GENERAL

INDIVIDUAL MEDICATION MANAGEMENT SYSTEM (IMMS) AS A PROPOSITION OF OBEYING THE DOCTOR'S RECOMMENDATION WITH PHARMACIST COOPERATION

MAGDALENA WASZYK-NOWACZYK[1], MAREK SIMON[2]* and KAROLINA MATWIJ[3]

[1]Chair and Department of Pharmaceutical Technology, Poznan University of Medical Sciences,
Grunwaldzka 6 St., 60-812 Poznań, Poland
[2]Department of Pathophysiology, Poznan University of Medical Sciences,
Święcickiego 6 St., 60-781 Poznań, Poland
[3]Student's Pharmaceutical Care Group, Chair and Department of Pharmaceutical Technology,
Poznan University of Medical Sciences, Poznań, Poland

Abstract: The pharmacist is an expert with the knowledge of drugs, who has a possibility to follow the patient's individual pharmacotherapy, which is the basis of the pharmaceutical care programme. The implementation of the Individual Medication Management System (IMMS) may be one of the proposals which will enable an analysis of the course of pharmacotherapy and elimination of drug problems, which are the chief goals of pharmaceutical care. In order to determine community pharmacy patients' degree of interest in the IMMS and to evaluate the degree of patients' discipline concerning the application of doctors' recommendations they were given an anonymous questionnaire. The research was done from August 2009 to May 2010 on a sample of 179 people selected at random. They were patients of community pharmacies in Poznań, where 70% were women and 30% were men, all of them aged between 20 and 85 years. The individual age groups were: 20–40 years – 27.0%, 41–50 years – 10.8%, 51–64 years – 43.6%, 65 years or more – 18.6%. The patients' education was as follows: primary – 4.7%, vocational – 8.0%, secondary – 31.0%, incomplete university – 12.0% and university – 44.3%. The χ^2 and Fisher-Freeman-Halton tests were used for statistical analysis of the results. Each time the level of statistical significance was assumed at $p < 0.05$. The collected results confirmed the fact that there is a higher number of specialists involved in patients' treatment with their age ($p = 0.001$), which indirectly leads to a higher number of prescribed drugs ($p = 0.00000002$). It was proved that more than 90% of the patients aged over 50 years take the prescribed drugs for more than a year ($p = 0.00000002$). The analysis confirmed the fact that there are mostly men which do not abide the indications concerning the dosage regimen ($p = 0.049$). The answers to the questions evaluating the patients' attitude to the IMMS revealed that 47.2% of the respondents indicate the advantages of the system. However, it was mostly women and respondents with university education that were the most interested in it. More than 50% of the patients aged 20–40 years and those aged over 65 years indicate the purposefulness of the systems. It is mainly the group aged 20–40 years that confirms facilitation in following the doctor's recommendations ($p = 0.02$). The respondents indicated their interest and confirmed the purposefulness of the IMMS mainly due to the fact that it helps to avoid drug-related problems resulting from omitting doses and helps to keep the dosage time and frequency in a long-term therapy. The research confirms the fact that individualized therapy will contribute to its higher efficacy, economy and safety.

Keywords: individual medication management system, pharmaceutical care, pharmacist, physician

The essential task of pharmaceutical care is to guarantee that the pharmacotherapy applied to the patient is as appropriate, efficacious and safe as possible (1). The principal action to achieve that goal is to recognize and solve real drug-related problems and to prevent potential problems (2). By definition, they are all adverse effects experienced by the patient, which are caused or may be induced by a drug which influences or may influence the effects of the applied therapy (3, 4). Therefore, differentiation between real and potential drug-related problems is an important issue. It is necessary to distinguish between a situation when the patient had a problem resulting from prescription of an inappropriate drug or inappropriate dosage of the drug was found. In this case it is necessary to take immediate

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action to eliminate the error. A potential problem is a situation when the presence of favorable circumstances for development of drug-related problems has been found, but their effects have not been observed in the patient yet. The risk of occurrence of adverse reactions of the drug is an example. Then, it is necessary to take appropriate steps to prevent the transformation from a potential problem into a real one. It is possible to solve or prevent drug-related problems only with full understanding of their causes (4, 5).

The prerequisite of an effective pharmacotherapy is appropriate dosage of the drug at a specific time, for a period of time recommended by the doctor. Grzelak-Hodor states that in order to achieve the clinical effect, the patient should receive at least 80% of the recommended doses (6). However, the data from the literature points to a significant problem resulting from patients' failure to follow the doctor's recommendations. As results from it, 30–60% of patients do not apply drugs according to the doctor's recommendations (7, 8). For example, only 12% of patients receiving statins abide pharmacotherapeutic regimens (6). Another problem indicated by the research is the fact that as much as 40% of elderly patients interfere with the process of their treatment. By voluntary reduction, increasing or omission of consecutive doses or additional application of OTC drugs patients disturb the prescribed scheme of pharmacotherapy (4, 9). The risk of occurrence of complications in those patients is twice as high as in the patients who exhibit a high degree of discipline. On average, in 35% of elderly patients who receive at least five different medications, the effects of adverse drug reactions (ADR) can be observed and in more than 15% they have become the cause of hospitalization (10). Furthermore, in Poland the expenditures caused by
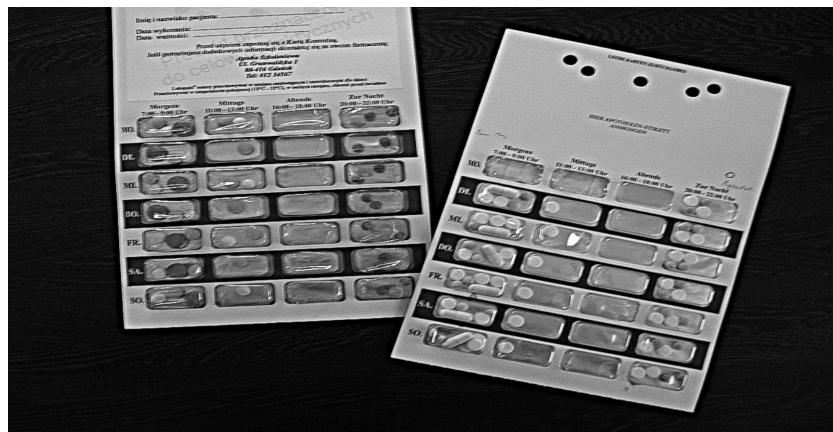

Figure 1. Individual Medication Management System
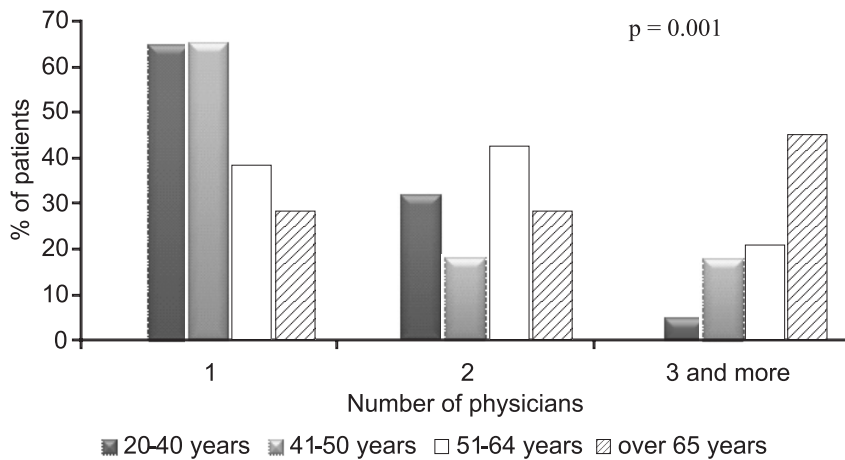

p = 0.001

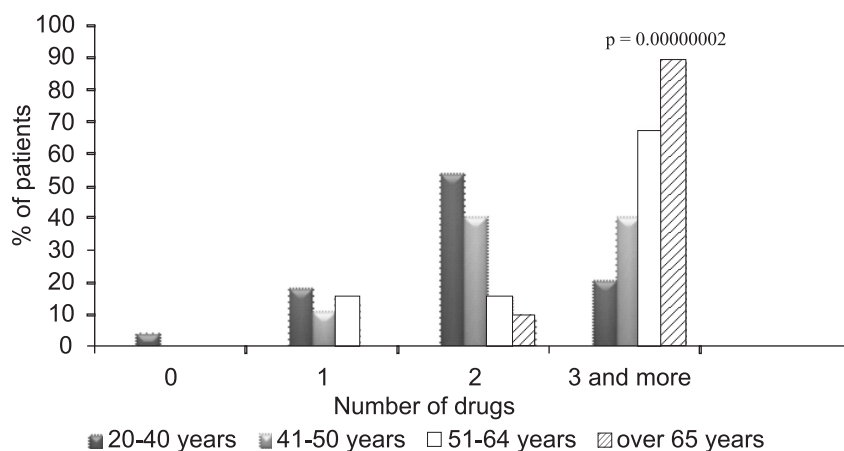Figure 2. Number of physicians involved in treating from the questioned age

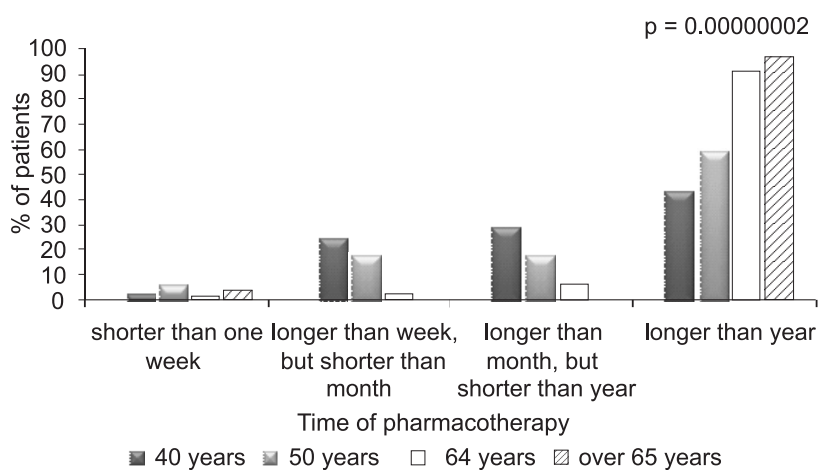Figure 3. Number of taking drugs from the questioned age

Figure 4. Pharmacotherapy time recommended by physician from the questioned age

patients' failure to abide the therapeutic discipline are estimated at 6 billion zlotys, which results from such factors as different doctors' recommendations, commissioned diagnostic examinations, costs of hospitalization, etc. Therefore, pharmacists' attempts to achieve the highest degree of compatibility between the patient's application of drugs and doctors' recommendations seem to be justified (11, 12).

The Individual Medication Management System (IMMS) is a proposal to improve the degree of patient's discipline to apply drugs appropriately (Fig. 1). It is a practical dispenser for solid drugs, which is divided into cells dedicated to specific times of the day on particular days of the week. The

set is prepared for a specific patient. It has the form of large, legible, easy and convenient to use disposable packages. In comparison with classic dispensers, the fundamental advantage of the system is the fact that the IMMS is prepared by qualified pharmaceutical staff, who provide the service as part of the pharmaceutical care programme and are in charge of it. This enables elimination of the application of the same drugs available under different trade names, gives a possibility to verify the volume of prescribed doses and possible interactions and to indicate the possible occurrence of adverse reactions and side effects. In consequence, it reduces the risk of overdosing and improves the safety of the patient's therapy (13, 14).
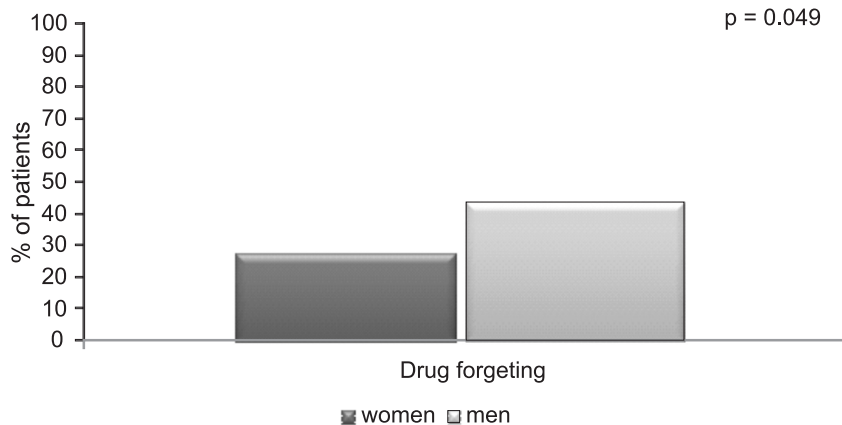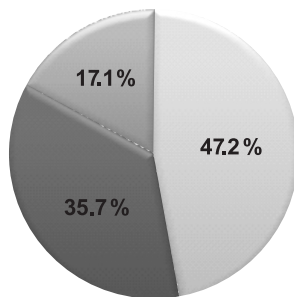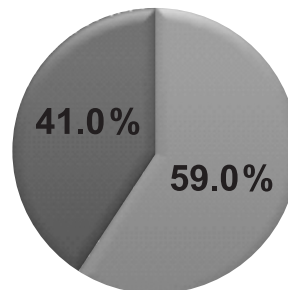
Figure 5. Problem of regular drugs taking from the questioned gender

Figure 6. Questioned opinion about Individual Medication Management System

Figure 7. Interest of Individual Medication Management System from questioned gender

Medication Management System among patients of community pharmacies

The assumed goal was to prove the degree of demand for this kind of individualized therapy in order to enable monitoring of the implemented therapy, detection and prevention of interactions and drug-related problems to guarantee the highest possible efficacy, economy and safety of the recommended pharmacotherapy. The aim of the study was also to evaluate patients' discipline in following doctors' recommendations to prove that the implementation of the IMMS in Poland will bring numerous benefits for patients' appropriate application of drugs.

MATERIALS AND METHODS

The research was done from August 2009 to May 2010 on a sample of 179 people selected at random. They were patients of community pharmacies in Poznan. One hundred twenty five women (70.0%) and 54 men (30.0%) aged between 20 and 85 years took part in the research. The most numerous group consisted of patients aged 51–64 years (43.6%). The other age groups were: 20–40 years – 27.0%, 41–50 years – 10.8%, 65 years or more – 18.6%. The participants of the research were mainly patients with university education – 44.3% and secondary school education – 31.0%. The education profile of the other groups was as follows: incomplete university education – 12.0%, vocational – 8.0% and primary – 4.7%.

An anonymous questionnaire written by the author of this study was applied. It assessed patients' application of drugs, following doctors' indications and patients' interest in the IMMS. Each questionnaire was provided with a short information brochure attached and presentation of demos how to use IMMS.

The results were calculated by means of Excel Microsoft Office and Statistica 8.0 from StatSoft and StatXact8 from Cytel. The following tests were used for statistical analysis: χ^2 or Fisher-Freeman-Halton. Each time the level of statistical significance was assumed at $p < 0.05$.

The effectiveness of the research was tested on the basis of questionnaire return, which was 68.1%. This gives grounds for the conclusion that the research technique which consists in distributing questionnaires to respondents in a pharmacy is relatively effective.

RESULTS

The research attempted to evaluate the range of the applied pharmacotherapy by patients of pharmacies, who were given the questionnaire. First, the number of doctors seen by individual patients was specified. It was found that along with the patient's age there is a growing number of specialists involved in treatment ($p = 0.001$). Most of the patients aged over 65 years saw at least three doctors ($p = 0.001$). The data collected in Figure 2 show this fact. The consequence of consulting several doctors
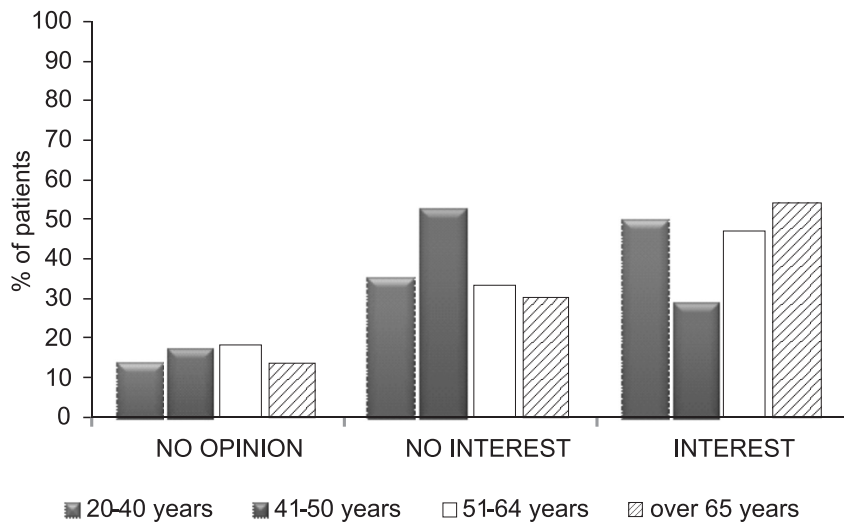

Figure 8. Interest of Individual Medication Management System from questioned age
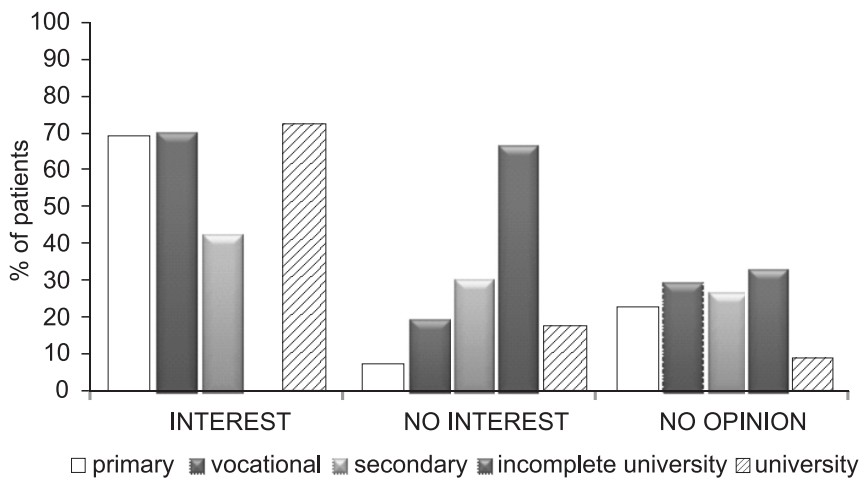

Figure 9. Interest of Individual Medication Management System from questioned education
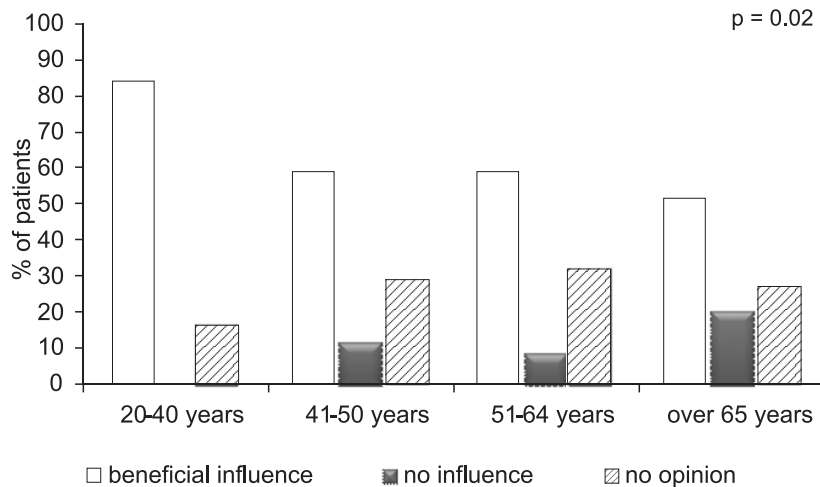
Figure 10. Beneficial influence of Individual Medication Management System on adherence from questioned age

is the number of prescribed drugs. The collected data prove that in this age group 87.9% of the respondents receive three drugs or more (p = 0.00000002), which can be seen in Figure 3. It was also proved that with age the time of application of prescription drugs is extended, which led to the conclusion that after the age of 50 more than 90.0% of the respondents receive drugs for more than a year (p = 0.00000002). The data are shown in Figure 4.

In the next stage of the analysis, the respondents evaluated the extent to which they follow doctors' recommendations concerning the drug dosage regimen. It was proved that it was mainly men that did not follow the recommendations on dosage of the drug (p = 0.049). Figure 5 shows the data.

The research also included evaluation of the degree of interest in the IMMS. The collected data show that 47.2% of all respondents have a positive opinion about the suggested dosage system (Fig. 6). However, the women showed more interest, which can be seen in the data in Figure 7. When evaluating the interest in the IMMS depending on the patients' age it was proved that in the age groups 20–40 years and over 65 years more than 50.0% of the patients indicated purposefulness of the system (Fig. 8). The research proved the fact that it is mainly patients with university education that show acceptance of the suggested system (Fig. 9). It is also interesting to quote the opinion that the IMMS considerably facilitates following the doctor's recommendations. The group aged 20–40 years had the most patients who confirmed that fact (p = 0.02; Fig. 10).

DISCUSSION AND CONCLUSION

Geriatric age is characterised by a higher frequency of diseases, especially chronic ones. The patient frequently applies pharmaceuticals prescribed by several doctors, which is the cause of the dangerous effects of polypharmacy (15–19). The research confirmed the fact that with age the patients see an increasingly higher number of doctors, who are in charge of their therapy. In consequence, the quantity of pharmaceuticals taken every day is higher and the time of application of drugs is extended. This statement is confirmed by the data from 2006, which prove that patients aged over 65 years apply 2–6 prescription only drugs on average (20). The pharmaceutical polytherapy is a special process as specific effects can be achieved only on condition that the patient applies individual drugs strictly according to the doctor and pharmacist's recommendations. Unfortunately, the research described in this study proved that a considerable number of patients, especially men, often forget to take a dose of the drug. Failure to abide the pharmaceutical regimen is a serious cause of absence of its effects, which is indicated as a problem not only in Poland but also around the world (5, 14). Patients frequently do not realize the consequences of inappropriate application of the drug, which may result from an erroneous interpretation of the leaflet accompanying the drug, from misunderstanding of the information given by the doctor or pharmacist and in specific situations – also from absence of any information (7).

Balcer et al. stress that simultaneous application of a large number of drugs is dangerous not only due to the increased risk of occurrence of adverse reactions but also due to mistakes in administration and dosage (9). The research conducted by Zygadło on 523 patients showed that in as many as 400 cases inappropriate application of drugs prescribed by the doctor was observed. The analysis of research findings resulted in the conclusion that more than 25.0% of the patients forgot to take drugs regularly, 23.0% additionally applied herbal drugs and nearly 50.0% used OTC drugs (from one to seven) (21). The conclusions from those studies show how important it is to monitor all pharmaceuticals prescribed to the patient and confirm the fact that a prescription filled in a pharmacy does not always give a guarantee of appropriate application of the medications (22, 23).

The situation in which an appropriately prescribed drug is not applied strictly in accordance with the indications brings harm not only to the patient but also increases outlay on health care mainly due to an additionally increased number of hospitalized patients. Most actions taken so far to improve patients' discipline in following the indications concerning the applied drugs still have not brought the expected therapeutic effects. One of the reasons is the fact that they are not versatile enough. A form of the IMMS specially prepared for the patient in the pharmacy may be complex help offered to them (13, 24, 25). Therefore, one of the goals of the research was an evaluation of the degree of patients' interest in the new service provided by community pharmacies. Nearly half of all the respondents expressed their positive opinion about the IMMS. However, the women were more interested in the system. The respondents stated that the new service would facilitate following the doctor's indications, mainly by its influence on appropriate, more conscious and precise application of drugs (14). The research also confirmed the fact that the purposefulness of the IMMS is especially recommended in the age group of patients older than 65 years. One of the reasons for that is the fact that having made a dosage analysis and having excluded all incompatibilities, the pharmacist will routinely attach written information about the administration of the applied pharmaceuticals, possible adverse drug reactions and the procedure to follow if they occur. If there is a recommendation to apply a non-standard dose of the drug, the division of e.g., a pill will be made at the pharmacy, which will ensure precision, accuracy and elimination of the risk of inappropriate portioning by the patient. Furthermore, if a few prescriptions from different doctors are filled for one patient, their ingredi-

ents will be verified by a pharmacist. This will improve efficacy of the therapy, limit the risk of occurrence of ADRs and help to reduce the expenditures on drugs by eliminating the drugs with identical ingredients and it will enable application of the medicament in accordance with the dosage required in a given therapy (13, 14).

The IMMS are in use in many European and North American countries and they exert a positive influence on patients' abidance by the therapy scheme. Studies stress the fact that they have a particularly wide application in complex therapy schemes. Especially elderly patients, who are often without continuous care and who suffer mostly from chronic diseases, have a chance to independence when taking drugs (14, 26, 27). Dosage systems are one of the most frequently applied methods facilitating patients' regular drug taking. As results from research studies, more than 50.0% of respondents suffering from diabetes and receiving from 3 to 29 drugs use the paid IMMS service (28). Thus the patient is constantly protected from making an error by a set of drugs analyzed and documented by a pharmacist (14, 29, 30).

Popularization of the IMMS is particularly significant at the time of intense discussions on the purposefulness of implementing pharmaceutical care in Poland. The described form of preparation of a set of drugs for the period of the patient's therapy may become an important element of this medical service.

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