

ORIGINAL ARTICLE

APPROACHES OF MEDICAL AND PHARMACEUTICAL SPECIALISTS TO INJECTION PHARMACOTHERAPY: QUESTIONNAIRE SURVEY

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ABSTRACT

The aim: To study medical and pharmaceutical specialists' approaches to outpatient injection treatment and their impact on the quality of medical care.

Materials and methods: The object of the study was the answers of health care professionals (n=1408) to the questions on the use of injectable pharmacotherapy in personal treatment, listed in a specially designed questionnaire on a single protocol. System analysis, questionnaire survey, statistical, comparative-and-analytical methods were used.

Results: The quality of outpatient injectable pharmacotherapy, according to the results of a survey of medical and pharmaceutical specialist, can be considered inappropriate, as in 52.9% of respondents the local adverse reaction were significantly more likely to develop compared to the respondents who did not have any local adverse reaction ($\chi^2=21.7819$, $p<0.05$). Most often, the following complications of injectable pharmacotherapy occurred in the analyzed respondents: pain – 45.8%; hardening – 28.3% and reddening – 21.7%. When conducting home-based treatment, 42.8% of the respondents involved persons without medical education for the execution of procedures, which is significantly more frequent ($\chi^2=26.5556$, $p<0.05$) in comparison with the respondents who invited medical personnel (27.0%) and used the method of self-injection (30.2%).

Conclusions: The results of a survey of medical and pharmaceutical specialists revealed that home-based injectable treatment, based mainly on their own experience, is common in the occupational environment of health care professionals.

KEY WORDS: questionnaire, injection pharmacotherapy, injectable medical products, adverse reactions, complications

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INTRODUCTION

According to the World Health Organization, annually only in developing countries and countries with economies in transition, there are about 16 billion injections per year [1]. However, it is considered that the overwhelming majority of injections are inappropriate, both in terms of the appointment of certain drugs, as well as the costs and risks of adverse reactions (AR) and complications of pharmacotherapy [2, 3]. Technologies of parenteral administration of drugs require additional qualified personnel, appropriate conditions for their implementation. The problem of disposing of used injectable medical products (IMPs) and packaging of drugs [4] is also serious. It should be noted that injection treatment, besides many advantages, conceals the threat of severe local reactions and purulent-necrotic complications, the treatment of which is often longer, more difficult and more expensive than treatment of the primary disease [5]. Nevertheless, at the end of the last century, injectable pharmacotherapy (IPhT) became so affordable, and the expectations of doctors and patients about the effectiveness of such a treatment so great that in many cases the cost and complexity of the procedure, the likelihood of post-injection complications were not taken into account, in particular, in the preparation of specialists [5, 6]. Parenteral administration of drugs is reasonably considered to be more effective than other routes of drugs entry into the body due to the bypass of the natural protective barriers of the gastrointestinal tract, skin, higher speed and completeness

of absorption, therefore – pharmacological action. However, this method of administration of drugs requires a violation of tissue integrity and is inherently a minimally invasive intervention [2]. In addition, IPhT requires liquid and sterile drugs, special means of their introduction (also sterile) and appropriate professional skills in performing procedures. As a consequence, parenteral treatment technologies are more resource-intensive, more expensive, and therefore less accessible. However, like any therapeutic intervention, IPhT, in addition to the predicted possible AR associated with the drugs themselves, poses risks in the ways of their delivery to the target organs (local AR and complications, often severe) [2]. Therefore, IPhT, being highly effective, especially in emergencies and serious illnesses, is significantly inferior to oral or rectal pharmacotherapy (PhT) in terms of safety and accessibility. In domestic medical practice, injection technologies are widespread not only in inpatient wards of outpatient healthcare facilities but also, due to the availability of injectable drugs and IMPs, in uncontrolled self-medication [1, 5, 7]. Despite this, there is little research on IPhT in the available information streams, and they are mostly descriptive. Insufficiently published research findings have been found on the impact of IPhT on the quality of medical aid and quality of life of patients, the approaches of medical specialists (MS) and pharmaceutical specialists (PhS) to medical and pharmaceutical care at the stages of injection treatment. Therefore, in our opinion, research into the use of IPhT in medical and

Table I. Distribution of demographic characteristics among 1408 respondents

Characteristic	Interns (n=801)	MS (n=368)	PhS (n=239)	Total (n=1408)	p-value
Age, years	21-51	22-75	26-64	21-75	*p<0.001
Range (min-max) Mean ± SD	23.9±2.1	43.4±12.8	37.8±10.2	31.3±11.8	
Residence					-
City	664 (83.0)	323 (88.0)	210 (88.0)	1197 (85.0)	
Village	137 (17.0)	45 (12.0)	29 (12.0)	211 (15.0)	

*Statistical significance of differences, Kruskal-Wallis Test for k=3 (H=897.43; df=2; p <0.01)

Table II. Distribution of respondents' answers to the main questions of the questionnaire

Main questions of the questionnaire	Interns n (%)	MS n (%)	PhS n (%)	n (%) 1408 (100)	Chi-square (p-value)	
1. Complications of IPHT as indicator of Quality	unavailable (AR -)	409 (51.1)	173 (47.1)	81 (33.9)	663 (47.1)	21.7819 (p<0.05)
	available (AR +)	392 (48.9)	195 (52.9)	158 (66.1)	745 (52.9)	
2. Where received IPHT:	at home	624 (77.9)	307 (83.4)	183 (76.6)	1114 (79.0)	5.7861 (p>0.05)
	in polyclinic	177 (22.1)	61 (16.6)	56 (23.4)	294 (21.0)	
3. Who injected:	non-medics	379 (47.3)	124 (33.7)	99 (41.4)	602 (42.8)	26.5556 (p<0.05)
	auto-injection	215 (26.8)	122 (33.15)	88 (36.8)	425 (30.2)	
	medical staff	207 (25.9)	122 (33.15)	52 (21.8)	381 (27.0)	
4. Choice of injection needle	needle length non-matter	622 (77.7)	207 (56.3)	172 (72.0)	1001 (71.1)	84.6507 (p<0.05)
	long needles	101 (12.6)	131 (35.6)	50 (20.9)	282 (20.0)	
	short needles	78 (9.7)	30 (8.2)	17 (7.1)	125 (8.9)	
5. Number of IMPs purchased per year:	< 10 IMPs	608 (75.9)	247 (67.1)	155 (64.9)	1010 (71.7)	16.3173 (p<0.05)
	> 10 IMPs	193 (24.1)	121 (32.9)	84 (35.1)	398 (28.3)	
6. Cost of purchased IMPs:	cost non-matter	469 (58.5)	191 (51.9)	90 (37.7)	750 (53.3)	40.5192 (p<0.05)
	expensive IMPs	309 (38.6)	158 (42.9)	144 (60.2)	611 (43.4)	
	cheap IMPs	23 (2.9)	19 (5.2)	5 (2.1)	47 (3.3)	
	own experience	472 (58.9)	249 (67.7)	168 (70.3)	889 (63.1)	
7. Whose advice when choosing IMP listened:	received advice of the attending physician	198 (24.7)	65 (17.6)	20 (8.4)	283 (20.1)	35.3613 (p<0.05)
	received pharmacist tips	131 (16.4)	54 (14.7)	51 (21.3)	236 (16.8)	
8. Area of Injections:	sciatic area	727 (90.8)	307 (83.4)	207 (86.6)	1241 (88.1)	13.6298 (p<0.01)
	other area	74 (9.2)	61 (16.6)	32 (13.4)	167 (11.9)	
9. Methods of drugs introduction:	separate administration of drugs	627 (78.3)	313 (85.0)	195 (81.6)	1135 (80.6)	7.5865 (p<0.05)
	co-administration of drugs	174 (21.7)	55 (15.0)	44 (18.4)	273 (19.4)	
10. *Frequently administered drugs:	antibiotics	607 (75.8)	281 (76.3)	173 (72.4)	1061 (75.4)	4.6192 (p>0.05)
	analgesics and NSAIDs	476 (59.4)	244 (66.3)	150 (62.8)	870 (61.8)	
	vitamins	338 (42.2)	134 (36.4)	88 (36.8)	560 (39.8)	

*The response rate is not 100% since respondents chose several answers

pharmaceutical environments is relevant, and the findings and conclusions may have practical importance.

THE AIM

To study medical and pharmaceutical specialists' approaches to outpatient injection treatment and their impact on the quality of medical care.

MATERIALS AND METHODS

The object of the study was the answers of health care professionals to the questions on the use of IPHT in personal treatment, listed in a specially designed questionnaire on a single protocol. 2000 questionnaires were distributed among the medical workers of Lviv and Lviv region during 2013-2017. Only 1477 questionnaires were properly filled out (valid), 69 of which were filled out by respondents

Table III. Association between QIPhT and the main studied variables

		AR – n (%)	AR + n (%)	Total n (%)	Chi-square (p-value)
1. QIPhT vs Who made injection	non-medics	264 (43.9)	338 (56.1)	602 (100)	$\chi^2=9.2888$ ($p<0.01$)
	auto-injection	215 (50.6)	210 (49.4)	425 (100)	
	medical staff	153 (40.2)	228 (59.8)	381 (100)	
2. QIPhT vs Cost of IMPs	expensive IMPs	276 (45.2)	335 (54.8)	611 (100)	χ^2 with Yates correction=4.7463 ($p<0.05$)
	cheap IMPs	13 (27.7)	34 (72.3)	47 (100)	
3. QIPhT vs. Frequency of Injections	<10 IMPs	492 (48.7)	518 (51.3)	1010 (100)	χ^2 with Yates correction=3.8876 ($p<0.05$)
	>10 IMPs	170 (42.7)	228 (57.3)	398 (100)	
4. QIPhT vs Consult	own experience	402 (45.2)	487 (54.8)	889 (100)	χ^2 with Yates correction=0.0039 ($p>0.05$)
	consult MS/PhS	233 (44.9)	286 (55.1)	519 (100)	
5. QIPhT vs Were made Injections	at home	524 (47.0)	590 (53.0)	1114 (100)	χ^2 with Yates correction=3.7761 ($p>0.05$)
	polyclinic	119 (40.5)	175 (59.5)	294 (100)	
6. QIPhT vs Area of Injections	sciatic area	597 (48.1)	644 (51.9)	1241 (100)	χ^2 with Yates correction=2.0208 ($p>0.05$)
	other area	70 (41.9)	97 (58.1)	167 (100)	
7. QIPhT vs Length IN	long needles	113 (40.0)	169 (60.0)	282 (100)	χ^2 with Yates correction=0.4014 ($p>0.05$)
	short needles	55 (44.0)	70 (56.0)	125 (100)	
8. QIPhT vs Self-injections	self-injections (sciatic area)	183 (51.0)	176 (49.0)	359 (100)	χ^2 with Yates correction=0.0028 ($p>0.05$)
	self-injections (other area)	34 (51.5)	32 (48.5)	66 (100)	
9. QIPhT vs Self-injections	self-injections & <10 IMPs	146 (51.0)	140 (49.0)	286 (100)	χ^2 with Yates correction=0.0286 ($p>0.05$)
	self-injections & >10 IMPs	69 (49.6)	70 (50.4)	139 (100)	
10. QIPhT vs PhT groups	antibiotics	470 (44.3)	591 (55.7)	1061 (100)	$\chi^2=1.3888$ ($p>0.05$)
	analgesics and NSAIDs	377 (43.3)	493 (56.7)	870 (100)	
	vitamins	231 (41.3)	329 (58.7)	560 (100)	

Table IV. Difference of subjects (interns, MS and PhS) on complications of IPhT (n = 745)

Type of complications	Interns n (%) 392 (100)	MS n (%) 195 (100)	PhS n (%) 158 (100)	n (%) 745 (100)	Chi-square (p-value)
pain	186 (47.5)	87 (44.6)	68 (43.0)	341 (45.8)	15.3401 ($p<0.05$)
induration	109 (27.8)	48 (24.6)	54 (34.2)	211 (28.3)	
redness	89 (22.7)	45 (23.1)	28 (17.7)	162 (21.7)	
suppuration	8 (2.0)	15 (7.7)	8 (5.1)	31 (4.2)	

with insulin-dependent diabetes mellitus and (due to the daily need for IPhT) were excluded from the study to form a homogeneous sample population. Thus, the statistical sample (n=1408) consisted of 239 questionnaires completed by PhS, 368 by MS, and 801 by interns (physicians and pharmacists). According to the survey conditions, the respondents to the questionnaire could give several correct answers, so the calculated relative values in some cases exceeded 100%. The quality of IPhT (QIPhT) was assessed by the respondents' answers regarding the absence of local AR in absolute and relative ratios. The study used the

methods of questionnaire survey, statistical, systematic and comparative analysis, analytical. The data were analyzed by the website «Social Science Statistics» [8]. Descriptive statistics included frequency distributions. A Chi-Square Calculator was used to compare variables. A p-value <0.05 was considered statistically significant.

RESULTS

The paradigm of our study is the thesis that the approaches of medical professionals to self-treatment will be reflected

in the answers to the questions of the questionnaire and corresponds to their understanding of the features of injection treatment, and therefore to the recommendations received from them by patients. The basic parameters of the study are presented using descriptive statistics. The mean and standard deviation of the sample was determined for each of the parameters studied. Among the respondents ($n = 1408$), the majority were urban residents (85.0%), the age of the respondents ranged from 21 to 75 years, and the overall average age was 31.3 ± 11.8 years (Table I).

The results of the distribution of the respondents' answers in general by sample and separately by groups (interns, MS and PhS) on the main questions of the questionnaire are presented in Table II.

As an indicator of the QIPhT we accepted the lack of local AR and other complications. The results of the study showed that overall, 52.9% of the respondents were significantly more likely to develop local AR compared to respondents who did not have any local AR ($\chi^2=21.7819$, $p<0.05$).

In most cases (79.0%), outpatient treatment was carried out at home, with only a small proportion of respondents (21.0%) attending outpatient clinics for IPhT, which had no statistically significant difference ($\chi^2=5.7861$ $p>0.05$). At home treatment, 42.8% of the respondents involved to perform the procedures persons without medical education, which is significantly more frequent ($\chi^2=26.5556$, $p<0.05$) compared to the respondents who invited medical staff (27.0%) and used the method of self-administration of drugs (self-injections) (30.2%).

According to the results of the analysis of the received answers, 71.7% of the respondents significantly more frequently ($\chi^2=16.3173$, $p<0.05$) received short-term IPhT courses during the year because they purchased less than 10 IMPs (syringes); Over $\frac{1}{3}$ MS and PhS – more than 10 IMPs.

The results of the IPhT analysis in outpatient treatment of medical and pharmaceutical workers showed the preferential use of 3 PhT drug groups: 1) antibiotics (75.4%); 2) analgesics and nonsteroidal anti-inflammatory drugs (NSAIDs) (61.8%); 3) vitamins (39.8%) between which there was no statistically significant difference ($\chi^2=4.6192$, $p>0.05$). Antibiotic therapy, analgesics and NSAIDs are most common among MS 76.3% and 66.3%, respectively, while injectable vitamin therapy is common among interns – 42.2% (Table II).

According to the survey data, 71.1% of respondents significantly more often ($\chi^2=84.6507$, $p<0.05$) did not give special importance to the size of the injection needle (IN), only 20.0% preferred long IN (MS – 35.6%), and 8.9% – short ones. Since the primary IPhT in the subjects was the use of antibiotic therapy, vitamin therapy, analgesic and NSAIDs requiring deep intramuscular administration, in 8.2% of patients with medical education who used short IN, this condition was violated, i.e., incorrect intramuscular injection of drug was performed.

Injectable PhT technology involves the use of strictly defined anatomical sites for intramuscular injection. The vast majority (88.1%, 1241 abs) of respondents used area buttocks for IPhT, 11.9% (167 abs) – injected into the

thigh and shoulder areas. It is worth recalling that 30.2% (425 abs) of the respondents used self-injections, of which 25.5% (359 abs) performed injection procedures in visually uncontrolled or poorly controlled gluteal areas which could lead to technically incorrect performance.

The survey examined the participation of physicians and pharmacists in the IPhT stages, in particular when selecting IMPs. It was found that when choosing IMPs, 63.1% of respondents were significantly more likely ($\chi^2=35.3613$, $p<0.05$) to follow their own experience compared with those who heeded the advice of a doctor (20.1%) or a pharmacist (16.8%).

In our opinion, a problematic and under-researched issue of IPhT is the introduction of so-called infusion and injection cocktails, that is, prepared extempore in a single volume of drug mixtures, as well as their pharmaceutical compatibility and clinical efficacy. In the available information sources, we have found only a few publications on this problem [7, 9, 10], in most cases, in the instructions for medical use, there are no proper guidelines for compatible injection drug administration. However, according to our study, co-administration of drugs even in the medical environment is practiced quite often (273 abs, 19.4%), of which 88 respondents (6.3%) administered several drugs in one syringe, 146 (10.4%) injected different drugs, not removing the IN but changing the syringe, another 39 (2.8%) reused the syringe but change the IN and the injection site. Thus, 19.4% of patients with medical education used co-administration of drugs ("injection cocktails"), which are not covered by medical standards and instructions for drugs use.

It is found that 53.3% of respondents are more likely not to give special value to the cost of IMPs ($\chi^2=40.5192$, $p<0.05$), compared to those who choose only expensive (43.4%) or cheap (3.3%) IMPs. As a significant proportion of respondents (43.4%), especially PhS (60.2%), favored more expensive syringes, we hypothesized that at higher cost, better syringe and IN performance, higher IPhT quality, in particular, sterility guarantees may be expected.

The next step involved an in-depth comparative analysis of the main results of our study with QIPhT. It should be recalled that as an indicator of QIPhT, we have accepted "AR–", that is, the absence of respondents with any complications of IPhT. At the same time, we have defined the presence of IPhT complications as "AR+". Establishing an association between QIPhT and the main studied variables is presented in Table III.

The study found a statistically significant association between QIPhT and those who made injection ($\chi^2=9.2888$, $p<0.01$). Thus, QIPhT was significantly higher with respondents' self-injections (50.6%) than with non-medics or medical staff involvement, 43.9% vs 40.2% respectively. This may indicate a lack of expertise of medical staff in injecting and require further investigation and further research in this area. At the same time, the results obtained indicate that self-injections can be administered by patients who have medical training and treat the procedure with due responsibility.

The hypothesis put forward by us that the cost of used IMPs may affect QIPhT was confirmed, as the results of the respondents' answers showed that the QIPhT when using more expensive IMPs was significantly higher than when using cheap, 45.2% vs 27.7% respectively (χ^2 with Yates correction=4.7463, $p < 0.05$).

The results of the analysis showed a statistically significant difference between QIPhT and frequency of injections (χ^2 with Yates correction=3.8876, $p < 0.05$). For short-term courses (>10 IMPs), QIPhT is significantly higher than long-term courses (>10 IMPs) during the year, 48.7% vs 42.7%, respectively.

In order to objectively evaluate the impact of medical aid (providing guidance) on IPhT quality indicators, a survey was conducted in which 36.9% of respondents received advice on injection technique and the rational choice of IMPs solely from physicians and pharmacists. It was found that QIPhT (no complications, AR-) in the analyzed population, where expert advice was provided, was generally not significantly higher (45.2%) than among those who guided only their own experience (44.9%) (χ^2 with Yates correction=0.0039, $p > 0.05$).

DISCUSSION

When evaluating QIPhT by its main components – safety, efficacy and availability, it is necessary to remember its specificity. Because IPhT combines, unlike enteral PhT, invasive intervention – the introduction of drugs into tissues, breaking their integrity. Therefore, in terms of the safety of PhT, in addition to the likelihood of pharmacological AR, there are also risks of local reactions and complications. In addition, IPhT is less economically and organizationally accessible. However, in the opinion of not only doctors but also patients, IPhT has certain advantages due to its effectiveness, shortening of treatment time and restoration of capacity [7, 10]. According to the results of our study, almost every 6th patient with medical education uses injectable methods of treatment, despite the fact that more than half (52.9%; 745 abs) of the respondents observe certain local reactions to the introduction of drugs: from local pain to suppuration. Differences of subjects (interns, MS and PhS) on complications of IPhT are shown in Table IV.

Thus, the following complications of IPhT occurred in the analyzed respondents: pain – 45.8%, induration – 28.3%, redness – 21.7% and suppuration – 4.2%.

Summarizing the results of the study, it should be noted that the data from our questionnaire indicated a number of IPhT risk factors for the likely causes of post-injection local AR. The results of the analysis of the conducted survey showed a generalized picture of the state of IPhT in the domestic medical environment and indicate that even among professionals who are called to carry out medical aid and pharmaceutical care, there are violations that can affect the quality and safety of IPhT. In many cases, co-administration of drugs, IMPs reuse, which increases the frequency of local adverse AR is practiced. The results of our study showed unjustified carelessness in conducting IPhT: 42.8% of cases of injection at home

are carried out by persons without professional training, less frequently (25.5%) – by a self-injection method in the inaccessible anatomical areas, which cannot guarantee technologically correct introduction of drugs. However, the results of the survey did not reveal any clear benefits of injection performed by medical personnel, compared to individuals without adequate training, which may indicate that professionals are not well educated about IPhT technologies and risks [3], and therefore do not have proper accountability for performing procedures. It is noteworthy that only a small percentage of respondents (20.1% and 16.8% respectively) use the advice of MS and PhS regarding injectable medicines and techniques; most of them rely on their own experience.

The analysis of a questionnaire survey of medical professionals revealed that there were some problems, the elimination of which could improve QIPhT, in particular, refusal of unjustified injection treatment in the absence of proper indications, polypragmasia, mixing injection solutions in one volume, reuse of IMPs.

Summarizing the above, it can be argued that only part of the respondents with medical and pharmaceutical education received in the outpatient setting safe and quality IPhT. The study also found that medical and pharmaceutical professionals treat IPhT as an effective, yet routine, treatment that does not require special knowledge, qualifications, or skills. In Ukraine, higher education on the topic of Injections is of a purely informational nature [2], and injection procedures are considered to be so routine that special training and professional care are not required. This and the irresponsible attitude towards IPhT are likely to explain the results of the questionnaire survey on the safety of injection treatment, particularly in the medical environment. Taking into account the high frequency and severity of local AR in established approaches to IPhT, this situation cannot cater to either providers or consumers of medical services.

The study had several limitations. The findings are based on self-reported information; thus, participants may have provided different information about the use of IPhT and IMPs. Another drawback is that research was conducted only in one region. Therefore the findings cannot be statistically generalized. Consequently, it is necessary to conduct more research in this area.

CONCLUSIONS

1. The results of a survey of medical and pharmaceutical specialists revealed that home-based injectable treatment, based mainly on their own experience, is common in the occupational environment of health care professionals. It is found that the price factor, for the most part, does not affect the choice of injectable medical products; however, in many cases there is an incorrect choice of injection needle, the reuse of syringe, the use of mixing different solutions in a single volume of syringe not covered by injection technology requirements. There is a statistically significant difference between the occurrence of local post-injection

adverse reactions and injection frequency, duration of injection pharmacotherapy, cost of injectable medical products, and those who made the injection.

- The quality of injection pharmacotherapy can only be considered acceptable in 47.1% of respondents who stated that they did not have any local adverse reactions. At the same time, 52.9% of respondents observed some local reactions to the introduction of drugs: from local pain to suppuration. Considerable reasons for this are the neglect of the rules and requirements for injection pharmacotherapy, the irresponsible, often too carefree approach of doctors to their own treatment, which can affect the professional care of patients, in particular in outpatient treatment.

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Conflict of interest:

The Authors declare no conflict of interest.

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A – Work concept and design, **B** – Data collection and analysis, **C** – Responsibility for statistical analysis, **D** – Writing the article, **E** – Critical review, **F** – Final approval of the article



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