01 Dosage-Pal

Overview

A smart prescription pillbox lid designed to solve medication forgetfulness, repeated dosing, and drug abuse.

Theme

Prescription Adherence
Safety & Locking Mechanism
Data Synchronization



SMART PRESCRIPTION DISPENSING SYSTEM REDEFINING PERSONALIZED MEDICATION ACCESS

01 Background

Reality

In the United States, the use of prescription drugs should be a precise, safe, and regulated process. However, reality reveals numerous loopholes, especially in terms of low self-discipline in medical adhereance , lack of tracking, and risk of abuse.



Medication Omission

Based on an 2022 research of NCBI adherence statistics overview, nearly 50% of patients with chronic conditions do not take medications as prescribed.

Absence of Objective Monitoring

FDA Medication Guide points out current prescription bottles do not track dose timing; caregivers must rely on self-reporting, which highly impairs dose adjustment.





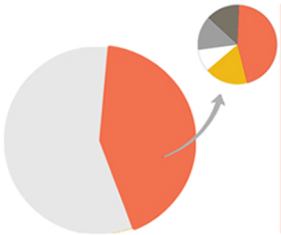
Drug Abuse Mortality Risk

According to CDC wonder, between 1999 and 2023, the number of overdose deaths caused by prescription opioid drugs continued to rise In 2023, although the number slightly decreased to 13,026, the fatal risk still remained at an extremely high level.

02 Questionaire

To investigate current situation of prescription medication habits and challenges, I surveyed 96 individuals aged 25 and above who regularly take prescription medications.

ACTIONS AFTER FORGETTINGTO TAKE MEDICATION



- 46% just let go
- 18% don't check the time interval, and take another one later
- 9% take an extra dose on their own, and take the next dose early
- 14% aren't sure what to do, and just take another one
- 13% chose to consult a medical professional

43% of all people taking medication forget to take their medication

57% of all people taking medication do not forget to take their medication

USER CATEGORIES

Based on the survey it is also concluded that many factors influences actions of different people taking medicines. the most vulnerable groups are:



Elderly People
By Age Group



Chronic Illnesses
By Patients



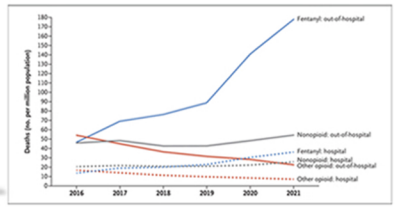
Opioid Medication Takers
By Prescription

Severity

Trends in drug overdose deaths by location and drug type.The chart shows the number of drug overdose deaths per million population in the United States from 2016 to 2021, a period that includes several years before and after the COVID-19 pandemic.



Current prescription drug bottles



Data extracted from N Engl J Med | Fentanyl-associated overdose deaths outside the hospital | New England Journal of Medicine. Accessed July 26, 2025. https://www.nejm.org/doi/full/10.1056/NEJMc2104991.

These figures are not cold statistics, but represent real-life crises that have occurred countless times.We have also seen that traditional medicine bottle designs have remained unchanged for decades and lack the ability to meet modern complex medication needs.

03 Persona



Zhong Li
Age:71
Occupation: Architect
Pain Point: Long work hours and frequent site visits make him forget or delay taking medication.



Ms.Li
Age: 54
Occupation: Office Manager
Pain Point: Needs to track both her own and her parents' medications, which can get confusing.



Shi
Age: 65
Occupation: Retired Engineer
Pain Point: Struggles with remembering multiple medicationsfor chronic conditions



Xue er
Age: 43
Occupation:Freelance Photographer
Pain Point: Unstable travel routine causes missed doses and irregular adherence.

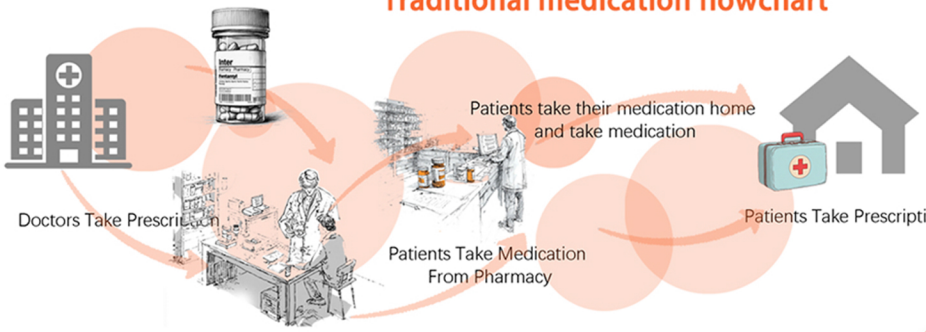
CONCLUSION

From our survey one thing became clear: people are not satisfied with the current design of prescription medication bottles.



04 Methodology

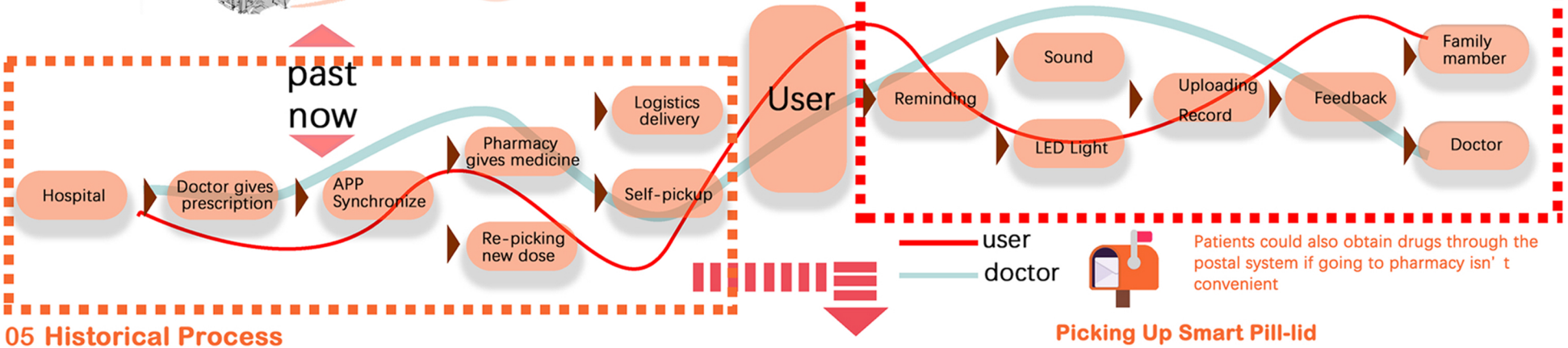
Traditional medication flowchart



Potential Problems

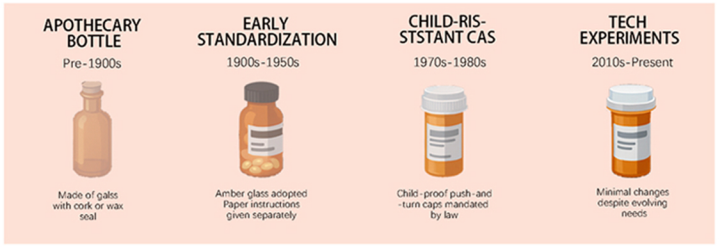
- Forget to take medication
- Repeated medication
- Incorrect medication
- Improper storage of medicines
- No record mechanism
- Family members unable to monitor





Patients could also obtain drugs through the postal system if going to pharmacy isn' t convenient

05 Historical Process



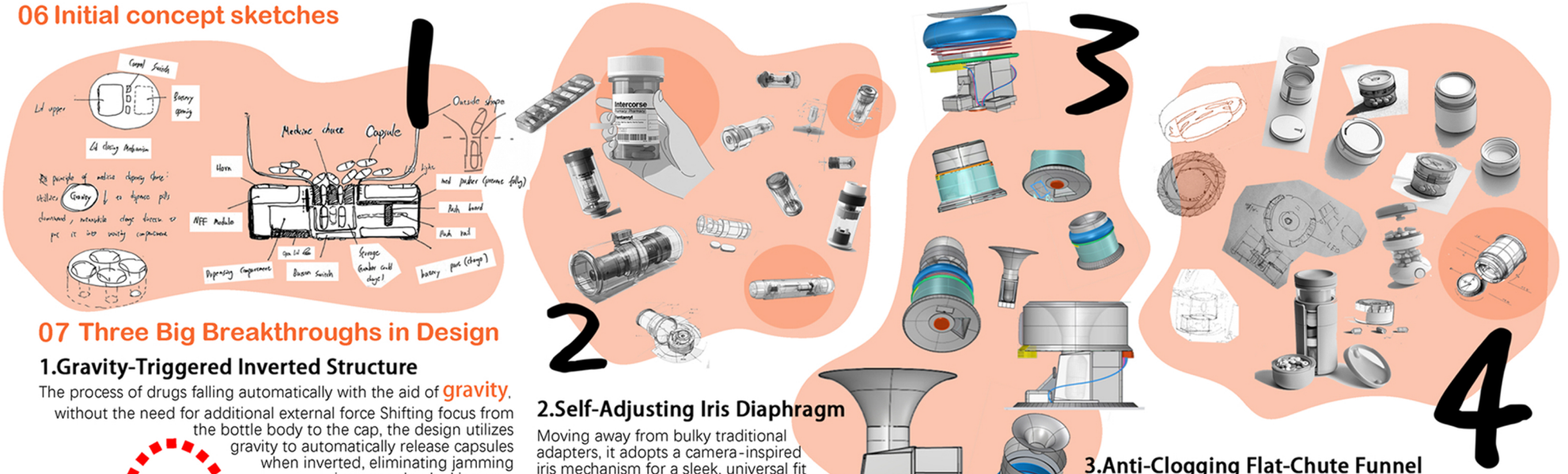


Picking Up Smart Pill-lid

Distribution:When dispensing new medications, the pharmacy will hand the patient the medication bottle along with the cap.

Instruction:When dispensing a medication for the first time, the pharmacist must personally explain to the patient the method of use,precautions,and other important information.

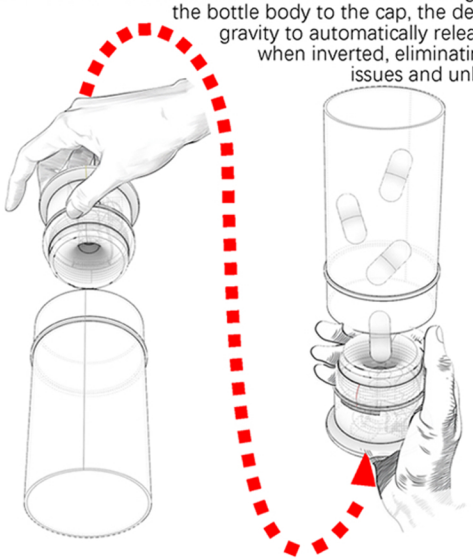
06 Initial concept sketches



07 Three Big Breakthroughs in Design

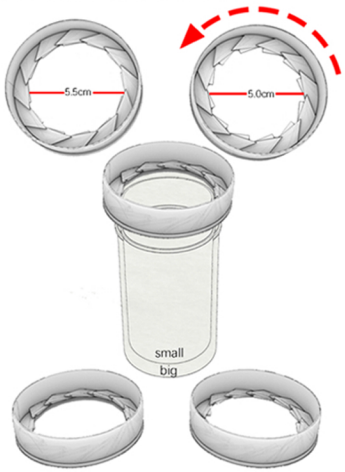
1.Gravity-Triggered Inverted Structure

The process of drugs falling automatically with the aid of **gravity**, without the need for additional external force Shifting focus from the bottle body to the cap, the design utilizes gravity to automatically release capsules when inverted, eliminating jamming issues and unlocking new possibilities.



2.Self-Adjusting Iris Diaphragm

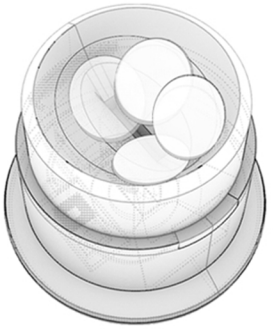
Moving away from bulky traditional adapters, it adopts a camera-inspired iris mechanism for a sleek, universal fit across various bottle sizes.



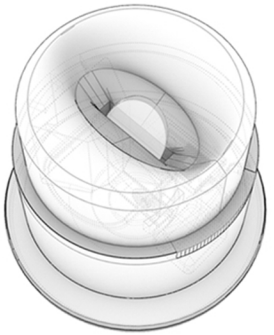
3.Anti-Clogging Flat-Chute Funnel

Replacing the round inlet with a flat opening prevents pill stacking, ensuring smooth single-dose dispensing and enhanced user experience.

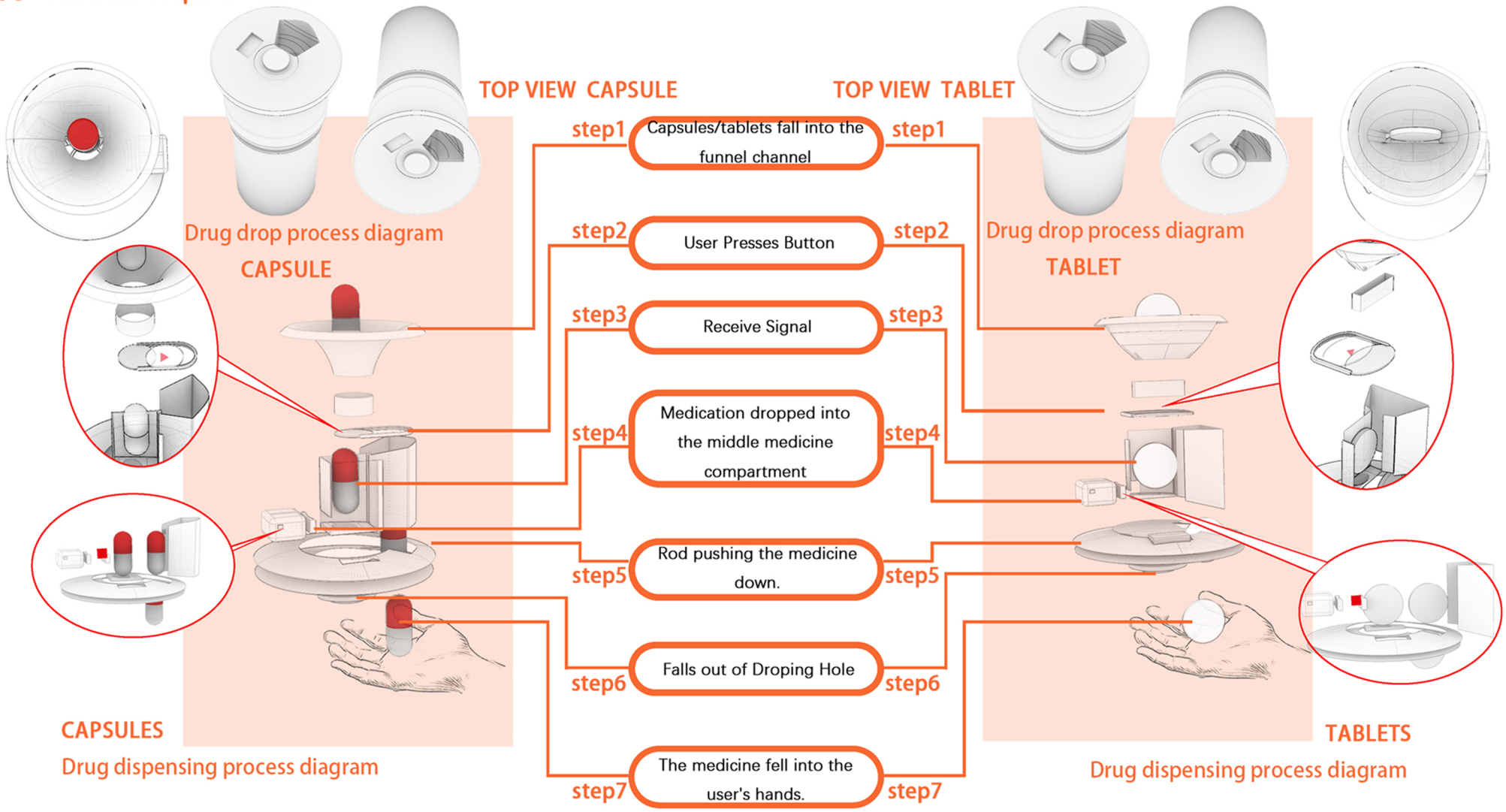
Initial version:
Tablet falls into **round** funnel channel



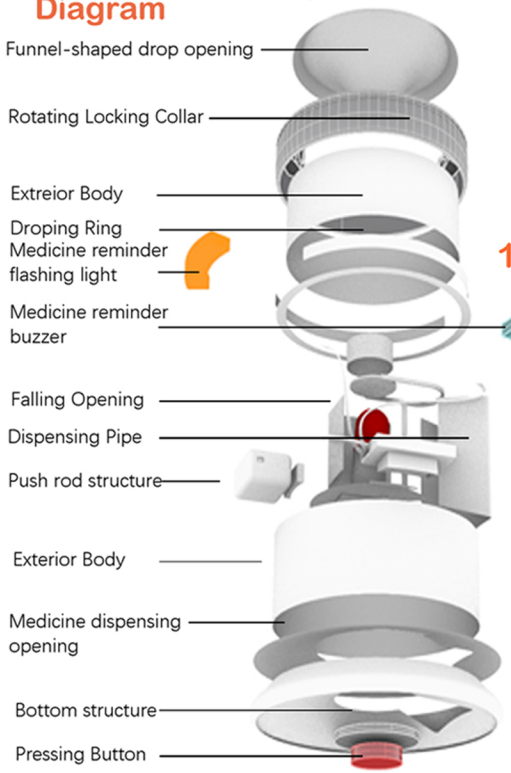
Advanced version:
The tablet fell into the **flat** funnel channel



08 Initial concept sketches



09 Structural Decomposition Diagram



10 Appearance of the medicine bottle cap





At night, there may be patients who need more than one medicine bottle. Different flashing colors and sounds have been considered.



11 Photos of the experiment process









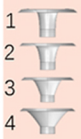


Test Conclusions

After ten rounds of testing, Capsule No. 2 was found to have the highest drug coverage rate and was selected as the best option.
Tablet No. 1 was found to have the highest drug coverage rate and was selected as the best option.

Sample Pass Rate

Capsule



	1	2	3	4	5	6	7	8	9	10	total
1	4/10	7/10	8/10	9/10	10/10	3/10	8/10	10/10	5/10	8/10	72/100
2	10/10	10/10	10/10	10/10	10/10	10/10	9/10	9/10	10/10	9/10	97/100
3	6/10	6/10	8/10	9/10	7/10	5/10	0/10	7/10	3/10	8/10	59/100
4	5/10	5/10	3/10	0/10	2/10	7/10	9/10	5/10	6/10	6/10	48/100

Take ten pills at a time and drop them all at once,at a height of 5-x centimeters.
the best
Passed number/total number of tests

Pill Tablet



	1	2	3	4	5	6	7	8	9	10	total
1	10/10	10/10	9/10	9/10	10/10	10/10	10/10	10/10	9/10	10/10	98/100
2	8/10	7/10	8/10	9/10	10/10	7/10	8/10	9/10	8/10	10/10	84/100
3	6/10	7/10	8/10	9/10	7/10	6/10	5/10	7/10	4/10	8/10	67/100
4	5/10	5/10	2/10	3/10	5/10	7/10	9/10	8/10	4/10	5/10	53/100

Take ten pills at a time and drop them all at once. at a height of 5-x centimeters.
the best
Passed number/total number of tests

12 Information Architecture

First Page
- Logo
- Service Name

Sign In Page
- Sign in welcome
  - email/username
  - password
- Other signing in methods
- Adding Device
  - NFC sychronizing
  - Enter Serial No.

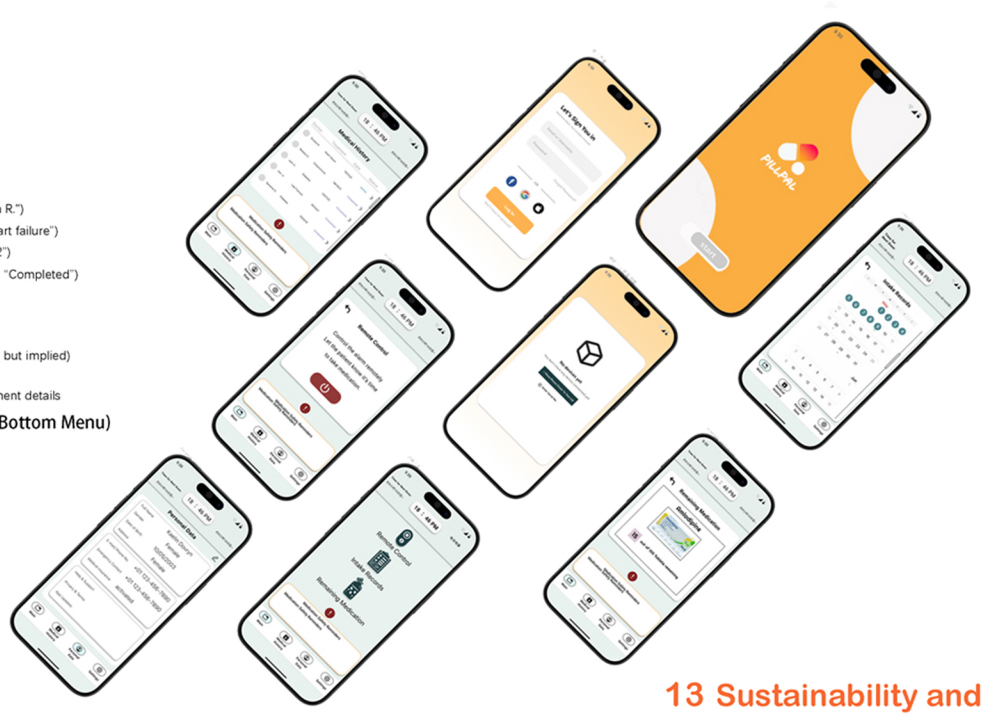
Home Page
- Header Section
  - Time for Next Dose
    - Clock display
  - Remaining time until next medication
  - Battery Status
    - Likely refers to pill box device power
- Primary Feature Grid (Main Functions)
  - Remote Control
    - Activate medication reminder alarm remotely
    - Useful for caregivers to remind patients
  - Intake Records
    - Opens calendar view of past medication taken
    - Logs by date
  - Remaining Medication
    - Displays current pill count left per prescription
- Alert Section
  - Medication Safety Reminders
  - Safety tips, alerts, and educational info
  - May be expandable or clickable
- Navigation Bar (Persistent Bottom Menu)



Medical History
- Header Section
  - Main Medical Records Table
    - Columns:
      - Doctor (e.g., "Suzana R.")
      - Treatment (e.g., "Heart failure")
      - Date (e.g., "10/21/22")
      - Status (e.g., "Active", "Completed")
    - Status types:
      - Active
      - Completed
      - Overdue (not shown but implied)
  - Row actions:
    - Arrow icon to open treatment details
- Navigation Bar(Persistent Bottom Menu)

Personal Data
- Header Section
  - Personal Info Card
    - Full Name:
    - Gender:
    - Date of Birth:
    - Address:
  - Contact information
    - E-mail / Phone No.
    - Emergency Contact
  - Insurance Information
  - Support & Legal
  - Secondary options typically used less frequently
    - Help & Support
    - Privacy & Terms
    - App Updates
- Navigation Bar (Persistent Bottom Menu)
- Scan QR code to obtain

Current project employs a fixed single-dose dispensing mechanism - future upgrades will be a smart mode allowing flexible dose adjustments on demand.



13 Sustainability and Future Improvement Directions

Implementing Eco-friendly Materials & Prolong Lifecycle

1.Using medical-grade biodegradable or recyclable plastics (PLA, recycled HDPE)

2.Design for disassembly to enable component recycling

3.Establish pharmacy return/refill progress

Increase Electricity Efficiency

1.Low-power LED and buzzer systems for extended battery life

2.Rechargeable battery systems to reduce disposable waste

3.Explore solar or kinetic charging options