If you've got prescription medications languishing in the back of your kitchen cupboard; if you've ever skipped the last few days of a course of antibiotics; if you've even given yourself a 'holiday' from your daily pills… you're contributing to one of the biggest challenges facing healthcare today. But you're not alone.

PEOPLE'S ADHERENCE TO MEDICATION IS SIMPLY: LOW

'Adherence' is the extent to which somebody's behaviour – taking medication, following a diet, or executing lifestyle changes, corresponds with agreed recommendations from a healthcare provider[1]. Of the spectrum of behaviours under the term 'adherence', this article focuses on adherence to *medications*. Here we share an overview of the insights we have gathered from our healthcare, public health and behavioural science research, which have informed our approach to this important topic.

The challenge for healthcare providers, the government and pharmaceutical companies is that only 50% of medication doses prescribed are ever taken[2]. A quote by former US Surgeon General Charles Everett Koop encapsulates the problem well: "*drugs don't work in patients who don't take them*". Sub-optimal adherence results in patients suffering sub-optimal health outcomes, including more hospital admissions. Proper adherence enables patients to manage their chronic diseases, resulting in improved health outcomes and a better quality of life.

'Adherence' covers the life span of a patient's relationship with their medication, which can be broken down into three stages: *initiation*, *implementation* and *persistence*[3].

Stages of adherence[4]

Initiation occurs when the patient takes the first dose of a prescribed medication (though can be broadened to the period between being prescribed a medication and taking the first dose).

Implementation is the extent to which a patient's actual dosing corresponds to the prescribed dosing regimen, from initiation until the last dose.
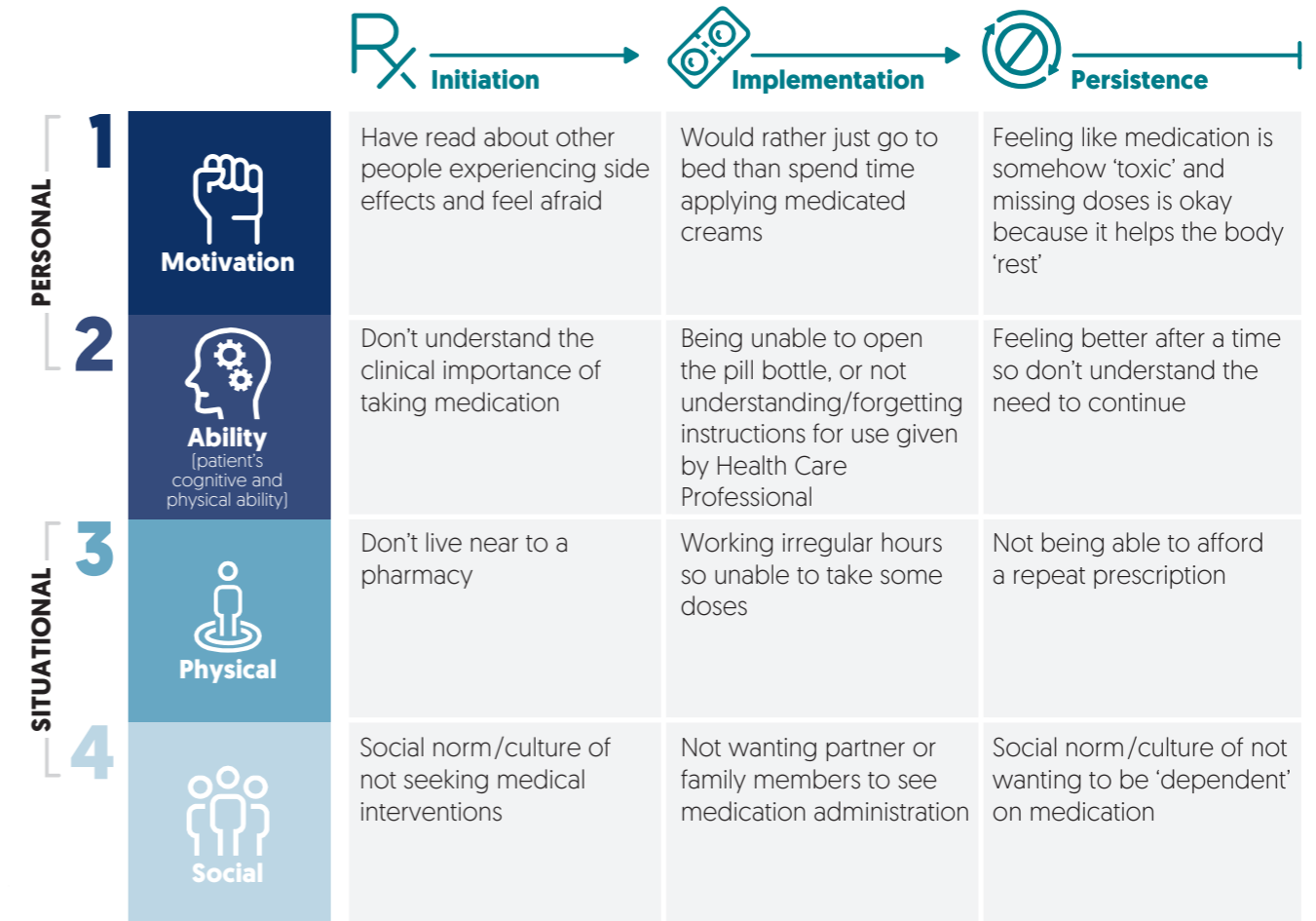
Persistence is the length of time between initiation and the last dose (before patients discontinue their medication).

Non-adherence was historically considered the shortcoming of the *patient*. Now, the healthcare system is moving towards a more empathetic, 'no-blame' approach and acknowledges that the onus for driving adherence is on healthcare practitioners, the government and pharmaceutical companies[5].

Part of this no-blame approach links with a broader industry shift towards patient centricity – a best practice ideal involving arranging the system around the patient rather than vice versa. Another reason is that learnings from the field of behavioural science indicate that it is uninformed to blame people for their 'bad' decisions since these are often the product of automatic decision-making processes (which determine much of our behaviour). An example of how non-adherence is more complicated than merely making 'bad' decisions comes from dermatology. Adherence to medicated creams for skin conditions is notoriously low, despite the visibility of symptoms and the hugely detrimental impact they can have on patients' self-confidence. This incongruity of patients wishing for their symptoms to be cured, yet often choosing not to apply their medication seems counterintuitive – one might have expected dermatology patients to be highly adherent since (unlike other conditions) dermatology is very visible.

This example highlights the complexity of the challenge. Indeed, one 2013 review found 771 individual factors influencing non-adherence[6]; reflective of the heterogeneity of patients' circumstances and attitudes. Understanding these individual behavioural drivers is crucial because in order to achieve a desired behaviour, we *must* understand the drivers and barriers which are shaping the current behaviour. The many drivers for non-adherence can be split into four categories: motivation, ability, physical context and social context. These categories, overlaid with the stages of adherence, start to give us a more granular framework for thinking about adherence:

		Initiation	Implementation	Persistence
PERSONAL	**1 Motivation**	Have read about other people experiencing side effects and feel afraid	Would rather just go to bed than spend time applying medicated creams	Feeling like medication is somehow 'toxic' and missing doses is okay because it helps the body 'rest'
PERSONAL	**2 Ability** (patient's cognitive and physical ability)	Don't understand the clinical importance of taking medication	Being unable to open the pill bottle, or not understanding/forgetting instructions for use given by Health Care Professional	Feeling better after a time so don't understand the need to continue
SITUATIONAL	**3 Physical**	Don't live near to a pharmacy	Working irregular hours so unable to take some doses	Not being able to afford a repeat prescription
SITUATIONAL	**4 Social**	Social norm/culture of not seeking medical interventions	Not wanting partner or family members to see medication administration	Social norm/culture of not wanting to be 'dependent' on medication

To fully map out a patient's behavioural drivers and barriers to adherence requires a holistic and empathetic understanding of that person. Only then is it possible to design a tailored behavioural intervention. For example, a *physical* barrier to initiation (such as not living near to a pharmacy) might be overcome with an intervention such as home delivery of medications. A *social* barrier to persistence could be met with a social media campaign or communications targeted to a patient's family members.

Understanding adherence behaviour in this way allows us to design effective interventions to target specific drivers/barriers. The next question is: how can we know that an intervention will affect behaviour? The academic literature doesn't point decisively towards particular recommendations (for instance, in a recent Cochrane review only complex adherence interventions were helpful - and even then, not to a great extent)[7]. Technological interventions such as
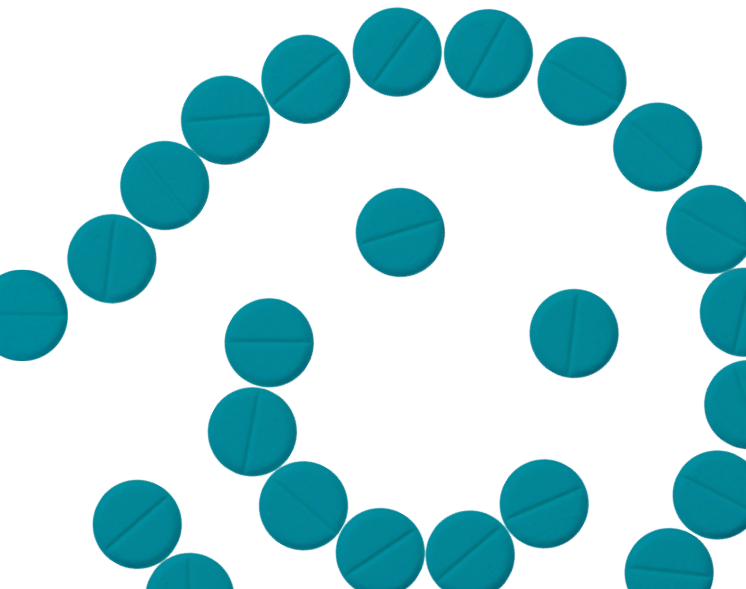
'smart' pills and pill boxes are too new to evaluate. This lack of clarity reinforces the need to fully understand the patient before designing interventions.

Returning to dermatology, we know from our ethnographic research that for many patients affected by psoriasis, the outcome of *better skin in the future* was not a sufficient incentive to remain adherent for extended periods of time. A variety of motivational barriers to persistence existed, including forgetfulness, prioritising the care of children over self-care and letting skin 'rest' periodically. Arguably, pharmaceutical companies and the NHS have previously relied too heavily on educational materials to promote adherence - assuming that if patients only knew what to do to achieve better skin outcomes, they would remain adherent over time. Instead, identifying these motivational barriers helps explain why education alone can be ineffective[8] - well-meaning initiatives such as information leaflets just don't target the relevant behavioural drivers.

AN EFFECTIVE INTERVENTION COULD BE TO MAKE THE DESIRED BEHAVIOUR INTO A HABIT

How can these motivational barriers be overcome? An effective intervention could make the desired behaviour (e.g. applying medicated cream in the morning after a shower) into a habit – thereby 'short circuiting' the need for motivation at all. A habit can be summed up as a cue which prompts a particular behaviour, and generates an immediate reward. In the psoriasis example, patients were unable to habitualise their application of creams because there was no reward following application to perpetuate the habit. Without a reward component, patients struggled to retain the motivation and discipline to *implement* and *persist* with their regime. In this case study, the intervention (to be implemented by a healthcare practitioner or pharmaceutical company) is a *reward* which perpetuates the habit. The nature of the reward, as with all habits, could be anything – provided it was trialled and proved effective.

In other sectors, including automotive, technology is successfully influencing consumer behaviour. Ford Fusion Hybrid's 'Efficiency Leaves' incentivise more economical driving. As motorists drive more economically, a leafy vine grows on the display and becomes lusher; a visual reward for the driver. There is satisfaction in receiving this feedback, akin to the satisfaction of seeing a smiley face light up on the road. Could we similarly leverage technology in healthcare interventions to modify behaviour?

TO IMPROVE ADHERENCE, WE NEED A FULL AND EMPATHETIC UNDERSTANDING OF THE PATIENT

Adherence should be a priority for the NHS and private sector alike. Historically, the healthcare sector has relied on educational solutions which do not address enough behavioural drivers as to be a sole solution to shape patient behaviour. In addition to improved patient outcomes, there are considerable economic implications of improved adherence. Health systems will be relieved of the downstream costs of treatment and hospitalisations which result from non-adherence[9], and pharmaceutical companies will benefit from more patients filling their initial and repeat prescriptions.

To improve adherence, we need a full and empathetic understanding of the patient; one where we seek to understand their individual barriers to adherence and where these barriers lie. By working with both pharmaceutical companies and the NHS to get closer to patients, we can create bespoke interventions which speak to individuals; a more informed, patient-centric approach to tackling the adherence challenge.

END NOTES

01.   http://www.who.int/chp/knowledge/publications/adherence_full_report.pdf

02.   http://www.who.int/chp/knowledge/publications/adherence_full_report.pdf

03.   https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3403197/

04.   https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3403197/table/tbl2/

05.   https://www.nice.org.uk/guidance/cg76/chapter/Introduction

06.   https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3722478/

07.   https://www.researchgate.net/profile/Xiaomei_Yao/publication/5426714_Interventions_to_enhance_medication_adherence/links/0c960534d4038d5e3d000000.pdf

08.   http://www.health.org.uk/sites/health/files/BehaviouralInsightsInHealthCare.pdf

09.   https://www.nice.org.uk/guidance/cg76/chapter/Introduction

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