Chapter 2

Adherence to Medication in Older Adults as a Way to Improve Health Outcomes and Reduce Healthcare System Spending

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Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.72070

Abstract

Medications are used as the primary approach to prevent and effectively manage the chronic conditions. Non-adherence to medication is recognized as a worldwide public health problem with important implications for the management of chronic diseases, which affects every level of the population, particularly older adults due to the high number of coexisting diseases and consequent polypharmacy. Estimated rates of adherence to long-term medication regimen are of about 50%, and there is no evidence for significant changes in the past 50 years. The consequences of non-adherence include poor clinical outcomes, increased morbidity and mortality and unnecessary healthcare costs. Factors contributing to non-adherence are multifaceted and embrace those that are related to patients, to physicians and to healthcare systems. Cognitive, sensorial and functional decline, poor social support, anxiety, depression symptomatology and reduced health literacy have been linked to medication non-adherence in the elderly patients. Many interventions to improve medication adherence have been described in the study for different clinical conditions; however, most interventions seem to fail in their aims. In this chapter, a revision of the implications of poor adherence as well as its predictors and available tools to improve adherence is performed.

Keywords: adherence, compliance, persistence, concordance, health literacy, healthcare, elderly

1. Introduction

One of the greatest achievements of mankind in the last century was the increase in average life expectancy, mainly due to advances in public health, technology and medicine. While

the twentieth century was the century of population growth, the twenty-first century will be known as the century of aging [1, 2].

Every second, two people celebrate their 60th anniversary [3]. Globally, in 2015, there were 901 million people who were 60 or older, most of whom are the elderly people living in developing countries. This number is expected to be more than double by 2050, reaching 2.1 billion (20% of total population). Interestingly, the number of people aged 80 or older is growing even faster than the elderly in general. By 2015, about 14% of the elderly population (125 million) were 80 or older, and that number is expected to triple by 2050, reaching 434 million (approximately 20% of the senior population) [4].

The speed at which the population is aging is dramatically increasing. For example, France needed 150 years to adapt from a change from 10 to 20% of the population over 60 years. However, developing countries such as India and Brazil have little more than 20 years to adapt to this reality [5]. In these countries, in 2010–2015, the average life expectancy was 68 years, but 78 years in the developed countries [3].

The increase in average life expectancy turns out to be an opportunity for older people and their families. With these extra years, the elderly can devote themselves to school again, can pursue a new career or can chase a lost passion [6]. But all of this depends on one key factor: health. WHO defined health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" [7].

From the biological point of view, aging occurs due to accumulation of damages, at both cellular and molecular levels. Telomeres are shortened as we age. Aging is characterized by changes in physical appearance such as gradual reduction in height and weight, due to loss of muscle and bone mass, higher reaction times, decline in memory, decreased sexual activity, reduced metabolic rate and a decline in auditory, olfactory and vision functions, as well as diminished lung, immune and renal functions. The speed at which aging occurs is determined by genetic and environmental factors [8]. Physical and social environments, as well as personal characteristics such as gender, ethnicity and socioeconomic status, are factors that affect the aging process from an early age. The environment has a huge influence on both the development and the maintenance of healthy habits. Lifelong healthy behaviors, in terms of diet, exercise and habits, contribute to the prevention of certain diseases [9].

Although this increase in average life expectancy is worthy of celebration, it must be borne in mind that increasing longevity has long-term consequences not only for health but for the health system and for economy too. There are health conditions that are associated with the increase in the elderly population. Cardiovascular diseases, cancer, chronic respiratory diseases and diabetes, the so-called non-communicable diseases are responsible for nearly 60% of the deaths, and they all share an unmodifiable risk factor such as age [10].

The major cause of death among the elderly in developed countries is cardiovascular diseases, accounting for 35% of all deaths [11]. Along with these diseases, cancer is the other major cause of mortality, being responsible for 22% of deaths [12].

The development of these chronic diseases occurs in several ways. There are malignancies such as lung or prostate cancer that are more common in the elderly population. An example of this condition is arthritis that may be present early but only with age it worsens and it manifests due to the senescence of the body in general. There are diseases that turn out to be a combination of the two factors, as with chronic respiratory disease, doubling its prevalence for each decade of life after the 40 years [2].

Usually, older adults have multiple medical problems. Almost 50% of the elderly population has at least three chronic diseases, and of this, approximately 10% has five or more. These diseases can coexist for several reasons such as by random chance, because they are part of the same continuum, because they have risk factors in common or because one triggered the other [2]. Aging and comorbidities together increase the risk of hospitalization and mortality.

This "demographic time bomb" has direct consequences for the economy. With the increase of lifetime expectancy, more people are claiming for pensions, and less number of people are working and paying taxes, which will have an impact on national budgets. The economic growth will also be affected since higher savings for pensions may lead to the reducing of capital investments. At the same time, age-related diseases, comorbidities and geriatric syndromes are gaining attention in society, increasing the demand for health services. The elderly people require more health services, suffer more hospitalizations and occupy the bed longer than any other age group, thus increasing the money spent on healthcare [13].

The main way to treat chronic illnesses is by using medicines. Although they are a powerful tool, its potential is not fully used, since half of the patients do not take them as prescribed, meaning they either do not take them or they do, but in the wrong dosage or in the wrong timing, failing to realize full benefits of treatments [14, 15]. Non-adherence is a huge problem that is directly linked with an increase in morbidity and mortality, costing between $100 and 300 billion per year, in the United States (**Figure 1**) [16].

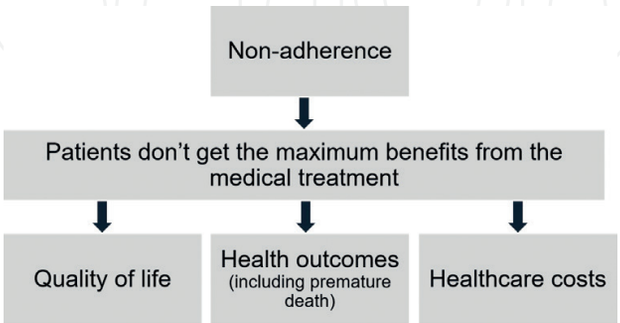

Figure 1. Non-adherence consequences.

2. Medical adherence taxonomy

"Drugs don't work in patients who don't take them" is the often-cited statement of Surgeon General of the United States C. Everett Koop (1985). Non-adherence is the major problem for pharmacotherapy in ambulatory patients. It is more prevalent than would be expected. It is highly associated with increased morbidity and mortality, and is an aspect that until recently was neglected. Despite its importance and all the efforts that have been made to understand it, non-adherence is still misunderstood. This behavior, in addition to the direct effects on the patient, since it compromises the preservation and the quality of her/his life, also has economic consequences. Therefore, in recent years, therapeutic adherence has been extensively studied from pharmacological, behavioral, economical perspectives [17]. Despite all the studies, the lack of uniformity in the methods of analysis and the absence of a universal taxonomy/terminology are a major obstacle when making/analyzing systematic reviews, as it makes it difficult to draw conclusions.

Compliance, adherence, concordance and *persistence* are the four widely used terms that have been used interchangeably. *Adherence* and *compliance*, the mostly used terms have different connotations in the patient's attitude regarding medication. *Compliance* comes from the Latin word *complire*, meaning to fulfil a promise/to complete an action, implying that the patient has a passive role on the process. *Adherence* derives from the Latin word *adhaerere,* which means remain constant, keep close, having the patient agreed with the prescription [15, 18, 19]. Of the other two terms, *Concordance* implies that the patient and the professional healthcare came to an agreement about the treatment that the patient should follow, acknowledging that they may have different points of view, while *persistence* relates to the time interval between the first and the last dose of medicine [19–21].

Given this heterogeneity, it was necessary to obtain a consensus on the terminology and taxonomy in the field of non-adherence. The ABC project (Ascertaining Barriers to Compliance) was created under the seventh Framework Program, and the main objective was to provide consensus taxonomy and terminology in non-adherence medication and to provide concise and adequate definitions that could serve the needs of both clinical research and medical practice [22].

Medication adherence is defined as an active, cooperative and voluntary participation of the patient in following recommendations from a healthcare provider. This is a multifactorial behavior that involves three critical steps (**Figure 2**).

Management of adherence has a main purpose to increase the benefit to the patient, and minimize the risk of harm, caused by the medication. It encompasses healthcare systems, providers, patients and their family/friend's networks, and serves to monitor and support patient's adherence to medication [22].

Adherence-related sciences include all the disciplines that study the causes and consequences of non-adherence, including medicine, nursing, sociology, biostatistics, pharmacy, behavioral science, pharmacometrics and health economics [19].

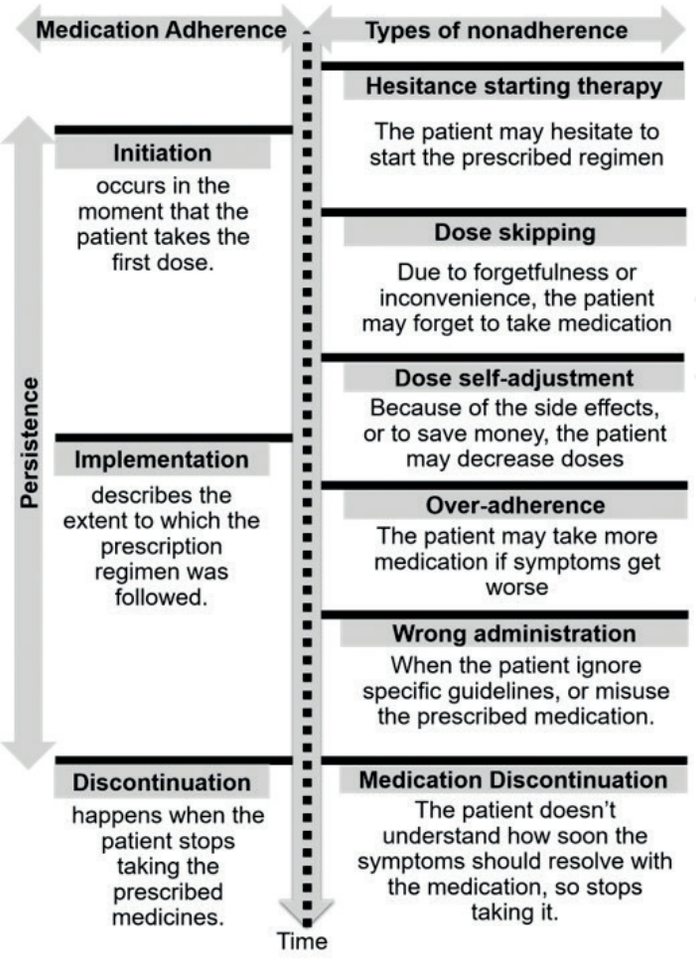

Figure 2. The ABC taxonomy of medication adherence describing its three key elements and demonstrating how patients can deviate.

The ABC taxonomy relies on these three elements, making a clear distinction between procedures that describe actions through routines that have been established (m*edication adherence* and *management of adherence*) and the sciences that study those procedures (*adherence-related sciences*) [22].

Of note, currently, the use of compliance has diminished, as this very term, for historical reasons, mostly, was perceived as the one that implies paternalistic relation between the doctor and patients. Therefore, this term is not advised by the ABC taxonomy.

3. Determinants of non-adherence

Non-adherence to therapy is a public health problem in general, with a special focus on the elderly population. Non-adherence causes the patient outcome to be compromised, resulting in decreased effective disease control, increased risk of hospitalization and increased morbidity and mortality [23].

To improve the adherence, we must first understand the causes, predictors and determinants responsible for non-adherence. Many of them have been described so far [24]. According to WHO, there are five large sets of factors by which people are non-adherent (**Figure 3**) [25]:

- socioeconomic factors;
- health system related;
- therapy related;
- patient related; and
- condition related.

The socioeconomic status is correlated with adherence to therapy. Of these factors, the professional situation, social support, housing conditions, distance to treatment, transportation and medication prices as well as social inequalities are the utmost importance. The existence of support provided either by the family or by friends has a very positive influence on adherence. The lack of involvement of family and friends leads to a state of social isolation, which is one of the determinants of non-adherence [26]. The professional situation is also important, since people with economic difficulties must set priorities in budget management, with food and housing being the first, often leaving the medication to second option [22].

The relationship between health professionals and patients is extremely important in adherence, since they play a critical role of technical and psychosocial support, giving the individual the basic skills to adhere to medication, developing beliefs about his/her ability to deliver on medications and on the benefits of therapy. However, the lack of knowledge and availability of health professionals, the overloading of health services, which translates into difficulties in access to consultations and the short duration of these, the lack of capacity of the system to promote psychoeducational programs, and the inexistence of follow-up mechanisms are some of the causes responsible for non-adherence [23]. Perhaps, there is a need to adapt the arrangements of the healthcare services to the needs of the growing number of old and very old persons.

The duration of, and the complexity of drug regimens may have consequences for adherence to therapy, since the longer and more difficult the treatment is, the greater the likelihood of discontinuation. Thus, it is necessary to develop simpler schemes, which require small changes in living habits, facilitating adherence. However, these are not the only characteristics on medication that lead to non-adherence. Side effects of some medications, including nausea, vomiting, fatigue and other metabolic changes as well as drug-drug interactions or adverse reactions to medications may also lead to treatment withdrawal [15, 23].

The cognitive and intellectual characteristics of the patients, as well as their personality and behaviour, and their knowledge of the disease and treatment and their motivation are the determinants related to the patient, which lead to non-adherence. To adhere, the patient must understand what is transmitted to him/her and understand the reason for the prescription.

Thus, it is important to focus on health literacy, understood as the ability of individuals to make healthy decisions based on the information provided. Since, adherence is a decision made by

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the individual based on their beliefs about the consequences of adherence to therapy, when the patients recognize that they have a responsibility to their health and that their behaviour may bring benefits, which improves adherence [15].

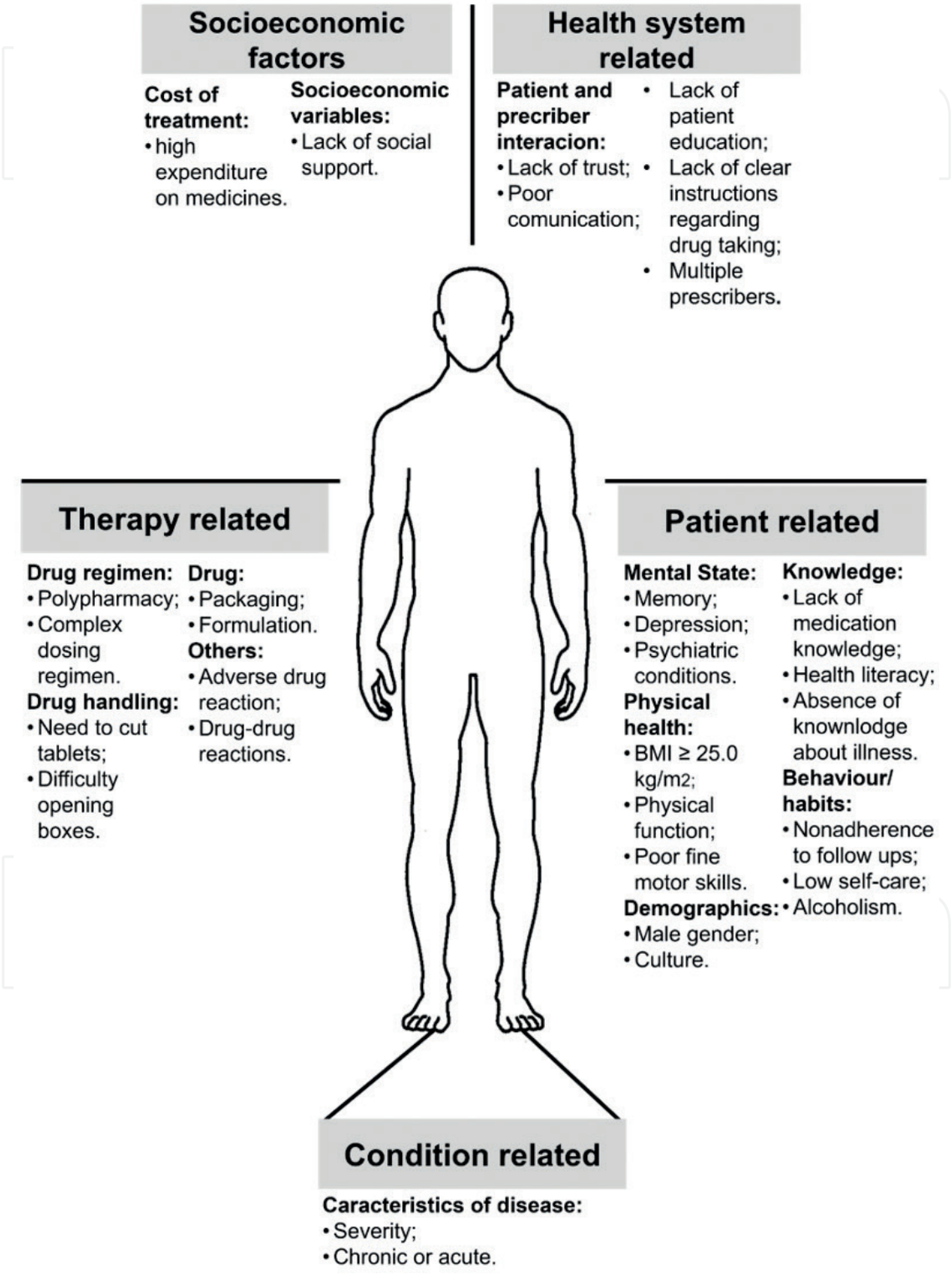

Figure 3. Predictors of non-adherence to medication, modified from WHO [25].

The characteristics of the disease such as severity and the symptomatic/asymptomatic nature are factors related to the condition that affects adherence. It is considered that the severity of the disease and the disability that symptoms cause at physical, psychological and social levels are most frequently associated with non-adherence. Individuals with chronic asymptomatic diseases do not adhere to treatment frequently, since the absence of symptoms lower their motivation to take their drugs continuously. In addition, the existence of other concomitant diseases that are treated with various medications (i.e., polypharmacy) is also one of the major factors that contribute to non-adherence [17, 25, 27].

4. Costs associated with non-adherence

With the increase of life expectancy, the greater the spending on health. Accord-ing to an OECD study, people over 65 accounts for 40–50% of health spending in Europe and their per capita costs are 3–5 times higher than those under 65. And, this tends to increase over time [28].

There are not many researches that investigate the impact of non-adherence on the economy, since it is difficult to assess. In addition to the direct impact on both patient health and non-adherence healthcare costs such as avoidable hospitalizations, emergencies, drugs, and so on, non-adherence leads to an indirect impact on the economy. In fact, per year, non-adherence leads to an average of 2.62 days that the employee missed work, leading to a decrease in the productivity [29]. Moreover, few articles focus on the costs of non-adherence among the elderly. The following paragraphs review the costs of non-adherence in several diseases that often affect the elderly such as chronic cardiovascular diseases, chronic obstructive pulmonary disease, diabetes, arthritis, and osteoporosis.

Will et al., in 2016, found that hospitalizations were eight times more frequent in non-adherent hypertension patients. Expenditures with these patients were four times higher compared to adherent patients. According to the author's estimates, in the United States of America, the outcome of non-adherence was $ 41 million, over 3 million for non-adherent hypertensive patients, over a period of 8 years. These costs were related to the cost of outpatient medication and preventable hospitalizations [30].

Bansilal et al., in 2016, studied the association between the levels of adherence and long-term major adverse cardiovascular events and resource utilization in coronary artery disease patients. The authors found that non-adherent patients have higher associated medical costs, with $ 719 associated with hospitalizations per patient and $ 821 associated with revascularization surgeries, being these patients also related to higher emergency visits. Thus, it is possible to deduce that non-adherence to treatments, in addition to the risk to the patient, leads to increases in expenses associated with secondary cardiac events [31].

In congestive heart failure, Esposito et al., in 2009, assessed the impact that adherence to therapy would have on the related costs in patients with congestive heart failure. Non-adherent patients (17,496 compared to 19,122 adherent patients) had higher costs for the health system (US$ 25,312

compared to US$ 19,402 for adherent patients), mainly explained by the increase in hospital admissions (42% of the total value), in terms of higher frequency/duration compared to adherent patients [32].

Simoni-Watilla et al., in 2012, demonstrated that adherent patients with chronic obstructive pulmonary disease had higher costs related to prescription medications than non-adherent patients. However, these were cost-effective since the adherent patients have much lower costs than the non-adherent patients, in terms of hospitalizations and outpatient [33]. Halpern et al., in 2011, drew the same conclusions. Although pharmacy costs were higher in adherent patients, non-adherent patients incurred higher total expenditures [34].

Ho et al., in 2006, evaluated the impact of non-adherence in Type 2 Diabetes. Higher HbA_1c, blood pressure and LDL cholesterol levels were recorded in non-adherent patients, leading to the increased risk of mortality and morbidity. The economic impact of non-adherence is continually increasing, resulting in long-term complications [35]. Dall et al., in 2010, estimated that $ 218 billion per year (indirect costs spent for treating diabetes) spent in the USA. Although the cost of treating diabetes is high, representing approximately 7% of health spending, the return on this investment is enormous. Per year, non-insulin and non-antihyperglycemic drugs, insulin and oral hyperglycemic agents cost $ 776, while avoidable hospitalizations cost $ 886 per patient [36].

Tang et al., in 2008, found that arthritis adherent patients have higher costs in the pharmacy than non-adherent patients. However, costs related to outpatient, inpatient and laboratory services, related to non-adherence, exceed the amount spent in the pharmacy [37]. Pasma et al., in 2017, demonstrated that decreased adherence leads to an increase in healthcare costs (in anti-TNF therapies, synthetic DMARDs and rheumatology outpatients) [38].

In osteoporosis, poor adherence reduces the potential effectiveness of the drug, resulting in decreased health outcomes and incurring heavy costs. Hiligsmann et al., in 2009 evaluated the economic outcome of non-adherence in osteoporosis patients. Non-adherent patients suffer from more fractures than adherent patients, leading to higher healthcare spending, in comparison to the costs associated with medication adherence [39].

In general, all adherent patients have higher drug costs for obvious reasons. However, in the long run, they incur lower expenses than the non-adherent patients, since visits to the emergency rooms, inpatient and outpatient are decreased [40]. One of the reasons that lead the elderly to non-adherence is the high price of medicines. For pensioners with poor retirement, they must manage the budget to pay for basic needs, being in the medicines no longer a priority [41]. One of the ways to overcome this problem is to increase support for the elderly in the purchase of medicines or to reduce their taxes. Although this will mean higher expenses initially, it will pay off in the long-term [42].

5. Interventions to promote adherence

To improve adherence to therapy in the elderly, there are many questions that need to be addressed and deserve all the attention, once they are the basis for deciding what course to take (**Figure 4**) [43].

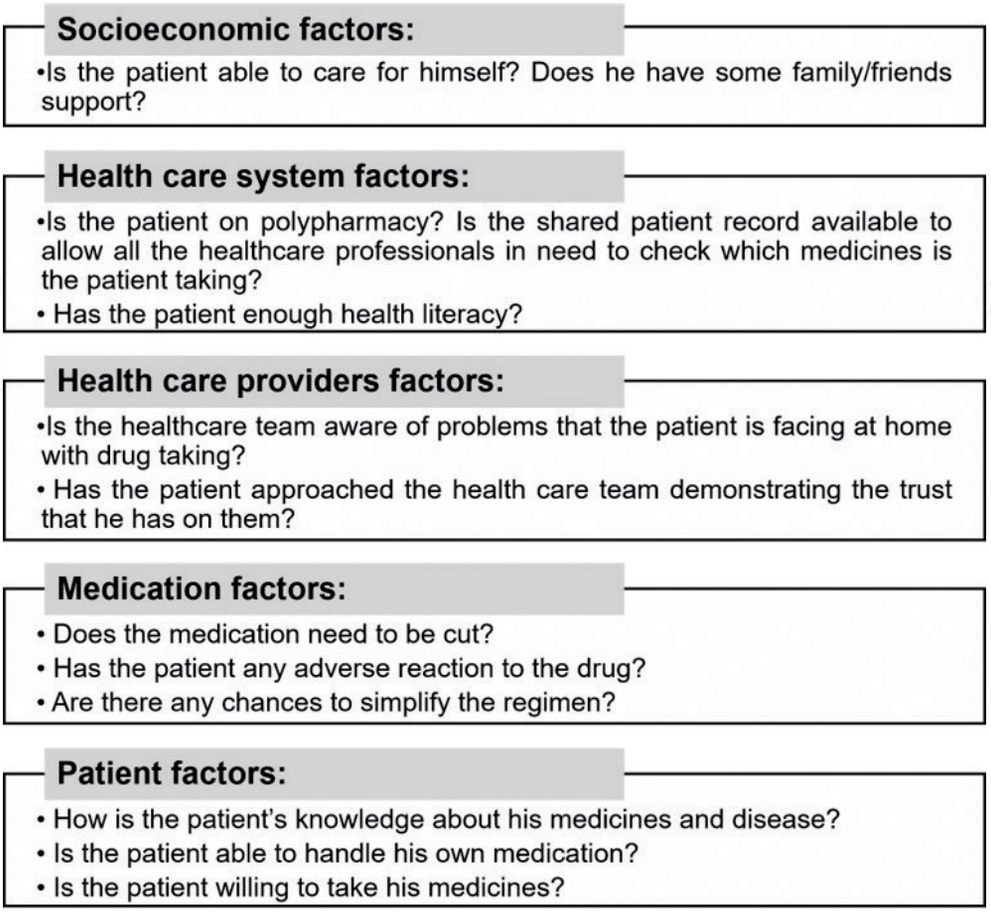

Figure 4. Questions to be addressed to the patient to choose how adherence can be improved.

Just as there are many reasons for a patient to not adhere to the therapy, there is no single solution to this problem. Interventions should be planned and appropriate to each patient, since each patient is unique, with her/his particularities and specificities. Therefore, health professionals should develop strategies that focus not only on the problem of adherence to therapy but also on all aspects that have directly or indirectly influenced it. The intervention of health professionals, to promote behavioural changes, should be based on the creation of a link with the patient and the informal care provider, through the establishment of an empathic relationship, always considering the sociocultural characteristics and the need for social support [12, 14].

To improve adherence, educational and behavioural interventions are needed. Educational interventions are simple measures that promote knowledge regarding both illness and medication and allow the provision of individual and/or group information, whether through oral, written, audiovisual and/or computerized transmission. To avoid barriers between the health professional and the patient, the language should be clear and objective, in line with the patient's level of knowledge and easy to memorize. Educational interventions that involve the patient, relatives or caregivers, are promoters of changes in adherence to the therapeutic

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regimen. Moreover, communication between health professionals and patients is an extremely important step toward promoting adherence to treatment. The preparation of the patient for adherence must include health literacy, once patients with basic or below basic health literacy may be unable to understand what information the box and the medicine data sheet has. Also, the patient should be provided with all specific information about the treatment such as the objectives of the therapy, the risks and benefits and expected results as well as the consequences of adherence or non-adherence. Behavioural interventions aim to:

- Involve patients in treatment;
- Simplify therapeutic regimens;
- Facilitate compliance with proposed treatments;
- Incorporate adaptation mechanisms into daily practice; and
- Provide supporting documentation and reward for improved adherence [14].

Patients should be actively involved in their treatment using strategies to prevent non-adherence. For that, the medicinal regimen should be changed as little as possible, since it interferes with the memorization, leading to forgetfulness and, consequently, non-adherence. Medical or nursing appointments are used to communicate or advise the patient and his/her family, keeping them informed of progress and results [15].

Counselling includes information about the drugs, their indications, side effects and how to overcome them. To encourage adherence to therapy, health professionals can use the following strategies [25]:

- listen to the patient;
- ask the patient to repeat the actions he/she should take;
- provide clear instructions as to drug taking, preferably in writing;
- propose a simpler therapeutic regimen that considers patient routines;
- use methods of counting medicines taken;
- contact the patient if he or she misses an appointment;
- adapt the frequency of consultations according to the needs of the patients, always referring to the importance of adherence to the therapeutic regimen; and
- reinforce positive behaviours and involve the family in the process of adherence.

According to Osterberg and Blaschke [17], the methods to increase adherence to the therapeutic regimen can be grouped into four categories:

1. patient education;
2. communication between health professionals and the patient;

3. the posology and type of medicine; and
4. the availability of health services.

According to the WHO proposal, increased adherence is based on three measures:

1. adequate and continuous information;
2. training of health teams in motivational strategies; and
3. adoption and continued application of these strategies [25].

Regardless of the classification used, the improvement in therapeutic adherence passes through the link between information and motivation. Knowing the concepts about diseases and treatments may result in the adoption of long-lasting behaviours and attitudes that favour adherence to treatment by patients.

6. Concluding remarks

As the population is aging, people are more prone to chronic diseases. Pharmacotherapy is the best treatment to follow. Approximately, half of the elderly have at least three chronic diseases, which result in polypharmacy. Complicated drug delivery regimens cause the elderly to eventually give up treatment. Another reason for treatment discontinuation is the high prices of medicines. Failure to adhere to treatment has a negative impact not only on the patient's health, increasing the risk of morbidity and mortality, yet also on the sustainability of entire healthcare care systems, due to higher number of avoidable hospitalizations and emergency visits, and finally, on the economy.

Thus, it becomes mandatory to find a way to overcome this problem, and it is necessary to implement techniques that increase adherence. These changes start with patient education. Providing the patients with all the necessary information about their illness, treatment, prognosis, and the consequences of non-adherence is the prerequisite of the right decisions. However, this should be followed with the use of other adherence-targeting interventions, tailored to the individual needs.

Finally, more studies are needed in this area, as the impact of non-adherence to therapeutics by the elderly on the economy has not yet been fully unveiled.

Acknowledgments

This work received financial support from the European Union (FEDER funds POCI/01/0145/FEDER/007728) and National Funds (FCT/MEC, Fundação para a Ciência e Tecnologia and Ministério da Educação e Ciência) under the Partnership Agreement PT2020 UID/MULTI/04378/2013.

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