Medication Adherence

August 2018 Tech Brief for Health Care Talent Network

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Long-term Pharmacotherapy for Chronic Illness

Smart pills, once ingested, transmit information from *within* the digestive system. When the purpose of the pill is to record medication compliance, all the pill needs to provide is confirmation of medication ingestion with a time-stamp. A receiving device collects data from the ingested pills. Data is then transmitted back to a program which can track compliance to a prescribed regimen.

Technological compliance tracking is not needed for patients who are willing and able to take responsibility for their health. Nor is it required for those with attentive caregivers, e.g. children or elderly with family and/or home health aides.

Those with risk on non-compliance include seniors living on their own, patients with complex pharmaceutical regimes, those struggling with **mental illness** and those with health conditions which are overwhelming to them. This last category – those unable to cope with a medical condition or chronic illness – has been identified as a **very significant health care expenditure**.

The Patient Protection and Affordable Care Act (**ACA**) made attempts to reduce the exorbitant cumulative costs of those, who due to poor coping skills, use emergency rooms as their primary care for chronic and preventable conditions. One provision targeting this challenge was the creation of **Accountable Care Organizations** (ACOs), which receive bonus payments for minimizing costs while achieving quality benchmarks such as mitigation of chronic disease. ACOs are likely to remain even as other parts of the ACA are struck down.

Compliance tracking technology can be an important part of cost savings for ACOs and provide relief for family members living at a distance who need to know when intervention is necessary to prevent further medical problems.

Labor Force Takeaway

Medication adherence technology is very likely to be included in health insurance policies that include **chronic illness coverage**. A single hospital visit due to non-compliance on the part of the patient likely would **cost** much more than the administration of smart-pill technology. This is equally true for addressing mental illness, diabetes, cardiac conditions, HIV, rheumatic diseases, etc.

TAN recommends upskilling healthcare paraprofessionals for compliance and attendant compensation.

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Digitally tracking if patients take their meds

In the 2012 movie, ***Robot & Frank***, the exasperated son of a retired jewel thief named Frank, presents his father with a robotic healthcare aide. Frank has been showing signs of dementia: milk spoils, clutter builds up, time is non-linear. The robot's job is to set Frank on a routine, control his diet, introduce moderate exercise and engage him in a project. The story is set in "the near future" where libraries are reimagined as book-free social spaces and robot assistants are relatively common. The themes are timeless: family, friendship and the fear of technology takeover.

In the real world, the need for accountability for actions that ensure **wellness** is indeed driving technological innovations. Unfortunately, medical compliance solutions are not yet bundled with companionable voice technology, gardening ability and **artistic plating** of healthy meals. That said, today's medical adherence technology (software based in doctor's offices or smart pills) is superior to the nagging, bartering and cajoling used on Frank.

According to a **Deloitte study**, lessons from behavioral economics should be leveraged in adherence programs, including how to use incentives to motivate consumers. However, they ponder how to motivate the non-adherent patient who is skeptical about incentives. This brings us to the heavy-handed smart pill solution.

The smart pill contains a drug and **a sensor** which is activated when it meets stomach fluid. The sensor then notifies a **receptor patch** worn on the arm. A paired cell phone application records when the patient has consumed the medication. Skip a dose and the patient will receive a cell phone reminder. With a patient's consent, the compliance data can be accessed by the patient's doctors or caregivers via a web portal.

The **first US application** for a **smart pill** combines an FDA approved ingestible sensor-transmitter and an existing medication. **Abilify MyCite** is a smart pill that treats schizophrenia. Schizophrenia, bipolar psychosis, and other mental illnesses **do not necessarily produce violent behavior**. Yet, many mass shootings are perpetrated by those with mental illness. Given the **societal concerns regarding psychosis and access to firearms,** smart pill technology could be just what families and government-caretakers need to balance civil rights/freedoms with safety.

> **Irony Alert: For patients hearing voices telling them that the government is implanting listening devices in their body, a monitoring sensor may be a hard pill to swallow.**

To counter forgetfulness as a reason for non-adherence, **~100 companies are developing tools to remind people to take their medications**. Many of these tools use artificial intelligence (AI) to identify who to monitor more closely. Anecdotal observation supports the **use of text message reminders**.

Meanwhile, back in "the near future", Frank is delighted to discover that his robot was never synced with legal databases. His attitude toward his butler/caretaker is transformed. The robot is pleased to have Frank engaged in a project that brings about a remission in his dementia. The project is cat burglary – stealing jewels from wealthy young neighbors who got rid of the books in the library.

Robot is programed to put Frank's well-being first. The tension between whose well-being is paramount – Frank's, the son's, the wealthy neighbor's, or the robot's - carries the story through to a droll and ironic conclusion. Though today's digital health solutions will never be loved, they will most certainly be appreciated.

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