Mama’s Digital Diary: Guided Note-taking for Mothers in Antepartum Care

Team 4 Grizzly-Coco-Icebear
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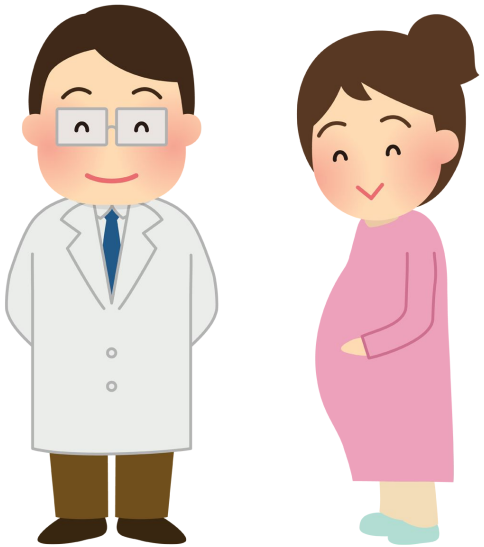
Midterm Presentation

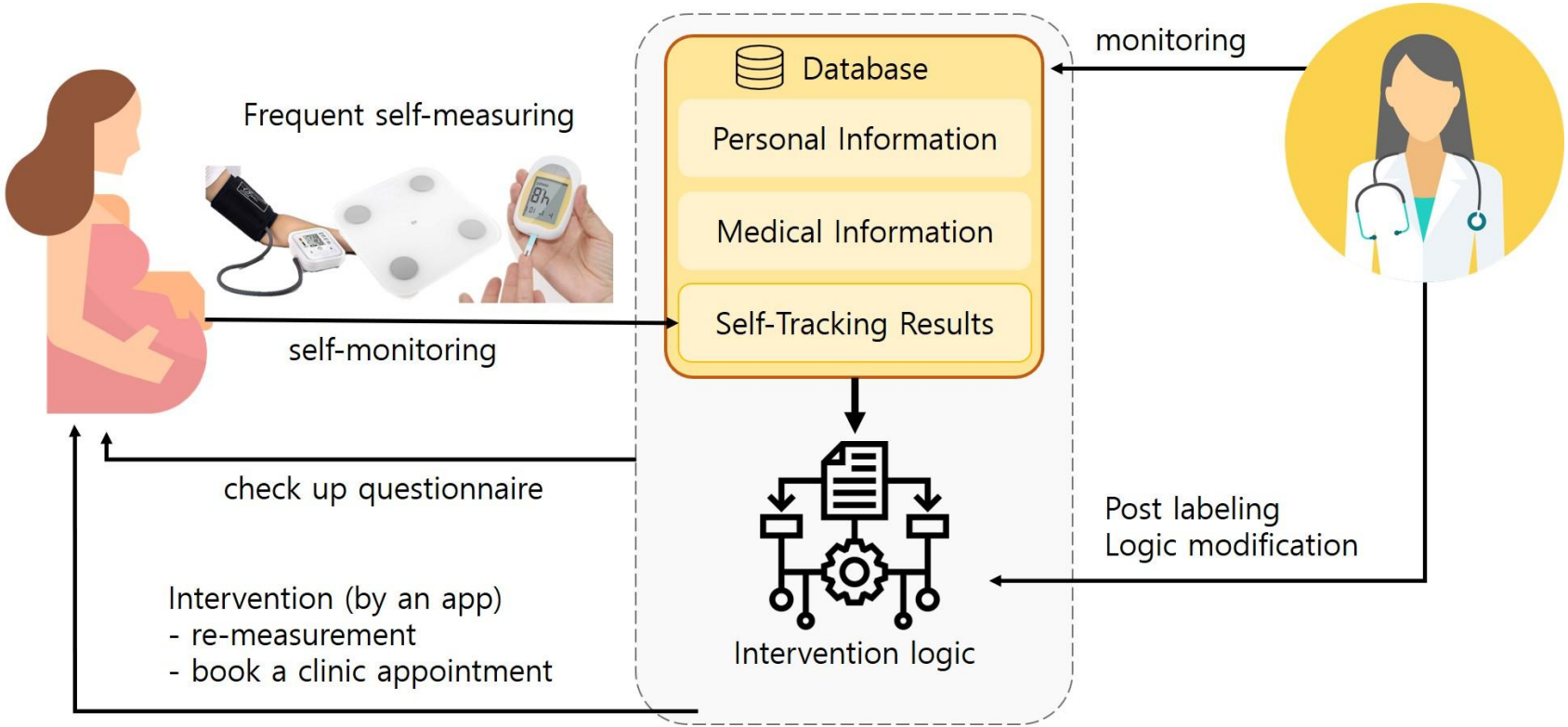
Our Initial Project Idea



Problem: The **data communication is poor** between patients in antepartum care and their doctors and **timely medical interventions** cannot be made

- An imbalance between patients' questions and doctors' feedback
- Data of patients are imperfectly reconstructed and has limited availability
- Contextual and non-standard data are easily neglected or arbitrarily considered

System Overview of Initial Project Idea



Feedback and Challenges

1. Scope is too broad
    a. Target user should be narrowed to either doctors or patients
    b. Too many components
        i. Self-monitoring with phones and wearables
        ii. Application-based interventions
        iii. Doctor-side monitoring

2. Lack of datasets
    a. “Antepartum care involves heterogeneous data types”
    b. “Patients ask too many questions to doctors”
    c. But we couldn’t start the design process until we get that dataset
        i. However, it was impossible to get the dataset before the experiment

Field Study

1. OPD(outpatient check up; 외래진료) observation
   a. Visited 4 OPD sessions at OB/GYN department
   b. Monitored a total of 54 cases (among which 42 cases were about antepartum care)

2. Interview with two doctors and one nurse

- Two babies inside
- The second baby is a little bit small
- The first baby is 800g, second 700g. Difference 100g is pretty observable.
- I think the local hospital can take a look at that. If the baby is too small then we will see again.
- No hospitalization, no medication.
- Eat a lot
- High protein is good. Meat, beans, eggs. But if the baby has some problem inside, then drink juice. Get hydratred.
- P: Getting lied to left side right side? → doesn't matter
- Another appointment 6 weeks later.
- Go the local hospital regularly
- Bleeding coming out, vaginal pain, feel not good → go to 4th floor. Delivery unit open for 24h.
- [illegible]
- [illegible]
- [illegible]
- If the baby's head goes down then we will try VD.
- P: Can I do my household? D: sure. But without very heavy weight. Exercise would be okay too."

Findings: (1) Possible app positions are limited

There are not many things for apps to do in the current practice

- Limited user group (from OPD observation)
  - Tracking health measures is important only for patients who have specific disease and are in a certain period (28-36 weeks)
  - However, severe patients tend to be already hospitalized and cared by nurses
- Limited capability (from interview with a nurse)
  - “Nothing can be confirmed until an outpatient visits the delivery unit (i.e., EMR of OB/GYN)”
  - “What apps can do then?”
- Still, there exists a niche (from OPD & doctors)
  - Blood pressure tracking is a really needed feature for some type of patients
  - Apps can give feedback for emergency screening
  - About 1 out of 5 patients brought a long list of questions in their diary app

Findings: (2) Symptom-based Communication

- Describing the symptoms were the dominant method of communication
  - “Your belly can get bigger and hard, but it’s okay.”
  - “Come if you see blood or have contraction every 5 minutes.”

- The communication was ambiguous and metaphorical
  - “You can distinguish amniotic fluid from discharge as it flows like **water.**”
  - “Labor is when an uterus contracts every 5 minutes. It feels like **wave.**”
  - “I felt pain as if my uterus was **falling out**.”

- Sometimes it depended on the prior context
  - “Come if you feel even a little more pain **than now**”

Findings: (3) Gaps in Describing Symptoms

- Doctors' description of expected symptoms were consistent
  - ex) blood, amniotic fluid, uterine contraction, stomachache, headache ...
- Doctors gave patients checklists in systematic way
  - To high-risk patients: "If you see blood, then come to the hospital ASAP"
  - To normal patients: "A little of blood is okay, but contact us if it flows"

- Patients' questions were abstract and diverse
  - General questions
    - What is the normal pain?
    - How it should be feel like?
    - How much of amniotic fluid is okay?
  - Peripheral symptoms
    - indigestion, itching, ...
  - Non-standard descriptions
    - "It feels weird that when I'm going to urinate, I have to relax completely."
  - Trivial or administrative questions
- Also, a majority of patients' questions were not "severe" ones in terms of safe delivery

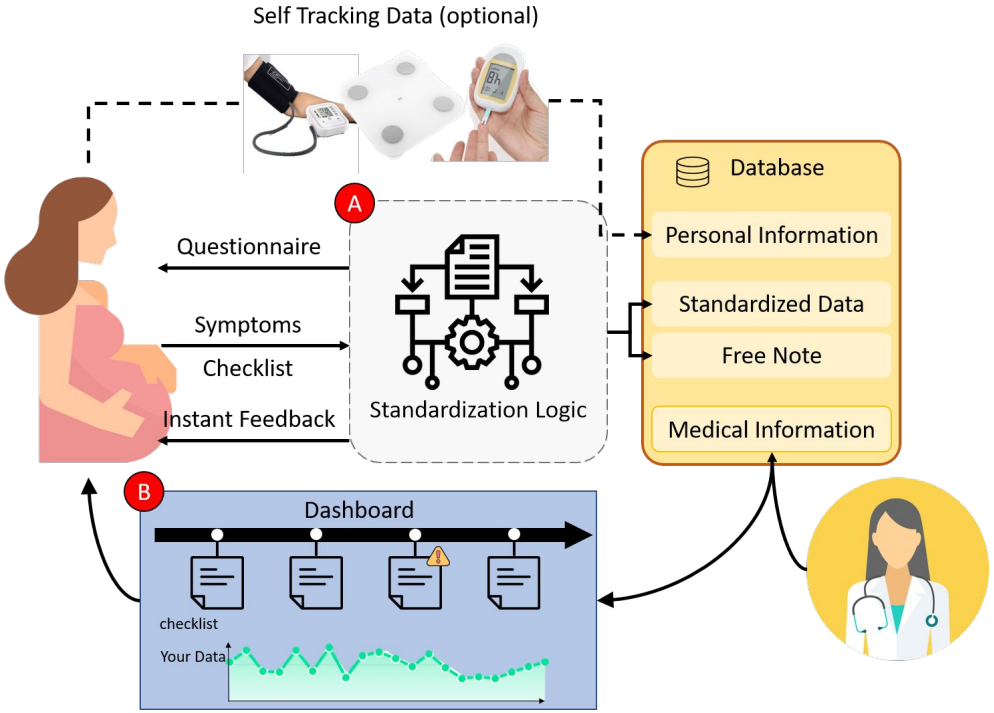
Refined Project Idea

Target User: Patients

Our system helps patients in antepartum care to

- **Articulate** : to describe their symptoms in standard and systematic way
- **Manage** : to organize symptom notes with doctors' checklist
- **Track** : to easily observe changes in their symptoms
- **Resolve** : to give early feedback if their questions are trivial enough

System Architecture Overview



- A patient inputs symptoms and checklist from doctor into system
  - **In efficient manner!**
- Standardization Logic
  - Q&A-based standardization
  - Instant feedback
    - e.g., “It is normal phenomenon, rest and check it again!”
- Dashboard
  - Visualization for all diary data

Key Technical Challenges

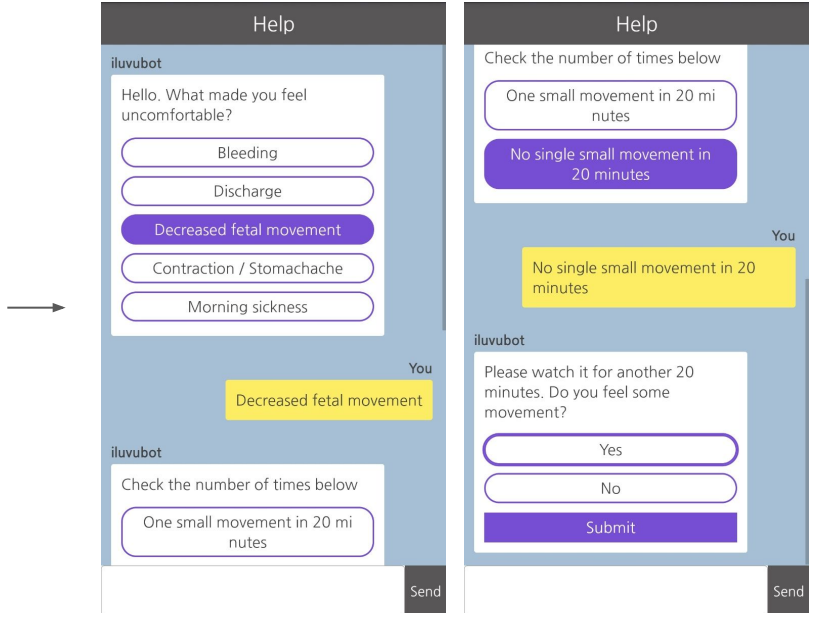
- How to implement standardization logic?
  - Possible solution
    - Data-driven clustering and automatic recommendation

- Visualization for free-form diary notes along with standardized tags
  - Harmonic visualization for quantitative measures, doctor’s checklist, and patient’s diary
  - Effective visualization for **textual data** is widely uninvestigated area!
  - Possible solution
    - Semantic similarity using NLP models
    - Mixed-initiative interface

Prototype

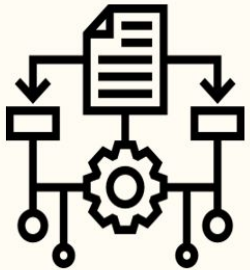
- Initial standardization logic from a doctor is implemented as a chatbot-like interface

태동감소		
	아래 횟수에 체크하세요.	
	20분 동안 1회 작은 움직임이 감지되었다.	정상입니다. 시간이 좀 더 흐른 뒤 태동을 다시 느껴보고 평가하세요.
	20분 동안 1회의 작은 움직임도 없었다.	자세를 바꾸거나 걸어본 후 다시 20분 동안 확인하세요.
	추가 20분 동안에도 움직임이 없었다.	분만장으로 내원하세요.
자궁수축/복통		
	아래 횟수에 체크하세요.	
	30분에 5회 이상	안정을 취하고 수분섭취를 충분히 한 후 다시 30분을 확인하세요.
	추가 30분에 5회 이상	분만장으로 내원하세요.
	아래 강도에 체크하세요.	
	약간 뻐근한 정도	괜찮습니다. 임신 중 자연스러운 증상입니다.
	콕콕 찌르는 양상	괜찮습니다. 임신 중 자연스러운 증상입니다.
	생리통과 같은 정도	주기적으로 반복되는지 확인하세요. (횟수 질문으로 이동)
	쥐어짜듯이 아픔	분만장으로 내원하세요.
	허리를 못 펼 정도의 아픔	분만장으로 내원하세요.
	허리통증	분만장으로 내원하세요.
	아래 통증의 부위에 체크하세요.	
	아랫배	(강도 질문으로 이동)
	왼쪽배	변비가 아닌지 확인하세요. (아닌 경우 강도 질문으로 이동)
	오른쪽배	(강도 질문으로 이동)
	윗배	체하거나 소화와 관련된 증상일 수 있습니다. 임신중독증에서는 간기능이상으로 인한 것이기도 합니다. 분만장으로 문의하세요.
입덧		

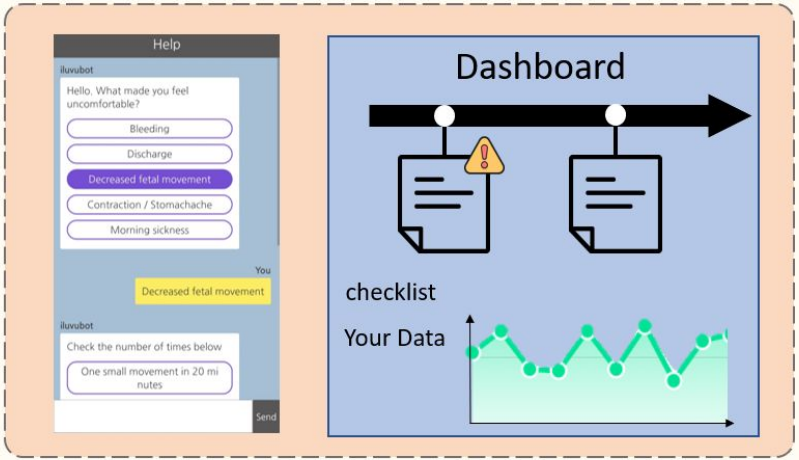


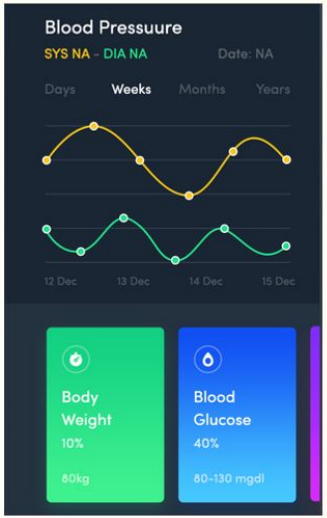
Final Deliverable

Application



Mixed-initiative
Standardization Logic





[1] https://dribbble.com/shots/5712445-Dark-Health-Care-Application-Design

Project Schedule

		Assignee	3/23	3/30	4/5	4/12	4/19	4/26	5/3	5/10	5/17	5/24	5/31	6/7
Domain Research	Proposal Presentation (Milestone 1)	Seokweon												
	Domain expert Interview ***(@Regular Meetings)***	All												
	Define Problem Situations ***(Outpatient Observation)***	All												
	Define Target User & Goals ***(@Regular Meetings)***	All												
	Mid-Presentation (Milestone 2)	Aeri												
Design	Brainstorming / Searching ***(w/ Pair Programming Sessions)***	All												
	Chatbot Prototype	Kiroong												
	Iterative Design Process **(w/ Real-World Deployment)**	All												
Implementation	Standardization Logic	Seokweon, Kiroong												
	Interface	Aeri, Seokweon												
	Dashboard	Kiroong, Aeri												
Evaluation	Pilot Study	All												
	User Study		X											
	Final Presentation (Milestone 3)	Kiroong Choe												

Findings: (2) Data scale is not too big

- Our former statement 1: “Patients ask too many questions to doctors”
  - Most OPD sessions were routine and doctor-driven
  - Also, questions asked by patients were in diverse topics
  - If we only collect quantitative health measurement, then the data size will to be moderate

- Our former statement 2: “Heterogeneous data types are involved”
  - Doctors said that blood pressure, blood sugar, and fetal movements are the most important
  - We also observed a case of a patient who do not regularly track her blood pressures
  - However, other types of data were much less appreciated

→ A trivial tracking + dashboard app would suffice!