

Patrícia Medeiros-Souza<sup>I</sup>

Leopoldo Luiz dos Santos-Neto<sup>II</sup>

Liana Tieko Evangelista Kusano<sup>III</sup>

Maurício Gomes Pereira<sup>IV</sup>

# Diagnosis and control of polypharmacy in the elderly

## Diagnóstico e controle da polifarmácia no idoso

---

### ABSTRACT

The article had the purpose of commenting on studies on polypharmacy in the elderly, focusing on diagnosis and control. Polypharmacy is defined as the use of a number of medications at the same time and the use of additional drugs to correct drug adverse effects. The fact that the elderly take more medications for the treatment of several diseases makes them more susceptible to the occurrence of adverse reactions. Prophylactic actions such as balanced prescriptions are vital to reduce the incidence of these reactions and prevent longer hospital stay, increased costs and aggravation of the elderly health condition.

**KEY WORDS:** Health of the elderly. Drug therapy, combination. Prescriptions, drug. Drug interactions. Drugs of continuous use. Comment [Publication type].

---

### RESUMO

O artigo teve por objetivo comentar estudos sobre polifarmácia em idosos, particularmente em diagnose e controle. O conceito de polifarmácia considera o uso de diversos medicamentos ao mesmo tempo, além da utilização de um fármaco para corrigir o efeito adverso de outro. Por consumirem mais medicamentos para o tratamento de diversas doenças, os idosos são mais vulneráveis ao surgimento de reações adversas. Medidas profiláticas, como a prescrição balanceada, são de fundamental importância para diminuir essas reações, tendo em vista o aumento do tempo de internação, gasto e piora do quadro de saúde do idoso.

**DESCRITORES:** Saúde do idoso. Quimioterapia combinada. Prescrição de medicamentos. Interações de medicamentos. Medicamentos de uso contínuo. Comentário [Tipo de publicação].

<sup>I</sup> Departamento de Ciências Farmacêuticas. Hospital Universitário de Brasília (HUB). Universidade de Brasília (UnB). Brasília, DF, Brasil

<sup>II</sup> Departamento de Ciências Médicas. HUB-UnB. Brasília, DF, Brasil

<sup>III</sup> Centro de Medicina do Idoso. HUB-UnB. Brasília, DF, Brasil

<sup>IV</sup> Departamento de Gerontologia. Universidade Católica de Brasília. Brasília, DF, Brasil

#### Correspondence:

Patrícia Medeiros de Souza  
Universidade de Brasília/UnB  
Faculdade de Ciências da Saúde  
Campus Universitário Darcy Ribeiro  
70910-900 Brasília, DF, Brasil  
E-mail: pmedeirosouza@uol.com.br

## INTRODUCTION

Significant advancement on medical sciences towards greater life expectancy has been seen in recent years. This benefit came with concurrent increasing costs for life quality promotion, including people's access to medications. The growth of elderly population is significant, and many people will need low or high-complexity multiple drug therapy due to the existence of acute or chronic diseases.

Population studies in Brazil show that at least 85% of the elderly have at least one chronic disease and about 10% of them have at least five diseases.<sup>26</sup>

The use of multiple medications can potentially provide substantial benefit in controlling many chronic diseases. But some polypharmacy therapies are inappropriate, leading to adverse drug reactions and interactions.

The objective of the present study was to comment on studies on polypharmacy in the elderly, particularly regarding its diagnosis and control.

## DEFINITIONS OF POLYPHARMACY

The definition of polypharmacy is still controversial. However, it may be defined as the use of one medication to correct the adverse effect of another or the increase on the number of medications considering five or more associations.<sup>1,6,12,28</sup>

Topical and herbal medications are generally excluded of this definition as they are often not included in the traditional methods of assessing prescription quality. Vitamins and minerals taken on as-needed basis are also generally excluded in these assessments because of the inconsistent inclusion of these medications in polypharmacy.

The duration of therapy has been another criterion described to define polypharmacy. Veehof et al<sup>29</sup> defined a minimum period of 60 days. However, this criterion has not yet been validated.

The diagnostic of several concomitant conditions may lead to polypharmacy. Considering the large number of polypharmacy concepts, there is need of an agreement in relation to this definition to evaluate its frequency, control its occurrence and to identify the risk of adverse reactions associated with polypharmacy.

## EPIDEMIOLOGY OF POLYPHARMACY AND CLINICAL OUTCOMES

Although scarce, some data show a growing elderly population in Brazil. In a study comparing the 1980 and 2000 age group population pyramids, an increase was seen in the population older than 60 years, from 6.1% to 8.6%.<sup>15</sup>

Due to an increased lifespan of the elderly both in developed and developing countries, identifying medication interactions aimed at preventing adverse drug reactions becomes paramount. Proportionally, the elderly use more drugs compared to other age groups. In Brazil, Passarelli et al<sup>23</sup> reported an average between 9.9 and 13.6 drugs in inpatients. The number of medications used in outpatient treatment was lower, ranging from 1.3 to 2.3 drug/patient.<sup>8</sup>

A Brazilian study investigated 45 elderly and found that polypharmacy in 33.3%. Antihypertensive agents were the most commonly used drugs, accounting for 53.3% of prescriptions.<sup>3</sup>

A 32% prevalence was found for cardiovascular medications in another prospective study involving hospitalized or bedridden elderly patients. It was also observed that of those who took drugs with tea (57%), 12% did not believe tea could reduce the therapeutic efficiency.<sup>10</sup>

Loyola et al<sup>17</sup> showed an association between the number of medical consultations and use of prescribed medications. Self-medication rate was lower among those who attended periodical medical consultations and high self-medication rates may be associated to lack of medical care. In contrast to studies conducted in developed countries, lower use of prescribed medications among elderly patients with lower socioeconomic condition was seen.<sup>17</sup>

In one of the few prospective studies on polypharmacy, Veehof et al<sup>29</sup> followed up 1,544 elders for three years, and identified a 42% incidence rate of polypharmacy. The number of medications used in the long term at the beginning of the cohort was the best predictor of polypharmacy development. The incidence of arterial hypertension and atrial fibrillation was associated to significant increase in polypharmacy (risk ratio of 37.3 and 19.6, respectively).<sup>29</sup>

In addition, the elderly above 86 years of age had an increase in hospital admission at emergency department from 12% to 21%.<sup>1</sup> In the same study, the number of elders admitted to hospitals in an urban area was three times higher than those in a rural area. Also, the number of elderly patients who attended emergency services decreased, suggesting changes in the behavior of elders who live in a rural area compared to those who live in an urban area, with no references on how the changes occurred.<sup>1</sup>

In regard to the incidence of polypharmacy in outpatients, a study<sup>25</sup> found five chronic diseases on average per elderly, who took about 11 medications each. Also, it was found that 81% of them had prescriptions

considered as inadequate, had inadequate treatment adherence or used drugs with narrow safety margin, which could cause medication toxicity.<sup>25</sup> In Brazil, medication cost is directly proportional to the increase in the population age. The same can be found in developed countries, where the expenditure with medications for elderly patients proportionally increases as longevity increases, having a great impact on these countries' economies.<sup>21</sup>

### ECONOMIC IMPACT OF POLYPHARMACY

In England, there was a progressive increase in medication consumption among the elderly for 20 years (1979–98). In the United States, the increase in medication expenditure from 1991 to 2000 was around 8.5%. Japan, on the other hand, had a disproportional growth with an estimated expenditure per elder in 1991 of US\$ 130 per capita.<sup>21</sup>

An increased consumption of herbal remedies in this age group was also seen as they are sold over the counter, thus facilitating access to these drugs without requiring medical prescription. Herbal remedies are part of the so-called complementary therapy.

Although these medications are not yet regulated, they account for US\$ 13 billion in sales in the year of 2000 in the United States. It was found that patients do not report to their physicians the use of these products, which can interact with other drugs and increase the risk of adverse reactions due to drug interactions as well as the costs to minimize these effects.<sup>7</sup>

Three factors have been indicated as key for increased costs with medications in the elderly: increased use of prescribed medications, increased costs of prescription drugs and the advent of new drugs. This increased expenditure due to a greater number of prescribed drugs could be minimized by using less costly drugs.<sup>4</sup>

The association between urinary incontinence, delirium and polypharmacy is common in people older than 50 years. Drugs used in the treatment of urinary incontinence are usually adrenergic, sometimes inducing delirium as an adverse effect. As it requires a different drug to reduce this adverse effect, this combination characterizes polypharmacy. In turn, polypharmacy itself may cause several complications, among them urinary incontinence and delirium.<sup>13</sup>

Other factors associated to polypharmacy in the elderly include the number of serious diseases which require a higher number of medications for its treatment and incur in higher expenditure with physicians and pharmacists as more providers will be involved.<sup>16</sup>

Admission rates may increase since increasing population age is associated to higher risk of side effects in

the elderly, a condition that can be aggravated by the use of polypharmacy.<sup>5</sup>

The most commonly complications associated to adverse drug reactions include gastrointestinal complications, accounting for 19%, and metabolic and hemorrhagic complications. The most commonly drugs involved in these events are diuretics, calcium blockers (9%), digoxin (8%), and nonsteroidal anti-inflammatory agents (8%).<sup>22</sup> Adverse drug effects produced an increased rate of hospital admission in elderly patients of around 4% and 38 (4%) died due to adverse drug effects. For each drug used by the elder, there is a 65% increase in the likelihood of hospital admission due to adverse drug effects.<sup>22</sup>

### POLYPHARMACY CONTROL MEASUREMENTS

Pharmaceutical care plays an important role in the reduction of polypharmacy in the elderly. Pharmacists evaluate aspects concerning the use of adequate medications; reduction of medication doses without affecting treatment efficiency; adjustment of doses beyond the drug safety margin; and correct use of the medication by elderly patients.<sup>27</sup>

The role of a clinical pharmacist has been confirmed as vital in the development of recommendations for both physicians and patients. A prospective study has shown a reduction of 24% in the use of inappropriate drugs as well as significant reduction in adverse drug effects when compared to the control group.<sup>18</sup>

Treatment adherence of the elderly patient is another factor that impairs polypharmacy reduction. Medication adherence can be defined as consistency between medical prescription and drugs consumed by the patient.<sup>20</sup> Compliance is lower among elders older than 85 years compared to those aged from 60 to 74 years. Another factor that contributes to the reduction of drug bioavailability is the fact that older adults drink less water and tend to take their medication with food, and make use of drugs, such as tranquilizers and laxative agents, by themselves.<sup>19</sup>

Interviews with patients, counting of pills and even electronic methods of pill counting are some measurements used to improve drug therapy adherence. These methods have both advantages and disadvantages. Pill counting provides an estimative of the number of pills consumed but does not take into consideration the time these pills are taken.<sup>14</sup>

The methods employed to control and reduce polypharmacy in the elderly are complex and pose a great challenge. Randomized clinical studies have shown that programmed interventions reduce polypharmacy for a short period only.<sup>24</sup> It seems that the decision of using or not prescribed medications in most cases depends on the preference of physicians and patients.

Another factor that could contribute to reduce polypharmacy complications is the reduction on conflicting information given by many different health professionals.<sup>9</sup>

The use of medications including beta-blocker drugs, sympathomimetic drugs, sedatives, hypnotic drugs, opiates, tricyclic antidepressive agents, antipsychotics and corticosteroids can produce significant physiological changes. The two drug classes most commonly associated to side effects include cardiovascular drugs (especially beta-blockers and diuretics) and those acting in the central nervous system (benzodiazepines). Moreover, there is a potential risk due to four factors including age, co-morbidities, number of drugs prescribed and number of drugs discontinued during treatment. A reduction of 26% in medication consumption and rational use of medications in the elderly was found although polypharmacy adverse effects were not reduced with a reduced number of medications.<sup>11</sup>

A number of methods have been proposed for polypharmacy reduction. Some authors point as vital for polypharmacy control the reduction of adverse effects since several drug interactions can be anticipated and prescriptions can be adjusted.<sup>5</sup> This also leads to reduced

costs of drug treatment. Thus, the reduction of the number of drugs prescribed requires a multidisciplinary approach by health professionals, and the adaptation of the elder in the social and family environment is vital. All these factors allow the elderly to live a mentally and physically healthy and harmonic life, resulting in the reduction in medication use especially anti-depressive agents and sedatives.

Actions for rational drug use are countless and their main focus is polypharmacy control and medication cost reduction. Among the main measures, there is the so-called safe prescription, defined as the process that recommends an adequate medication for a given patient in ideal conditions, providing a balance between therapeutical activity and adverse effect. First of all, a prescription should be safe. In this context, the balanced prescription considers the physiological changes of the elderly and the adverse effects of the drugs aiming at an adequate dose which should be possible with the individualization of the therapy.<sup>2</sup>

#### ACKNOWLEDGMENTS

To Laura Patrícia da Silva of Universidade Católica de Brasília, for her help with the literature review.

## REFERENCES

1. Aminzadeh F, Dalziel WB. Older adults in the emergency department: a systematic review of patterns of use, adverse outcomes, and effectiveness of interventions. *Ann Emerg Med.* 2002;39(3):238-47.
2. Aronson JK. Balanced prescribing. *Br J Clin Pharmacol.* 2006;62(6):629-32.
3. Blanski CRK, Lenardt MH. A compreensão da terapêutica medicamentosa pelo idoso. *Rev Gaucha Enferm.* 2005;26(2):180-8.
4. Bodenheimer TS. Affordable prescriptions for the elderly. *JAMA.* 2001;286(14):1762-3.
5. Burgess CL, Holman CD, Satti AG. Adverse drug reactions in older Australians, 1981-2002. *Med J Aust.* 2005;182(6):267-70.
6. Carlson JE. Perils of polypharmacy: 10 steps to prudent prescribing. *Geriatrics.* 1996;51(7):26-35.
7. Ciocon JO, Ciocon DG, Galindo DJ. Dietary supplements in primary care: botanicals can affect surgical outcomes and follow-up. *Geriatrics.* 2004;59(9):20-4.
8. Coelho Filho JM, Marcopito LF, Castelo A. Perfil de utilização de medicamentos por idosos em área urbana do Nordeste do Brasil. *Rev Saude Publica.* 2004;38(4):557-64.
9. Field TS, Mazor KM, Brisacher B, Debellis KR, Gurwitz JH. Adverse drug events resulting from patient errors in older adults. *J Am Geriatr Soc.* 2007;55(2):271-276.
10. Flores LM, Mengue SS. Drug use by the elderly in southern Brazil. *Rev Saude Publica.* 2005;39(6):924-9.
11. Graves T, Hanlon JT, Schmadler KE, Landsman PB, Samsa GP, Pieper CF, et al. Adverse events after discontinuing medications in elderly outpatients. *Arch Intern Med.* 1997;157(19):2205-10.
12. Hanlon JT. Drug-related problems updates. *Am J Geriatr Pharmacother.* 2004;2(1):88-90.
13. Hogan DB. Revisiting the O complex: urinary incontinence, delirium and polypharmacy in elderly patients. *CMAJ.* 1997;157(8):1071-7.
14. Hohl CM, Dankoff J, Colacone A, Afilalo M. Polypharmacy, adverse drug-related events, and potential adverse drug interactions in elderly patients presenting to an emergency department. *Ann Emerg Med.* 2001;38(6):666-71.
15. Lotufo PA. Brazil is getting older: some lessons from the Bambuí Health and aging study. *Sao Paulo Med J.* 2004;122(3):79-80.
16. Linnerbur S, Ruscini M. Cholinesterase inhibitor use in geriatric outpatients with dementia. *Am J Health Syst Pharm.* 2005;62(9):923-6.
17. Loyola Filho AI, Uchoa E, Firmo JOA, Lima-Costa MF. Estudo de base populacional sobre o consumo de medicamentos entre idosos: Projeto Bambuí. *Cad Saude Publica.* 2005;21(2):545-53.
18. McVeigh DM. Polypharmacy in the older population: recommendations for improved clinical practice. *Top Emerg Med.* 2001;23(3):68-75.
19. Merle L, Laroche M L, Dantoine T, Charmes JP. Predicting and preventing adverse drug reaction in the very old. *Drugs Aging.* 2005;22(5):375-92.
20. Murray MD, Morrow DG, Weiner M, Clark DO, Tu W, Deer MM et al. A conceptual framework to study medication adherence in older adults. *Am J Geriatr Pharmacother.* 2004;2(1):36-43.
21. O'Neill C, Hughes CM, Jamison J, Schweizer A. Cost of pharmacological care of the elderly: implications for healthcare resources. *Drugs Aging.* 2003;20(4):253-61.
22. Onder G, Pedone C, Landi F, Cesari M, Della Vedova C, Bernabei R, et al. Adverse drug reactions as cause of hospital admissions: results from the Italian Group of Pharmacoepidemiology in the Elderly (GIFA). *J Am Geriatr Soc.* 2002;50(12):1962-86.
23. Passarelli MC, Jacob-Filho W, Figueras A. Adverse drug reactions in an elderly hospitalised population: inappropriate prescription is a leading cause. *Drugs Aging.* 2005;22(9):767-77.
24. Pitkala KH, Strandberg TE, Tilvis RS. Is it possible to reduce polypharmacy in the elderly? A randomised, controlled trial. *Drugs Aging.* 2001;18(2):143-9.
25. Shimp LA, Ascione FJ, Glazer HM, Atwood BF. Potential medication related problems in noninstitutionalized elderly. *Drug Intell Clin Pharm.* 1985;19(10):766-72.
26. Silvestre JA, Costa Neto MM. Abordagem do idoso em programas de saúde da família. *Cad Saude Publica.* 2003;19(3):839-47.
27. Simonson W, Feinberg JL. Medication-related problems in the elderly: defining the issues and identifying solutions. *Drugs Aging.* 2005;22(7):559-69.
28. Steinman MA, Rosenthal GE, Landefeld CS, Bertenthal D, Sen S, Kaboli PJ. Conflicts and concordance between measures of medication prescribing quality. *Med Care.* 2007;45(1):95-9.
29. Veehof LJJ, Stewart RE, Haaijer-Ruskamp FM, Jong BM. The development of polypharmacy. A Longitudinal study. *Fam Pract.* 2000;17(3):261-7.