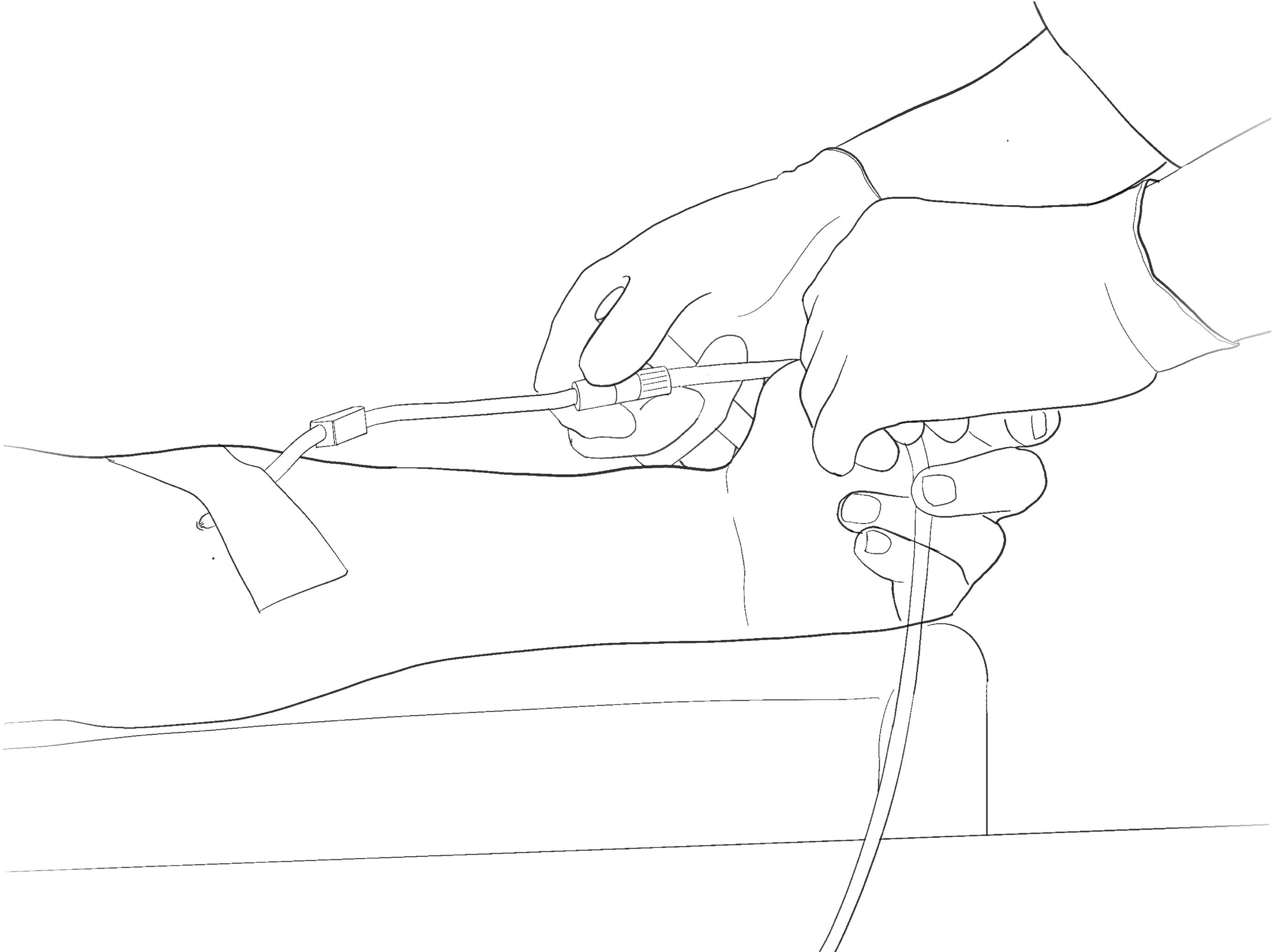
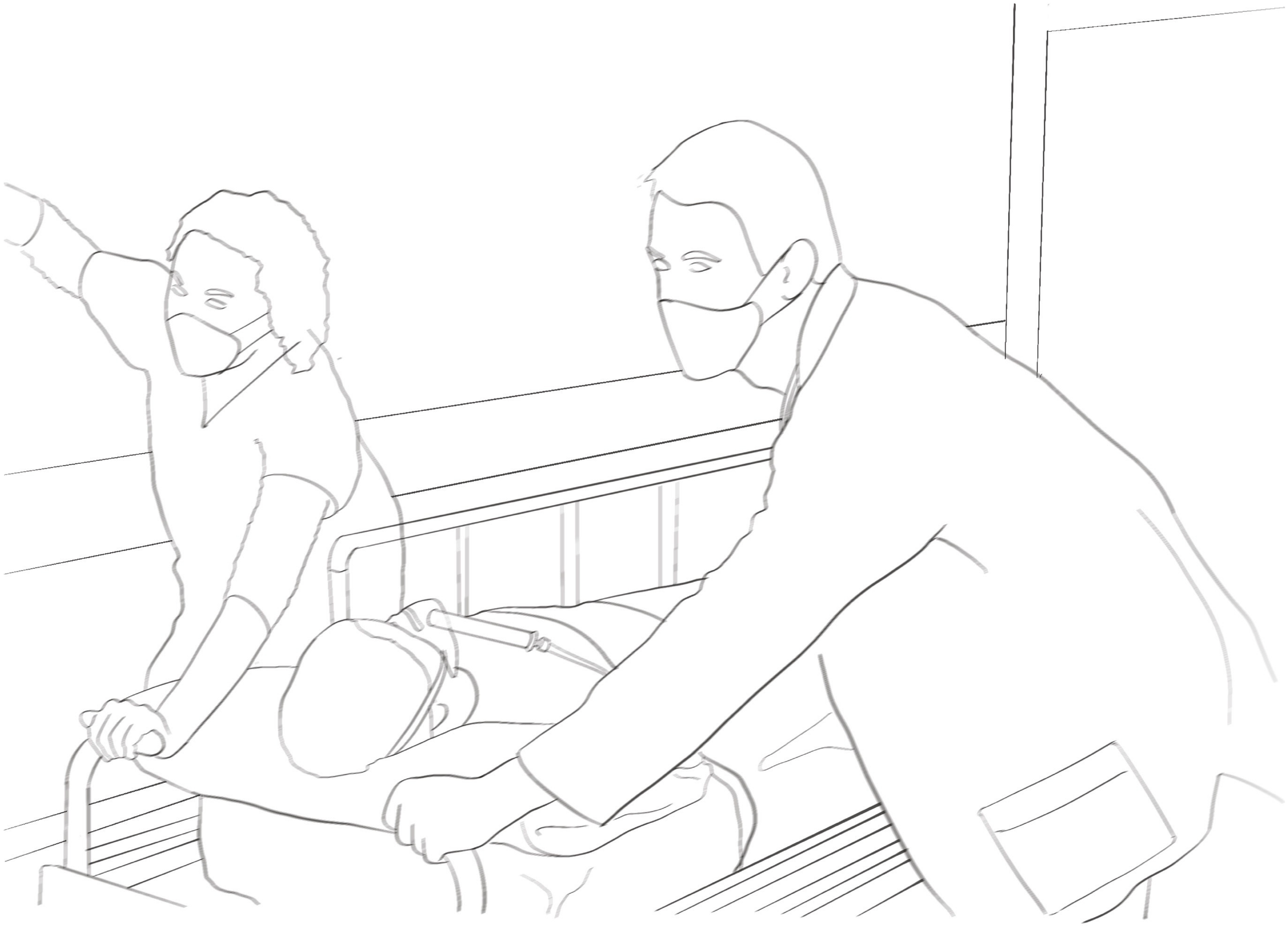
HEMOTEC

Blood Monitoring System

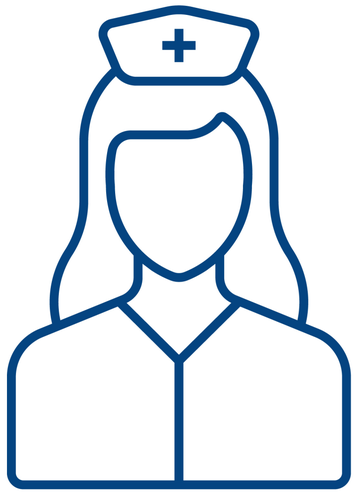
Jack Garanzini
Capstone 2022





Problem identification

Core issues



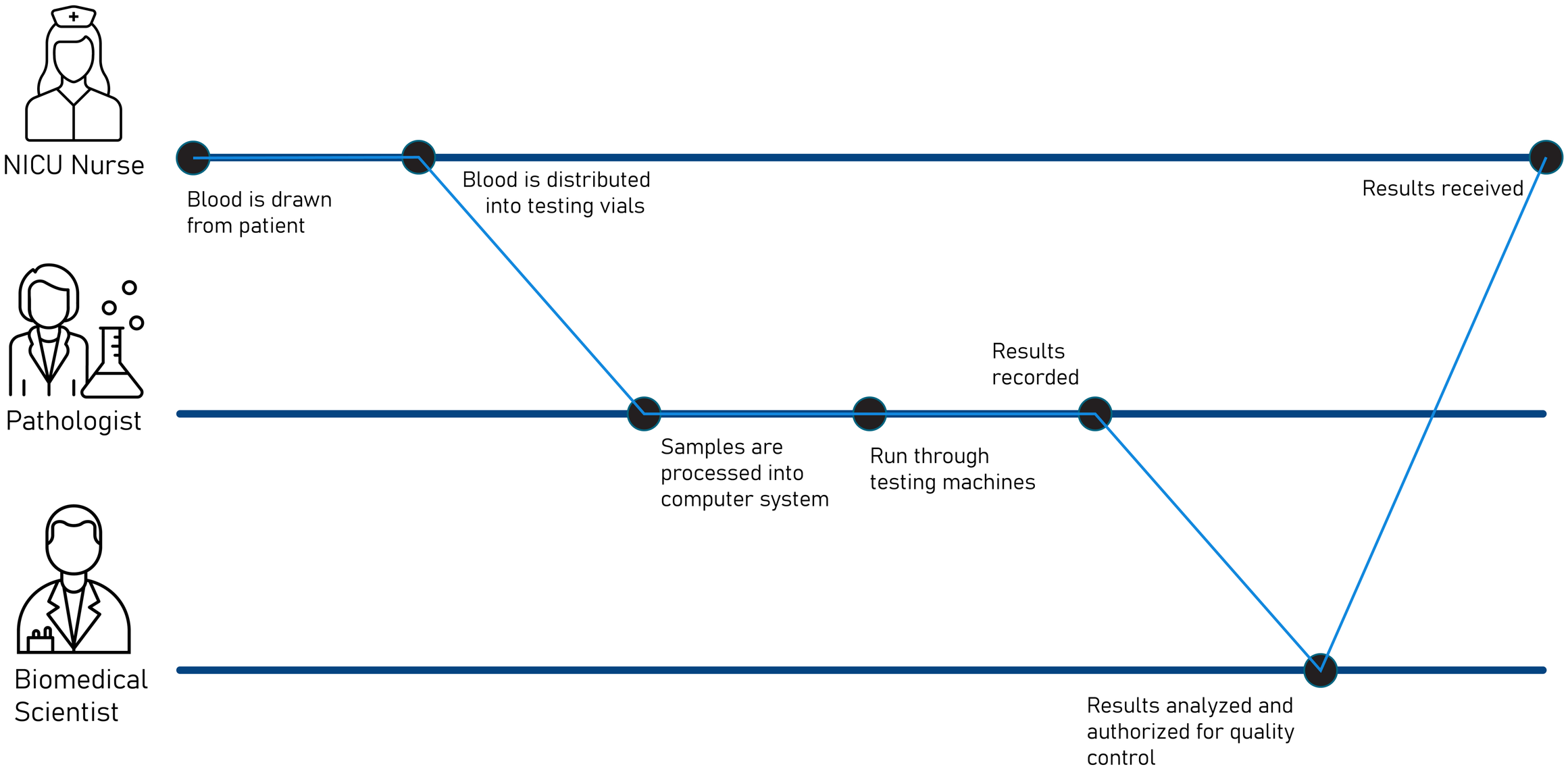
Nurses need blood vital information back **as quickly as possible**

Hospitals are very **inconsistent** working environments

Bloodwork **takes up a large amount** of nurses' valuable time.

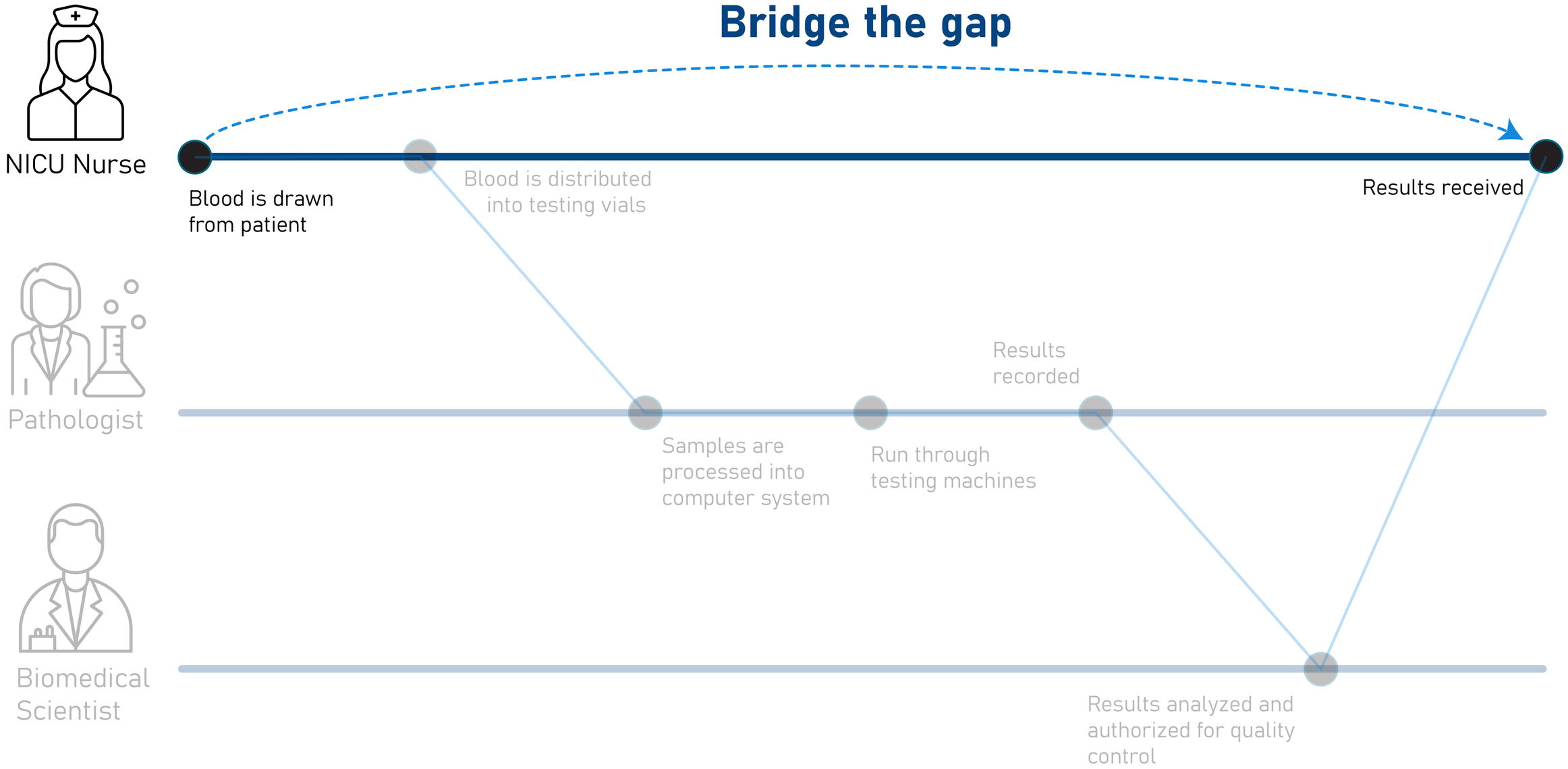
Problem identification

Journey mapping



Problem identification

Journey mapping



How might we:

Make blood test results quickly accessible to ICU nurses?

Research

Interviews and ideation

Nurse
Interviews

Iterative
prototyping

Over 100 unique
solutions

Current market

Product landscape

	FBC ANALYSER	BLOOD GAS ANALYSER	ELECTROLYTE ANALYSER	PULSE OXIMETER
PURPOSE	Determine cell count of red and white blood cells and platelets.	Test for the exact levels of oxygen and carbon dioxide in the body.	Test for electrolyte levels such as sodium, potassium, and chloride.	Test for oxygen saturation in the bloodstream and tracks BPM.
TIME	60 seconds	35 seconds	100 seconds	3 seconds
USER(S)	Pathologist	Pathologist/Nurse	Pathologist/Nurse	Nurse
CONSTANT	No	No	No	Yes

Current market

Product landscape

FBC ANALYSER

BLOOD GAS ANALYSER

ELECTROLYTE ANALYSER

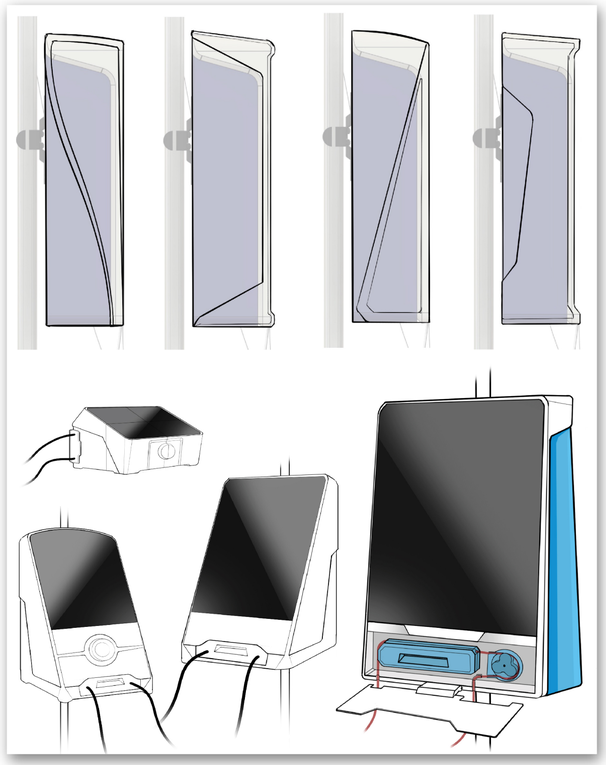
PULSE OXIMETER

PURPOSE	Determine cell count of red and white blood cells and platelets.	Test for the exact levels of oxygen and carbon dioxide in the body.	Test for electrolyte levels such as sodium, potassium, and chloride.	Test for oxygen saturation in the bloodstream and tracks BPM.
TIME	60 seconds	35 seconds	100 seconds	3 seconds
USER(S)	Pathologist	Pathologist/Nurse	Pathologist/Nurse	Nurse
CONSTANT	**No**	**No**	**No**	**Yes**

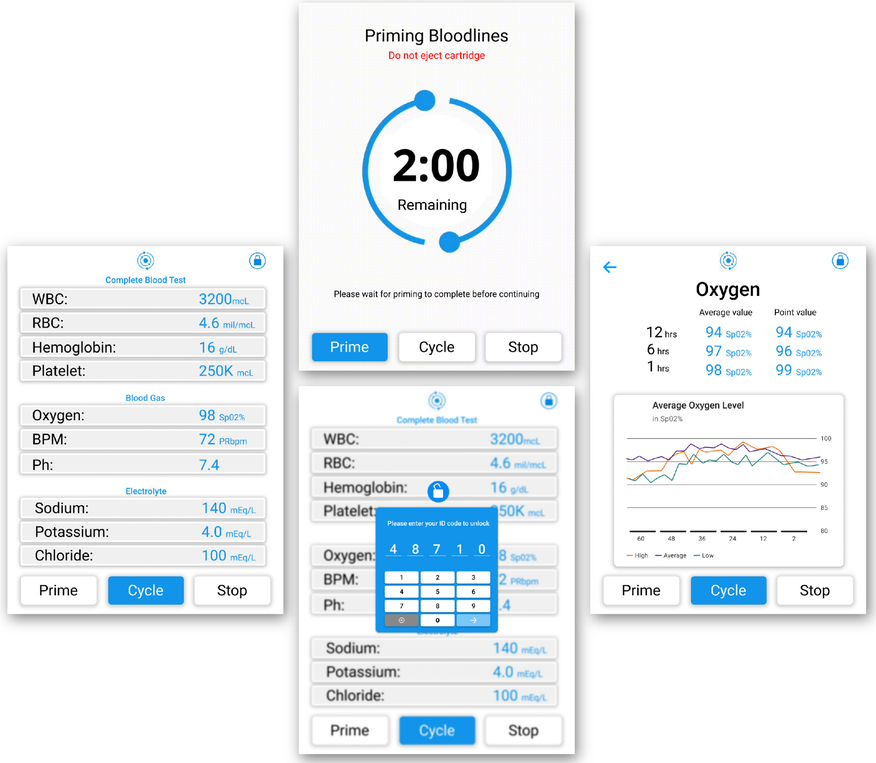
Constant monitoring is uncommon, but the most valuable asset to nurses

Research

Iteration



Concept sketching



UX workflows

More prototyping

HEMOTEC

Blood Monitoring System

Innovation

Cartridge system

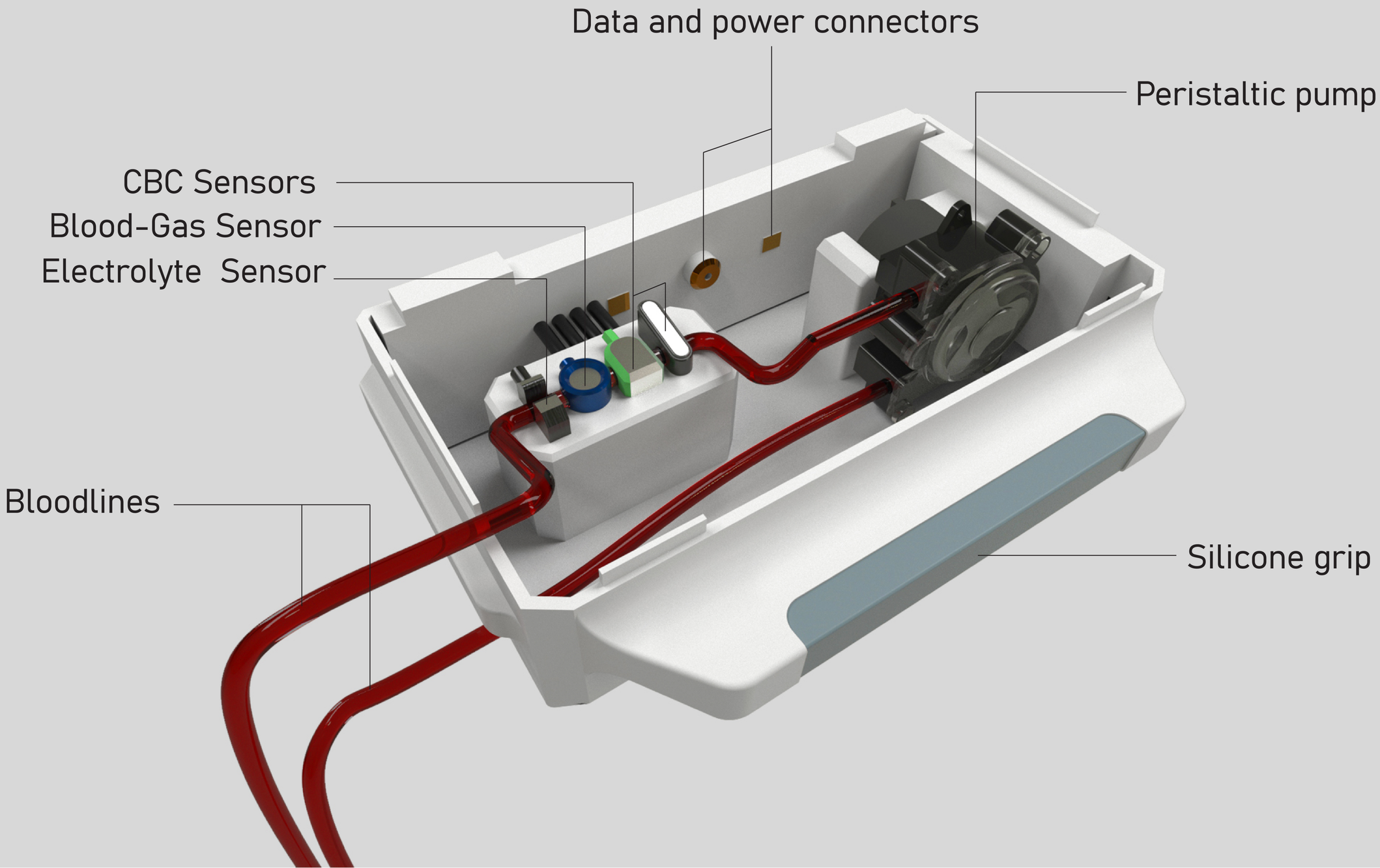
1. Blood is pumped through tubing
2. Blood is run over sensors in cartridge
3. Data is displayed on screen
4. Blood is returned to the patient

Blood is constantly monitored

Individual blood test negated

Innovation

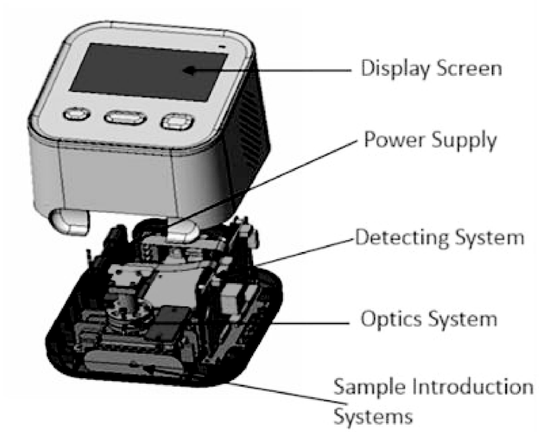
Cartridge system



Product Feasibility

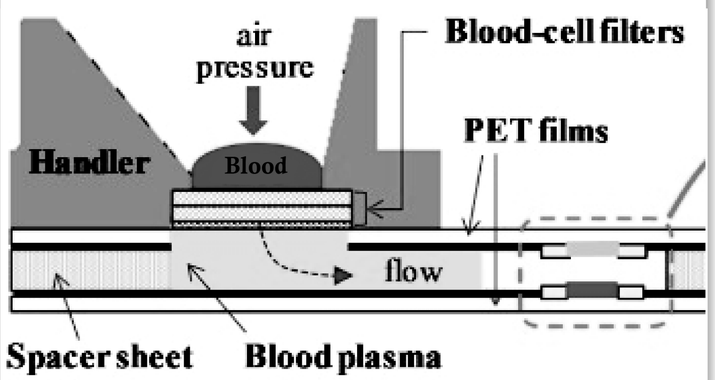
Sensor technology

CBC Testing



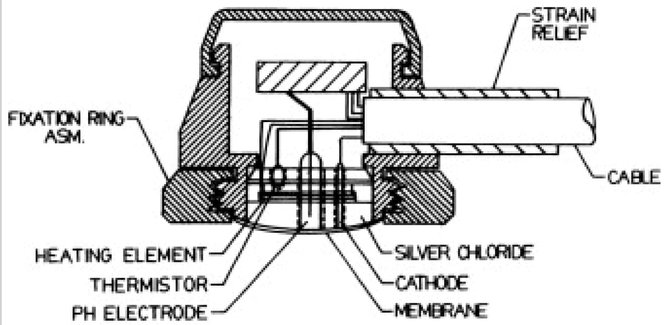
Mini Complete Blood Count Device

Blood Gas Sensing



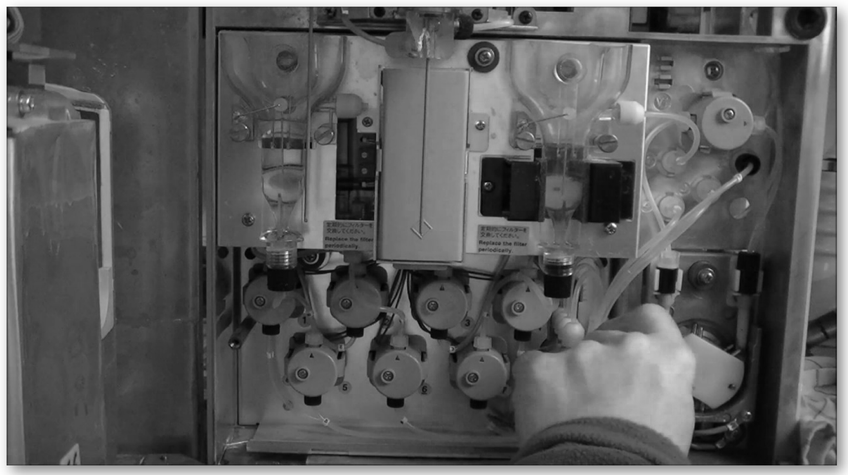
Blood Plasma Electrolyte Sensor

Electrolyte Reading



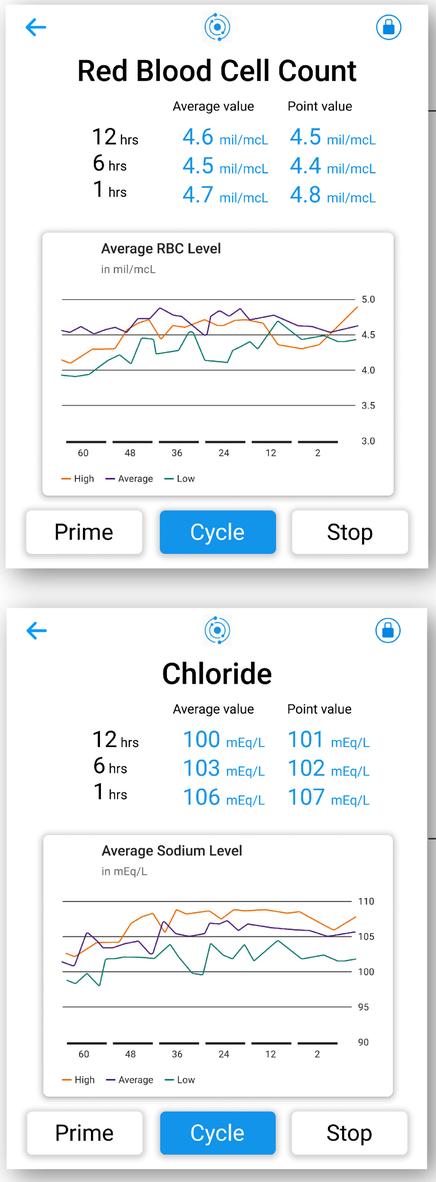
Trans-cutaneous Oxygen and Carbon Dioxide Sensor

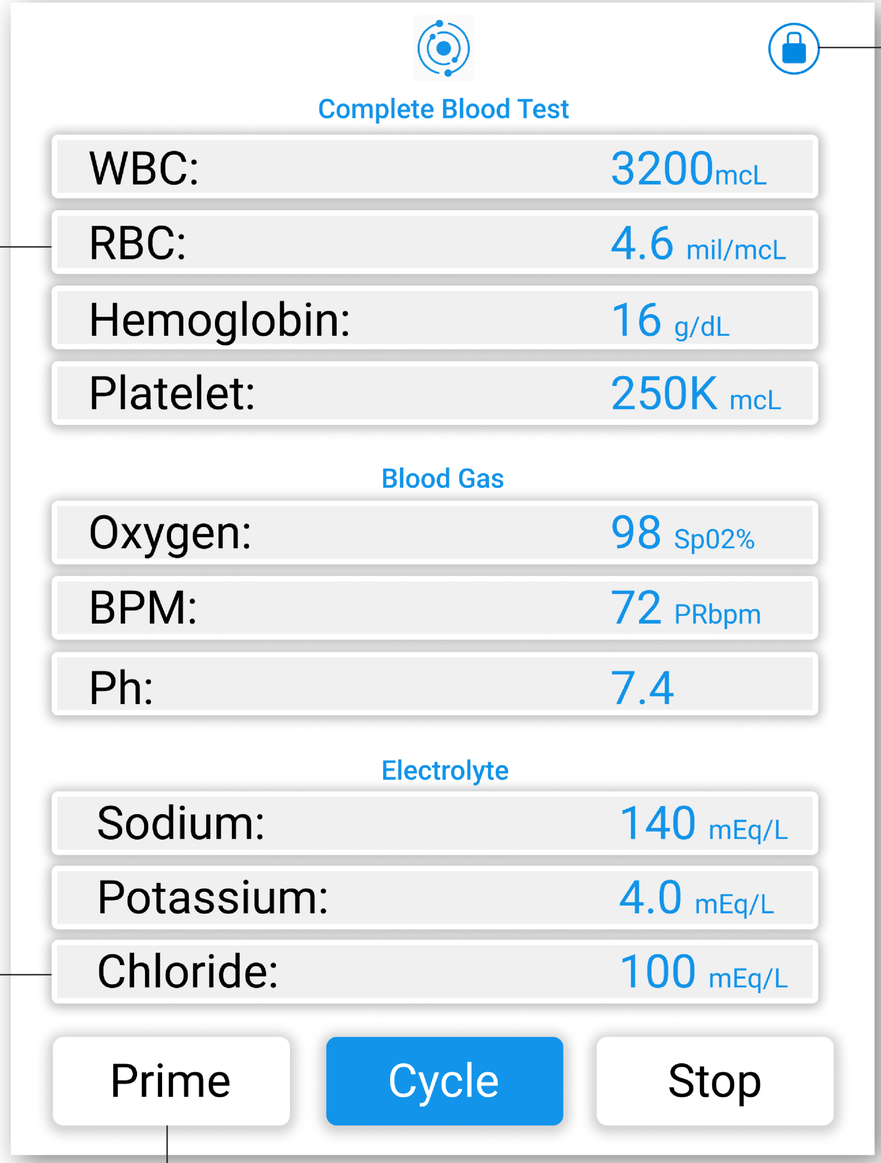
Blood testing machine size is largely dictated by how blood is **transported** through the machine and **computing power.**

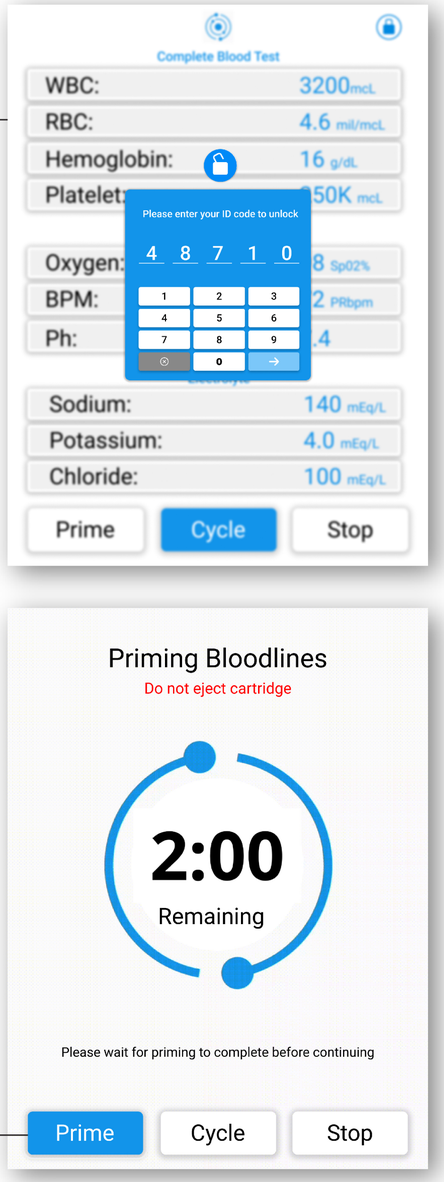


Hemotec

User interface







Hemotec

Product Breakdown

Wipeable body

Touch screen display

Sensor cartridge

Heparin solution

IV pole

VESA mount

Heparin line

Bloodlines

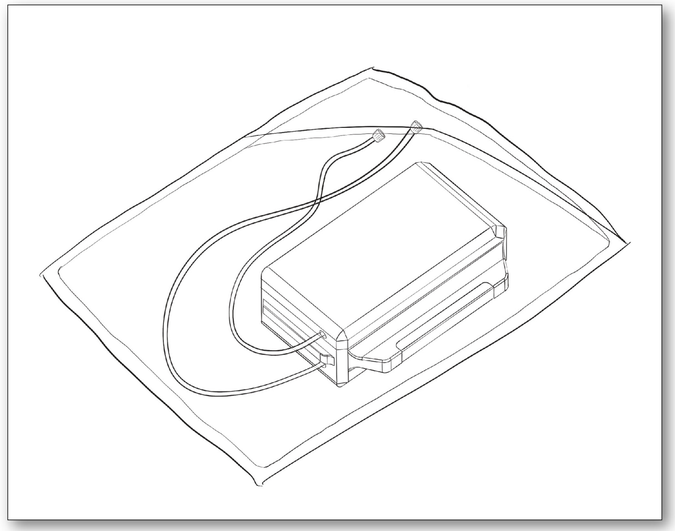
Stopcock


Complete Blood Test
WBC: 3200 mcL
RBC: 4.6 mil/mcL
Hemoglobin: 16 g/dL
Platelet: 250K mcL
Blood Gas
Oxygen: 98 SpO2%
BPM: 72 PRbpm
Ph: 7.4
Electrolyte
Sodium: 140 mEq/L
Potassium: 4.0 mEq/L
Chloride: 100 mEq/L
Prime
Cycle
Stop

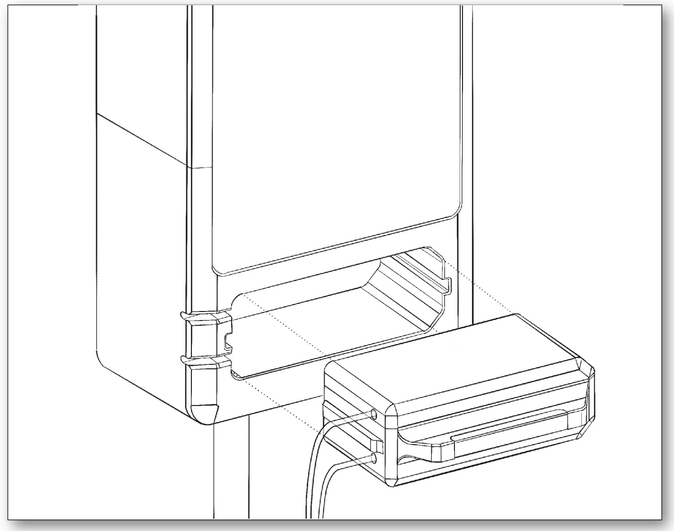
User workflow

Prototype Demonstration

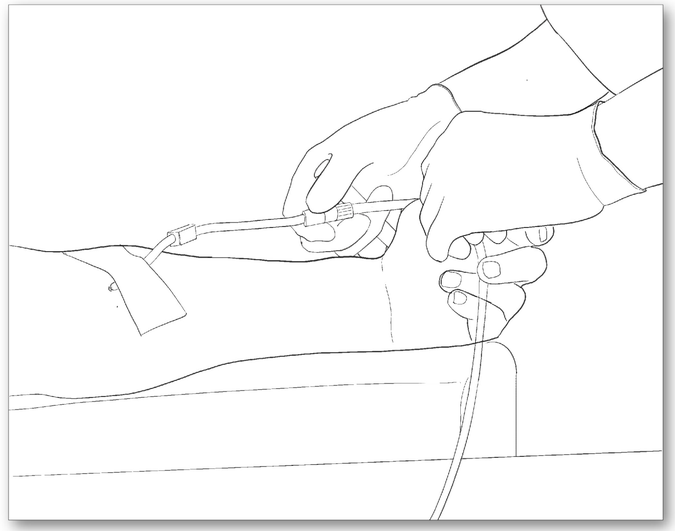
1. Remove cartridge from bag



2. Insert cartridge into device

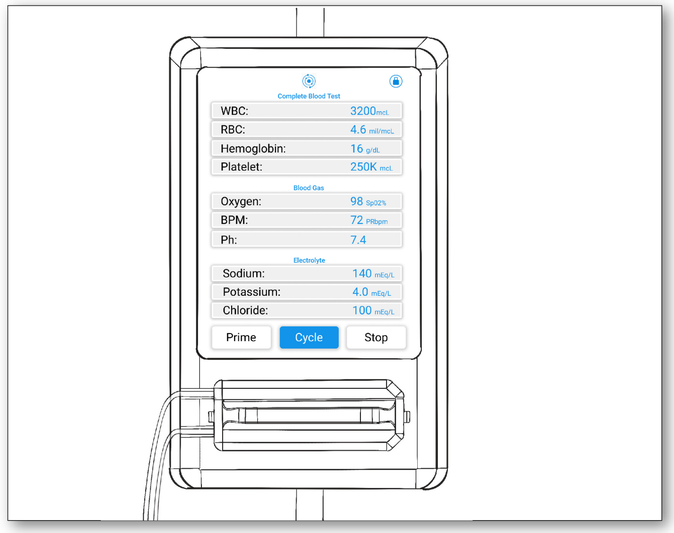


3. Connect to patient

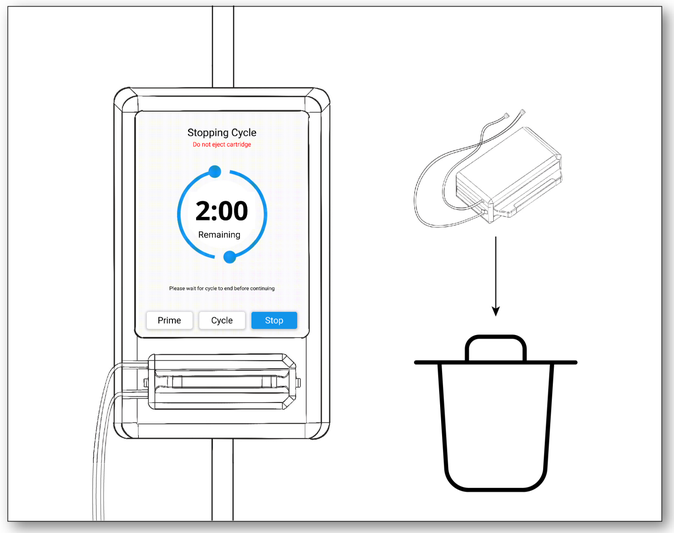


4. Prime bloodlines

5. Begin monitoring cycle

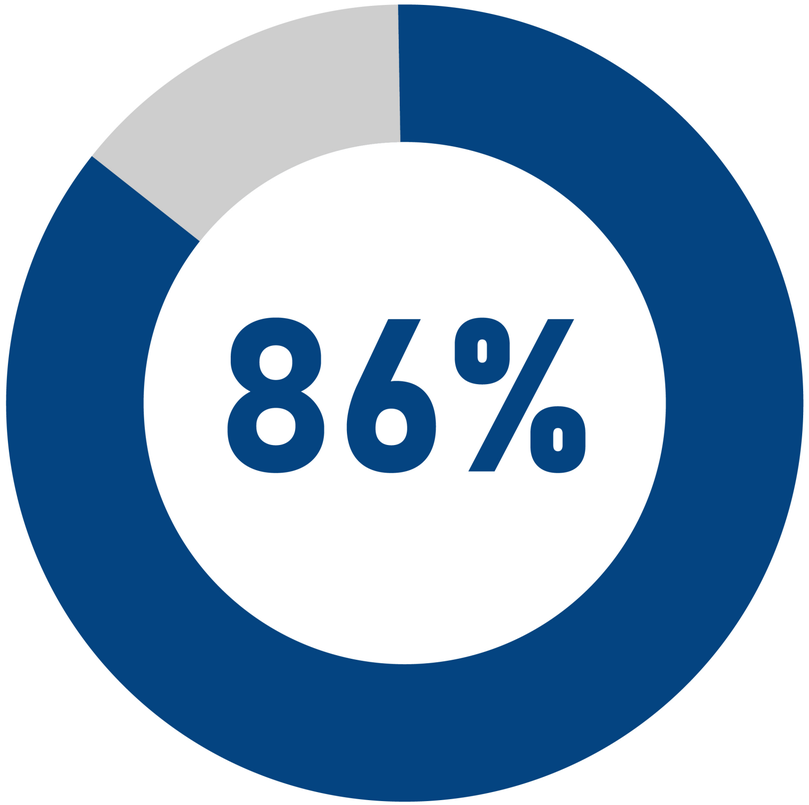


6. Stop and discard cartridge



User testing

Product validation



Would use Hemotec over current blood-work system

“This would be such a time saver! I spend a large portion of my day doing blood-work.”

“This could also be used for specialty cases, with different cartridges with sensor for specific patient conditions.”

“This would be an improvement to use in line on an ECMO unit for immediate results.”

Future plans

Next steps

CARLSON SCHOOL OF MANAGEMENT

UNIVERSITY OF MINNESOTA

Participate in the MVP Challenge Founders Day 2022

May 10th 4-6 pm
Northrop Auditorium

Thank you

Any comments or questions?