The challenge

Intrapartum hypoxia (often equated with birth asphyxia) is estimated to account for about two million perinatal deaths annually including intrapartum stillbirths and early neonatal deaths, **with 98-99% of the burden in low-and middle income countries.**

Continuous electronic FHR monitoring is the **“gold standard”** for identifying fetuses at high risk in the developed world, but this method is neither available nor feasible in resource limited settings.

Intermittent FHR monitoring with a Pinnard is the alternative and most frequent method in these settings, but evidence concerning reliability and/or efficacy is almost non-existent. In addition, Pinnards are reported to be difficult to use, to be **time-consuming and painful for the mother.**

The goal

- To detect the fetus at risk during labor which is a key and critical catalyst for timely interventions to reduce deaths, improve child health.
- To provide a fetal heart rate monitoring device that is **easy to use, and painless for the patient with less burden on the healthcare provider (midwives, doctors).**

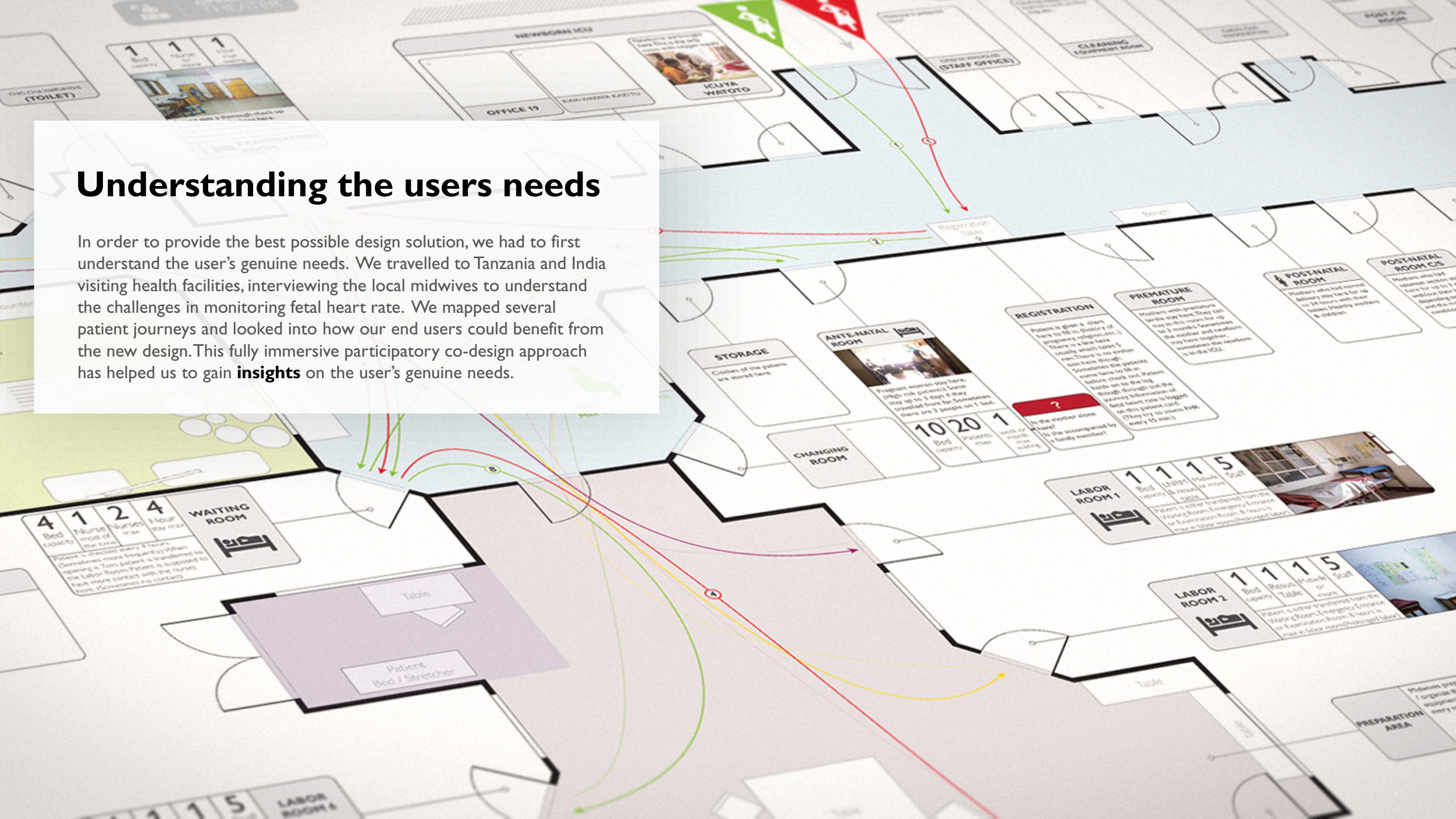
Overview of the user-centered design process

Industrial Design

User Interface

Understanding the users needs

In order to provide the best possible design solution, we had to first understand the user's genuine needs. We travelled to Tanzania and India visiting health facilities, interviewing the local midwives to understand the challenges in monitoring fetal heart rate. We mapped several patient journeys and looked into how our end users could benefit from the new design. This fully immersive participatory co-design approach has helped us to gain **insights** on the user's genuine needs.



Exploring design opportunities

These insights were translated into **design opportunities** where we explored comfort, form language and user Interfaces that could provide a solution both to the patients and to the healthcare provider's needs. Different concepts were created through sketching and mock-up making as well as creating a working prototype.

Evaluating concepts in the field

We had to be sure that the new design would fit in to healthcare provider's needs and that it is comfortable to use for the soon to be mothers. We had several field-trips for design evaluations through mock-ups and a working prototypes. We had brainstorming and workshops sessions with healthcare providers; midwives, doctors and nurses coming from different levels of experience in the field.

Our learnings

Increased speed

Current fetal heart rate monitors in the market take approximately 1 to 2 minutes to detect a good fetal heart rate signal and often are not reliable. This is mainly because the sensors on them generally have only 1 crystal to rely on. We implemented a 9 crystal-sensor to the design which dramatically reduces the amount of time needed to detect a good fetal heart rate signal to between **2 to 10 seconds.**

Reduced workload

Current fetal heart rate monitors are designed for quick manual checks whereas Moyo can perform both continuous and intermittent fetal heart rate measurements, and alerts the midwife when abnormal fetal heart rate is detected. Our aim was to reduce workload of the care provider where staff resources are scarce. Training will help implement decision-making and early obstetric responses.

Building confidence

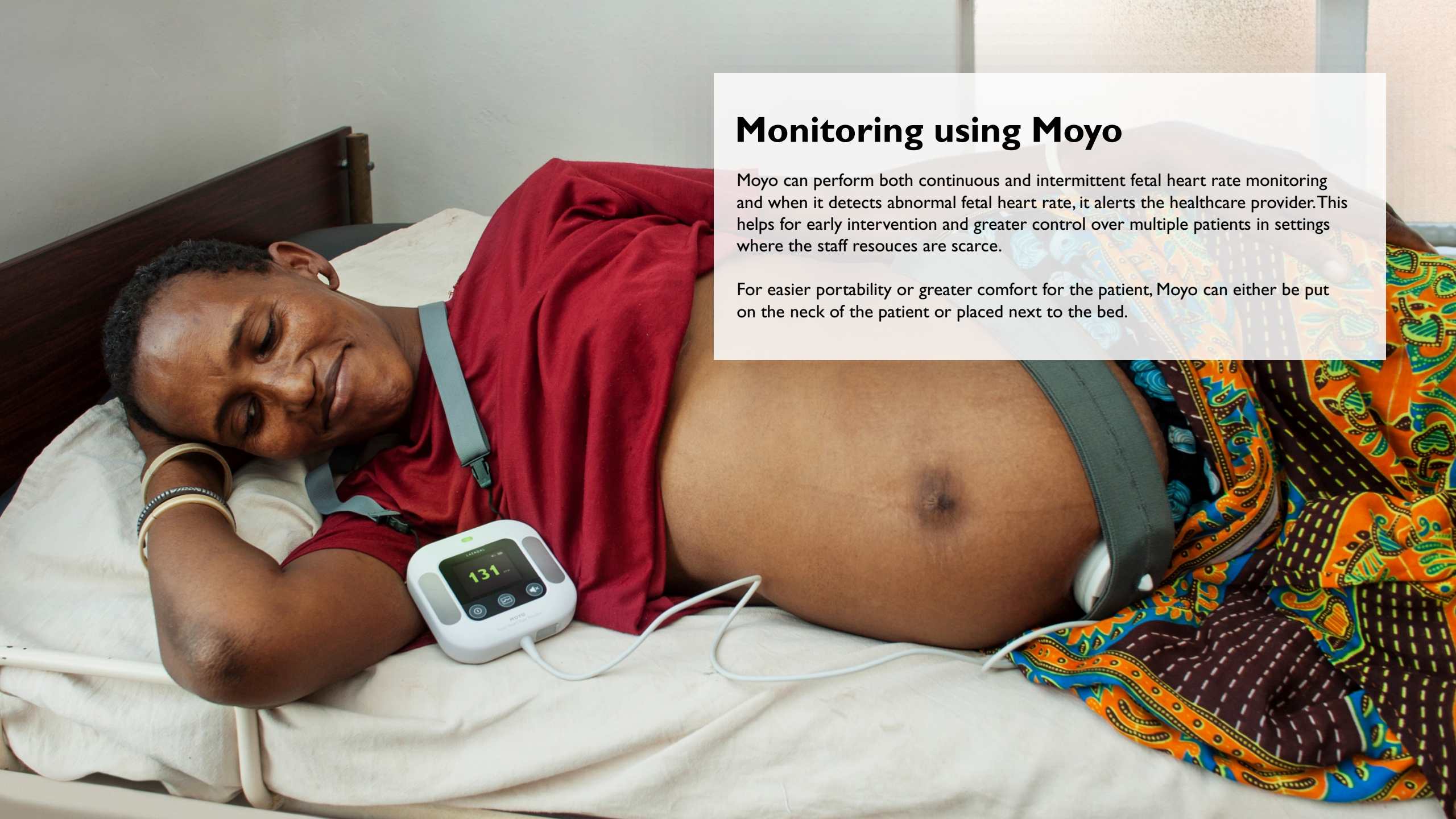
Increased speed in detecting the fetal heart rate, and reduced workload of the midwives helps midwife build confidence and establish pride in their works in saving newborn lives.

The result

Moyo - Fetal Heart Rate Monitor

The main unit and the sensor are connected via one permanent cable. The entire length of the cable is not shown in this image for illustration purposes.

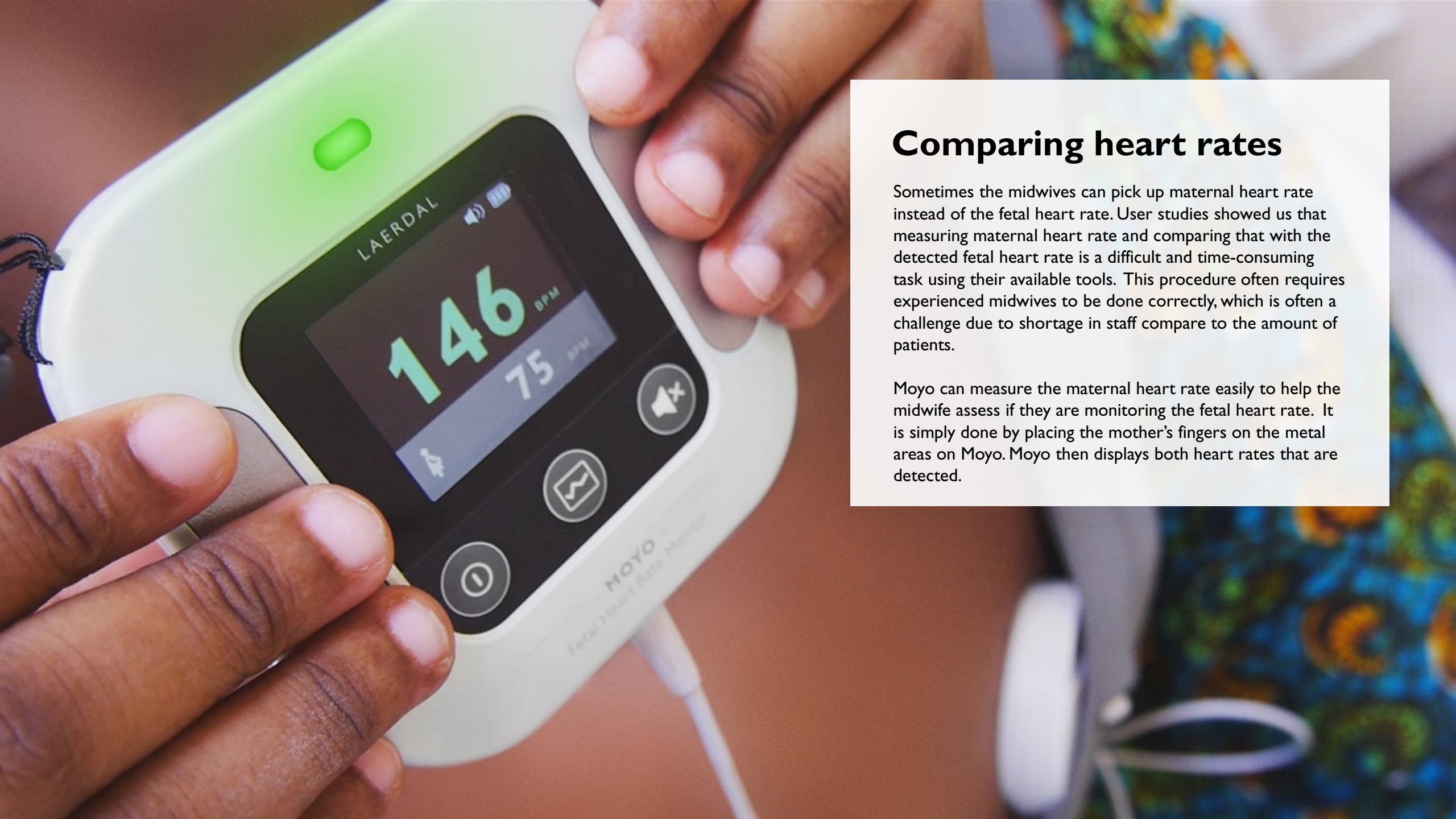

148
MOYO
Fetal Heart Rate Monitor



Monitoring using Moyo

Moyo can perform both continuous and intermittent fetal heart rate monitoring and when it detects abnormal fetal heart rate, it alerts the healthcare provider. This helps for early intervention and greater control over multiple patients in settings where the staff resouces are scarce.

For easier portability or greater comfort for the patient, Moyo can either be put on the neck of the patient or placed next to the bed.



Comparing heart rates

Sometimes the midwives can pick up maternal heart rate instead of the fetal heart rate. User studies showed us that measuring maternal heart rate and comparing that with the detected fetal heart rate is a difficult and time-consuming task using their available tools. This procedure often requires experienced midwives to be done correctly, which is often a challenge due to shortage in staff compare to the amount of patients.

Moyo can measure the maternal heart rate easily to help the midwife assess if they are monitoring the fetal heart rate. It is simply done by placing the mother's fingers on the metal areas on Moyo. Moyo then displays both heart rates that are detected.


139