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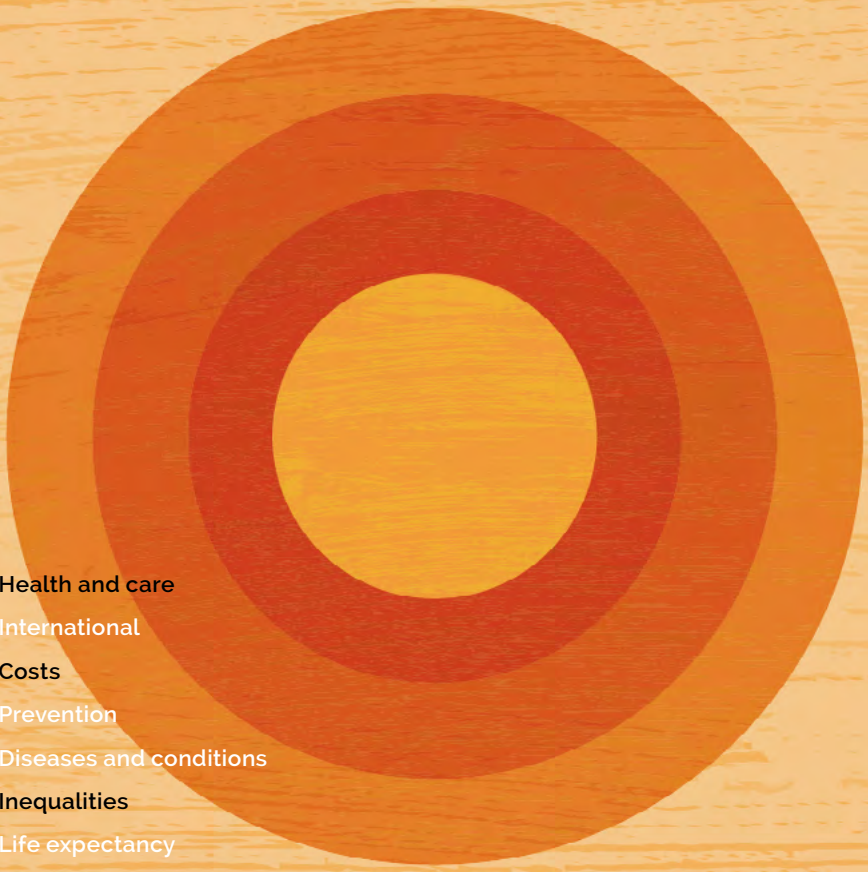
Doctor's Orders

Why adherence is critical to improving health outcomes across the life course



Health and care

International

Costs

Prevention

Diseases and conditions

Inequalities

Life expectancy

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Contents

About this report

This report was developed following a review of systematic reviews, medical literature, and literature from other sources, as well as in-depth semi-structured interviews with 10 international stakeholders who have an interest in adherence. We are grateful to all our interviewees for their time and insight.

This report has a particular focus on prevention, as well as three chronic conditions: diabetes, osteoporosis and cardiovascular disease (CVD). However, the findings are likely to be applicable to a wide range of other chronic conditions where adherence to medical advice is critical to ensure the best possible health outcomes.

Executive summary

A chance to win a scholarship in Ohio, free sausages in Germany, and a €150 coupon in Greece – these are just some of the myriad of incentives on offer to persuade people to get vaccinated against COVID-19.[1,2,3] On the flip side of the coin, other countries are making the vaccination compulsory in different ways: Austria has mandated the jab for all citizens,[4] England previously mandated it for social care workers,[5] while Canada has banned the unvaccinated from buying alcohol in Quebec.[6]

Governments around the world have been swift to experiment with ways to increase uptake in the face of a global pandemic. But this type of intervention isn't on the agenda to help people adhere to prescribed medication regimes or engage with healthy lifestyles, whether for preventative purposes or to help those with chronic conditions (such as CVD, diabetes and osteoporosis) manage their health. It should be.

There is a huge opportunity to improve health outcomes and reduce costs by ensuring people adhere to the medications prescribed for them. In many cases these medicines are funded in whole or substantial part by governments or health insurers, and reductions in adherence mean that the expected cost effectiveness and health outcomes gains from those medicines may be reduced. Given that payers fund these medicines for the health outcomes gains (and future healthcare expenditures they will offset through correct administration), ensuring high adherence should be much higher up the priority list for all governments.

There's a wealth of evidence for the benefits of healthy behaviour (including maintaining a healthy body weight, not smoking, minimising alcohol consumption, engaging in physical activity), including maintaining good health and ageing well. But people don't always find it easy to adhere to recommendations on preventative behaviours.[7]

Encouraging and helping people with chronic conditions adhere to their prescribed medication has the potential to improve health outcomes and enhance longevity as well. Nearly half of all adults and approximately 8% of children (aged 5-17) worldwide have a chronic condition.[8] Yet, studies have consistently shown that adherence to medication is poor; estimates range from under 80% to under 50%, with an average of 50%. The World Health Organization (WHO)

estimates that adherence to medication for chronic conditions is as low as 50% in developed countries and even lower in developing countries.[9]

Non-adherence is also expensive for governments. Figures suggest that the annual costs of medication non-adherence range from $100 billion to $290 billion in the USA, €125 billion across Europe and AU$7 billion in Australia.[10,11] 10% of hospitalisations in older people are attributed to non-adherence. The typical non-adherent patient requires three extra medical visits per year, leading to increased treatment costs of $2,000 per annum.[12]

Vast amounts of medicines are dispensed around the world. In England alone, 1.12 billion prescription items were dispensed in the community in 2019, at a cost of £9.08 billion.[13] Clearly it's important that these medicines are used according to their prescribing conditions. This is not only to achieve the intended effect of those medicines but also to reach the cost-effectiveness expected of them by national governments. To paraphrase Albert Sabin, *"a (medicine) that sits on the shelf is useless"*. By extension, it is also not cost-effective for the condition that it was prescribed.

Treatment regimens for medicines are based on high-quality clinical evidence that are approved by appropriate regulatory authorities – which is why governments and insurers have agreed to pay for them. So, given that poor adherence can be quantified, and is often evident in predictable patterns or disease areas, it seems wise to invest in mechanisms and interventions to encourage increased adherence. We could see a considerable improvement in health outcomes (and consequently longevity), not only by developing new drugs, but by helping people adhere to existing treatment regimens that have already been researched, tested and prescribed for them.

There is no magic wand to improve adherence. In 2003, WHO found that the barriers to adherence and preventative behaviours fall into five dimensions:

- Social and economic related factors
- Health system/health care team-related factors
- Therapy-related factors
- Condition-related factors
- Patient-related factors[14]

However, it appears that adherence isn't usually prioritised by governments, health providers or healthcare professionals (HCPs). Adherence isn't measured at a national level for any disease, apart from in Sweden where hypertension is recorded. And as governments don't prioritise adherence, health providers aren't measured or incentivised for improving it, meaning HCPs may not have the time and resources (or reminders) to focus on it during consultations.

Interventions to improve adherence should consider all five of the domains identified by WHO. Studies suggest that personalised approaches lead to the best outcomes. Theories from behavioural science should be applied to adherence interventions, and there should be exploration of how financial incentives and rewards, as used during the pandemic, can be used to encourage adherence in people with chronic conditions. HCPs should receive training in behaviour change methods so they can support people with adherence.

People are individuals who require personalised approaches to adherence. There needs to be policy solutions at three levels: the level of the person at risk of ill health or already living with a chronic condition; the provider level, including pharmaceutical companies and different health care workers, from pharmacists to support workers; and government level, to embed adherence within health systems and patient pathways. A piecemeal approach won't be enough to move the dial to improve adherence, and with it, health outcomes.

Supporting adherence to existing treatment regimes in people with chronic conditions, and those at risk of developing them, as well as encouraging them to make changes to their lifestyles, offers a substantial reward. It's time to claim it.

Key recommendations

Improving adherence isn't the responsibility of any one individual; every function in the healthcare system, from governments to healthcare providers, pharmaceutical companies and HCPs has a role to play. Below are recommendations for action, developed based on evidence outlined in the report and interviews with stakeholders. The recommendations fall into three themes: **democratising access**, **inspiring and engaging** and **better use of technology**. They're aimed at governments around the world, healthcare providers, WHO, pharmaceutical companies, and universities and researchers.

If these actions are put into place, people will be better supported to more rigorously adhere to their medical interventions. There will be benefits for them individually and for society as a whole, as a wide range of social, medical and economic outcomes will be positively impacted.

Democratising access

Governments should:

- Fund annual medicine reviews to help people with chronic conditions with decision making and any identified gaps in care, and report on the number of medicine reviews conducted every year across different demographic groups
- Prevent co-payments from causing a barrier to adherence, as evidence shows they can hinder people from taking prescribed medication
- Invest in HCP training programmes on behaviour change to supply workers with the requisite skills and knowledge to support adherence to medication regimes and lifestyle behaviour programmes

Universities should:

- Ensure that undergraduate curricula for all HCPs include an adherence topic that communicates the importance of adherence for the health outcomes of individuals, and helps HCPs to implement effective behaviour change methods

Inspiring and engaging

Governments should:

- Promote and prioritise adherence as an effective disease management tool, by including it in national chronic disease strategies; for example, those for CVD, osteoporosis and diabetes
- Set metrics for acceptable adherence rates, and measure and report on adherence rates for chronic conditions, including CVD, diabetes and osteoporosis, at a national (or subnational) level
    - ➢ In countries where medicines are funded from public money, measures could be implemented to assess divergence from acceptable adherence rates, and appropriate metrics set to ensure that 'value for money' is maintained

- Establish behavioural insight teams with a focus on health, and research the effect of using different incentives to encourage people with chronic conditions to adhere to medications and lifestyle changes
- Expand the role of pharmacists, with concomitant resources and funding, to allow these professionals to support adherence, monitor for signs of non-adherence and conduct medicine reviews
    - ➢ Pharmacy contracts should reimburse behaviour that supports adherence
    - ➢ Consider giving pharmacists limited prescribing rights
- Fund real-world randomised controlled trials of interventions to improve adherence and ensure these are formally evaluated

WHO should:

- Publish annual adherence rate results, with comparisons between countries

Providers should:

- Use learnings from the research on the different adherence trajectories for different groups with chronic conditions to develop tailored interventions for people at greater risk of non-adherence
- Explore using the COM-B model to develop interventions that support individuals to adhere to their medical directions

Better use of technology

Governments should:

- Invest in research to test how technology, including wearables, can improve adherence
- Invest in the collection and management of electronic health records, including supporting deidentified assessments of patterns of use and care
    - ➢ Ensure that health records are linked across all healthcare providers (private and public), allowing everyone involved in an individual's healthcare delivery to access that person's medication record, with appropriate permissions

- Ensure that people with chronic conditions can view their health records easily and that records incorporate information and advice to be used as a tool to help with medication adherence and management

Healthcare providers should:

- Build on the increased use of online consulting during the pandemic to deliver more regular virtual follow-up reviews to check medication adherence and management

Section 1: Adherence

1.1 What is adherence and why is it important?

Adherence isn't a common topic in modern healthcare policy conversations. Indeed, WHO last focused on it in 2003. Yet it's of vital importance because without it, people will simply not realise the full benefits of their medication and any recommended lifestyle changes; their health won't be as good as it could be. A generation after the WHO report, and with the rise of digital health technology amid the fallout from the COVID-19 pandemic, it's time to assess how a concerted effort on improving adherence could bring major benefits for people with chronic conditions.

What do we mean by adherence?

WHO defines adherence as "the extent to which a person's behaviour, taking medication, following a diet, and/or executing lifestyle changes – corresponds with agreed recommendations from a health care provider."[15]

Non-adherence is usually defined as taking less than 80% of a prescribed dose of medication.

Optimal adherence is essential for successful treatment; low adherence can lead to treatments not working in the way that they should, as well as cost wastage due to reduced cost-effectiveness and increased use of healthcare services. A wealth of evidence shows that non-adherence is associated with an increased risk of poor health, adverse clinical events, and mortality. If people are to live longer and healthier lives, encouraging high adherence is a vital part of the puzzle – and it's currently being overlooked.

"The prize is a healthier population and increased longevity."

Professor Stephen Higgins, Director, Vermont Center on Behavior and Health, Virginia H. Donaldson Professor in Translational Science, Departments of Psychiatry and Psychological Science, University of Vermont

Adherence is a dynamic process that changes over time; the diagrams and definitions below illustrate the key elements of adherence, from initiation (when people begin their course of medication or lifestyle change), through implementation, to discontinuation (when individuals stop their course of treatment). Each stage of the process must be considered to best support people with chronic conditions.

Definitions

Initiation: When someone with a chronic condition first takes a dose of prescribed medication.

Discontinuation: When the patient stops taking the medication.

Implementation: The extent to which the patient's actual dosing corresponds to the prescribed dosing regimen.

Persistence: The length of time between initiation and discontinuation.[16]

Adherence to medication

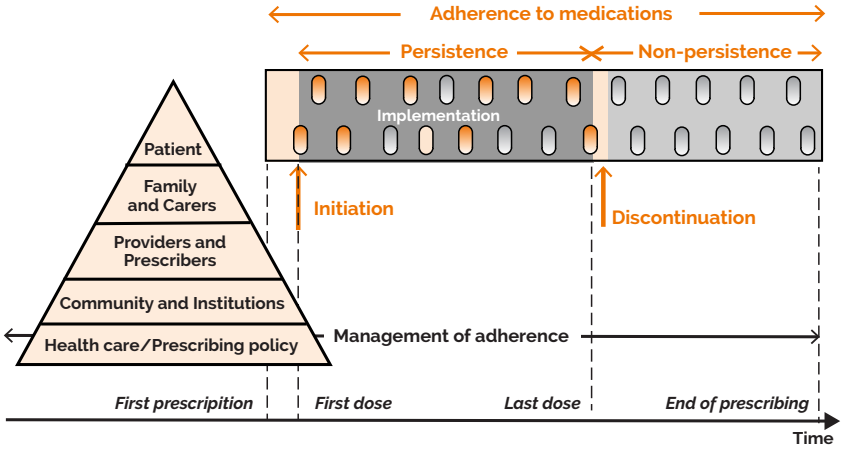

Figure 1: Adherence trajectory[17]

Clinical trials usually result in high adherence, as participants are closely followed. But if adherence in the real world differs from that in clinical trials, it's unlikely that trial results will be replicated, affecting clinical outcomes.

In 2003, the WHO estimated that adherence to chronic disease medications is as low as 50% in developed countries and even lower in developing countries, and subsequent studies have arrived at similar figures.[18] Adherence hasn't substantially changed over the last 50 years. People with acute conditions tend to have higher rates of adherence than people with chronic conditions.[19] If people are to live longer lives in good health, we must help people with chronic conditions to improve adherence.

"Adherence is important because without it we lose the benefit of the treatment. Resources invested in basic research, drug development, developing clinical guidelines and implementation are wasted if people don't adhere to their treatments."

Clara Marquina, Research Fellow, Monash University

Non-adherence is also expensive, because health outcomes are not optimised. Figures suggest that the annual costs of non-adherence to medication range from $100 billion to $290 billion in the USA, €125 billion in Europe and approximately AU$7 billion in Australia.[20] [21] 10% of hospitalisations in older people are attributed to non-adherence. The typical non-adherent patient requires three extra medical visits per year, leading to increased treatment costs of $2,000 per annum.[22]

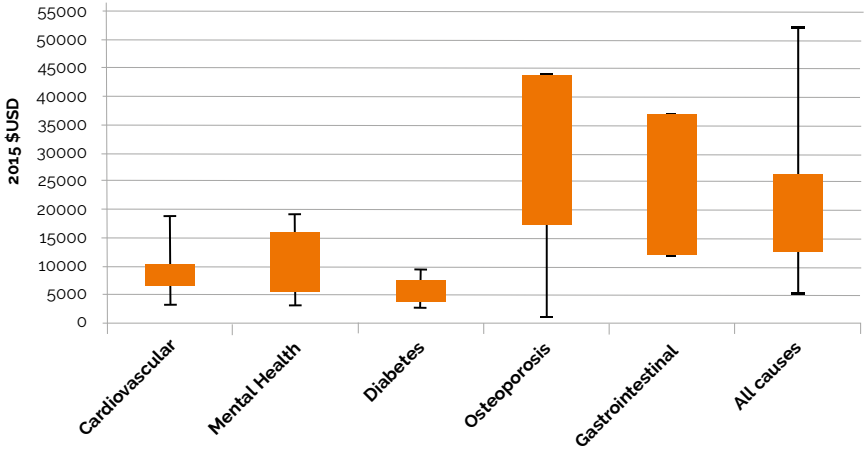

Figure 2: Medication non-adherence costs[23]

Annual adjusted medication non-adherence costs per patient per year. Minimum, maximum and interquartile range of adjusted annual costs incurred by people with chronic conditions. All-cause costs include mixed studies.

Adherence to lifestyle changes

Medication adherence shouldn't be the only focus; it's just as important to help patients to adhere to lifestyle modification and behaviour changes. Evidence shows that adherence to lifestyle modifications is also sub-optimal.[24]

"The evidence is so strong now that patients who are not adherent have worse outcomes, whatever disease one is looking at, in terms of worsening disease, increasing hospitalisations and greater morbidity. When you follow that through, then it's the healthcare system that would benefit too, as these patients are more costly, and they end up with more hospitalisations."

Professor John Weinman, Professor of Psychology as applied to Medicines, King's College London

Prescribed treatments are based on high-quality clinical evidence, and when reimbursed by payers are considered 'good value for money' in terms of cost-effectiveness – which is why governments and insurers have agreed to pay for them. Given that adherence issues are known and often identifiable, it seems wise to invest in mechanisms and interventions to encourage improvement. We could see a significant improvement in health outcomes and longevity on all fronts simply by helping people adhere to the existing treatment regimens that have already been researched, tested and prescribed for them.

1.2 What affects adherence?

Non-adherence doesn't have one simple cause. It's almost certainly affected by a range of factors. These vary for different people and may change over time; for example, a significant life event, such as the death of a partner or losing a job, could affect a person's ability to adhere to their medication or maintain healthy lifestyles.

Non-adherence can be intentional (for example, a medication holiday) or non-intentional (forgetting to take medication). The 2003 WHO study and subsequent others identify a range of factors that affect adherence, which fall into five dimensions. Within each dimension of adherence, there are many factors which affect it.

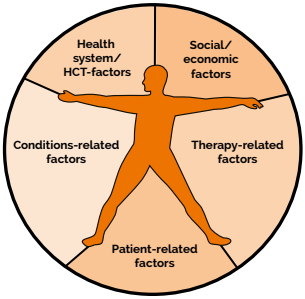

Figure 3: The five dimensions of adherence

Table 1: Examples of factors categorised by WHO's five dimensions of adherence[25]

Socioeconomic	• Low socioeconomic status • Poverty • Illiteracy • Low level of education • Unemployment • Lack of effective social support networks • Unstable living conditions • Long distance from treatment centre • High cost of transport • High cost of medication
Healthcare systems	• Poorly developed health services with inadequate or non-existent reimbursement by health insurance plans • Poor medication distribution systems • Lack of knowledge and training for health care providers on managing chronic disease • Overworked health care providers • Lack of incentives and feedback on performance
Medical conditions	• Severity of symptoms • Level of disability (physical, psychological, social and vocational) • Rate of progression and severity of the disease • Availability of effective treatments
Therapy	• Complexity of the medical regimen • Duration of treatment • Previous treatment failures • Frequent changes in treatment • The immediacy of beneficial effects • Side-effects and the availability of medical support to deal with them
Patient	• Patients' knowledge and beliefs about their illness • Patients' motivation to manage it • Confidence (self-efficacy) in their ability to engage in illness-management behaviours • Expectations regarding the outcome of treatment and the consequences of poor adherence

The WHO model shows that there are a range of factors that affect adherence: from the wider social determinants of health, to the individual patient, to the health system. Encouraging adherence requires concerted efforts across all five dimensions – this means adherence interventions are often complex and multifaceted. But the 2003 WHO study also found that research has tended to focus on interventions based on patient-related factors rather than system and healthcare team interventions: this continues to be the case nearly twenty years later. Health systems around the globe should encourage the development of actions across all five dimensions, which should lead to a wider range of interventions, and in turn improve health outcomes and reduce long-term costs.

However, despite multiple attempts, it has proved difficult to draw firm conclusions about which interventions support adherence. A 2014 Cochrane review of interventions identified a wide variety of randomised controlled trials (RCTs), which tested different adherence interventions. The review concluded that it wasn't possible to identify any interventions that made a significant difference.[26]

1.3 Measuring adherence

Measuring adherence, especially isolating it from other factors, isn't easy. Trials and studies often use a range of measures, from how often people renew prescriptions, to self-reporting (which carries a risk of bias), to biomarkers.

Some studies have started using technology to measure adherence. For example, medication event monitoring systems include a microchip in medication packaging, which records when the packaging is opened and closed. Other studies have used pill count, while others looked at pharmacy dispensing records.

But having a range of measures makes it difficult to compare results between adherence studies. And some measures may be inaccurate, as they measure processes but not the health outcome. Just because someone has opened packaging, doesn't mean that they have taken the pill.

"One problem is how to assess adherence. The subjective way is asking the patient, which is not very useful. The other option is going through the pharmacy records if you have access to them but records are not always linked. We have come up with an objective measure which we use in hypertension - a blood or urine test. If healthcare professionals can have an objective test, then they can discuss it with patients which overcomes a big barrier. So you might suspect a patient is non-adherent and you ask them and they say 'yes, of course' but you can't challenge them easily, so an objective test overcomes a barrier."

Dr Pankaj Gupta, Cardiovascular Consultant and Head of Service, Leicester Hospital and Associate Professor University of Leicester

Urine test measuring adherence to over 60 medications

Researchers from the National Centre for Adherence Testing in the UK have developed a urine test that identifies whether patients are adherent to over 60 medications. Patients provide a sample on the day they visit their clinic.

The results help to inform a conversation with their clinician or HCP about whether they're adhering to their medication regime.

The test is relatively cheap – about £40 – and is now being used by providers around the UK. A clinical trial is under way, which should report in 2023.

Adherence studies must measure both adherence and clinical outcomes in order to confirm whether adherence does lead to the expected clinical outcomes. It's difficult to construct RCTs that permit this, as they need to be large, run for significant timeframes and control effectively for bias. There have been calls for further investigation into how to construct RCTs that measure adherence effectively.[27] Where data is linked, and access to it is permitted, another option would be to use population-level datasets, to assess the impact on outcomes for people with chronic conditions over time. Real-world trials could also be used.[28]

Section 2: Exploring adherence in three chronic conditions

2.1 Adherence and cardiovascular disease

Cardiovascular disease (CVD) is the leading cause of morbidity and mortality globally, accounting for about 17 million deaths annually – that's 30% of all deaths around the world.[29] There are a range of surgical techniques available for people with CVD, but there are also many treatments that can help prevent both primary and secondary CVD, such as statins, aspirin and hypertension-reducing agents.

Despite strong evidence for their efficacy, medication non-adherence is a major problem, affecting outcomes and increasing costs. Clinical markers that can increase the risk of CVD, such as hypertension and dyslipidaemia (elevated cholesterol) do not manifest in a way that may be obvious to those living with the condition. This is why CVD has been termed a 'silent killer'. But it can also mean decreased incentive for adherence in those with CVD.

"For many cardiovascular diseases, treatment will continue throughout a patient's life. Adherence is essential in order to ensure treatment efficacy. Adherence entails the patient being able to understand the value of treatment and the doctors' reinforcing adherence to such treatment."

Jean-Luc Eiselé, Chief Executive Officer, World Heart Federation

Evidence based on data from two million people around the world suggests that patients with good adherence to treatment therapies can lower their CVD risk by 20% and reduce the risk of all-cause mortality by 35%.[30] The authors of the study estimated that about 9% of cases of CVD in the EU could be attributed to non-adherence. These figures partly reflect the fact that only about half of CVD patients consistently take prescribed medications.[31] Low social status, low health literacy, co-morbidities and polypharmacy are all associated with reduced adherence.[32] It's been estimated that non-adherence costs for CVD medication range from $3,347 to $19,472 per patient per year.[33]

Co-payment increases the risk of non-adherence: access to insurance or another programme that assists with medication costs decreases the risk of non-adherence in patients with CVD by 36%. The same

study found that high frequency of dosing is another factor; non-adherence increases by 38% for doses prescribed twice a day, compared to doses taken once a day.[34]

Statins have clinical efficacy in both primary and secondary prevention of CVD. Yet evidence shows that people with CVD often don't continue taking them. A systematic review found that adherence at one year was worse in people aged over 65 taking them for primary prevention purposes (48%) compared to people of the same age taking them for secondary prevention (62%).[35] The authors speculate that poor perception of risk of how the condition may progress might partly explain the differences in adherence between those taking statins for primary prevention purposes and those taking them for secondary prevention.

Qualitative studies of patients and primary care doctors found a variety of attitudes that might affect adherence among both groups. Patient attitudes were influenced by:

- Scepticism about guidelines, and mistrust of academia and the pharmaceutical industry
- Unknown side effects and whether they felt the medication was necessary
- How the medication might affect compliance with other healthy behaviours
- Their perception of benefits and risks
- Confidence in prevention and taking control of their health
- Trust in HCPs and influence of family, friends and the media[36,37]

HCPs' attitudes, and consequently their abilities to support people to adhere, were also influenced by a range of factors, including their personal views, trust in guidelines and the need to personalise treatment and discuss approaches with the patient.

2.2 Adherence and osteoporosis

It's estimated that osteoporosis affects 500 million women and men around the world. It tends to affect older people: one in three women over the age of 50 will experience osteoporotic fractures, as will one in five men aged over 50. In Europe, fragility fractures are the fourth leading cause of chronic disease morbidity, after ischemic heart

disease, dementia and lung cancer; these fractures are a significant cause of disability in later life.[38]

Adherence is a significant problem in osteoporosis. Several studies show poor initiation and persistence in people living with osteoporosis.[39] A recent review including 124 studies found the prevalence of medication adherence ranged from 13% to 95%.[40] In addition to poor clinical outcomes, the unadjusted total healthcare costs and/or total costs of non-adherence are shown to range from $669 to $43,404.[41]

Like CVD, osteoporosis is a silent disease. One symptom, bone pain, isn't usually present until the disease has progressed. This means that those with osteoporosis may not be aware of its existence until they have a bone density scan or experience a fracture. It may also be one factor hindering adherence, as taking medication may not make an obvious day-to-day difference.

Preventing fractures and pain can help to improve or maintain people's quality of life and prevent worsening of the condition. Together, appropriate medications, lifestyle modifications and (in those who have experienced fractures) fracture liaison services can help to support people with osteoporosis and prevent or slow down progression. Adherence to medication and engaging with fracture liaison services is therefore important.

Many people with osteoporosis are prescribed bisphosphonates, drugs that help to slow the rate at which bone breaks down in the body. They're usually taken daily or weekly, although they're sometimes also given intravenously every few months. They should usually be taken in perpetuity, as they've been proven to improve outcomes and reduce fractures and frailty. However, some people don't even begin taking bisphosphonates, with one study reporting that 20-30% of patients don't initiate treatment after a prescription for oral bisphosphonates.[42] If they do begin treatment, people frequently miss doses, while few continue taking them after one year; this figure ranges from 16 to 60%.[43] Monthly dosage has been associated with greater adherence compared to weekly dosage.[44]

"Persistence is really a challenge and can be overlooked. Non-adherence is not a single construct, that is too simplistic. People need to be motivated and encouraged to persist with medication."

Hans Wouters, Senior Researcher, General Practitioners Research Institute, The Netherlands

Fracture liaison services work with older people who've already had at least one fracture, helping them to reduce the risk of future fractures, placing the patient at the centre of care, and helping them manage their condition. A 2018 systematic review found that fracture liaison services helped to improve adherence among participants, improving the management of fractures and resulting in higher rates of bone mineral density testing, treatment initiation, and adherence, along with significant reductions in re-fracture and mortality rates.[45]

Improving adherence in osteoporosis requires a suite of measures and a range of interventions. In 2019, an expert group meeting organised by the European Society for Clinical and Economic Aspects of Osteoporosis, Osteoarthritis and Musculoskeletal Diseases (ESCEO) and the International Osteoporosis Foundation (IOF) found several factors influence adherence, including: socioeconomic and cultural factors, the behaviour of people with osteoporosis, the involvement of HCPs and the sharing of information on bone turnover markers to encourage persistence.[46] They identified the following measures as likely to improve adherence for people with osteoporosis:

- Shared decision-making
- Patient education and counselling
- Adherence monitoring by pharmacists or medical secretaries
- Simplifying dosage instructions
- More qualitative research to understand what helps people to adhere to medication
- Using datasets to understand the reasons for non-adherence, and which interventions work
- Developing new interventions, likely to be complex and multi-factorial
- Digital technology
- Offering interventions to people who will be more receptive to interventions because adherence interventions may be costly and resources are limited.

"Education and improved dialogue between doctors and their patients are central to tackling the challenge of poor adherence. It's a two-pronged approach. Through educational initiatives and online tools, IOF seeks to provide doctors with resources to assist them in their daily clinical practice. Currently, we are developing a simple visual tool to help doctors initiate dialogue with their patients about osteoporosis and fracture risk during a medical consultation. At the same time, we constantly engage in patient outreach via our social media channels and member organizations to emphasize the importance of adherence."

Philippe Halbout, Chief Executive Officer, International Osteoporosis Foundation

2.3 Adherence and diabetes

Globally, 387 million people live with diabetes, a prevalence of 8.3%. This is expected to rise to 592 million people by 2035.[47] People with diabetes are encouraged to monitor their blood glucose levels, giving them better access to data on their condition than those with osteoporosis or CVD. Despite this, people with diabetes also need encouragement to adhere to blood sugar monitoring and medication. A 2017 meta-analysis found that individuals with good adherence were 10% less likely to be admitted to hospital and 28% less likely to die of any cause, compared to a group with poor adherence.[48]

Helping people with diabetes to continue with their prescribed medication could lead to significant cost savings. One study followed a group of nearly three quarters of a million US veterans over time. It found that improving medication adherence would lead to annual cost savings ranging from $661 million to $1.16 billion.[49] Although people who are non-adherent have pharmacy and outpatient costs 7% lower than people who were adherent, their inpatient costs are 41% higher. A systematic review of studies into the economic impact of diabetes reported that one study estimated the total cost of non-adherence in the US to be just over $5 billion, with annual costs per patient ranging from $2,741 to $9,819.[50]

Developments in technology have led to more people using continuous blood glucose monitors, which constantly measure blood glucose levels and allow people to view them in real time. There is emerging evidence that this may encourage better adherence to blood glucose monitoring, as well as better adherence to lifestyle behaviour changes.[51]

Adherence has rightly been called the "next frontier in quality improvement" in medicine. It's clear that encouraging better adherence in people living with diabetes could help to improve outcomes and reduce costs significantly.[52]

"We are not achieving targets for LDL cholesterol. We are not achieving targets for lowering blood pressure. 50% of people prescribed medications are actually not getting any benefit at all. We need to raise awareness of adherence. Patients need to know it is an issue."

Clara Marquina, Research Fellow, Monash University

Section 3: How to improve adherence

Improving adherence could lead to better clinical outcomes, lower costs and improved longevity. But how to reap that reward? Our interviewees reported that improving adherence is a complex problem requiring a multifaceted approach. The examples of CVD, osteoporosis and diabetes demonstrate the complex array of factors that affect adherence. This section explores the actions that could be taken at each level: those of the person living with the condition, HCPs, health systems and governments.

"We need to remember that we have made medicine an industry, but it is a societal issue. If we can get society involved, it will help."

Dr Pankaj Gupta, Cardiovascular Consultant and Head of Service, Leicester Hospital and Associate Professor University of Leicester

3.1 The role of the person living with the condition

Before people can adhere to medication and lifestyle changes, they must be diagnosed appropriately. Our interviewees said that after diagnosis, adherence must be part of tailored, patient-centred care, where patients are supported by a team of HCPs as part of their ongoing treatment. We must make people with chronic conditions aware of their condition and its potential long-term health impacts, how it is best managed, and the importance of adherence, both in the short-term and long term, to minimise future health risks. Care needs to be personalised, as what affects adherence will vary from person to person and may change over time.

"It's like needing to remind a child to brush their teeth and not eat too much chocolate. You will probably need to start at two-year-old and repeat that message every day until the child leaves home. Likewise, health professionals can continually make the patient the focus of care, empowering them to take charge of their health."

Jean-Luc Eiselé, Chief Executive Officer, World Heart Federation

3.1.1 A tailored, person-centred approach

It can be tempting to focus on medications when trying to improve adherence. Polypharmacy, where people are required to take multiple medications to manage a condition or a range of conditions, has been found to affect adherence. A report by Age UK found that in England, more than 1 in 10 people aged over 65 are prescribed at

least eight different medications each week, increasing to nearly 1 in 4 people aged over 85.[53] Polypharmacy like this can mean that people don't take enough of their medications, or even that they take none at all.

The Organisation for Economic Co-operation and Development (OECD) has noted that there's little research on adherence among people with co-morbidities, as research tends to be focused on individual diseases.[54] One avenue is the so-called 'polypill', which can treat more than one condition at once. It could be valuable for pharmaceutical companies to invest in research to identify co-morbidities with potential for treatment with polypills, or to reduce the number of drugs required. However, some of our interviewees were sceptical about polypills, pointing out that it makes it difficult to tailor dosages or identify which element of a polypill is contributing to unwanted side effects. There may also be regulatory issues.

Dosing patterns can also affect adherence. Some drugs must be taken daily, whereas others are weekly or monthly. Some medications have specific requirements when they're taken, such as being taken with food or before eating; our interviewees reported that such conditions can affect adherence. But a study investigating adherence to statins found that some medications still produced clinical results even if the dosing schedule wasn't adhered to consistently. The authors suggest that this data could be used to identify more desirable dosing schedules for individual patients based on their likely adherence behaviours.[55]

"Someone who has had a heart attack is on a cocktail of pills and they ask, 'why am I on these pills?'. Polypills are the way to go. The more drugs you take, adherence gets worse."

Dr Pankaj Gupta, Cardiovascular Consultant and Head of Service, Leicester Hospital and Associate Professor University of Leicester

Instead of a focus on medications, it would be better to remember the WHO's five dimensions of adherence and ensure that people experience personalised care, with shared decision making.

Identifying how an individual will behave and predicting their likely adherence trajectory over time could help ascertain appropriate, personalised interventions. In France, a study monitored the adherence of people with CVD who had been prescribed aspirin, over three years. Researchers found a pattern of four groups: people

who did not adhere (non-adherents (40.2%)), people who were more likely to not adhere with time (delayed non-adherents (13.6%)), people who were more likely to adhere with time (delayed adherents (9.6%)), and people who adhered throughout (persistent adherents (36.6%)). Women, people with low socioeconomic status, and people taking three or more different medicines were more likely to belong to the non-adherent groups.[56]

This pattern was replicated in people with diabetes. A 2016 study of people with diabetes taking oral hypoglycaemics in the USA used a group adherence model to identify seven different groups of behaviour.[57] These groups included "perfect adherers", those with "low adherence", "early discontinuers", and those who "didn't adhere at all".

These studies suggest that understanding patterns of adherence behaviour over time for different groups might be helpful in addressing adherence. Interventions could be developed to suit the needs of different groups. The case study below illustrates one approach.

Pharmacy and GP interventions

In Spain, 746 people on statins were recruited to a randomised trial that lasted six months. 46 community pharmacists and 50 GPs took part. Non-adherent patients were randomised into an intervention group and a non-intervention group. The type of interventions provided depended on whether patients were intentionally or non-intentionally non-adherent (see Table 2).

The study found that interventions provided to patients with unintentional non-adherence were more effective than those provided to patients with intentional non-adherence. The study illustrates the range of interventions needed to alter non-adherent behaviour (see Table 2).[58]

Table 2: Interventions used for different causes

Cause	Intentional/ non-intentional	Type of intervention
Forgetfulness	Non-intentional	• Display of pictograms on medicine box • Use of a dispenser or reminders
Polypharmacy	Intentional	• Referral to GP for dose adjustment • Provision of information about the treatment, and the risks and benefits of taking the drug
Cultural reasons or belief	Intentional	• Referral to GP for alternative treatment
Doubt regarding effectiveness of drugs	Intentional	• Provision of information about the treatment, and the risks and benefits of taking the drug • Communication between the GP or community pharmacist, and family members
Medication cost	Intentional	• Exploration of options to reduce costs

This approach could also be applied to prevention. A 2012 study found an association between healthy behaviours (exercise, healthy diet, not smoking, low alcohol consumption, maintaining a healthy BMI) and healthy ageing, in that people who adhered to more of these behaviours were healthier as they aged, but there was heterogeneity in the findings.[59] Most participants adhered to one, two or three healthy behaviours. The study found clusters of behaviours: for example, people who adhered to alcohol recommendations

tended to have a healthy diet; it also found an additive effect for some behaviour combinations. This suggests that it's important to understand what motivates people to adhere to some but not all health behaviour recommendations; it's also important to understand whether health behaviour adherence is influenced by a common cause.

Another study found that a range of factors can affect people's attitude to taking medications, from how risks are presented to people's values and beliefs to whether they are already on other medications.[60] The authors point out that clinical guidelines tend to focus on medicine effectiveness; they don't take patient preferences and values into account sufficiently. For example, framing risk negatively was more likely to persuade patients to take CVD preventative treatments. Clinical guidelines should therefore incorporate shared decision-making tools that consider the patient's personal values as well as clinical characteristics. A wide range of factors influence decision making and this should be borne in mind.

"All healthcare professionals, pharmacists and prescribers, have a role to play. We've got to embed shared decision making within health systems. And as that becomes embedded, make sure adherence is a part of that."

Professor Nina Barnett Consultant Pharmacist, Northwick Park Hospital, London, North West Healthcare NHS Trust & NHS Specialist Pharmacy Service and Visiting Professor, Kingston University, London

These studies identified different groups of behaviours, suggesting that people's adherence behaviour varies. We may need to use these findings to develop a range of services to support adherence, and work with people to find the service that best suits their likely behaviour. Considering likely motivators or barriers to adherence (for example, individual attitudes to risk) in order to offer individualised support is likely to have more effect as well as being more cost efficient.

We can learn from the approaches used when treating HIV, where there's been success in introducing differentiated service delivery (DSD) to support adherence based on patients' individual needs and adherence behaviours. Recommended by WHO, DSD takes a person-centred approach by tailoring services to the preferences, expectations and needs of people living with and vulnerable to HIV. It also reduces unnecessary burdens on the health system.[61] For

example, Kenya offers a service for teenage girls and young women based in locations that suit them, which includes peer supporters. This has led to increased uptake of PrEP (pre-exposure prophylaxis), a medicine which can prevent at-risk people from developing HIV.[62] In South Africa, adherence clubs (now known as HIV clubs) have 25-30 people in treatment meeting four to six times a year, to review their symptoms, and get peer support and medication.[63]

"In the HIV world, there has been a move towards differentiated service delivery, where care is arranged around the patients in greatest need and tries to minimise the burden on those who have demonstrated adherence."

Professor Matt Fox, Departments of Epidemiology and Global Health, Boston University

3.1.2 Using behavioural science

Since taking medication and maintaining lifestyle changes involves people's behaviour, ideas from behavioural science could help deliver more sophisticated approaches with better results.

Common concepts from behavioural science[64]

Status quo bias

People tend to favour the status quo due to familiarity.

Hyperbolic discounting

People tend to over-value the present and under-value the future.

Anchoring heuristic

People tend to make decisions based on what they already know.

Availability heuristic

People make decisions based on examples they can easily recall, which might be skewed or biased.

Social norms

People are influenced by the behaviour of others around them.

Choice architecture

People are influenced by the way decisions are presented to them. Nudge theory is an example of choice architecture, whichposits that shaping the environment can influence the likelihood that individuals choose one option over another.

People with chronic conditions must take regular steps to manage their health long term. Their conditions can also be progressive, necessitating new behaviours. And people's lives change over time in other ways: marital status, caring status, employment and their financial situation, for example. These changes can affect their ability to manage their condition and their general behaviour.

Governments have started to use behavioural science in healthcare, as well as in other policy domains: for example, the UK Government established the Behavioural Insights Team in 2010. There's evidence that people's behaviour tends to cluster into different groups. However, applying behavioural science is not a quick fix. It requires a

change of mindset among HCPs, as well as a change of culture within health systems. Any interventions developed based on behavioural science would likely need to be ongoing rather than one-offs. A combination of in-person techniques and digital interventions could ensure 'nudges' or other behavioural science techniques lead to positive behaviour change and improved adherence.

"The world of behaviour change is not one of quick fixes."

Professor John Weinman, Professor of Psychology as applied to Medicines, King's College London

As yet there's a lack of agreement in the literature about what works for adherence. One systematic review found that nudge techniques gave statistically significant effects in improving medication adherence: these included financial incentives, reminders and feedback.[65] Our interviewees recommended that findings from behavioural science could be usefully applied to encourage greater adherence. This includes the full range of the behavioural science framework, from large-scale population interventions to smaller 'nudges' to individuals. They consistently agreed that supporting people with behaviour change is crucial to improving adherence. [66,67]

"Some people are going to need a little more because they have more natural obstacles in their way, such as poverty or addiction. We still don't know enough about people's behaviour and adherence - we need to integrate behavioural science into medicine much more."

Professor Stephen Higgins, Director, Vermont Center on Behavior and Health, Virginia H. Donaldson Professor in Translational Science, Departments of Psychiatry and Psychological Science, University of Vermont

There are a range of frameworks available. Researchers have suggested the popular COM-B model as a useful framework for addressing adherence. This says that people must have the right psychological and physical **capability**, social and physical **opportunity**, and **motivation** (whether a desire or a need) to change their behaviour. These components interact, so interventions must target one or more to change behaviour.

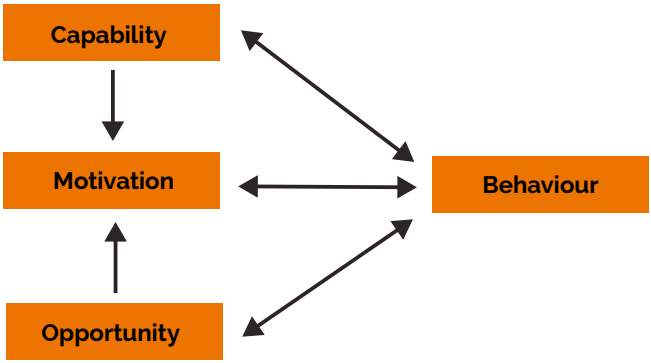

Figure 4: The COM-B model of behaviour change

"The COM B framework works quite well for adherence and helps you to start thinking about the patient in front of you. Is it they don't have capability because they can't remember or physically can't open the bottle? Is it a motivational issue that they don't want to, or their mood or habitual day to day behaviour is a barrier? Or is it an opportunity issue, that they aren't getting very good support from their healthcare providers or their social environment? All three factors need to be present for people to be adherent."

Professor John Weinman, Professor of Psychology as applied to Medicines, King's College London

The UK Government Behavioural Insights Team, now a separate entity, recommends that policies for changing health behaviour should follow the EAST framework: easy, attractive, social and timely.[68]

People's attitude to undertaking preventative health behaviour could be addressed via the motivation component from the COM-B model. We've already seen that patients require a significant benefit from a drug to consider taking it for primary prevention purposes, that patient preferences and values should be referenced in guidelines, and that framing risk negatively may be effective (see **A tailored, person-centred approach** in this chapter).[69]

Adherence is affected by a multiplicity of factors, which makes it difficult to address. Changing people's behaviour – addressing both the person living with the condition as well as the health system that surrounds them – could be a key part of improving adherence. Using frameworks such as COM-B to address adherence should become more widespread.

3.1.3 Exploring incentives

There's growing interest in financial incentives to encourage adherence. Financial incentives have been offered to encourage people to have COVID-19 vaccinations. Examples include the opportunity to be entered into a lottery to win $1 million in Australia or have their college fees paid in Ohio, USA,[70,71] along with other financial incentives.

However, some researchers have raised concerns that using lotteries as an incentive is unethical, as people tend to overestimate their likelihood of winning.[72]

COVID-19 vaccination incentives around the world

The **Latvian** health service ran a 12-week lottery for everyone who received their first jab. It offered prizes from €100 to 100,000.[73]

In the **US**, the doughnut company Krispy Kreme offered a free doughnut to anyone who showed their vaccination card.[74]

In **Australia**, the Prime Minister Scott Morrison committed to repealing legislation that prevented pubs from offering free beer to anyone who has had a vaccine.[75]

In **California, USA**, up to 2 million vaccinated people were eligible to claim a $50 voucher.[76]

And there's evidence that incentives can work. A randomised controlled trial of people on statins found that financial incentives improved adherence to statin taking.[77] Incentives have also been shown to help encourage pregnant women to stop smoking and to encourage people to participate in cardiac rehabilitation programmes.[78] [79] The UK Government is currently investing in a programme to explore the role of incentives in encouraging healthy behaviours.[80] Participants in the pilot will earn points for increasing step counts and eating healthily: points can be exchanged for gym passes and discounts at shops.

Our interviewees suggested that financial incentives might work best for specific interventions, such as smoking cessation, rather than as interventions for chronic conditions, which require ongoing medication regimens and lifestyle behaviours.

"These problems are not evenly distributed throughout the population; they are overrepresented in deprived populations. We know some things scientifically about biases in decision making that go along with being in a deprived state. A financial incentive leverages a bias for the present and provides a here and now reward for making a healthier choice."

Professor Stephen Higgins, Director, Vermont Center on Behavior and Health, Virginia H. Donaldson Professor in Translational Science, Departments of Psychiatry and Psychological Science, University of Vermont

While offering financial incentives may help to improve adherence, co-payments for medications recommended by prescribers may act as a disincentive. This is particularly true for people with chronic conditions – not only are they prescribed medication to take in perpetuity, but many are prescribed more than one medication, which means costs can quickly add up.[81] A Cochrane review found that co-payments tend to reduce the use of medication, especially by those from marginalised and/or underserved groups.[82] Any prescription charge policy that incorporates co-payments for people with chronic conditions should be carefully evaluated for its effect on adherence, health outcomes and hospital use.

Given that it has proven difficult to identify specific interventions that improve adherence, it seems worth exploring financial incentives more fully, with a focus on preventing perverse incentives and identifying the appropriate 'dosage' of financial reward. It may be best to reserve financial incentives for those who are most resistant to adherence.

"Money is just one type of incentive; we are susceptible to incentives generally. There are other incentives such as social recognition and opportunities, for example, with the COVID-19 vaccine, to go to sporting or musical events. As part of our health literacy, all of us, including policymakers, have to come to recognise how much we respond to incentives."

Professor Stephen Higgins, Director, Vermont Center on Behavior and Health, Virginia H. Donaldson Professor in Translational Science, Departments of Psychiatry and Psychological Science, University of Vermont

3.2 The role of healthcare providers

HCPs, pharmaceutical companies and healthcare provider organisations could do more to encourage adherence. A European study in 2012 found that adherence isn't considered a priority by HCPs or pharmaceutical companies.[83]

The challenge is finding the right way to help HCPs focus on adherence, rather than making it an additional pressure on already stretched health services and professionals.

"A part of medicine is social work, but it's not what people go into medicine for."

Professor Matt Fox, Departments of Epidemiology and Global Health, Boston University

3.2.1 The role of HCPs

For tailored, person-centred healthcare that includes a focus on adherence, HCPs need the requisite skills and knowledge to support people with behaviour change. This should lead to confidence in raising the issue of adherence in a manner that's most likely to lead to fruitful outcomes. Our interviewees agreed that adherence, tailored to suit each person with chronic conditions, should be a focus of the healthcare system. It needn't be the sole preserve of doctors but can be shared by a range of HCPs, such as nurses, pharmacists, psychologists, allied health professionals and support workers.

"There has to be a system change to enable a culture change. The system has to encourage, enable and embed."

Professor Nina Barnett Consultant Pharmacist, Northwick Park Hospital, London, North West Healthcare NHS Trust & NHS Specialist Pharmacy Service and Visiting Professor, Kingston University, London

However, HCPs get little training on adherence; undergraduate curricula don't always cover it in any detail. This leads to a lack of skills, knowledge and confidence in how to address adherence. HCPs need better awareness of the importance of adherence in delivering positive health outcomes, and to overcome their natural tendency to overestimate the adherence rates of their patients (an example of optimism bias, another concept from behavioural science).[84] In the UK, King's College London have developed a training programme for HCPs. More programmes like this should be rolled out.

Adherence training for HCPs

In the UK, the Centre of Adherence Research and Education, at King's College London, provides HCP training on adherence, based on use of the COM-B model.

This consists of an initial on-line learning module, a two-hour face-to-face adherence support training session and a follow-up session to review progress. The programme includes a brief, easily completed screening tool for patients: HCPs are encouraged to share this with patients before appointments to feed into discussions during each consultation. The training team has found that the vast majority of patients indicate on the screener that they face at least once barrier, which might prevent them from adherence.

The aim of the training is to provide HCPs with the practical skills that will improve conversations about adherence with their patients. The team aims to develop further levels of training as the programme progresses and is currently evaluating the outcomes so far.

"We need tools, time and training if we are to improve adherence."

Professor John Weinman, Professor of Psychology as applied to medicines, King's College London

3.2.3 The special role of pharmacists

Pharmacists can play a critical role in promoting adherence, given their patient-facing role in dispensing medication. Their presence on many high streets and communities also makes them a more accessible option than many other HCPs, particularly for older people. There's increasing evidence of the positive contribution community pharmacist-led interventions can have on improving both adherence and health outcomes.[85]

Pharmacists are well placed to support adherence, as they understand the benefits, side effects and risks of the medications they dispense, and know the patient population they serve. A systematic review of randomised clinical trials, exploring the benefits of motivational interviewing by pharmacists, found that motivational interviewing, either face-to-face or over the telephone, contributes to adherence. The authors recommended that the practice was explored further.[86]

"In the continuum of care the pharmacist is the final healthcare expert before the person receives their medicine. Ultimately, we have to build a rapport with the person so we know they trust us, they will feel empowered in their own care and get the best possible outcome from their medicine. It is probably the most complex thing we do as community pharmacists and certainly the most rewarding."

Daragh Connolly, Acting President Community Pharmacy Section, International Federation of Pharmacists, Superintendent Pharmacist, Haven Pharmacy Connolly's

Another systematic review of interventions by community pharmacists found that they led to clinically significant outcomes for blood pressure and cholesterol management, but didn't help people with diabetes. It also found that the interventions which proved effective were multifaceted, targeted and personalised, usually including elements of education, simplification of treatment regimens, communication between patients and HPCs, follow-up, and monitoring. These interventions often took significant time, and pharmacists and patients were usually self-selected, so there could be bias in the results.[87]

A more viable and immediate alternative may be to focus on ensuring people with chronic conditions have regular medication reviews. Age UK have called for a focus on helping older people manage their medicines by involving them in decision making, and having regular medicine reviews that focus on ensuring their treatment regimen is easy to follow. In Sweden, the Check My Medicines programme helps older people review their medications.[88]

"The answer is to use your own experience and professional training. So I know the side effect profile of this medicine and try and understand something about the daily life of this person and then I can zone in on the people who need the most support."

Daragh Connolly, Acting President Community Pharmacy Section, International Federation of Pharmacists, Superintendent Pharmacist, Haven Pharmacy Connolly's

Pharmacists could undertake medication reviews and their computer systems could deliver 'nudges' such as alerts if people have not attended for refills. In England, medicine reviews are being offered to certain groups of people, including those who are frail or on ten or more medications.[89]

Financial incentives could encourage pharmacists to support people to improve their adherence. In Quebec, Canada, the pharmacy contract includes higher rates of payments for more complex medications and for medications treating more complex diseases, allowing pharmacists to spend more time supporting people with greater needs.

3.3. The role of government and health systems

Adherence is overlooked by many governments around the world, with the result that it isn't part of national health strategies or objectives. This means that healthcare provider organisations have few incentives, resources or motivation to consider adherence.

3.3.1 Making adherence a priority

No government sets out to allow the poor use of medicines. But by not focusing on adherence, health outcomes are not fully realised and there is a loss of accountability for the public spend of money. Governments must make adherence a national priority if we are to see progress in improving adherence.

The OECD surveyed their member countries in 2017 and found that none of them see adherence as a national priority.[90] Of the countries surveyed, although many invest in interventions and studies to address adherence, only Sweden monitors it at a national level, by recording the percentage of patients still following a prescribed antihypertensive therapy regimen after 12–18 months. In the UK, the National Institute for Clinical Excellence (NICE) does have a clinical guideline about adherence, with recommendations about how to involve patients in clinical decision making, but there are no measures of its implementation.[91]

Governments should start to measure adherence at a national level. This would allow them to see where adherence is poor and help them focus efforts on how to increase adherence rates at both an individual and population level. Ideally, we should be able to compare adherence rates in different countries. In its 2018 working paper the OECD offered to work with countries to develop such measures.[92]

"Governments are not prioritising this issue. Most of our healthcare workers are overworked and they can only hope that people take the drugs and follow the guidelines. Health systems input all these resources and develop protocols and then at the last step of the process, we don't make an effort to ensure that people are taking their medicines. Improving adherence should be in every national plan."

Clara Marquina, Research Fellow, Monash University

Having ways to quantify adherence would have two-fold benefits: it would not only raise awareness of the issue, but help identify any diseases with particularly good or bad adherence levels, which may offer information to help improve levels overall. Using electronic health records could help countries to measure adherence, allowing data to be collated and reported. It would allow health systems to track key medications that make the most difference to health outcomes, to see if they're being dispensed as prescribed.

"The data already exists. We don't need data on all the drugs; we need to monitor and collate data specifically on drugs that we know people have difficulty adhering to."

Daragh Connolly, Acting President Community Pharmacy Section, International Federation of Pharmacists, Superintendent Pharmacist, Haven Pharmacy Connolly's

Governments must also include adherence requirements in national plans and provide funding for HCP training and adherence interventions. Our interviewees were clear that some adherence interventions made with patients during consultations need not be time consuming, but would add to the burden of already over-stretched HCPs if they were required without supplying extra resources. So, governments should provide additional funds to improve adherence upfront, to realise later gains in health outcomes and reduced costs.

3.3.2. Technology

Governments should also explore the advent of smartphone technology, and the increased availability of big data and artificial intelligence. Smartphone apps and other digital solutions can support adherence, although our interviewees cautioned that technology is a tool to support behaviour change, not a panacea. It must be coupled with tailored, person-centred support.

Studies have shown that technology can support adherence. A Cochrane review found that automated telephone response systems are likely to have a positive effect on encouraging people to attend preventative cancer screening; they may also encourage osteoporosis screening, and are likely to have a small positive effect on medication adherence. But when such systems were part of a range of interventions, or allowed voice participation or referral to advice, they were more likely to be successful.[93]

"Daily wearable devices prompt us to think 'yes I must do it,' serving as a feedback mechanism that supports the patient."

Jean-Luc Eiselé, Chief Executive Officer, World Heart Federation

Another study examining the use of digital technology across a range of outcomes found that texting reminders improved medication adherence for people with CVD.[94] One study of 16 RCTs, which focused on the use of apps, found that they did tend to increase adherence, despite a wide variety in design and types of use.[95] Further research is required to identify what elements make an app effective.

Mobile and wireless technology, including voice and text messaging, GPS and Bluetooth technologies, has also been found to support secondary prevention in CVD.[96] The use of wearables and connected devices might help improve adherence if people are willing to be monitored in such ways.

And the rise in the use of online consultations during the pandemic might prove an opportunity to introduce regular adherence check-ins or reviews without physical visits to a hospital or GP. This would lower costs and be more convenient for many people with chronic conditions.

Interviewees reported that in some countries (for example, the UK and Ireland) secondary care HCPs, such as psychiatrists and cardiologists, can't see primary care records, while pharmacists can't view health records. Linking health records to allow any HCP to see prescribed medications could support adherence by helping them to have conversations about adherence and taking any necessary steps to change or reduce the burden of medication. Computerised clinical decision support systems (CDSS), which are used to help clinicians with their clinical decision making, could also incorporate processes to help HCPs support people with chronic conditions to adhere. However, evidence is mixed about the benefit these systems provide

and whether clinicians take notice of them, though they do seem to help clinicians adhere to clinical guidelines.[97]

Giving people with chronic conditions access to their own health records would empower them to be in charge of their own health. It would be of great value to develop electronic health records that include advice about individual health conditions and their management, so people have access to appropriate evidence-based information to refer to following their HCP consultations. Governments could also expand their web-based information to include specific evidence-based information (whether or not EHR is used) to prepare appropriate disease-specific information, as well as adherence and support tools. CDSS can be integrated with electronic patient health records, so that people can interact with them, supporting shared decision making. How these tools could be used to specifically address adherence merits further exploration.

"Nowadays, we each own all our bank data and that has changed our lives drastically. The same should go for managing our health. The health system isn't there yet but that's the direction to take whereby the patient owns their health data as that would lead to a real shift in care."

Jean-Luc Eiselé, Chief Executive Officer, World Heart Federation

Section 4: Key recommendations

Democratising access

Governments should:

- Fund annual medicine reviews to help people with chronic conditions with decision making and any identified gaps in care, and report on the number of medicine reviews conducted every year across different demographic groups
- Prevent co-payments from causing a barrier to adherence, as evidence shows they can hinder people from taking prescribed medication
- Invest in HCP training programmes on behaviour change to supply workers with the requisite skills and knowledge to support adherence to medication regimes and lifestyle behaviour programmes

Universities should:

- Ensure that undergraduate curricula for all HCPs include an adherence topic that communicates the importance of adherence for the health outcomes of individuals, and helps HCPs to implement effective behaviour change methods

Inspiring and engaging

Governments should:

- Promote and prioritise adherence as an effective disease management tool, by including it in national chronic disease strategies; for example, those for CVD, osteoporosis and diabetes
- Set metrics for acceptable adherence rates, and measure and report on adherence rates for chronic conditions, including CVD, diabetes and osteoporosis, at a national (or subnational) level
    - ➢ In countries where medicines are funded from public money, measures could be implemented to assess divergence from acceptable adherence rates, and appropriate metrics set to ensure that 'value for money' is maintained
- Establish behavioural insight teams with a focus on health, and research the effect of using different incentives to encourage

people with chronic conditions to adhere to medications and lifestyle changes

- Expand the role of pharmacists, with concomitant resources and funding, to allow these professionals to support adherence, monitor for signs of non-adherence and conduct medicine reviews
  - ➢ Pharmacy contracts should reimburse behaviour that supports adherence
  - ➢ Consider giving pharmacists limited prescribing rights
- Fund real-world randomised controlled trials of interventions to improve adherence and ensure these are formally evaluated

WHO should:

- Publish annual adherence rate results, with comparisons between countries

Providers should:

- Use learnings from the research on the different adherence trajectories for different groups with chronic conditions to develop tailored interventions for people at greater risk of non-adherence
- Explore using the COM-B model to develop interventions that support individuals to adhere to their medical directions

Better use of technology

Governments should:

- Invest in research to test how technology, including wearables, can improve adherence
- Invest in the collection and management of electronic health records, including supporting deidentified assessments of patterns of use and care
  - ➢ Ensure that health records are linked across all healthcare providers (private and public), allowing everyone involved in an individual's healthcare delivery to access that person's medication record, with appropriate permissions
- Ensure that people with chronic conditions can view their health records easily and that records incorporate information and

advice to be used as a tool to help with medication adherence and management

Healthcare providers should:

Build on the increased use of online consulting during the pandemic to deliver more regular virtual follow-up reviews to check medication adherence and management

Closing remarks: Adherence is in everyone's interests

Addressing adherence won't be an easy task, but it could produce significant improvements in health outcomes for people living with, and at risk of, chronic conditions. In turn, this would improve longevity and benefit society as a whole. It could also make financial savings for health systems around the world.

Governments must drive solving the adherence problem as it requires a multifaceted approach and integrated, person-centred healthcare systems. Measuring adherence at a national level is key, as is investing in person-centred interventions for people at risk of ill health and those already living with chronic conditions.

Techniques from behavioural science should be incorporated into interventions to make adherence as easy as possible for everyone. Technology and data should be used to run real-world trials and to make it easy for HCPs to monitor adherence and support people living with chronic conditions.

If we wish to reap the full rewards offered by proper adherence to medication and lifestyle changes, we will need to bring together evidence and solutions from medicine, pharmacy, economics and psychology. It requires everyone to play their part.

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About the ILC

The International Longevity Centre UK (ILC) is the UK's specialist think tank on the impact of longevity on society. The ILC was established in 1997, as one of the founder members of the International Longevity Centre Global Alliance, an international network on longevity.

We have unrivalled expertise in demographic change, ageing and longevity. We use this expertise to highlight the impact of ageing on society, working with experts, policy makers and practitioners to provoke conversations and pioneer solutions for a society where everyone can thrive, regardless of age.

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