreasonable [8]. Just as Google has challenged the GP's monopoly on diagnosing, so has self-tracking devices—like Google, the most common outcome is still faulty self-diagnosis or hypochondria.

One challenge *with data* is how contemporary data practices that come with smart technologies and at-home medical devices [13] often provide context-free information about an activity, and

act as though revealing that data to a user empowers them to make stronger or more knowledgeable decisions about a condition than they could before. Simply exposing data is not the same as helping people to understand and interpret that data, and places responsibility on a person to make an expert decision that they may feel uncomfortable doing on their own [16,22]. At the same time, having people using the lived experience of their own bodies to interpret their data seems like an obvious advantage. The technologies—and the data they produce—are not held accountable for the quality of their data, which leaves the people using them without real grounds to respond.

The first challenge might be understood as a problem of acknowledging situatedness, while the second as a problem of response-ability—having the capacity to respond to health concerns [15]. Our goal is to create humane devices that reimagine the relationship between domestic life, medical care, and health data. Avoiding clear feedback such as numeric values, graphs, and algorithmic responses to whether the results are “good” or “bad” and instead work with slow or in other ways ambiguous feedback [9,11,19,20] could support a different conception around in-home health care based on a person’s knowledge of their health as a practice to be maintained instead of a condition to be diagnosed. Aesthetic perspectives from design research offer insights toward producing care devices that "encourage close, personal engagement with systems" by leveraging ambiguity of relationship to foster interpretation with the aim of helping users understand themselves in different ways [3,9,21].

We acknowledge that there are dangers in designing this kind of technology. Our intention is not to force people into being their own doctor or create a false sense of security. Instead, our goal is to produce devices that are reflective—operating alongside existing medical practice, and creating opportunities to share information that might otherwise be unavailable. To both outline and make explicit our commitments in producing *careful devices*, we offer a manifesto integrating our proposed design-led approach with current domestic health care research.

A design manifesto for *careful devices*

- Careful devices should be interpretive first, and analytical second. Meaning should come from a combination of experience and material interaction.
- Careful devices should produce data that represent the body in thoughtful, considered ways that do not reduce to a set of medicalized parameters.
- Careful devices should be situated in sociocultural and aesthetic contexts of domesticity and private personal life.
- Careful devices should produce data that acts as a discussant in creating new doctor/patient relationships around health and care.
- Careful devices should foster new means of response-ability within its area of responsibility.
- Careful devices should prompt new ways of reflecting on and understanding the self.

Collaborating with users, potential users, and medical practitioners, this research project will use design-based HCI research to co-speculate how we can create careful devices. Our aim in this project is to use the manifesto to design across three inflection points: creating variation in use, variation in aesthetics, and variation in the response-ability of data. To illustrate how this manifesto can inform the design of humane domestic health technologies, we offer *Ovum*, a careful fertility tracker.

A design case: *Ovum*

Ovum is a careful ovulation-tracking device for couples seeking to conceive. Detecting and monitoring fertility in the home is complex, knowledge intensive and highly personal [5], which warrants carefulness when designing tracking devices. There are various ways of tracking ovulation: charting the menstrual cycle, testing for the luteinizing hormone in urine, measuring sharp increases in basal body temperature, and tracking an increase of electrolytes in saliva. Existing fertility tracking devices are available for each of these methods, and include smartphone applications to track the menstrual cycle, thermometers to measure basal body temperature, chemical tests for urine, and microscopes to inspect saliva. These devices are typically designed for an individual and represent clinical instruments, even though fertility tracking and sexual intercourse are not medical procedures and involve mostly two people. Further, urine and temperature tracking use binary representations of the body as either fertile or infertile, black-boxing data interpretation and re-enacting the clinician/patient relationship.



Figure 2: *Ovum* in its packaging (left), and held (right)

Ovum is based on the saliva-tracking method of detecting fertility. We chose to track saliva because it presents the only unmediated form of fertility tracking: as the body approaches ovulation, drying saliva reveals fern-shaped crystals that are no longer present after ovulation has taken place. Through magnification and illumination of a saliva sample, typically using a microscope, this form of tracking allows for a real-time, direct reading and interpretation of the body's fertility.

We designed *Ovum* to be part of a shared private environment. Two people are typically involved in the act of conception—emotionally, relationally, and sensually. It projects a saliva sample on to the wall or ceiling of a bedroom. This approach inverts the act of individually peering into a microscope, making the process visible to more than just the partner who will become pregnant. The projection resembles the moon and requires a dimmed room, creating a shared aesthetic and romantic experience that draws it closer to the intimacy that is meant to follow its use.

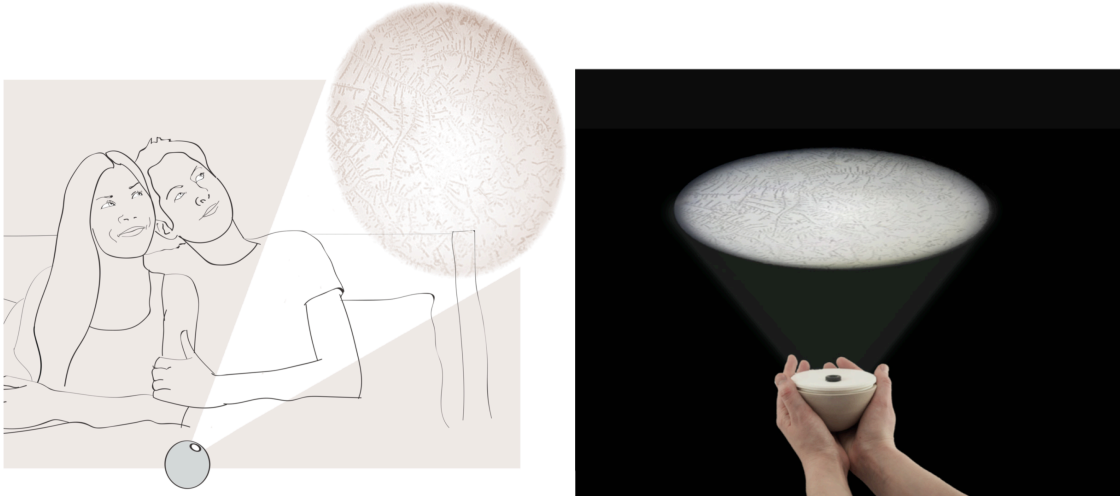


Figure 3: In use, Ovum materializes a physical quality of the body and enables it to be shared.

Ovum is designed as a domestic object instead of a clinical instrument. Commercial saliva self-tracking devices typically have a plastic appearance—lipstick style—containing a lens that magnifies a drop of saliva placed on it as well as a LED to enable inspection. We deliberately abandoned the lipstick form, which is strongly gendered towards female users. Instead, *Ovum*'s shape was designed for use in the bedroom by replacing the typical hard plastic with ceramic, and giving it a cone like shape to resemble the projection it produces.

We see *Ovum* as an example of a Careful Device. Based on the manifesto, reading the saliva sample directly reads the body, and meaning emerges as a natural consequence of the emotional experience from the material interaction. Its form is designed to take into specific consideration the private domestic context where health self-tracking occurs. *Ovum* does not analyze and translating bodily data itself. Instead, it creates data that is interpretable, and can be part of discussions with a doctor. The magnified saliva, with its poetic and romantic appearance invites for ways of seeing the body beyond clinical representation, and acknowledges the interpretive potential of the body's inner workings.

Conclusion

We believe that critical interaction design in the context of home health devices can strike a balance between medical knowledge and the lived experience of health. Design research can produce humane devices that support reflection about experiences of the self and the body. We believe that this can offer a different perspective on the self than would be possible in a purely clinical setting. This vantage opens the frame of health to include more perspectives than would otherwise be taken into account, including those who have been excluded from medical trajectories, taking insights from knowledge that medicine is uncertain about, and providing a site for people to actively participate in issues of their own care.

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