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SMART PILL DISPENSER – A NEW TOOL FOR IMPROVING PATIENT ADHERENCE

Non-adherence by patients to dosing regimens is a major problem and it is estimated that around 50% of people with chronic disease do not take their medications regularly. This has major costs not only financially but also in increased rates of complications and higher morbidity and mortality. Harnessing the power of smartphones can provide a method of ensuring that patients remember to take medication at the right time and dosage. Paul Wismer from Balda explains how their product, the Smart Drug Dispenser, can fulfill these requirements.

Many of us are familiar with the challenge and the statistics concerning patient's adherence. Adherence is the extent to which a patient acts in accordance with the prescribed interval (and dose) of a dosing regimen. Poor adherence is ubiquitous in medicine, and its ramifications are far from trivial.

There are even two types that can

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be differentiated. The term primary adherence refers to the filling of the very first prescription. In chronic diseases, such as diabetes, the rate of non-adherence is around 20%. Secondary adherence refers to following the prescribed regimen once the prescription is filled. Here only around 50% are taking their meds correctly. Factors such as number of events per day (once a day *versus* four per day) are important. The

more a person has to take, the greater the chance of non-compliance.¹

Non-adherence costs the US alone a staggering US\$300 billion (£205 billion) per year in the form of emergency department use, hospitalisations and diagnostic tests. As said, nearly 50% of patients with chronic diseases do not take their medications regularly. Furthermore, patients who are non-adherent to treatment are more likely to experience worsening medical conditions, unnecessary complications and overall higher rates of morbidity and mortality (Figure 1).²

New research conducted for a national multimedia educational campaign to raise awareness about the importance of medication adherence shows that there are clear benefits and opportunities linked to increased communication between people who take prescription medications and their healthcare professionals, as well as to the use of tools that make it easier to adhere to medications (Figure 2).³

But the question is: what concrete solutions are available to help combat this huge problem? Over the years, a number of “dispensing aids” as well as organisers and reminders have been developed. But a more holistic approach is needed to help improve adherence, specifically the secondary



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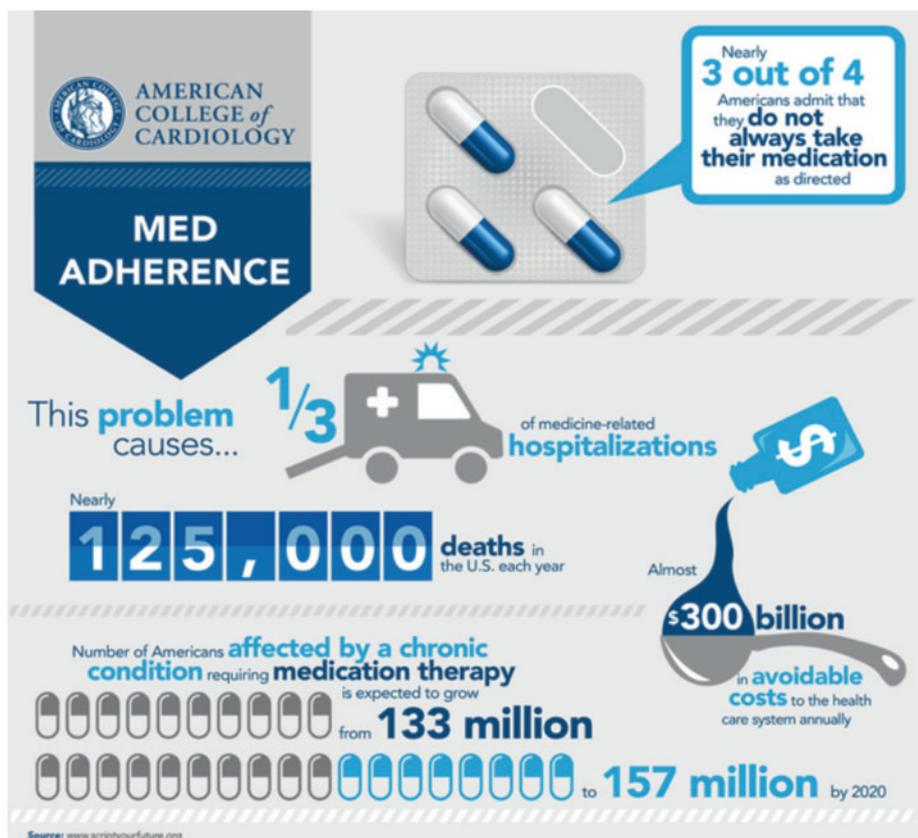


Figure 1: The cost of medical non-adherence (from www.scriptyourfuture.org).

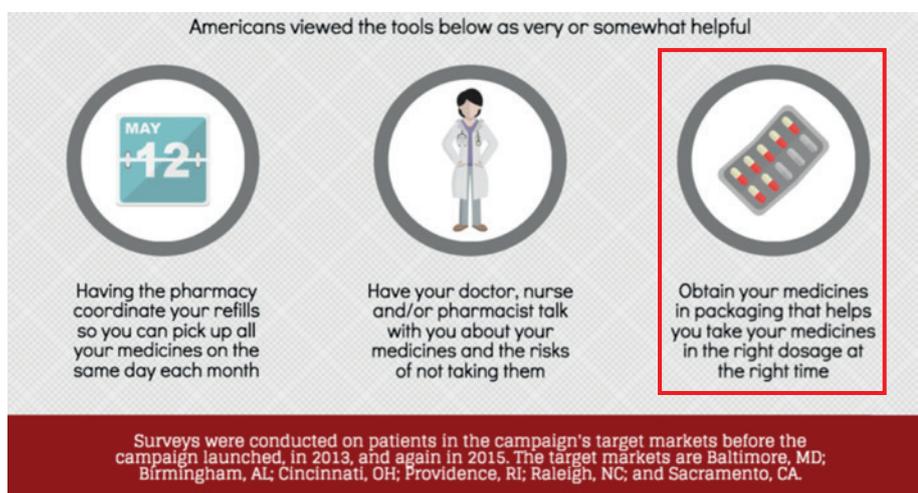


Figure 2: Packaging can be very helpful in improving compliance (from www.scriptyourfuture.org).

adherence (i.e. once the patient has obtained his/her first prescription).

THE SMART DRUG DISPENSER

We now live in a world full of smart phones and apps. Today there are 3.4 billion Smartphone subscriptions and Ericsson (Stockholm, Sweden) predicts this will grow to 6.4 billion by the year 2021.⁴

Why not use that computing and communication platform to help patients in their daily lives? This is the approach that has been taken by Balda Healthcare,

which has teamed up with Mechatronic AG (Darnstadt, Germany) to develop the world's first "Smart Drug Dispenser" for pills.

Balda brings decades of experience with hand-held devices made of plastic and incorporating electronics. Mechatronic is an expert in designing electronics for medical products and designed the app in addition. This teamwork of expertise is now paying dividends. Using a minimum of electronics in the dispenser itself and communicating, via Bluetooth, bi-directionally with the smart phone/app, this system promises to provide adherence support.

Via the app, the number of pills and the time when the medication is to be taken is entered in a user-friendly way (Figure 3). This can be done by the physician or a family member or the patients themselves. The device, which easily fits in the palm of your hand, stores the dosage regimen and dispenses the tablets via the push of a button. Alone, it can give its own optical and even acoustic signals, if deemed necessary. The associated smartphone and app, however, would be the main source of user reminders – via APP alerts and an acoustic signal – until the proper dose has been dispensed. Using the power of the smart phone, a text message or email could be sent to a care provider or family member if the patient fails to take his or her (correct) dosage.

The dispenser locks itself after the proper number of pills have been dispensed and, in general, is locked until the time for medication is reached. This prevents under- or over dosage. This could help prevent abuse of pain medication, for example. Balda believes these features could be a way to give family members peace of mind, knowing the dosage regimen can be followed.

Obviously, unlocking the power of the smartphone, both in computing and in communication, means there are additional features that could be added into the app, such as monitoring the number of pills remaining and helping with the logistics of re-ordering by communicating with the prescribing physician or pharmacy.

We have seen the scientific figures showing that this support is dearly needed. The Smart Drug Dispenser therefore makes an important contribution to therapy adherence and safety. Balda introduced it to the medical community for the first time at the CPhI in Madrid, in October of 2015. In the meantime the Smart Drug Dispenser, together with its development partner, Mechatronic, has received two innovation awards at two different shows in the past nine months. The first was at the Compamed show (which runs parallel to Medica) in Düsseldorf, in November 2015. The second was at the MedTec Europe in April (Figures 4 and 5).

Christoph Klaus, Head of the Business Unit, Balda Healthcare, has described the potential of the system: "An ageing population that is also tech-savvy has a need for modern solutions. The Smart Drug Dispenser is an exciting product that provides added value for patients, physicians,



Figure 3: The smart pill dispenser.

relatives and also health insurers.” Thomas Ullmann from Mechatronic AG is also pleased with the result of the co-operation between the development service provider and the plastics specialist: “With the Smart Drug Dispenser, we have taken an innovative step in the direction of user-friendly operation whilst offering a high degree of user safety.”

THE BENEFITS OF THE SMART DRUG DISPENSER

- Solving a great unmet need: medical adherence
- Feasible today (technology is available)
- Ethically relevant and could save lives
- Unburdening of family members/give them peace of mind
- Potentially large cost savings for society – global cost of non-compliance estimated up to \$1 trillion!

Specifically for pharma companies:

- Help in clinical studies to track/insure compliance
- Differentiator from competition for serial production
- Increase customer loyalty and revenue in general.

REFERENCES

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2. *Practical Strategies to Improve Patient Adherence to Treatment Regimens - Imran Aslam, MD; Steven R. Feldman, MD, PhD.*
3. *www.scriptyourfuture.org.*
4. *Ericsson Mobility Report (Mobile World Congress Edition) Feb 2016.*



Figure 4: DeviceMed Award for innovation (left). Presented at Compamed /Medica, Nov 2015. Winner of the Exhibitor Innovation Competition MedTec Europe, April 2016 (right).



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