Polypharmacy among elderly patients in Poland: prevalence, predisposing factors, and management strategies

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ABSTRACT

INTRODUCTION   The world's elderly population is growing dramatically. Pharmacotherapy in seniors is particularly challenging due to changes in metabolism, multimorbidity, and a great interest in nonprescription drugs.

OBJECTIVES   We aimed to provide up-to-date data on pharmacotherapy in the geriatric population of Poland, to determine factors predisposing to polypharmacy and excessive polypharmacy, and to identify seniors who are most likely to require multidisciplinary interventions in the field of pharmacotherapy.

PATIENTS AND METHODS   We analyzed the use of all prescription and nonprescription drugs taken within 2 weeks preceding the study in a representative national sample of 3014 home-dwelling seniors aged over 65 years. The variables of age, sex, place of residence, level of education, and multimorbidity were considered. Poststratification was used to balance the sample structure to match the Polish population of 2017.

RESULTS   Consumption of at least 1 drug was reported by 90.7% of the participants, and the mean number of drugs used was 5.01 (95% CI, 4.87–5.15). At least 1 nonprescription drug was used by 44.2% of the respondents, with a mean number of 0.52 (95% CI, 0.49–0.55). More than 5 drugs were taken by 53.5% of the entire population, while the use of more than 10 drugs was reported by 8.7% of the respondents, with multimorbidity as the most predisposing factor. Single-pill combinations accounted for 27.2% of medications.

CONCLUSIONS   The high prevalence of polypharmacy resulting from multimorbidity confirms the need for the implementation of combined medical and pharmaceutical care of the geriatric patients.

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INTRODUCTION   A significant increase in life expectancy is considered one of the greatest social achievements of the 20th century. However, this longevity, together with declining fertility rates, have led to a progressive aging of the population. The number of individuals over the age of 65 years is projected to increase from 524 million in 2010 (8% of the world's population) to 1.5 billion (16% of the world's population) by 2050.[1]

Pharmacological therapy in seniors is particularly complicated due to progressive aging-related changes in metabolism and the coexistence of multiple diseases that require complex drug regimens.[2] Additionally, there has been a growing interest among older adults in over-the-counter (OTC) drugs that are widely available on the pharmaceutical market.[3]

The literature provides a broad and thorough description of the negative medical, economic,

WHAT'S NEW?

Our study reveals that Polish home-dwelling seniors consume a high number of prescription and nonprescription drugs. The factors predisposing to polypharmacy and excessive polypharmacy include multimorbidity, male sex, age of 85 to 89 years, low level of education, and living in a small or medium-sized city. Moreover, we provide unique data on the consumption of single-pill combinations in elderly Polish patients. Polypharmacotherapy can have negative health consequences; therefore, actions must be taken in the field of complex medical and pharmaceutical care of the geriatric patients. Various management strategies are available to optimize pharmacotherapy and prevent medication-related problems. Unfortunately, there is still limited clinical evidence for long-term benefits of these interventions in elderly people. Our results provide additional information supporting the introduction of coordinated pharmaceutical care in Poland.

and social consequences of polypharmacy (PP), defined as taking 5 or more drugs, and excessive polypharmacy (EPP), which refers to using at least 10 drugs.[4] The negative implications of PP and EPP are a strong motivation for the continuous monitoring of pharmacotherapy in older adults in many countries around the world.[5-8] There has also been a growing recognition of the importance of deprescribing, defined as the process of withdrawal or dose reduction of a drug for which the risk outweighs the benefit in specific patients.[9] The available methods include physician-led interventions, clinical decision support systems, prescriber education programs, pharmacist-led medication reviews, direct-to-patient education, and multidisciplinary interventions.[10] There is accummulating evidence for the safety and clinical effectiveness of deprescribing; unfortunately, the long-term benefits associated with the intervention are often not sustainable or clinically meaningful.[11] Moreover, there is a lack of robust evidence for the effectiveness of deprescribing in seniors with multimorbidity and frailty, as these patients are routinely excluded from clinical trials.[10]

Nevertheless, the need to explore the implementation of deprescribing into routine clinical practice is of major importance across health care settings worldwide. An example of such an intervention is a new regulation introduced by the Ministry of Health of the Republic of Poland in December 2021, which aims to implement pharmaceutical support in the form of drug interviews as a new service in the Polish health care system.[12]

The objective of this study was to provide an up-to-date assessment of pharmacotherapy in the geriatric population of Poland. Furthermore, we aimed to determine the factors predisposing this population to PP and EPP, and to identify the seniors who are most likely to require multidisciplinary interventions in the field of pharmacotherapy.

PATIENTS AND METHODS The study group consisted of patients who participated in the NOMED-AF (NOninvasive Monitoring for Early Detection of Atrial Fibrillation), a nationwide, cross-sectional, observational study conducted from 2017 to 2019. The participants were randomly selected by the Ministry of Digital Affairs of the Republic of Poland from the social security number database; therefore, they constituted a sample representative of the Polish population in terms of sex, age, and place of residence. A detailed description of the methodology of the NOMED-AF study was presented in a separate publication.[13] All participants provided their written informed consent prior to enrolment. The study was approved by the Independent Bioethics Committee for Scientific Research at the Medical University of Gdansk (13/2020; 2020-04-21) and by the Bioethics Commission at the Silesian Medical Chamber in Katowice (26/2015; 2015-07-01).

The specific inclusion criterion for the present study was the consent to provide information on taken drugs. We analyzed the pharmacotherapy in 3014 respondents, including 1479 women and 1535 men over 65 years of age. The mean (SD) age of the entire sample was 77.5 (7.9) years, and the mean age for separately men and women was also 77.5 (7.9) years. The data were obtained by trained nurses using a detailed questionnaire, either directly from the respondents or from their family members or caregivers. During the interviews, the respondents or their representatives were asked to present the packaging of all the drugs they had consumed at least once in the 2 weeks preceding the study. The interviewer gathered information on each medication, including drug name, form, single dose, and dosing frequency. In the analysis, we considered the number of pills (not active substances) of prescription or nonprescription / OTC drugs, based on the database of the Office for Registration of Medicinal Products, Medical Devices, and Biocidal Products.[14] The products not listed in this database, including the majority of dietary supplements, which lack clear classification and information on exact formulations, were excluded from the analysis. If the same substance was sold simultaneously as a prescription drug and an OTC preparation, it was classified as the former category.

The analysis of pharmacotherapy was performed for all drugs together and independently for prescription and nonprescription drugs, taking into account the following variables: sex (male, female), age (in cohorts: 65–69, 70–74, 75–79, 80–84, 85–89, >90 years), place of residence (village, small city with <50 000 inhabitants, medium-sized city with 50 000 to 200 000 inhabitants, large city with >200 000 inhabitants), and the level of education (primary, secondary / vocational, higher). We also noted the frequency of single-pill combinations (SPCs), which are defined as drugs that include 2 or more active ingredients combined in a single-dose form. Qualitative analysis of pharmacotherapy was performed according

TABLE 1 Pharmacotherapy in the elderly population of Poland[a]

Parameter		Number of all drugs				Number of prescription drugs				Number of nonprescription drugs			
		0	1–4	5–9	≥10	0	1–4	5–9	≥10	0	1–4	5–9	≥10
Sex	All	9.3	37.1	44.8	8.7	11.2	41.6	41.5	5.7	55.8	44.0	0.1	0
	Women	7.9	39.2	45.2	7.6	10.3	42.8	42.3	4.6	57.5	42.3	0.1	0
	Men	11.4	33.9	44.2	10.5	12.7	39.8	40.3	7.3	53.1	46.7	0.1	0
Age, y	65–69	12.7	47.8	34.2	5.3	15.4	50.6	30.4	3.6	60.9	39.0	0.1	0
	70–74	11.6	38.7	42.3	7.4	12.7	44.3	38.3	4.7	60.0	40.0	0	0
	75–79	7.5	30.0	51.5	11.0	9.5	35.3	48.0	7.2	54.0	45.5	0.4	0
	80–84	5.0	27.6	55.8	11.7	6.9	31.9	53.8	7.5	45.5	54.4	0.1	0
	85–89	5.0	24.6	56.4	13.9	6.6	29.4	54.5	9.4	51.4	48.2	0.2	0.2
	≥90	1.1	32.0	53.8	13.1	1.5	39.9	51.0	7.6	44.0	56.0	0	0
Level of education	Primary	9.2	33.1	49.2	8.5	11.6	38.3	44.6	5.4	53.4	46.6	0	0
	Secondary / vocational	9.8	39.3	41.9	9.1	11.4	42.7	39.9	5.9	58.2	41.6	0.2	0
	Higher	7.8	38.5	45.6	8.1	9.1	45.4	40.1	5.5	52.5	47.2	0.2	0
Place of residence	Village	9.2	36.6	46.9	7.3	11.2	41.8	42.6	4.4	54.5	45.5	0	0.1
	City <50 000 inhabitants	7.8	37.9	48.3	6.1	8.8	42.8	44.2	4.3	55.8	44.0	0.2	0
	City 50 000–200 000 inhabitants	8.9	39.4	39.2	12.5	11.1	42.0	38.6	8.4	59.0	41.0	0.1	0
	City >200 000 inhabitants	11.3	35.5	42.2	10.9	13.9	39.8	39.2	7.1	55.5	44.1	0.3	0

Data are presented as the percentage of patients.

a   The results presented in all tables are based on a complex scheme of randomization of respondents. The data were obtained after weighing the sample in relation to the structure of the Polish population aged ≥65 years in 2017.

to the anatomical-therapeutic-chemical (ATC) classification.[15]

The respondents provided information on diagnosed chronic diseases and were asked to present discharge cards from previous hospitalizations. Based on these data, codes from the *International Classification of Diseases, Tenth Revision* (ICD-10) were assigned. The Charlson Comorbidity Index (CCI) was used to determine the degree of multimorbidity. We applied the 2 most commonly used definitions: taking 5 or more drugs was considered PP, while EPP was defined as the use of more than 10 drugs.[16]

Statistical analysis   Poststratification was used to adjust the sample structure to match the Polish population of 2017. The results are presented as percentages, medians with interquartile ranges (IQRs), and means with 95% CIs. Normality of the data distribution was verified using the Shapiro–Wilk test—some of the variables were not normally distributed. Stepwise logistic regression was performed, and odds ratios with 95% CIs were calculated. The analysis was performed using the R statistical package, version 3.6.3 (R Foundation for Statistical Computing, Vienna, Austria) and SAS 9.4 TS Level 1M5 (SAS Institute, Inc., Cary, North Carolina, United States). A *P* value below 0.05 was considered significant.

RESULTS   The results were stratified according to the age structure to reflect the Polish population aged over 65 years in 2017. Therefore, the results

are representative of the general population of Poland. A detailed description of sampling and subsequent weighing can be found in the methodological publication.[13]

Consumption of all drugs   Consumption of at least 1 drug was admitted by 90.7% of all respondents, and was more common among women (92.1%) than men (88.6%). The mean number (95% CI) of all drugs consumed was 5.01 (4.87–5.15), and the median value (IQR) was 5 (3–7). Most respondents took 5 to 9 pills per day. Detailed data concerning the consumption of all drugs are presented in **TABLES 1** and **2**.

PP was identified in 53.5% of all individuals over 65 years old, most frequently in men, in the age group of 85 to 89 years, in the participants with primary education, and those living in small cities. The strongest predisposing factor for PP was multimorbidity. Of note, in the age groups of 70 to 74 years and 80 to 84 years, as well as in the respondents older than 90 years, the risk of PP was lower than in the youngest cohort (65–69 years). Other factors had no influence on the frequency of PP (**TABLE 3**).

EPP was identified in 8.7% of all respondents, most frequently in men, in the age group of 85 to 89 years, in the participants with secondary / vocational education, and those living in medium-sized cities. The strongest predisposing factor for EPP was multimorbidity. Male sex and living in medium-sized or large cities were also relevant variables, whereas other factors were not significant (**TABLE 4**).

TABLE 2 Number of all drugs consumed by the geriatric population of Poland

Parameter		Sample size, n			Mean (95% CI)			Median (IQR)		
		Women	Men	All	Women	Men	All	Women	Men	All
Overall		1479	1535	3014	4.97 (4.79–5.16)	5.06 (4.84–5.27)	5.01 (4.87–5.15)	5 (3–7)	5 (2–7)	5 (3–7)
Age, y	65–69	281	291	572	3.83 (3.51–4.14)	4.30 (3.85–4.76)	4.04 (3.77–4.31)	3 (2–6)	4 (1–6)	4 (2–6)
	70–74	325	307	632	4.57 (4.18–4.96)	4.91 (4.51–5.30)	4.71 (4.43–4.99)	4 (2–7)	5 (2–7)	4 (2–7)
	75–79	268	317	585	5.42 (4.94–5.89)	5.83 (5.47–6.20)	5.58 (5.25–5.90)	5 (3–8)	6 (4–8)	5 (3–8)
	80–84	274	255	529	6.14 (5.75–6.53)	5.83 (5.38–6.28)	6.04 (5.73–6.34)	6 (4–8)	6 (3–8)	6 (4–8)
	85–89	195	247	442	6.26 (5.70–6.81)	5.84 (5.41–6.26)	6.13 (5.72–6.53)	6 (4–8)	6 (4–8)	6 (4–8)
	≥90	136	118	254	5.83 (5.16–6.51)	6.66 (6.01–7.32)	6.03 (5.49–6.56)	5 (4–8)	6 (4–9)	6 (4–8)
Level of education	Primary	668	498	1166	5.31 (5.02–5.59)	4.93 (4.55–5.31)	5.19 (4.95–5.41)	5 (3–8)	5 (2–7)	5 (3–8)
	Secondary/vocational	674	788	1462	4.80 (4.53–5.07)	5.02 (4.72–5.33)	4.89 (4.69–5.09)	4 (2–7)	5 (2–7)	5 (2–7)
	Higher	131	245	376	4.59 (4.05–5.12)	5.43 (4.94–5.91)	5.01 (4.63–5.38)	4 (3–6)	6 (3–8)	5 (3–7)
Place of residence	Village	593	536	1129	5.09 (4.83–5.36)	4.75 (4.43–5.06)	4.95 (4.75–5.16)	5 (3–7)	5 (2–7)	5 (3–7)
	City <50 000 inhabitants	351	376	727	4.84 (4.51–5.16)	5.15 (4.73–5.58)	4.96 (4.70–5.22)	5 (3–7)	5 (2–8)	5 (3–7)
	City 50 000–200 000 inhabitants	275	308	583	5.13 (4.72–5.54)	5.20 (4.58–5.81)	5.16 (4.81–5.51)	5 (3–7)	5 (2–8)	5 (3–7)
	City >200 000 inhabitants	260	315	575	4.82 (4.31–5.32)	5.35 (4.89–5.82)	5.03 (4.66–5.39)	5 (2–7)	5 (3–8)	5 (2–7)

Abbreviations: IQR, interquartile range

Consumption of prescription drugs Consumption of at least 1 prescription drug was declared by 88.8% of all respondents; slightly more often by women (89.7%) than by men (87.3%). The mean number (95% CI) of all prescription drugs used was 4.49 (4.35–4.62), and the median value (IQR) was 4 (2–6). Most respondents took 1 to 4 prescription pills per day. Detailed data concerning the consumption of all prescription drugs are presented in Supplementary material, *Table S1*. Qualitative analysis of the prescription drugs according to the ATC classification is presented in Supplementary material, *Table S2*.

Consumption of nonprescription drugs Consumption of at least 1 nonprescription drug was reported by 44.2% of all respondents; more often by men (46.9%) than by women (42.5%). The mean number (95% CI) of all nonprescription drugs was 0.52 (0.49–0.55). Most respondents took 1 to 4 nonprescription pills per day. Detailed data concerning the consumption of all nonprescription drugs are presented in Supplementary material, *Table S3*.

Single-pill combinations The percentage of all individuals taking SPCs was 27.2%, with no significant difference between the sexes. SPCs were most often used by older adults in the age group of 75 to 79 years, those with higher education, and living in medium-sized cities. Detailed data concerning the consumption of SPSs are presented in Supplementary material, *Tables S4* and *S5*.

Comorbidities The mean value (95% CI) of the CCI was 4.38 (4.30–4.47) points, and it was slightly higher in men (4.46 [4.34–4.58] points) than in women (4.34 [4.22–4.45] points). The median value (IQR) of the CCI in the entire cohort was 4 (3–5) points—4 (3–6) points in men and 4 (3–5) points in women. The distribution of the CCI in the study population is presented in Supplementary material, *Figure S1*.

The most frequent chronic diseases were arterial hypertension, diabetes mellitus, and chronic heart failure. Detailed data concerning the prevalence of the most common chronic conditions are presented in Supplementary material, *Table S6*.

DISCUSSION We observed a high consumption of drugs among the geriatric population of Poland. The 2019 World Health Organization (WHO) report[17] confirms that PP is a widespread concern in many countries around the world. In the 2018 Polsenior study,[18] the first national study assessing the health condition of elderly Poles, the prevalence of PP among people aged over 65 years was higher than that reported in

TABLE 3 Logistic regression model identifying factors predisposing to polypharmacy

Parameter		OR	95% CI	P value
Sex	Women (ref)	1.00	–	–
	Men	1.04	0.87–1.25	0.64
Age, y	65–69 (ref)	1.00	–	–
	70–74	0.71	0.56–0.89	0.003
	75–79	1.24	0.96–1.60	0.1
	80–84	0.73	0.54–0.99	0.04
	85–89	0.71	0.49–1.03	0.07
	≥90	0.61	0.38–0.98	0.04
Level of education	Primary (ref)	1.00	–	–
	Secondary/vocational	0.98	0.81–1.20	0.87
	Higher	1.30	0.98–1.74	0.07
Charlson Comorbidity Index		1.95	1.82–2.09	<0.001
Place of residence	Village (ref)	1.00	–	–
	City <50 000 inhabitants	0.99	0.79–1.23	0.9
	City 50 000–200 000 inhabitants	0.79	0.61–1.02	0.07
	City >200 000 inhabitants	0.90	0.72–1.14	0.38

Abbreviations: OR, odds ratio; ref, reference

TABLE 4 Logistic regression model identifying factors predisposing to excessive polypharmacy

Parameter		OR	95% CI	P value
Sex	Women (ref)	1.00	–	–
	Men	1.45	1.06–1.98	0.02
Age, y	65–69 (ref)	1.00	–	–
	70–74	0.75	0.48–1.16	0.19
	75–79	1.13	0.73–1.75	0.57
	80–84	0.71	0.44–1.15	0.16
	85–89	0.71	0.41–1.22	0.21
	≥90	0.66	0.33–1.33	0.24
Level of education	Primary (ref)	1.00	–	–
	Secondary/vocational	1.14	0.82–1.60	0.44
	Higher	1.01	0.61–1.67	0.97
Charlson Comorbidity Index		1.65	1.54–1.77	<0.001
Place of residence	Village (ref)	1.00	–	–
	City <50 000 inhabitants	0.76	0.50–1.15	0.20
	City 50 000–200 000 inhabitants	1.74	1.16–2.59	0.007
	City >200 000 inhabitants	1.56	1.05–2.30	0.03

Abbreviations: see **TABLE 3**

our research; however, the results of that study were not weighted according to age structure of the Polish population. The PP rate in our analysis was similar to that observed in the follow-up national study, Polsenior 2[19] from 2018–2019, even though that study also included younger respondents aged 60 to 65 years.[19] Kardas et al[20] reported an even higher prevalence of PP based only on the use of prescription drugs among the geriatric population of Poland in 2019. Overall, these data may indicate that PP among seniors in Poland is an increasing problem.

Under the guidelines of evidence-based medicine, multidrug regimens using prescription drugs are often part of the treatment in elderly people with multiple morbidities. However, the consumption of nonprescription drugs and dietary supplements without medical recommendation may not be medically justified and can be outright harmful.[21] As observed in this study, 44.2% of all people aged over 65 years admitted to using at least 1 nonprescription drug. These results are comparable with those of previous international studies that reported the prevalence of self-medication between 20% and 60%, depending on the methodology of the study.[22] The mean number of nonprescription drugs in our analysis was also similar to that reported in the Polsenior and Polsenior 2 studies.[18,19]

Reduction of inappropriate polypharmacy is a major public health goal identified by the WHO Third Global Patient Safety Challenge: Medication Without Harm.[11] Various management strategies are available to optimize pharmacotherapy and prevent medication-related problems in geriatric patients. Physician-led interventions are based on standardized tools, such as the Beers' criteria,[23] the STOPP criteria (Screening Tool of Older Persons' potentially inappropriate Prescriptions), and the START criteria (Screening Tool to Alert doctors to the Right Treatment),[24] as well as the FORTA (Fit For the Aged) list,[25] the PRISCUS list,[26] the Medication Appropriateness Index,[27] or the Good-Palliative-Geriatric Practice Algorithm.[28] Reduced exposure to potentially inappropriate medication is associated with a lower risk of adverse drug reactions and hospitalization in elderly individuals; however, it has no influence on mortality.[29] Prescriber education programs are another strategy to reduce prescription errors, although there is no robust evidence for health benefits associated with this intervention.[30] Clinical decision support programs are becoming more accessible due to gradual computerization of health care systems. The available literature proves their effectiveness in terms of deprescribing; however, these interventions have little effect on hospital admissions or mortality in general.[31] With the increasing importance of shared decision-making, studies indicate that direct-to-patient education about the benefits and harms of drugs can lead to a significant decrease in the use of potentially inappropriate medications.[32] Pharmacist-led medication reviews vary across countries, and may include services such as medication assessments, care plans, and follow-up evaluations. These interventions are cost-saving due to anticipated reduction in the number of adverse outcomes, and can also improve appropriateness of prescribing and physical functioning of patients.[33] However, they have no significant influence on hospital admissions or mortality.[34] Overall, deprescribing is an established management strategy to minimize polypharmacy and potentially

inappropriate medications. Unfortunately, there is still limited clinical evidence for its efficacy in terms of geriatric outcomes.[35]

The new Polish regulation[12] is an example of a strategy to optimize pharmacotherapy. It aims to establish comprehensive medical and pharmaceutical care of patients based on drug reviews conducted by pharmacists. Currently, a pilot project of the program is being introduced by the Medical University in Poznań, which is responsible for choosing and supervising 75 community pharmacists from all Polish voivodeships (both urban and rural areas) participating in the project. The project involves 3 patient consultations with a pharmacist within 1 month. The pilot testing includes a group of 750 to 1000 Poles chosen by the pharmacists, comprised of individuals aged 18–60 years who take at least 5 drugs and persons over the age of 60 years who consume more than 10 drugs in their normal regimens.

The responsibilities of the pharmacists include identification of the patient's actual or potential drug-related problems and their causes (eg, level of compliance based on an interview), and ranking these problems according to their importance and the level of risk for the patient. Moreover, the pharmacists will educate the patients on appropriate drug administration, preventive health regimens, importance of compliance, and the patient's right to obtain comprehensive information about the pharmacotherapy during each medical or pharmaceutical visit. If any of the identified problems are related to nonprescription drugs, the pharmacist will issue a written recommendation to optimize pharmacotherapy and inform the patient about the dangers of self-treatment. If the problems are related to prescription drugs, the pharmacist will contact the physician directly on behalf of the patient or write a recommendation to establish contact between the patient and the physician. The drug review will result in the development of an individual pharmaceutical care plan (IPCP) for each patient, based on the therapeutic outcome monitoring and sum-of-the-parts analysis methods along with the principles of evidence-based medicine. Paper versions of the IPCP forms will be forwarded to a coordinating center for data collection and further analysis. The main goals of IPCPs include improvement of patients' quality of life and achievement of therapeutic, economic, and financial benefits. The end of the pilot project is planned for December 2022.[12]

Our study results highlight the importance of pharmaceutical care of geriatric patients. We showed that PP and EPP occur more often in men, in the age group 85 to 89 years, in individuals with lower level of education, and those living in small or medium-sized cities. The main factor predisposing older people to PP and EPP was multimorbidity. The prevalence of the most common comorbidities identified in our study is comparable with data from the Collaborative Research on Ageing in Europe project and the WHO Study on Global Ageing and Adult Health.[36] The Polish geriatric population is characterized by the most frequent multimorbidity patterns, namely, cardio-respiratory (angina, asthma, and chronic obstructive pulmonary disease), metabolic (diabetes, obesity, and hypertension), and mental-articular (arthritis and depression).[37,38] The identified high-risk groups of elderly patients are most likely to require special attention and may receive the greatest benefits from multidisciplinary interventions in the field of pharmacotherapy.

Another area of great interest is the use of SPCs, which is associated with a decrease in the risk of adverse drug reactions and, due to reduced pill burden, an increase in patient compliance.[39,40] These effects are more pronounced with increasing age of the patients and the number of drugs taken.[41] However, the literature provides little evidence on the efficacy of SPCs in elderly patients with multimorbidity, where the lack of dosing flexibility for individual SPCs components can limit the effectiveness of reaction in the case of rapid changes in a patient's clinical state.[42] To our knowledge, there are no Polish population studies on the frequency of the use of combined preparations among older adults. In our study, cardiovascular drugs represented 51.1% of all SPCs, while multivitamin / multielectrolyte preparations accounted for 22.3%, and the combination of paracetamol and tramadol made up 11.6% of all SPCs. These results may change our understanding of the potential benefits of SPSc on health outcomes in elderly patients.

The strengths of our study include the use of real-life settings and a representative sample of elderly, home-dwelling Poles. These approaches enabled us to obtain unique, up-to-date data on pharmacotherapy among the Polish geriatric population. A few limitations are present in our study. First, the data were obtained during interviews, risking an inherent possibility that the respondents would not fully reveal their drug consumption information. Second, even though the study was designed in such a way as to reflect the demographic structure of the Polish population, the oldest respondents who consented to participate in the study were probably a selected group with relatively low morbidity. Together with the exclusion of institutionalized patients, this bias might have resulted in an underestimation of the number of drugs reported in our study.

Conclusions In the context of the high consumption of drugs due to multimorbidity among the Polish geriatric population, and the previously documented negative impact of PP and EPP on the quality of life and life expectancy, our findings reveal a great need for the introduction of combined medical and pharmaceutical care of older adults. Coordinated pharmaceutical care may play a significant role in improving the safety and quality of pharmacoterapy in the elderly, and is in accordance with the plans for the development of

such a care in Poland. Follow-up studies will be required to assess the results of this strategy in Polish geriatric patients.

SUPPLEMENTARY MATERIAL

Supplementary material is available at www.mp.pl/paim.

ARTICLE INFORMATION

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