

anusha narayan
human-centred design engineer

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about

I am a fourth year design engineering student at Imperial College London with a passion for designing data-driven, human-centred solutions for enhancing the health and wellbeing of vulnerable populations, particularly children.

education

Imperial College London
MEng Design Engineering
2020 – 2024

experience

MathWorks
UX Design Intern
July 2022 – September 2022

MathWorks
UX Design Intern
April 2023 – September 2023

skills

R&D skills	technical skills
user research	data science
literature review	machine learning
technical writing	mechanics
human-centred design thinking	electronics
designing for children & families	fea
futures thinking	python
system design	javascript
app design	matlab
	arduino



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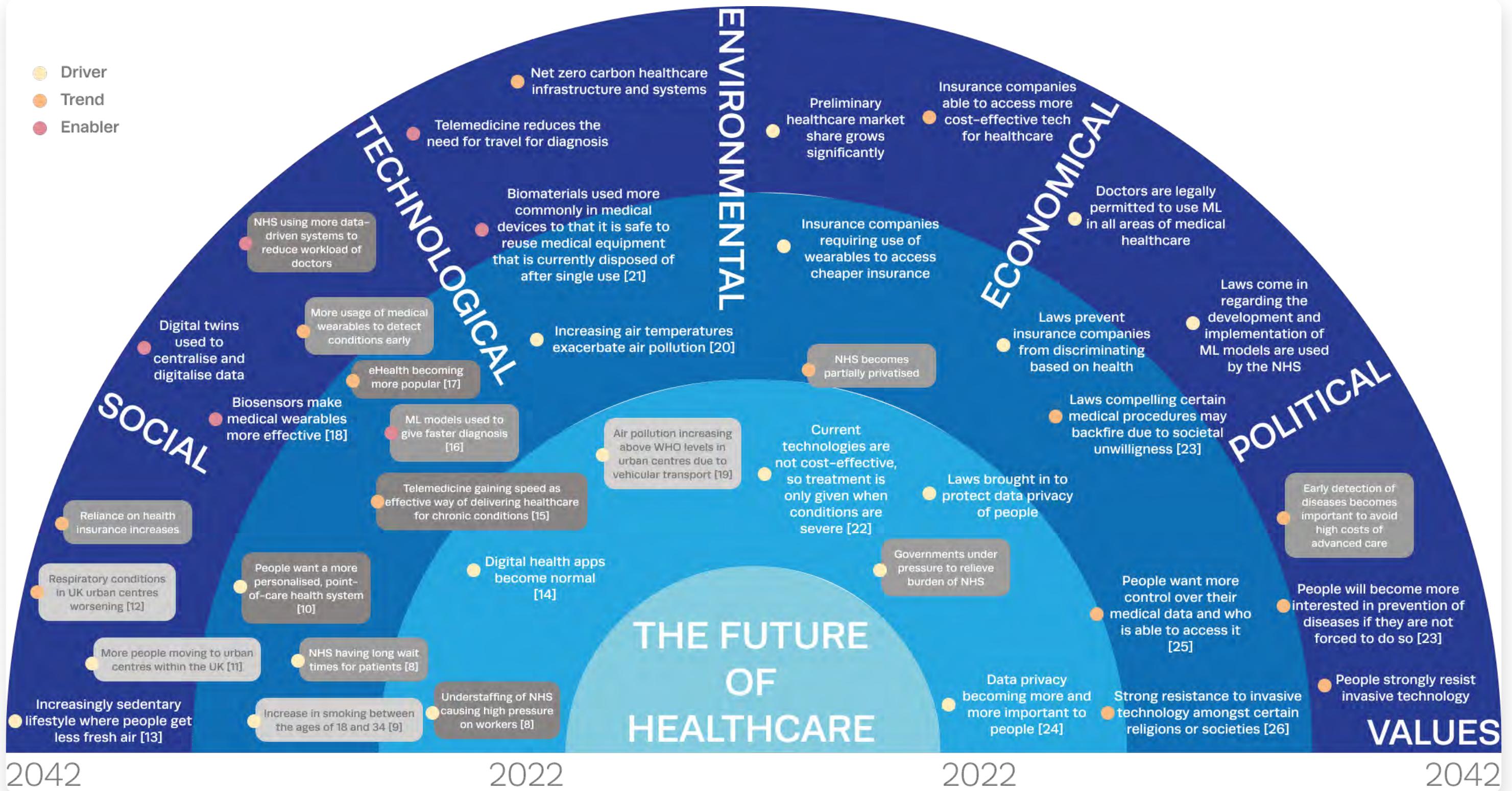


Pulmo

By 2050, 75% of the world's population will live in cities, leading to heavy overcrowding in urban centres. Indoor air quality in the UK is poor, and the increase in vehicular transport will damage outdoor air quality further. The combination of these three factors spell a bleak future for lung health, especially for those in urban centres. It will therefore become increasingly important for respiratory problems to be detected early, so that patients have a greater chance of improvement. Effective containment of lung disease is dependent on an early diagnosis, which is often difficult in healthcare systems worldwide.

future contextual studies

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To envision a future scenario, a STEEPV Wheel was employed. Within the "Healthcare's Future" theme, key drivers, trends, and enablers were pinpointed, including telemedicine growth, personalized point-of-care solutions, preventive models, and data-driven system integration in healthcare, alongside NHS partial privatization.

The diagram illustrates the Pulmo app's features and data analysis process. It shows a central human torso with various monitoring components. On the left, there are three main sections: 'Cheaper Insurance' (with a policy icon), 'Taking Control of Personal Health' (with a person icon), and 'Data Collection' (with a smartphone icon showing a graph). Three circular icons represent different types of diseases: 'Airway Diseases' (person icon), 'Lung Circulation' (oxygen icon), and 'Lung Tissue Diseases' (lung icon). Lines connect these icons to a central hub, which then connects to the monitoring components. The monitoring components include 'Wheeze Detection' (stethoscope icon), 'Oximetry' (pulse icon), 'Lung Imaging' (camera icon), 'Heart Monitoring' (heart icon), 'Validation' (checkmark icon), and 'Chest Expansion' (person icon). Below the torso, a network of nodes represents 'Data Analysis and Interpretation', connected to a doctor icon.

Cheaper Insurance

Health insurance companies are offering lung monitoring devices to their policyholders, in exchange for a cheaper insurance rates.

Taking Control of Personal Health

Because people are interested in monitoring their own lung health (due to the general worsening air quality [4]), this is an attractive offer. They obtain Pulmo from their insurance company, and set up an account on the accompanying app.

Data Collection

Pulmo collects data on the user's lung health (blood oxygen levels, lung capacity etc.) and uses it to provide tips to the user on how best to improve their lung health.

Airway Diseases

Lung Circulation

Lung Tissue Diseases

Wheeze Detection

Oximetry

Lung Imaging

Heart Monitoring

Validation

Chest Expansion

Data Analysis and Interpretation

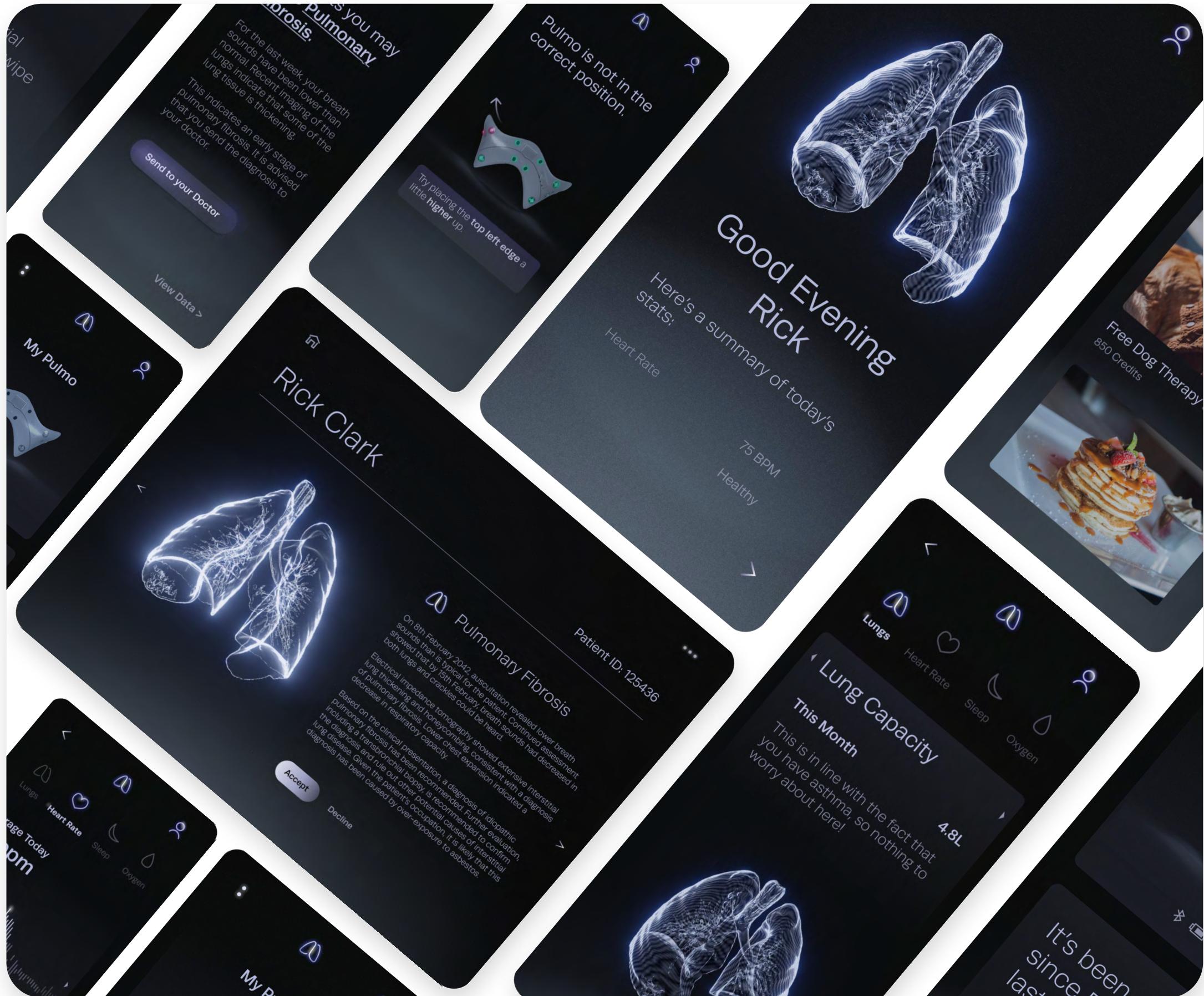
The data collected will be analysed using machine learning algorithms. Any inconsistencies can be detected early and used to suggest potential respiratory conditions.

An alert of the suspected condition will appear on the app. The user can take the diagnosis to their doctors, who can view the data and validate the diagnosis.

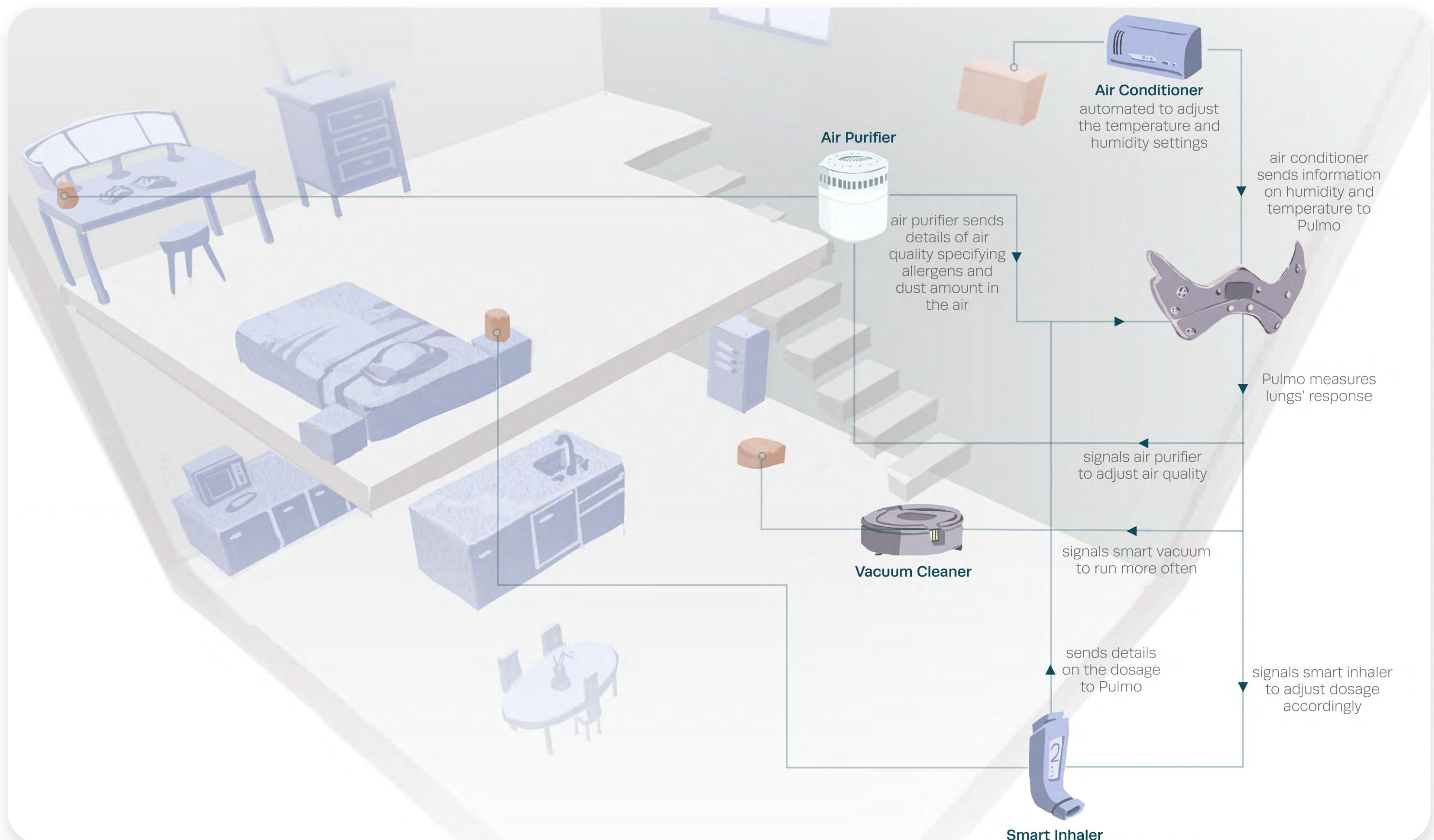
the pulmo app



The trend of personalised healthcare means that users will want autonomy over their own pulmonary health. Giving this data to the user in the form of an app will help them to gain that autonomy. If a problem is detected, a preliminary diagnosis can be sent to a doctor, with the accompanying data, so that they can confirm it.



pulmo and iot



As home IoT systems become progressively more utilised, Pulmo can be integrated in to ensure optimal user lung health.

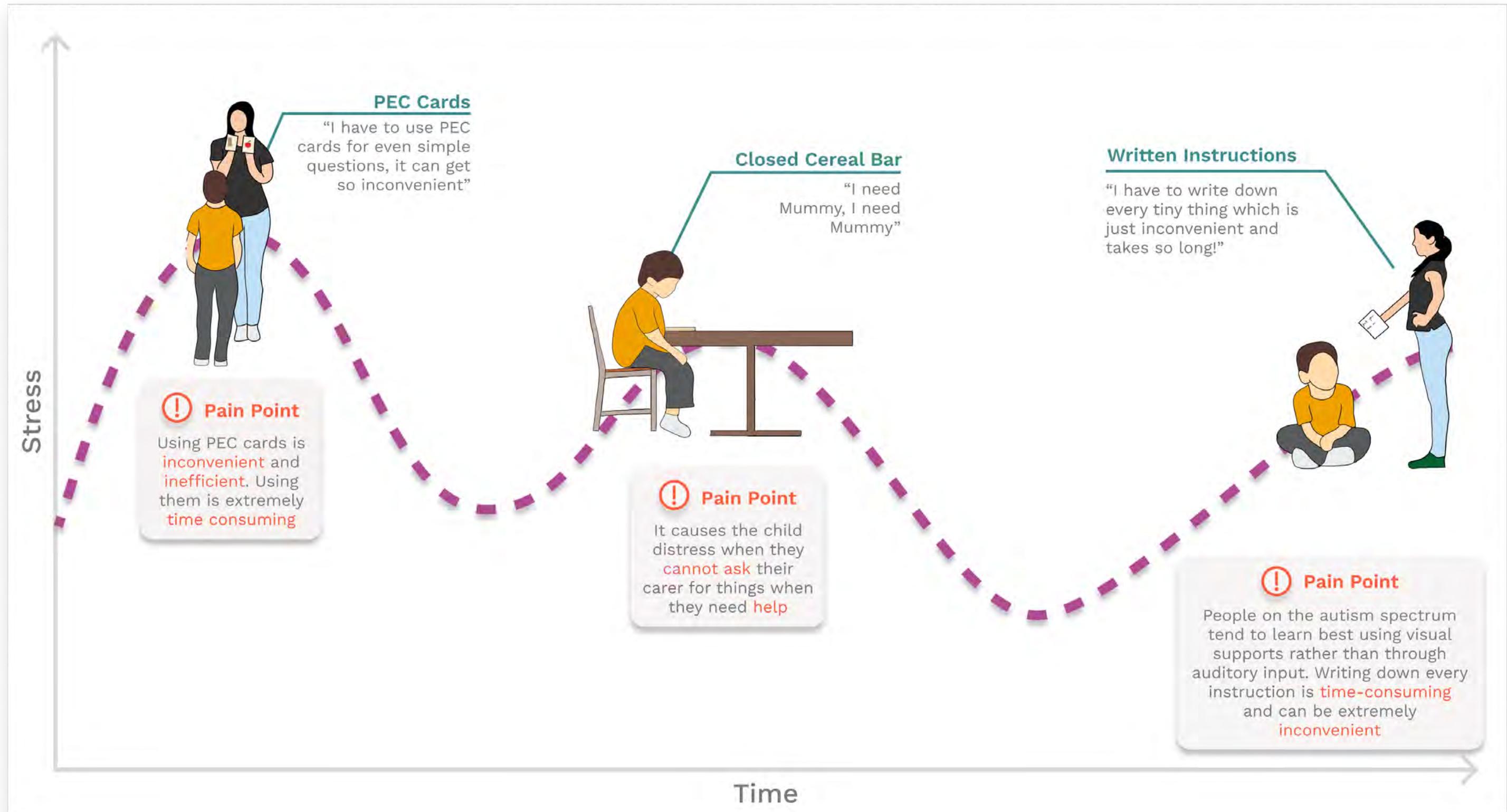




U Me

40% of children who are diagnosed with autistic spectrum disorder are non-verbal. Not being able to communicate their wants and needs is a daily struggle for children with severe autism. This causes frustration, as they struggle to communicate to even the people closest to them, such as parents or carers.

empathy mapping



I carried out an exercise of empathy mapping, to produce a user journey, detailing the stresses that both the child and carer go through on a daily basis. From this, I developed a concept of a two-way communication device, designed to address the pain points identified above.

concept development

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pros
cons



The shape is uniform meaning it could easily be held the wrong way



Easy to distinguish between buttons and instruction lights

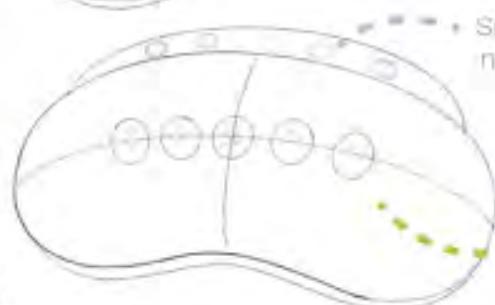


Joystick is harder to use for children with dexterity issues

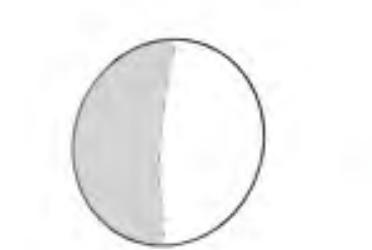
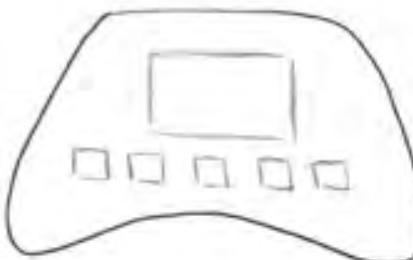
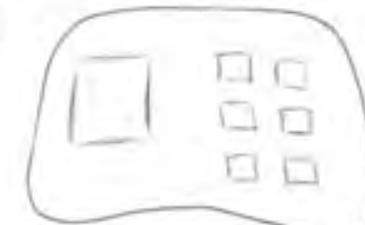
The shape is not uniform meaning it is more intuitive to hold it the correct way



Separation between buttons of carer/child are not as clear



Small buttons - may not be large enough for images
Clearer separation between buttons and instruction lights



product assembly process



The U Me works in conjunction with an accompanying app on the carer's phone. They communicate using Bluetooth. When the child presses a button on the device, they will receive visual and tactile feedback, through an RGB LED, and vibration motors. If the carer sets an instruction on the app, an icon will then show up on the pixel display of the U Me. The device will also vibrate, letting the child know that they have a task to complete.

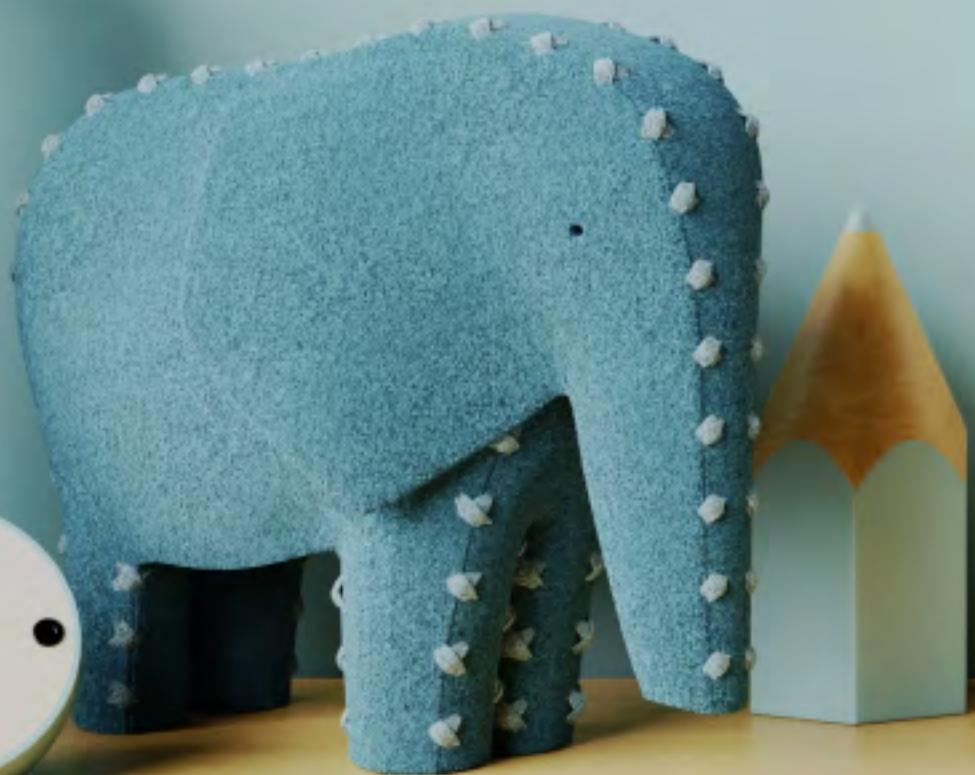


product usage

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U Me



the period product steriliser

500 women and girls around the world live in period poverty – without adequate access to menstrual hygiene. They are forced to resort to unhealthy alternatives that can have severe consequences on their physical and mental health.



ideation



I ideated, using a variety of design techniques such as brainstorming and SCAMPER, to come up with a number of ideas that would fit the brief – to provide women and girls with a long lasting, hygienic supply of period products. I subsequently ranked them based on feasibility, impact and desirability, and decided to develop a form of period product steriliser. This would allow period products to be reused multiple times.



functionality development



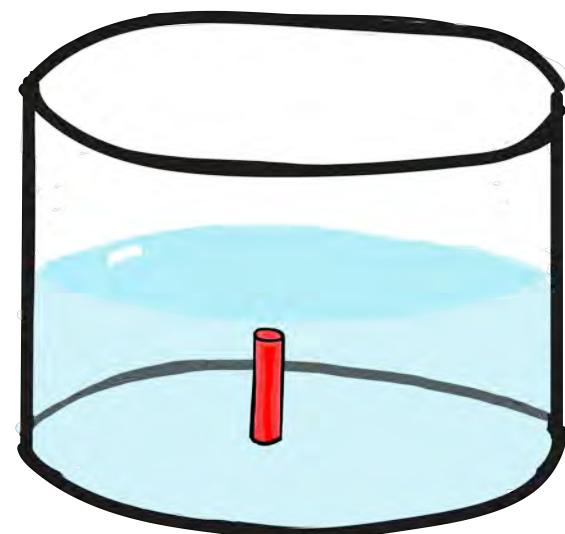
- 1 the problem: some water must remain cold so that the product can be effectively soaked

An insulative material must be chosen for the entire steriliser. An icebox-style system will be in place in the walls of the steriliser. The walls, and subsequently the water will stay cold and allow the period product to soak effectively.



- 3 the problem: some water must remain hot, in order to kill any bacteria

An immersion heater in the water will heat up the water when required, meaning that an electric circuit will be needed. The material of the steriliser must therefore be carefully chosen to be sturdy and impermeable, so that no water can touch the electronics.



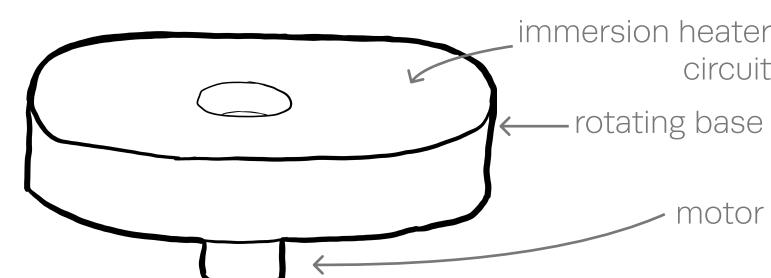
- 2 the problem: water is not readily available so it must stay inside the steriliser

A latch across the top can be opened by the user and the period product dropped in. Water will not splash out, extending the life of the product.



- 4 the problem: rotating the product whilst it is in hot water will kill bacteria more effectively

The container can be put on a rotating base, the base can also hold the electronics for the immersion heater.



how it works



long-lasting

The product must be able to provide a **long-lasting supply** of period products to the user.

The steriliser cleans period products so that they are ready for reuse, making a normal supply last much longer.

hygienic

The product must be **hygienic** and not cause any detriment to the user's health.

The steam that is injected into the steriliser kills any bacteria, meaning that the products that are reused are hygienic and healthy for the user.

discreet

The product must be **discreet** so as to avoid the girls and women being shamed (some cultures consider periods to be unclean).

The steriliser is completely plain from the outside, thus meaning that it will not draw attention to itself, meaning that it is discreet.

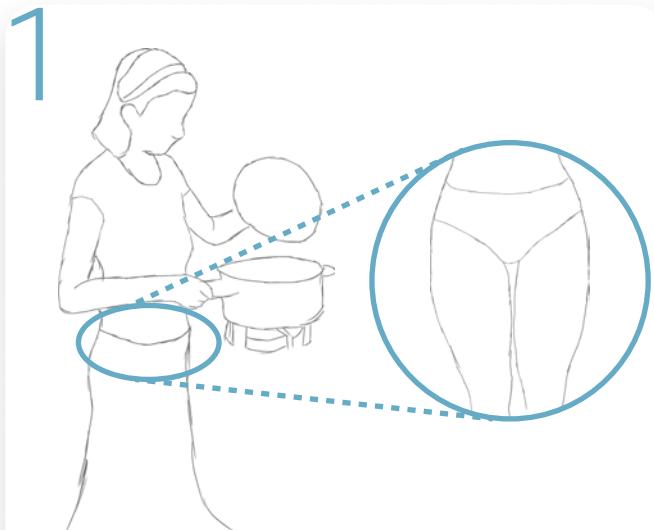
easy to use

The product must be **easy to use** so that girls and women are able to use it alone without requiring external help.

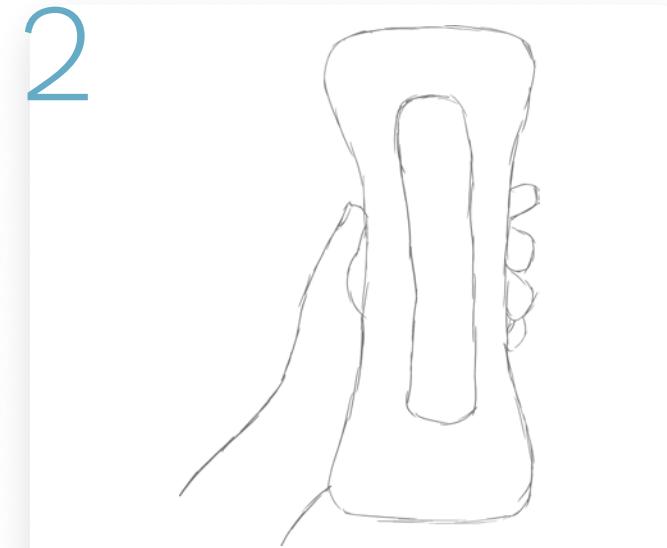
The user simply has to open the top latch to put the period product in, and open the bottom latch to remove it, meaning that they are able to use it on our own.



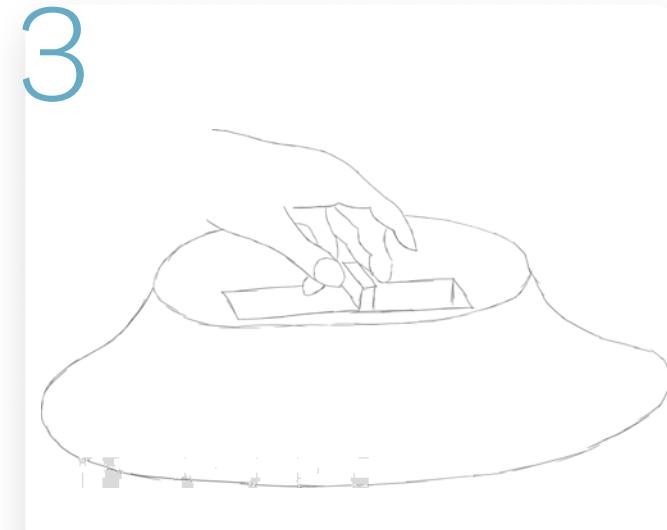
Storyboard



Woman uses the period product
as she does her daily work



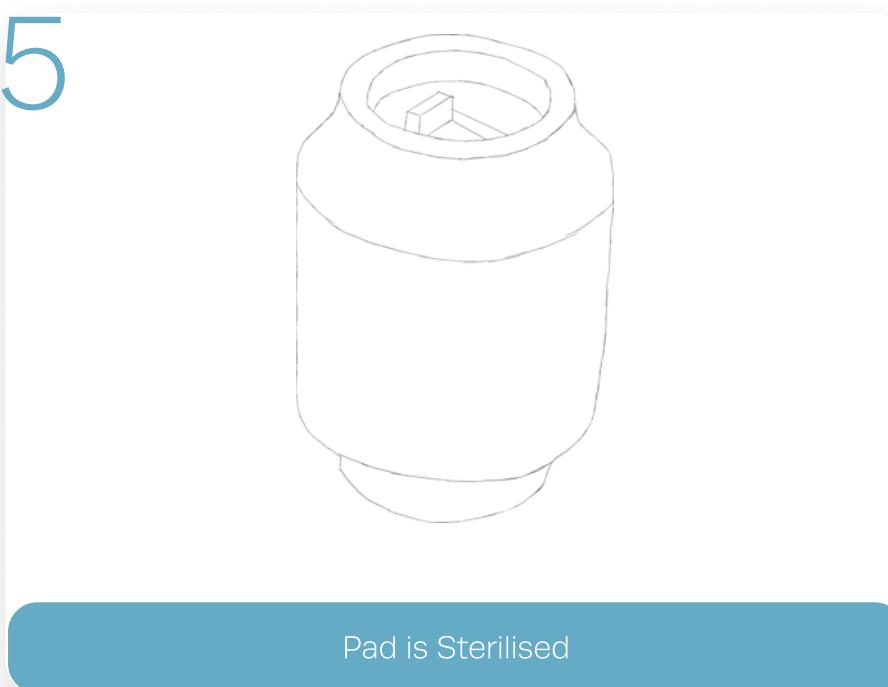
Woman removes the pad



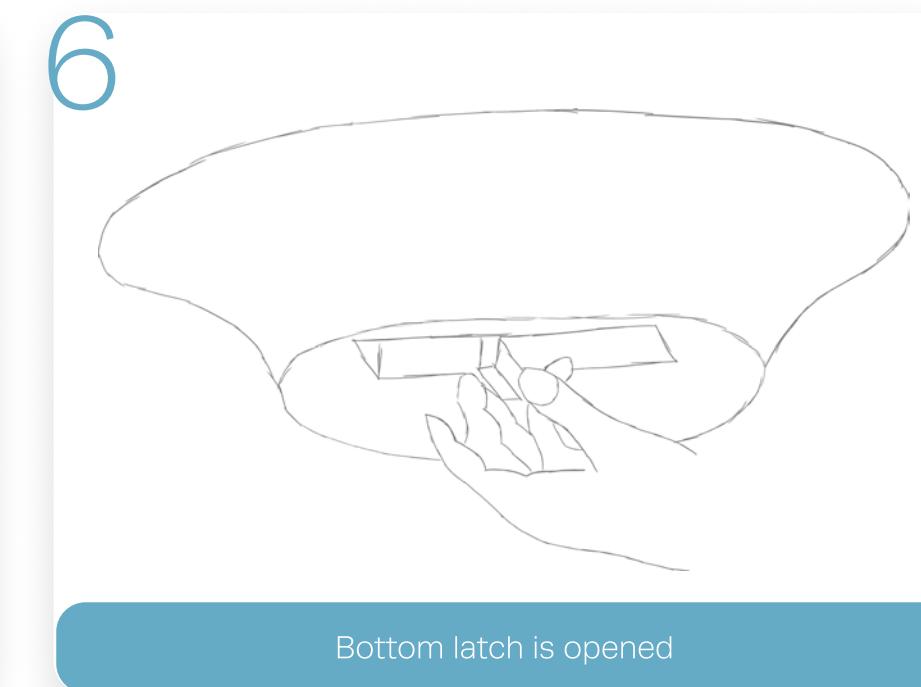
Open top latch



Put pad in



Pad is Sterilised



Bottom latch is opened



Pad is removed

