

QUALITY OF HOSPITAL PHARMACY SERVICES IN ROMANIA – PHARMACEUTICAL STAFF'S PERCEPTION

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Abstract

This cross-sectional study aimed to assess the quality of pharmaceutical services through the perception of pharmaceutical staff in Romanian hospital pharmacies. One hundred and thirteen pharmacists and pharmacy assistants in Romanian hospital pharmacies voluntarily answered a self-designed questionnaire, distributed online between February and April 2023. The 33-item questionnaire included five sections corresponding to the main activities of the pharmaceutical staff and was validated. The five-category Likert scale was used for the respondents' answers. The statistical analysis was done in SPSS 27.0. Respondents' answers indicated high performance in daily pharmaceutical activities, including drug dispensing, drug management, pharmacy management, related professional activities, and those in crisis situations (medians ≥ 4). Statistically significant differences were found according to the general and professional characteristics of the participants and the hospital pharmacies ($p \leq 0.05$). The application of good pharmaceutical practice rules reveals the high quality of services provided by Romanian hospital pharmacy staff and their integration into multidisciplinary teams.

Rezumat

Acest studiu transversal a avut ca scop evaluarea calității serviciilor farmaceutice prin percepția personalului farmaceutic din farmaciile de spital din România. O sută treisprezece farmaciști și asistenți de farmacie din farmaciile de spital din România au răspuns voluntar la un chestionar de concepție proprie, difuzat online în perioada februarie–aprilie 2023. Chestionarul cu 33 de întrebări a cuprins cinci secțiuni corespunzătoare principalelor activități ale personalului farmaceutic și a fost validat. Scala Likert cu cinci categorii a fost utilizată pentru analiza răspunsurilor respondenților. Analiza statistică s-a efectuat în programul SPSS 27.0. Răspunsurile respondenților au indicat o performanță ridicată a activităților farmaceutice de eliberare a medicamentelor, a managementului medicamentelor, a managementului farmaciei, a activităților profesionale conexe și a celor din situații de criză (mediane ≥ 4). Diferențele semnificative statistice au fost observate în funcție de caracteristicile generale și profesionale ale participanților și ale farmaciilor de spital ($p \leq 0.05$). Aplicarea regulilor de bună practică farmaceutică relevă calitatea înaltă a serviciilor furnizate de personalul farmaciilor de spital din România și integrarea acestuia în echipele multidisciplinare.

Keywords: hospital pharmacy, pharmaceutical practice, questionnaire, pharmacy services quality

Introduction

In Europe, the hospital pharmacy is responsible for the use of medicines to optimise patient clinical outcomes in collaboration with multidisciplinary teams. The requirements for the quality of hospital pharmacy services are set out in the Good Pharmaceutical Practice (GPP) guidelines, which define quality standards in the field. Hospital pharmacists are involved in several complex processes and activities,

such as the selection, acquisition, and dispensing of medicines; compounding pharmaceutical preparations; providing clinical pharmacy services; quality assurance of medicines for patient safety; continuing postgraduate education in pharmaceutical practice; and conducting clinical trials of medicines (1).

In Romania, a hospital pharmacy is a section without beds within a hospital, authorised by the Ministry of Health, which provides patients with pharmaceutical products for human use, according to the register of

medicines and doctors' prescriptions (2). The number of hospitals has increased in recent years, from 527 in 2020 to 558 in 2025. Romanian hospitals are territorially dispersed across development macro-regions. Most hospitals are public (373), but not all have hospital pharmacies in their organisational structure (3).

In most Romanian hospital pharmacies, there is a pharmacist who can also serve as chief pharmacist, and one or two pharmacy assistants who work under a free practice authorisation (2, 4). The number of pharmaceutical staff was determined by the number of hospital beds, so there is one pharmacist for every 110 beds and one pharmacy assistant for every 40 beds (5). Pharmaceutical staff have responsibilities according to the position held. Thus, the chief pharmacist has collaborative relationships with the hospital ward staff, serving on the committee for evaluating offers to purchase medicines, the committees for receiving medicines and other purchased medical supplies, the drug committee, the local ethics committee for approving clinical trials, and the pharmacovigilance team. It also monitors medicine consumption, reports drug discontinuities, and participates in the hospital on-call report (2, 6). The hospital pharmacist is responsible for the management of medicines, ensuring optimal conditions for the storage, preparation, and dispensing of medicines, and the destruction of expired drugs. The pharmacy assistant supports the pharmacist in all their activities in the pharmacy but cannot participate in the dispensing of medicines, narcotics, and psychotropics to patients (2). The pharmaceutical activity in the hospital pharmacy is carried out in accordance with GPP rules, which serve as performance standards (7, 8), and the territorial college of pharmacists issues an annual certificate of compliance (9, 10).

The self-assessment of the activities of pharmaceutical staff in hospital pharmacies is conducted only within the framework of the hospital manager's evaluation of medical staff, based on an internal questionnaire with precise objectives. The quality of Romanian hospital pharmacy services has not been reported in the specialised literature, nor have the internal assessments of hospital managers been made public. Also, the previous literature did not provide data on aspects of pharmaceutical staff activities in Romanian hospital pharmacies. Therefore, we aimed to develop and apply a questionnaire to explore the perceptions of pharmaceutical staff in Romanian hospital pharmacies regarding five areas of activity: dispensing of pharmaceutical products, medication management, pharmacy management, related professional activities, and those in crises.

Materials and Methods

Participants, study design and ethical considerations

One hundred and thirteen pharmacists and pharmacy assistants from hospital pharmacies in Romania were recruited *via* social media to complete an online questionnaire between February and April 2023.

Pharmacists and pharmacy assistants licensed to practice in hospital pharmacies were included in this quantitative, descriptive, observational, cross-sectional study. Pharmacists and pharmacy assistants working in community pharmacies, other pharmaceutical fields, or the pharmaceutical industry were excluded from the study.

Participants who self-selected based on their accessibility and willingness to complete the questionnaire (convenience sampling) distributed the online questionnaire to other accessible and available potential participants (snowball sampling) to increase the study sample.

Participants gave their informed consent before voluntarily responding to the anonymous online questionnaire. The study was conducted in accordance with the 2013 Declaration of Helsinki, with the 2024 amendment. It was approved by the Ethics Committee of Grigore T. Popa University of Medicine and Pharmacy Iasi (no. 237/19.11.2022).

Questionnaire

A self-designed questionnaire was developed according to the GPP guidelines (8, 10, 11), job descriptions in hospital pharmacies in Romania, and with the principles of quality management (12) by a group of experts consisting of teachers with experience in pharmaceutical management, public health, clinical pharmacology and two experienced pharmacists.

The questionnaire in Romanian, consisting of thirty-three simple, short, closed-ended and positive items, was structured according to the context of the main activities in the hospital pharmacy, in five sections: (I) pharmaceutical products dispensing, the preparation of magistral and officinal medicines, the dispensing of psychotropic and narcotic medicines and the reporting of the side effects to the competent authorities (items 1 to 5), (II) medication management regarding supply, reception, storage and preservation, inventory, control regarding the validity period, management and destruction of expired medicines (items 6 to 12), (III) pharmacy management regarding the supervision of pharmacy activity and cleanliness and sanitation of the premises, appropriate technical equipment, but also compliance with the norms, regulations and legislation in force (items 13 to 23), (IV) related professional activities of collaboration with hospital physicians, pharmaceutical supply chains and information in the pharmaceutical field (items 24 to 26) and (V) activities in crisis

situations regarding pandemic and epidemic periods, the lack of a medicine on the market or discontinuities in the supply of drugs and sanitary materials (items 27 to 33). A five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree) was used for the responses.

The questionnaire had a section on the characteristics of the respondents, grouped into general characteristics (gender, age groups, completed education, marital status and income), professional characteristics (type of employment contract, seniority in the pharmacy, position held and experience in the profession) and characteristics of the hospital pharmacies (location in development regions, urban/rural areas and private/public system).

Questionnaire Validation

A group of 23 evaluators, consisting of teachers, pharmacists and pharmacy assistants, public health specialists, and clinicians with hospital experience, analysed the content of the questionnaire through a pre-test on a standard validity form. The standard validity form of the questionnaire content included several components assessing the clarity, relevance, and completeness of the items. A 4-point response scale was used to evaluate the items: 1 = unclear/ not relevant/ not comprehensive; 2 = poor clarity/ poorly relevant/ poorly comprehensive; 3 = satisfactory clarity/ satisfactory relevance/ satisfactory comprehensiveness; and 4 = clear/ relevant/ comprehensive. In separate sections, the evaluators could suggest deleting any irrelevant items, modifying the content of any item to improve clarity and adding a new item. The data were transmitted to the authors of the questionnaire and were collected and centralised in Excel files to be processed and interpreted for the validity indices of the questionnaire content.

A pilot group of 20 participants, consisting of conveniently selected pharmacists and pharmacy assistants from hospitals who provided verbal consent to complete the preliminary version of the questionnaire, was used to assess the feasibility of the questionnaire. The participants' opinions were forwarded to the questionnaire authors. The data were collected and centralised in Excel files for processing and interpretation of the internal consistency of the questionnaire.

Statistical analysis

Statistical processing was done in SPSS 27.0 (SPSS Inc., Chicago, IL, USA).

To validate the questionnaire, validity and reliability indices – Inter-Rater Agreement (IRA), Item Content Validity (ICV), Scale Content Validity (SCV) – completeness and Cronbach's alpha coefficient were calculated.

Scores from 1 to 5 were used to assess respondents' answers, and the scores were summed for each section of the questionnaire. Thus, the scores were

treated as ordinal variables for data interpretation. The median and interquartile range (IQR) were used as descriptive statistics parameters. The medians between 1 and 2 received the qualification "inadequate"; the median at 3 received the qualification "moderately adequate"; and the medians between 4 and 5 received the qualification "strongly adequate". For the statistical analysis of the data, non-parametric tests, Mann-Whitney and Kruskal-Wallis, were used to highlight statistically significant differences between respondents, not respecting the normal distribution law, established by applying the Kolmogorov-Smirnov fit test. Statistically significant results were considered for values of the significance coefficient $p \leq 0.05$.

Results and Discussion

Questionnaire validation

The evaluation of the questionnaire reveals clarity and relevance indices exceeding 95.7%, indicating good results. The IRA and ICV values indicate the highest percentages. The SCV was very good, being 99.9% for clarity and 100% for relevance. The IRA and the completeness index are both 100%, which is very good. The Cronbach's alpha coefficient was 0.921, indicating an excellent internal consistency of the questionnaire. Therefore, the questionnaire was validated.

This questionnaire was designed because no valid questionnaire was found in the literature that aligned with professional practice in hospital pharmacy in Romania. The European Association of Hospital Pharmacists (EAHP) developed a questionnaire (13), translated by the National Association of Hospital Pharmacists in Romania, but it was not validated (14). The five-category Likert scale was the best for assessing the psychometric quality parameters of the questionnaire (15), which was demonstrated by specific statistics (16), in agreement with those used in the previous literature (17, 18).

Respondent characteristics

The questionnaire was distributed online to 157 pharmacists and pharmacy assistants in hospital pharmacies in Romania, but only 113 members of the pharmaceutical staff completed it. The response rate was 71.97% (113/157). Of the 113 pharmacists and pharmacy assistants who completed the questionnaire, only 112 respondents were eligible. The eligibility rate was 99.1% (112/113).

The general characteristics of the respondents are shown in Table I; the professional characteristics in Figure 1; and the characteristics of the hospital pharmacies are found in Figure 2. In this sample, the majority of the pharmaceutical staff in Romanian hospital pharmacies are women, over 40 years old, with higher education, married and with an average income (Table I), who work in hospital pharmacies in

the North-Eastern region of Romania, in urban areas and in the public system (Figure 2) with full-time

indefinite employment contracts and have over 10 years of experience in the profession (Figure 1).

Table I

The respondents' general features (n = 112)

Variables	Categories	n	%
Gender	Male	9	8.0
	Female	103	92.0
Age groups	< 40 years	27	24.1
	40-50 years	45	40.2
	> 50 years	40	35.7
Education level	Post-secondary education	32	28.6
	Graduate education	26	23.2
	Postgraduate education	54	48.2
Marital status	Unmarried	17	15.2
	Married	82	73.2
	Divorced	12	10.7
	Widowed	1	0.9
Income	Minimal income	3	2.7
	Medium income	74	66.1
	Above-average income	35	31.3

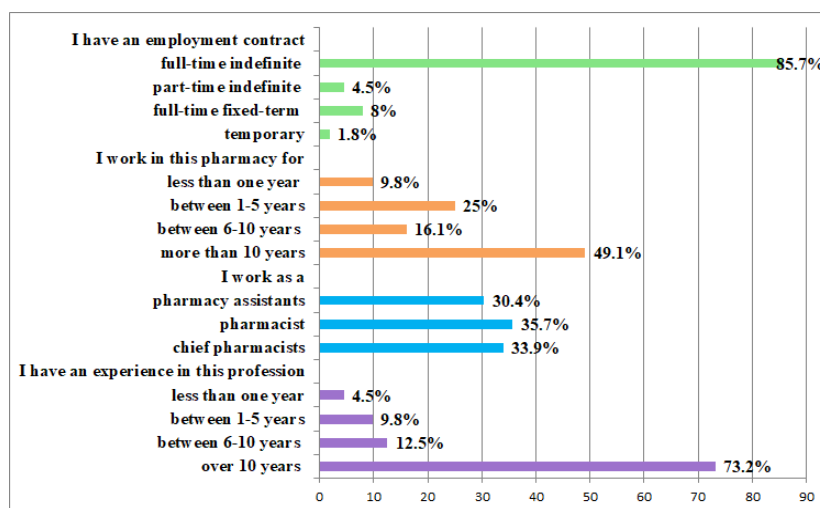


Figure 1.

The professional characteristics of the respondents

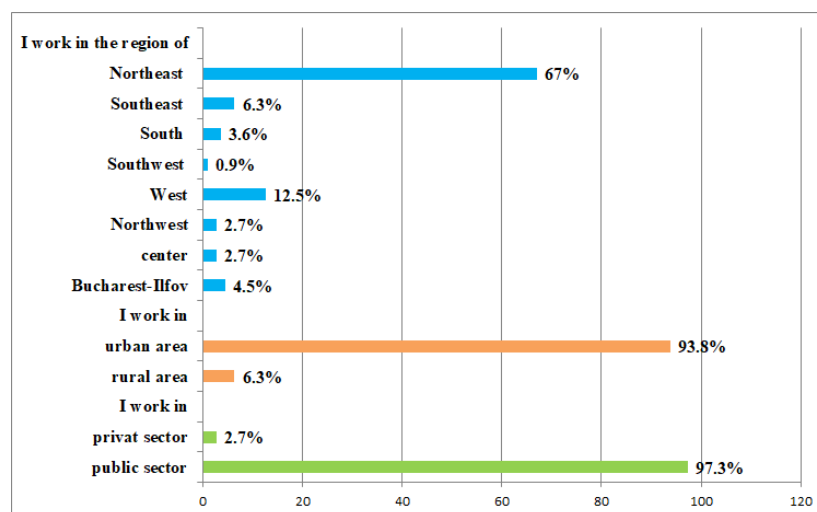


Figure 2.

The characteristics of the hospital pharmacies where respondents work

Quality of pharmaceutical products dispensing activity

The median of 4.00 and the IQR of 3.60 ÷ 4.60 indicate a strong, adequate quality of the pharmaceutical products dispensing activity, the compounding of

magistral and officinal medicines, the dispensing of psychotropic and narcotic medicines, and the reporting of side effects to the competent authorities (Table II).

Table II

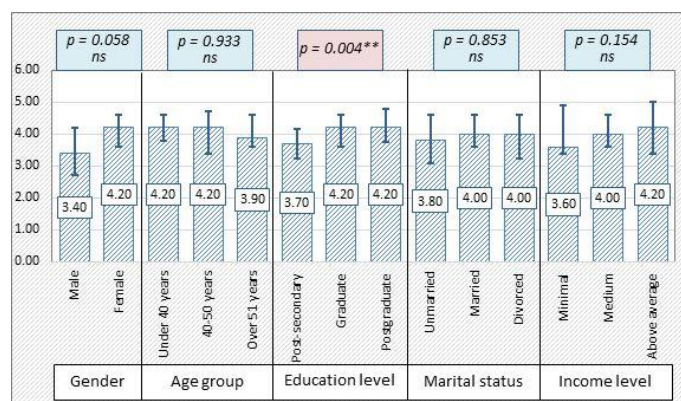
Descriptive statistics of the questionnaire scores

Sections	Minim	Maxim	Median	IQR
Pharmaceutical products dispensing	2.20	5.00	4.00	3.60 ÷ 4.60
Medication management	3.43	5.00	4.42	4.14 ÷ 4.85
Pharmacy management	2.91	5.00	4.50	4.00 ÷ 4.90
Related professional activities	2.00	5.00	4.00	3.66 ÷ 4.66
Activities in crises	2.57	5.00	4.14	3.85 ÷ 4.57

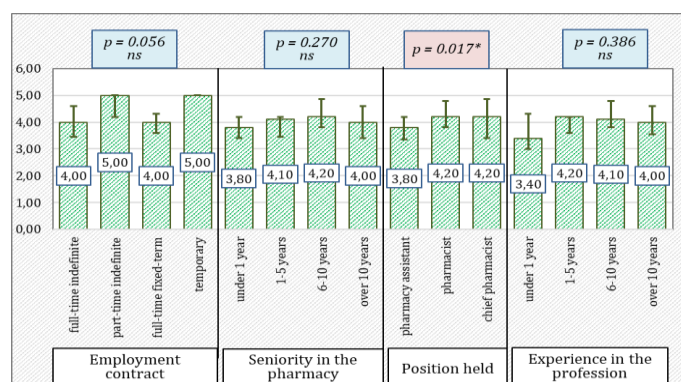
Thus, the perception of the pharmaceutical staff regarding these activities indicates pharmaceutical practice in the hospital pharmacy that is in accordance with GPP guidelines and performance indicators. The pharmaceutical staff in Romanian hospital pharmacies dispense medicines and medical supplies to inpatients for 24-72 hours, based on physicians' prescriptions in the hospital departments. Thus, pharmaceutical staff dispense medications intended for hospitalised patients, emergency kits, medications with special regimens such as psych-

otropics and narcotics, medications from national programs, and medications for emergencies. The procedures for dispensing pharmaceutical products are complex, involving preparation, packaging, labelling and nominal, globalised or global dispensing (8).

In our study, statistical differences in median scores are according to completed studies ($p = 0.004$), position held ($p = 0.017$), and hospital location in development regions ($p = 0.043$) (Figures 3-5).

**Figure 3.**

Comparison of pharmaceutical products dispensing scores according to the general characteristics of the respondents

**Figure 4.**

Comparison of pharmaceutical products dispensing scores according to the professional characteristics of the respondents

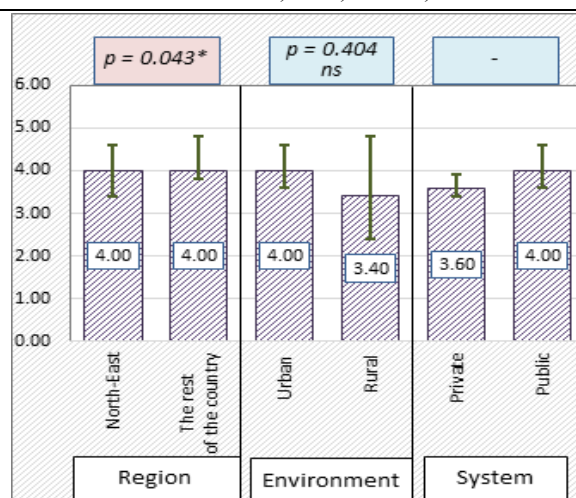


Figure 5.

Comparison of pharmaceutical products dispensing scores according to the characteristics of the hospital pharmacies

These results indicate the influence of pharmaceutical staff on these activities and reflect the region's socio-economic development within the hospital's organisational structure.

Male respondents, over 50 years old, with post-secondary education, unmarried, with minimum income, with one year of pharmacy experience and professional experience, working as pharmacy assistants in rural hospitals in the private system, have a median of 3, which means that they report a moderately adequate activity (Figures 3-5). These particularities indicate the professional limitations that pharmacy assistants face in dispensing and preparing certain medicines in hospital pharmacies. The dispensing of psychotropics and narcotics is

individualised *per* inpatient and falls solely under the responsibility of pharmacists. The compounding procedures for magistral and officinal preparations must ensure product quality, a responsibility of the chief pharmacist and the pharmacist (8).

Quality of medication management

The median of 4.42 and the IQR of 4.14 ÷ 4.85 indicate a strong, adequate quality of medication management, regarding supply, reception, storage and preservation, inventory, control of drug quality and validity period, and management and destruction of expired medicines (Table II). Statistically significant differences between scores are according to gender ($p = 0.015$) (Figure 6).

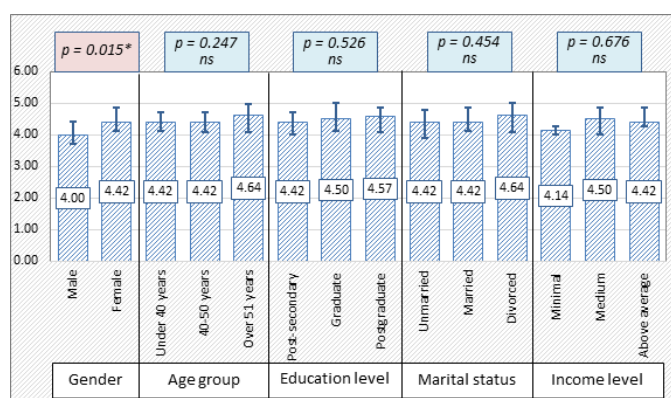


Figure 6.

Comparison of medication management scores according to the general characteristics of the respondents

The Romanian hospital pharmacy has a stock of medicines and medical supplies adequate for each hospital. The hospital management, together with the chief pharmacist, periodically places supply orders from wholesale pharmaceutical supply chains with whom they have commercial contracts, based on auction. Chief pharmacists and pharmacists are

responsible for the qualitative and quantitative reception of compliant medicines and pharmaceutical substances, and pharmacy assistants for the reception of OTC (Over-the-Counter) drugs and medical supplies. Purchased pharmaceutical products are stored and preserved under quality conditions provided for each product (8).

Any non-conformity of the purchased pharmaceutical products is reported to the National Agency for Medicines and Medical Devices in Romania (NAMMDR), and the products are withdrawn and returned to the pharmaceutical supply chains. NAMMDR authorises the marketing of medicines in Romania, manufacturers, and pharmaceutical supply chains in the context of drug safety and pharmacovigilance, and collaborates with the European Medicines Agency (EMA) (19).

Expired medicines are considered toxic waste for the environment, which is why hospitals are responsible for collecting them (20, 21) to be taken over and neutralised by authorised companies (22, 23). The chief pharmacist identifies, stores, and oversees expired medicines until they are removed from the pharmacy (8).

Quality of pharmacy management

The median of 4.50 and the IQR of 4.00 ÷ 4.90 indicate a strong, adequate quality of pharmacy management, regarding the supervision of pharmacy activity and the cleanliness and sanitation of the premises, the appropriate technical equipment, and compliance with the norms, regulations, and legislation in force (Table II) (24).

The functionality of the hospital pharmacy space is ensured by the appropriate technical and material equipment and the optimal organisation of the activity of the pharmaceutical staff to provide quality services, for which the chief pharmacist and the hospital administration are responsible (8, 25). The Ministry of Health has developed quality standards regarding the spaces, equipment, and activities of pharmaceutical staff, as well as pharmaceutical services for dispensing and preparing medicines, in order to evaluate and accredit hospital pharmacies (7). Romanian College of Pharmacists (RCP) also developed procedures for evaluating hospital pharmacies regarding the guidelines on GPP (8, 10, 11). At the same time, pharmaceutical staff implement the internal regulations of each hospital in their practice, which are not included in the law. In this regard, Daina *et al.* (26) developed several operational procedures performed by pharmaceutical staff to assess the quality of pharmaceutical services provided by a hospital in Oradea.

In this study, statistically significant differences in scores are observed by completed studies ($p < 0.001$), income ($p = 0.012$), position held ($p < 0.001$), and hospital location (urban/rural) ($p = 0.022$) (Figures 7-9).

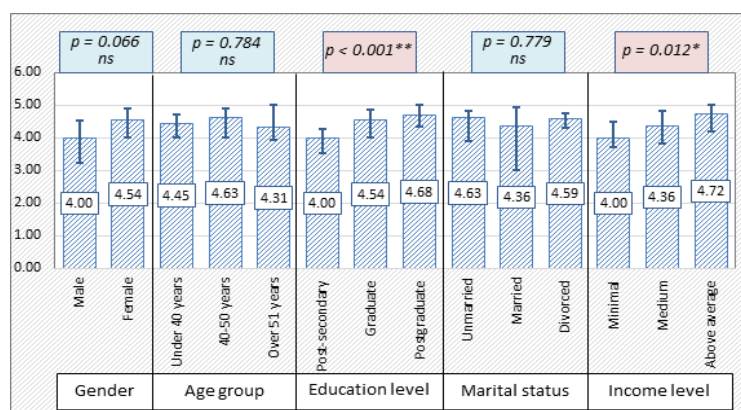


Figure 7.

Comparison of pharmacy management scores according to the general characteristics of the respondents

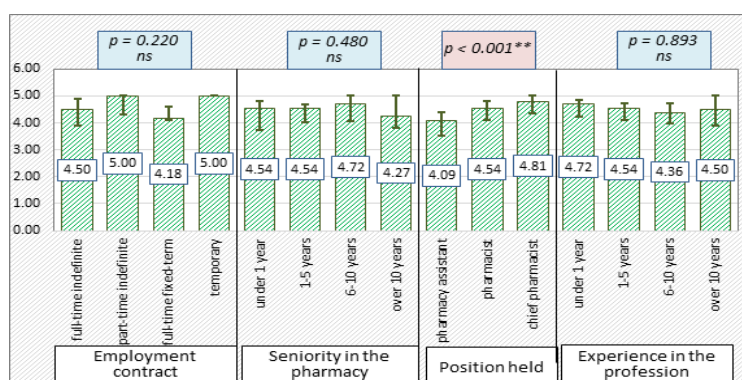


Figure 8.

Comparison of pharmacy management scores according to the professional characteristics of the respondents

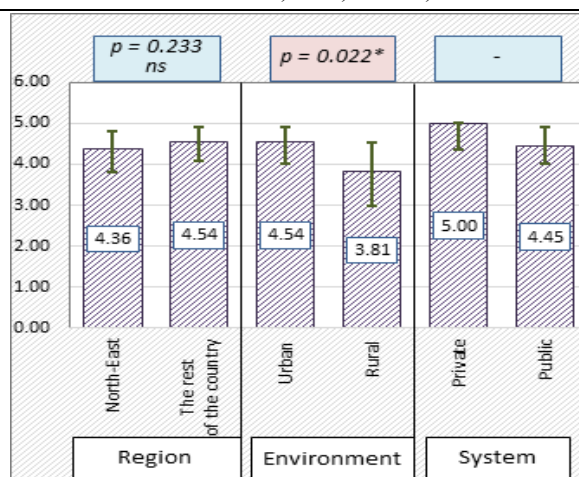


Figure 9.

Comparison of pharmacy management scores according to the characteristics of the hospital pharmacies

These results signify the socio-economic interferences of pharmaceutical staff and the demographics of the hospital area in the management of the hospital pharmacy. Iorga *et al.* (27) surveyed hospital pharmacists and found a high level of satisfaction with pharmacy management, interpersonal relations, organization and communication and a low level of satisfaction with remuneration and promotion. Also, Pană (28) highlighted the lower remuneration of hospital pharmacists compared with physicians, although salaries for medical staff in public hospitals have increased (29). At the same time, Hancu (30) also noted the lack of solid motivation of young people to attend the Faculty of Pharmacy, due to poor promotion prospects and inadequate remuneration.

Quality of related professional activities

The median 4.00 and the IQR 3.66 ÷ 4.66 indicate a strong, adequate quality of related professional activities of collaboration with hospital physicians, pharmaceutical supply chains and information in the

pharmaceutical field (Table II). Statistically significant differences in scores are observed by gender ($p = 0.037$) and by function held ($p = 0.008$) (Figures 10 and 11).

The hospital pharmacist works in multidisciplinary healthcare teams (31) and serves as a counsellor to physicians on drug pharmacokinetics and pharmacodynamics, individual dosing to minimise side effects and drug interactions, especially for chronic inpatients with polypharmacy. Hospital pharmacists, along with physicians, can also be involved in clinical trials. Hospital pharmacists have administrative responsibilities for selecting prescribed medications (32) and can generate savings for the hospital on medication costs.

In our study, male respondents with a minimum income, working in rural hospitals, and with pharmacy and professional experience of 1-5 years have a median of 3, indicating a moderately adequate level of activity (Figures 10-12).

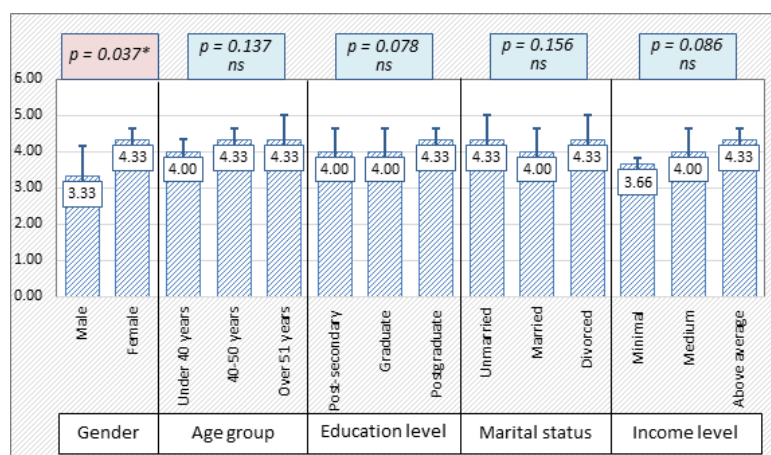


Figure 10.

Comparison of related professional activities scores according to the general characteristics of the respondents

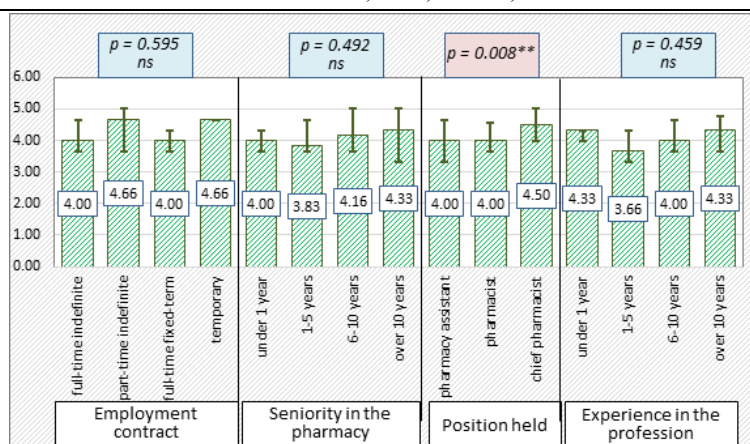


Figure 11.

Comparison of related professional activities scores according to the professional characteristics of the respondents

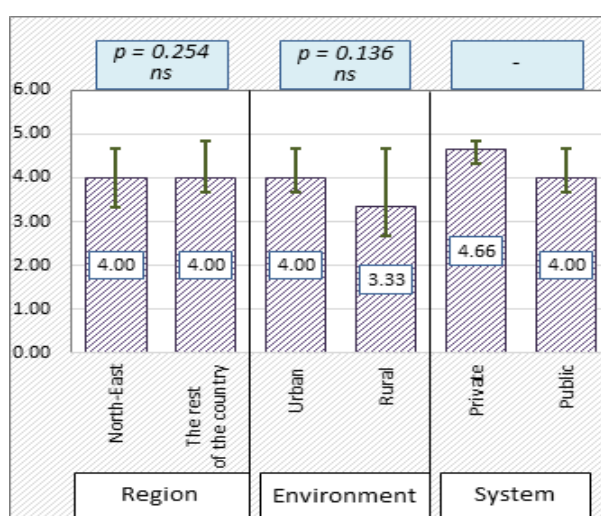


Figure 12.

Comparison of related professional activities scores according to the characteristics of the hospital pharmacies

These particularities of the pharmaceutical staff indicate the professional limitations that arise in the exercise of these activities.

The main traditional activities of hospital pharmacists included the purchase, storage, preservation, dispensing, distribution, information and selection of medicines. With the evolution of this profession, hospital pharmacy emerged as a pharmaceutical speciality and expanded to many countries worldwide (33). Even though inpatient healthcare has become much more complex, in countries such as Bulgaria, Greece, and Romania, this speciality has not been established, as it has been in most European countries (34, 35). Shanableh *et al.* (36), in a study of pharmacists in three hospitals in Malaysia and the United Arab Emirates, highlighted that professional education improved knowledge of pharmacovigilance practices among hospital pharmacists.

Quality of activities in crisis situations

The median of 4.14 and the IQR of 3.85 ÷ 4.57 indicate a strong, adequate quality of activities in crisis situations, such as pandemics and other

epidemiological events, the lack of a medicine on the market, or discontinuities in the supply of drugs and medical supplies (Table II). Statistically significant differences in scores are observed by the completed studies ($p = 0.023$) and the function held ($p = 0.015$) (Figures 13 and 14).

Male respondents with post-secondary education have a median of 3, indicating a moderately adequate level of activity (Figure 13).

Hospital pharmaceutical services in Romania have been accessible, efficient, and flexible for new hospitalisation cases during the COVID-19 pandemic. 21,123 beds were allocated for continuous hospitalization to treat patients with COVID-19 in 2020, of which 98.4% in public hospitals (37). The volume of secondary care services in hospitals has increased compared to the volume of primary and community care services due to the oversizing of hospitals and the overstrain of professionals, and therefore, the pyramid of medical services has remained inverted (38). Also, the costs of hospitalisations and treatments have increased, and it has been necessary to

supplement the supply of hospital pharmacies with antiviral medicines, as well as antiseptics and disinfectants. The pharmaceutical staff in hospital pharmacies has been alongside the medical team, demonstrating professionalism (39). Hospital pharmacists reorganised their activities during the COVID-19 pandemic due to the high workload, adopted new communication and collaboration strategies with

physicians for the management of inpatients, compounded and dispensed antiviral and anti-inflammatory drugs, and took additional individual protective measures (40). Toma and Crişan (41) proposed expanding the guidelines on GPP during the COVID-19 pandemic of seven professional associations, including the one in Romania.

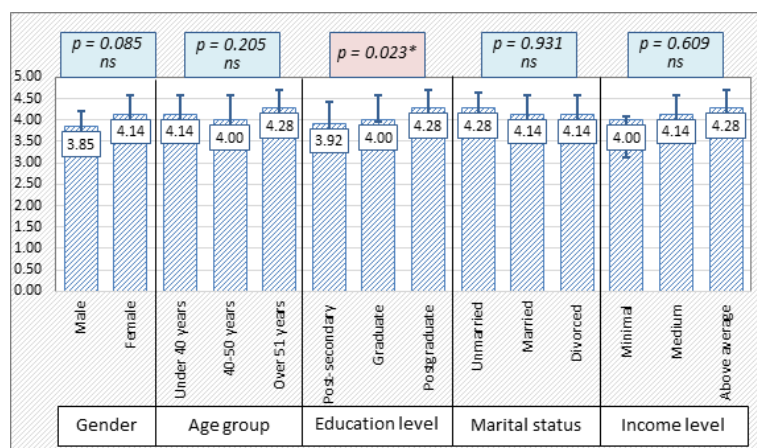


Figure 13.

Comparison of activities in crises scores according to the general characteristics of the respondents

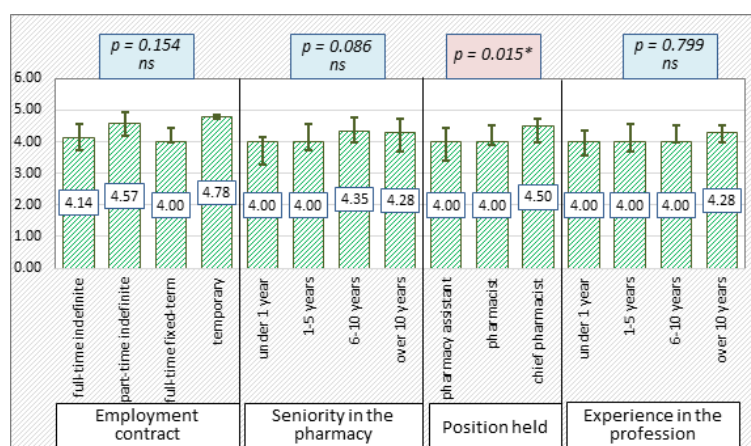


Figure 14.

Comparison of activities in crises scores according to the professional characteristics of the respondents

Discontinuities of medicines have always existed, including during the COVID-19 pandemic and the influenza epidemiological season, in the general European context, and were notified by the NAMMDR (42) and reported by the pharmacist to the hospital administration. Traoré *et al.* (43), studying disorders related to the withdrawal of medicines from the market for 6 years, concluded that risks must be assessed to identify alternative methods to mitigate these dysfunctions. Chalmeta *et al.* (44) proposed a computer architecture for managing medicines from hospital entry to release and disposal, based on blockchain, radio-frequency identification, quick response codes, the Internet of Things, artificial intelligence, and big data.

This questionnaire-based study assessed the main aspects of pharmaceutical practice in hospital pharmacies in Romania, including the dispensing of pharmaceutical products, medication management, pharmacy management, related professional activities, and activities in identified crisis situations, in line with the Romanian performance indicators (6, 8, 10, 11, 45). The results of our study on the perception of pharmaceutical staff on the quality of services provided by Romanian hospital pharmacies are reported for the first time in the literature.

The authors (46) identified, in 24 hospital pharmacies in Namibia, barriers related to human resources, collaboration with medical services, and gaps in health policies that emerged in the provision

of hospital pharmaceutical services, with a focus mainly on the acquisition, preparation, and distribution of medicines. Rodriguez-Escudero *et al.* (47) reported high levels of compliance with pharmacist supervision of drug use and safety, and lower levels regarding the role of the pharmacy technician in pharmaceutical activities, across 18 hospital pharmacies in Puerto Rico.

The differences in pharmaceutical practices across hospital pharmacies worldwide and the lack of an international consensus have led to the development of key performance indicators to improve the quality of services provided by hospital pharmacists. Most performance indicators have been developed for clinical services in hospitals and outpatient clinics, such as medication review, patient safety, and patient counselling, to monitor and evaluate the quality of pharmaceutical practice (48). Lopes *et al.* (49) defined 85 key performance indicators for Portuguese hospital pharmaceutical practice to assess both the quality of clinical and support activities of pharmacists. Also, Boucher *et al.* (50) assessed the contribution of hospital pharmacists to patient care using 16 validated performance indicators to compare the performance of hospital pharmacy departments in Quebec.

Horak *et al.* (51) reported the results of the EAHP survey on the evolution of the hospital pharmacist profession in member countries, including Romania. Thus, half of the hospital pharmacies served more than 500 beds, 80% of the hospital pharmacies had 10 or fewer pharmacists, 58% of the hospital pharmacies in the country had performed an audit in the last 3 years for the priorities of medicine use, and 67% of the participants had contingency plans for drug shortages. Also, 70% of the respondents were involved in the preparation of medicines; 47% of the pharmacists currently worked as part of a multidisciplinary team; and fewer than 50% of the pharmacists provided clinical pharmaceutical services (52) and were involved in the management of vaccines during the COVID-19 pandemic (53).

The hospital pharmacist profession has continually evolved in recent decades to meet the demands of inpatients and has been accompanied by changes in technological resources, including digitalisation, robotisation, and artificial intelligence (54-56).

A national survey of hospital pharmacy managers on pharmacy practice for dispensing and compounding medicines in the United States of America indicated that 92.5% of hospitals had a method for pharmacists to review medication orders on demand, 86.1% of hospitals used automated dispensing cabinets as a decentralized model, 80% of hospitals could scan barcodes when restocking automated dispensing cabinets, 73.4% of hospitals used the electronic health record, and 62.8% of hospitals used technologies to assist in the sterile product preparation for inpatient safety (57, 58). Another survey conducted in

hospitals in Saudi Arabia, Kuwait, United Arab Emirates, Oman and Bahrain on pharmaceutical practice of dispensing and preparing medicines showed that 75.0% of hospitals used a centralized inpatient medications distribution system, 37.5% of hospitals used automated dispensing cabinets, almost all hospitals used the electronic health record, and between 4.7% and 17.2% of hospitals used technologies to assist in the preparation of sterile products and to verify barcodes (59).

The present study has implications for quantifying the quality of pharmaceutical services in hospital pharmacies. It suggests implementing internal assessments to provide data to improve and adapt the daily activities of pharmaceutical staff to the hospital's permanent requirements.

Our study has several limitations. The recruitment of respondents was based on their skills in using online communication technologies, due to the COVID-19 pandemic and the epidemiological alert state in Romania. Due to the small number of respondents and the territorial dispersion of hospitals, the sample is not representative of Romania, although one or two pharmacists/pharmacy assistants work in hospital pharmacies. Self-reported assessments were subjective and may have led to overestimation of responses. The results of our study are specific to pharmaceutical practice in Romanian hospital pharmacies and cannot be compared with hospital practices in other countries. The application in hospital pharmacies of other questionnaires based on national performance criteria, developed by decision-makers, would be desirable. Thus, the results obtained could be compared with those of the present study to analyse the evolution of certain aspects of hospital pharmaceutical practice.

The changes in the status and responsibilities of pharmacists in Romania, due to the implementation of pharmaceutical services, represent a challenge for higher education institutions with a human medical-pharmaceutical profile and the RCP.

Conclusions

Our study developed and validated a questionnaire for self-assessment of the pharmaceutical staff activities in hospital pharmacies in Romania. The study indicated the performance of the quality of pharmaceutical practice in accordance with the quality standards of the guidelines on GPP. A particularity of the performance of these quality activities was the involvement of pharmacy assistants working in rural hospitals. This study demonstrated that hospital pharmacists focused their work on the preparation and dispensing of medicines, drug supply, supervision of pharmacy activities, and other related activities and in crises, requiring an alignment of hospital

pharmaceutical practice with international standards and implementation of the advanced technologies.

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Availability of data and materials

The data generated in the present study are included in the figures and/or tables of this article. The other data generated in the present study may be requested with the author's permission.

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki and its subsequent amendments. The study was approved by the Ethics Committee of "Grigore T. Popa" University of Medicine and Pharmacy Iasi (no. 237/19.11.2022).

AI use disclosure

Not applicable.

Conflict of interest

The authors declare no conflict of interest.

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