

Medications and therapies are constantly being enhanced to improve patient care. No matter how effective the drug, it does not have an impact if the patient is not taking it according to the healthcare provider's instructions. The World Health Organization defines *adherence* as “the extent to which a person's behavior - taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider.” This challenge focuses specifically on improving *medication adherence*- is the patient taking his/her medications according to the provider's recommendations?

Half of Americans take a prescription medication regularly¹

Approximately 125,000 deaths in the U.S. can be attributed to medication nonadherence¹⁰

\$100 to \$300 billion in healthcare costs can be avoided by improving medication adherence²

Nearly 50% of people with a chronic condition stop taking their medication in the first year³

Up to 1/3 of prescriptions are never filled³

46% of patients don't understand dosing instructions³

Medication adherence is a multi-faceted problem and problems can occur anywhere among the provider, pharmacy, health plan, and patient. The main problems to solve are:

How can we ensure the patient *gets* the medication?

How can we ensure the patient *knows how to take* the medication?

How can we ensure the patient *actually takes* the medication?

This is a long-known problem with many solutions being proposed and implemented at various phases of the care cycle.

- CVS Health has many articles, studies, and solutions^{1,2,3}
- [This study](#) showed that health literacy was the strongest predictor of medication adherence for a population aged 65 and older

- [PillPack](#) sorts medications doses and delivers them to each patient (recently acquired by Amazon⁴) (This was actually created at a past hackathon!)
- [ScriptYourFuture](#) is a campaign by the National Consumers League to improve adherence
- [HealthPrize](#) is a platform for improving patient education through gamification and other methods
- FICO, somewhat controversially, created a [medication adherence score](#) that is compiled through non-medical data and can be created without the patient's consent⁵
- [AdhereTech](#) created a smart pill bottle that can track contents and usage⁶
- [Abilify MyCite](#) is an FDA approved wifi-enabled pill that tracks ingestion and has sparked worries about "Biomedical Big Brother"⁷

Despite all this, the problem of medication adherence has still not been solved. Apps and services are fragmented depending on the patient's location, health plan, and pharmacy. Many patients may not self-report accurately due to lack of education, lack of technology literacy, or desire to hide non-adherence. Data collected without consent and devices that monitor behavior can cause distrust and spark concerns about patient privacy.

Can you come up with creative and innovative solutions using hardware, software, and/or data to help keep patients adherent, and in turn, healthier?

***Older patients at MSK: Fill out things like pill diaries and pill bottle return forms for their drugs- so we know if they are taking them every day or not

Older people tend to pick up the phone at home (landline)- can have an automated message asking them if they have taken their medication that day- some algorithm with answers and questions (tree and stem, if/then)

Reminder to take medicine, Have you taken medicine? When do you plan on taking medicine? For younger patients- emails about taking it- or on an app that pushes notifications, even a text message

Easier to read instructions- patients can ask questions via teledoc or something similar

Reading:

1. [A personalized approach to helping patients manage their medications \(CVS Health, 2018\)](#)
2. [Promoting medication adherence \(CVS Health, 2017\)](#)
3. [Adherence: Why it's so hard and what we can do about it \(CVS Health, 2014\)](#)
4. [Amazon buys PillPack, an online pharmacy, for just under \\$1B \(TechCrunch, 2018\)](#)
5. [Keeping score on how you take your medicine \(NYTimes, 2011\)](#)
6. [Improving Medication Compliance with Smart Pill Bottles \(Medgadget, 2018\)](#)
7. [First Digital Pill Approved to Worries About Biomedical 'Big Brother' \(NYTimes, 2017\)](#)
8. [Medication Adherence: The Elephant in the Room \(U.S. Pharmacist, 2018\)](#)

9. [Interventions to improve adherence to self-administered medications for chronic diseases in the United States: a systematic review \(Ann Intern Med., 2012\)](#)
10. [Medication Adherence: Helping Patients Take Their Medicines As Directed \(Public Health Rep., 2012\)](#)

Data sources:

- [Medicare Part D prescriber data](#)
- [Medicare Part B utilization and payment data](#)
- [Data.gov pharmacy tag](#) ([bulk data](#) can be downloaded if government shutdown persists)
- [AdhereR R package \(simulated data\)](#)