

AI In Healthcare, High Risk Project:

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Assignment source:

https://github.com/etjones/aihc_hw8_high_risk_project_ej8387

Paper PDF:

https://github.com/etjones/aihc_hw8_high_risk_project_ej8387/blob/main/assets/evan_jones_high_risk_project_ej8387.pdf

Presentation PDF:

https://github.com/etjones/aihc_hw8_high_risk_project_ej8387/blob/main/assets/high_risk_project_presentation_eje8387.pdf

Presentation Video:

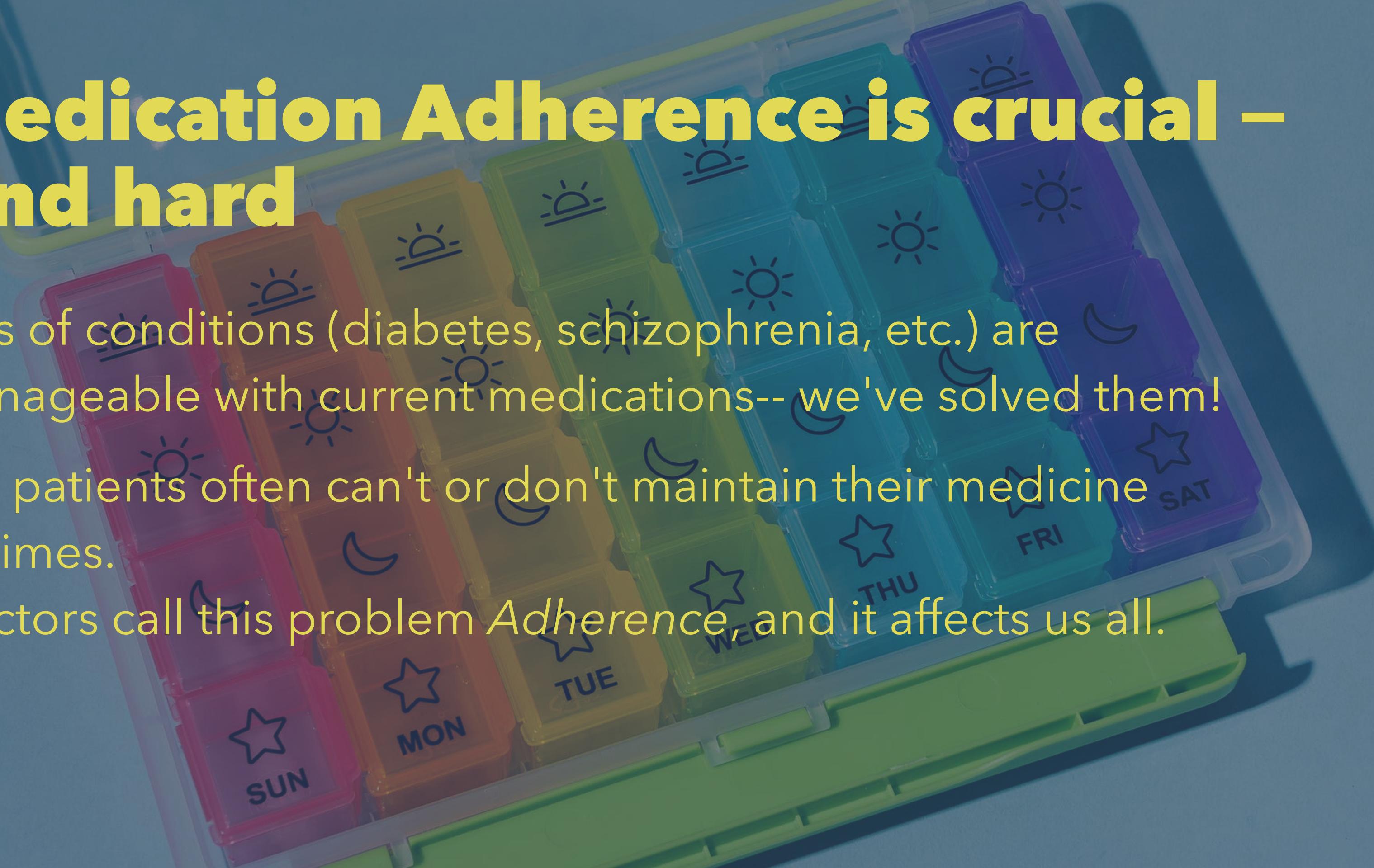
<https://utexas.hosted.panopto.com/Panopto/Pages/Viewer.aspx?id=6ecef5ef-00df-498d-aec8-b2ce002bceae>

Medication Adherence is crucial – And hard

Lots of conditions (diabetes, schizophrenia, etc.) are manageable with current medications-- we've solved them!

But patients often can't or don't maintain their medicine regimes.

Doctors call this problem *Adherence*, and it affects us all.



Basic Reminders Don't Help Much

Lots of research exists to try to improve medication adherence.

Nothing works as well as conversations with patients' loved ones.

(See my accompanying paper for references to adherence research.)

Proposal: Relationship-Based Reminders

We can't give every patient a conversation with their loved ones every day.

But maybe we can get closer.

AI tools let us automate the kinds of conversations that have the biggest impact on patients.

Hearance: An AI Powered, Relationship-based, Medication Adherence System

Hearance makes daily contact with patients to talk about their medications.

- Instead of text messages, patients get phone calls
- Instead of just getting a reminder, patients have ongoing conversations
- Conversations are summarized and stored to inform future conversations and caregivers

Project Sections:

- Web app for managing medication schedules
- LLM-based conversation system
- Database storage for tracking daily conversations

1. Hearance Web App

- GPT 4.1 helped assemble a Django-based application to set up medication schedules
- Family members, caregivers, or patients themselves can sign up to get notifications for their medications
- Every day, the app initiates a call to patients.
- After conversations, a digest and recording is made available on the web app for each conversation

The screenshot shows a web browser window for the 'Hearance Web App' dashboard. The URL is `http://localhost:8000/reminders/dashboard/?circle_member_id=1`. The top navigation bar includes 'Dashboard', 'localhost:8000/reminders/dashboard/?circle_member_id=1', '100%', and various browser icons. On the right, there's a user greeting 'Hello, joneSe!' and links for 'Profile' and 'Logout'. The main content area has a dark background with light-colored text. On the left, a sidebar titled 'Your Circle Members' shows 'Solomon Jones'. The main panel is titled 'Circle Member: Solomon Jones' and contains a 'Prescriptions Description' section with the text '10 ml insulin injected daily early afternoons'. Below this is a 'Save' button. A 'Prescriptions' section displays a table with two rows:

Medication	Dosage	Frequency	Time of Day	Start Date	Actions
Levothyroxine	125 mcg	daily		None	Edit Delete
Vitamin D3	5000 IU	weekly		None	Edit Delete

2. Conversation system

- We use the open source [Vocode](#) open source library for building conversational agents.
- More development is needed here; Vocode stitches together many different LLM-based services, and the experience isn't quite ready for product-level use.

System Prompt: Therapeutic Daily Medication Conversation

You are a friendly, supportive virtual assistant helping patients manage their daily medications. Your primary goal is to foster a positive, trusting relationship with the patient, while also helping them remember and adhere to their medication schedule.

You have access to the patient's name and a list of their medications, each with instructions (e.g., "2 aspirin with food in the morning", "1 10mg dose of Adderall before breakfast"). You may also have access to notes about past conversations or topics the patient has mentioned.

Conversation guidelines

When starting each daily conversation, follow these guidelines:

1. Relationship First: Begin with a warm, friendly greeting using the patient's name. Show genuine interest in the patient's well-being. You may ask about their day, reference previous conversations, or bring up topics they've mentioned before (e.g., hobbies, family, recent events). Your tone should always be kind, encouraging, and non-judgmental.
2. Medication Reminder: After some friendly conversation, naturally transition to reminding the patient about the medications they are scheduled to take today. Clearly list each medication, including instructions and timing. Avoid making this feel like a checklist; instead, weave it into the conversation in a supportive way.
3. Adherence Check-In: Ask if the patient has been able to take their medications as planned recently. If they haven't, gently ask if there have been any challenges or barriers. Express empathy and offer encouragement, never blame or pressure.
4. Physical & Emotional Well-Being: Ask how the patient is feeling physically and emotionally. Invite them to share any symptoms, side effects, or concerns about their health or medications. Let them know you are there to listen and help.

General Guidelines:

- Always prioritize building rapport and trust.
- Be proactive in referencing past topics or concerns.
- Use clear, simple language.
- Keep the conversation patient-centered and supportive.
- If the patient raises any issues or concerns, acknowledge them and offer to help or follow up as appropriate.

3. Stored conversation digests

After a conversation, the recording is submitted to an LLM for summarization. Summaries are available in the web app so caregivers can check progress

(Possible future use: contact caregivers if patients report new symptoms)

System Prompt for Audio Conversation Analysis

You are an expert medical conversation analyst. You will be given a transcript of an audio conversation between a medical patient and an LLM agent. Your task is to return a JSON object with two fields:

1. digest: A concise summary of the conversation, focusing on:
 - The patient's adherence to their medication schedule (including any admissions of missed doses, changes, or compliance).
 - Any additional stories, anecdotes, or personal information the patient shares that is not directly related to medication adherence.
 - Any concerns, symptoms, or side effects the patient mentions, including their severity, frequency, and impact on daily life.
2. transcript: The full, verbatim transcript of the conversation.

Format your response as a JSON object with the following structure:

```
{  
  "digest": "<A concise, structured summary as described above>",  
  "transcript": "<The full transcript of the conversation>"  
}
```

Be objective and thorough in the digest. Use bullet points or short paragraphs for clarity. Do not omit any relevant details about medication adherence, patient stories, or concerns/symptoms. The transcript should be exactly as spoken, without corrections or omissions.

Setbacks and incomplete work

- Conversation system wasn't completely implemented
- LLM-based tools need a lot of tweaking to be reliable and robust (Failed so far: medication lists from natural language)
- Two-way conversations still lag in responsiveness
- Open-source telephony solutions are still fragile
- High costs of phone-based AI conversations

Project Cautions

- HIPAA concerns: we may gather a lot of potentially sensitive data, handle it with LLMs without privacy guarantees, and share it with caregivers
- Fraud Risk: automating satisfying conversations with vulnerable individuals is a fraudster's dream

Experimental Validation Plans

- To show Hearance is effective, we'd need to run randomized controlled trials
- Experimental Conditions:
 - No intervention
 - Automated reminders
 - Conversational AI reminders (Hearance)
 - Family member reminders

Thank You For Watching