Original Article

# Development of professional competencies in higher pharmaceutical education according to students

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## ABSTRACT

The introduction of new professional competencies in the training of specialists with higher pharmaceutical education in Russia dictates the necessity to obtain useful information from students about the understanding of competencies, their relevance for future professional activity. To establish the opinion of pharmacy students of different courses on the perception and the degree of readiness to perform professional competencies (mandatory and recommended), presented in the Sample Basic Educational Program for specialty "Pharmacy" (specialist). The survey involved 359 pharmacy students from 37 higher education institutions of Russia. All respondents were divided into five target cohorts (C1-C5), depending on the course of study. The study was conducted using a web survey based on a structured questionnaire. The study demonstrated a high degree of respondents' perception of mandatory professional competencies (Me 5, IQR: 4-5). The recommended competencies were perceived ambiguously by the students. When assessing the degree of formation of professional competencies of pharmacy students, it was found that their ability to independently perform each compulsory or recommended competence increases with an increasing course of study. The results of the formation of compulsory professional competencies of senior students were high (in the cohort C4 – 90%, C5 – 96%). The degree of satisfaction of the survey participants with the acquired professional competencies was close to the data on the levels of their readiness to perform the competencies.

**Keywords:** Professional competencies in pharmacy, Pharmaceutical competencies, Pharmaceutical education, Pharmacy students' opinion, Professional skills in pharmacy

## Introduction

Current trends in the expanding role of pharmacy professionals, the greater use of digital technologies in healthcare, and the development of cooperation within interprofessional groups dictate increased demands on the training of professionals with higher pharmaceutical education (pharmacists) [1-5]. Graduates must be equipped with the necessary knowledge, skills, and abilities to provide competent pharmaceutical care in an unstable, changing environment. The preparation of a competitive graduate in the specialty "Pharmacy" (specialist) in Russia is based on the formation of professional competencies [6]. These include preparation for solving tasks of professional activity of the following types: pharmaceutical, expert-analytical, organizational-managerial, control and resolution, and production and research. Professional competencies are developed based on professional standards [7-10], as well as concerning the requirements for graduates in the labor market, generalization of Russian and international experience, consultations with leading employers [6, 11-16]. In 2019 in Russia, professional competencies were presented in the Sample Basic Educational Program (SBEP) of the Federal Educational and Methodological Association in the system of higher education in the specialty "Pharmacy" (specialist) [17]. The SBEP includes 27 professional competencies, including 6 mandatory competencies (MPC) and 21 recommended competencies (RPC).

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Educational and Methodological Association in the system of higher education in the specialty "Pharmacy" (specialist) [17]. The SBEP includes 27 professional competencies, including 6 mandatory competencies (MPC) and 21 recommended competencies (RPC).

Currently, the SBEP is used in the system of higher pharmaceutical education as a tool to guide the development of basic educational programs of each higher educational institution and assess the formation of professional competencies in the specialty "Pharmacy" (specialist). Considering that the SBEP is a relatively new tool, obtaining data from pharmacy students on their perceptions of professional competencies can provide useful information regarding the clarity of key concepts and suggestions, as well as identifying gaps in their understanding of the roles and responsibilities of pharmacy students. While many stakeholders have contributed to the development of the SBEP and experienced practicing educators have supported the presented professional competencies, it is unknown whether the students-pharmacists consider the MPC and RPC relevant for their future work and are sufficiently prepared to perform them.

The objective of the work is to establish the opinion of students-pharmacists of different courses on the perception and degree of readiness to perform professional competencies (mandatory and recommended) presented in the SBEP for the specialty "Pharmacy" (specialist).

## Materials and Methods

The study involved a survey in which students majoring in the specialty "Pharmacy" (specialist) were to participate. Respondents were searched on the portals: Surveys for pharmaceutical and medical universities, Surveys for doctors and pharmacists, VseOprosy, All-Russian portal for pharmacists and pharmacists, MedMnenie; on forums: Pharm-Community, Pharmedicine; in groups: Pharmstudent, Pharma Community, Pharma RF, Conversations about medicine and pharmacy on Facebook; on the platform for surveying students; on the site Katrenstil. The inclusion criteria for the survey were students currently enrolled in the 1st-5th year of the specialty "Pharmacy" (specialist), over 18 years of age, willing to participate in the survey. Participation was anonymous and voluntary. Respondents were fully aware of the purpose, nature, and potential benefits and risks of the survey. The survey was conducted following the principles stipulated in the Declaration of Helsinki and the ICC/ESOMAR international code on market, public opinion, social research, and data analysis [18].

The survey involved a total of 359 participants from 37 higher education institutions in Russia. The sample size was determined by time and resource constraints. The sample was drawn using a probability (random) stratified method. This was due to the aim of reducing the participation of respondents from large educational institutions or a particular year of study. For example, older students may be more likely to answer the questions posed; as a result, their response rate would be higher in the overall analysis. All survey participants were divided into five target cohorts (C1-C5), depending on their course of study.

The survey instrument, a structured questionnaire, consisted of three parts and contained 12 questions. The first part of the questionnaire focused on the characteristics of the respondents, the name of the higher education institution, the course of study, and the reasons why they chose the profession (6 questions). The second part of the questionnaire included 3 questions, 2 of which consisted of 27 items. The questions dealt with students' perception of professional competencies and their opinion on the formation of each MPC and RPC. The third part of the questionnaire summarized the satisfaction with the formed professional competencies, further plans for their application, and professional development (3 questions). The questionnaire was accompanied by a cover letter with information for the survey participants, including indicators of professional competence achievement in the specialty "Pharmacy" (specialist) from the SBEP [17]. The Likert scale was used in the answers to some questions of the questionnaire, and a "free text" field was applied for a deeper understanding of the respondents' opinions.

The questionnaire was preliminarily tested on 15 undergraduate students of the specialty "Pharmacy" (specialist) at the Sechenov First Moscow State Medical University. The purpose of the pilot study was to determine the time needed to conduct the survey, the technical feasibility of using the questionnaire and additional information in the web survey, and the clarity of the questions on the questionnaire and the cover letter. The final version of the questionnaire was used for the mass survey from April to June 2020. Codes were assigned to all questionnaires for tracking purposes and stored securely.

Data were statistically processed using SPSS.Statistics.v17.Multilingual-EQUiNOX (SPSS Inc). Study results were expressed either in absolute and relative values or in metric units such as median (*Me*), lower (25%), and upper (75%) quartiles (*IQR*), or mean ± standard deviation ($M \pm SD$). Cross tabulations, Mann-Whitney tests, and Kruskal-Wallis tests were used to assess differences between target cohorts (C1-C5). The critical level of significance for statistical hypothesis testing in the study was 0.05.

## Results and Discussion

### *Characteristics of survey participants*

The number of respondents in each target cohort corresponded to the following: C1 – 70 1st-year students, C2 – 72 2nd-year students, C3 – 72 3rd-year students, C4 – 71 4th-year students, and C5 -74 5th-year students. Women predominated among the respondents in each of the five cohorts: C1 – 72.2%, C2 – 77.1%, C3 – 73.6%, C4 – 78.9%, and C5 – 85.1%. The mean age of respondents in group C1 was 18.2 ± 0.8 years (*Me* 18, *IQR*: 17-19), in group C2 was 19.1 ± 0. 9 years (*Me* 19, *IQR*: 18-20), in group C3 – 20.2 ± 1.2 years (*Me* 20, *IQR*: 19-21), in

group C4 – 21.4 ± 1.2 years (*Me* 21, *IQR*: 20-23), and in group C5 – 22.6 ± 1.4 years (*Me* 22, *IQR*: 21-24). The participants of the survey represented 11 large higher education institutions of Russia (with the number of students in the specialty "Pharmacy" in one course 100 or more) and 26 smaller educational institutions (with the number of students in one course less than 100). The proportion of respondents who had previously received secondary vocational education in the specialty "Pharmacy" corresponded in the C1 cohort – 24.3%, C2 – 29.2%, C3 – 22.2%, C4 – 28.2%, and C5 – 27.0%.

The choice of profession is one of the decisive factors in a student's professional development. It was relevant to identify the reasons that prompted the survey participants to choose the profession of a pharmacist. The results showed that the main factors in choosing a profession in all target cohorts were: dreaming of becoming a pharmacy specialist (about 60% of respondents with the possibility of choosing one or more answers), enrollment due to the advice of relatives and friends (about 40%), desire to help sick people and take care of the health of loved ones (about 30%), a sufficient score to enter the profession (about 30%). Therefore, the choice of future work activity for the majority of respondents had a rather clear orientation to the future profession.

## *Respondents' perceptions of professional competencies*

The study of the perception of MPC and RPC by the survey participants included an assessment of the clarity of the interpretations, their topicality, relevance, necessity, and the degree of agreement with them. The evaluation was carried out on a 5-point scale.

There was a high level of agreement that the competencies were clear, relevant, and necessary (*Me* 5, *IQR*: 4-5) among the respondents on the overall MPC. The lowest level of perception in all target cohorts was for the competency "able to perform clinical laboratory investigations of the third category of complexity, including through the introduction of new research methods and techniques" (*Me* 4, *IQR*: 3-5). Differences in perceptual levels of MPC between student cohorts were not significant ($p>0.05$).

The level of respondents' perception of RPC was in the range of 2-5 points **(Table 1)**. The lowest scores were observed among the participants of the survey of the target cohorts C1 and C2 for the following professional competencies: RPC-9 (*Me* 2, *IQR*: 1-2 and *Me* 2, *IQR*: 1-3 respectively), RPC-12 (*Me* 2, *IQR*: 1-2 and *Me* 2, *IQR*: 1-3 respectively), RPC-16 (*Me* 2, *IQR*: 1-3 in cohorts C1 and C2) and RPC-20 (*Me* 2, *IQR*: 2-3 in cohort C1). The low level of perception of professional competencies among students of all courses was observed in RPC-1 and RPC-16 (*Me* 2-3). The most comprehensible, relevant, and topical professional competencies among the respondents of all target cohorts were RPC-2, RPC-5, RPC-6, RPC-7, and RPC-8 (*Me* 5). Significant differences in the levels of their perception of RPC-9 and RPC-12 were found among first- and fifth-year students ($p<0.05$).

**Table 1. Students' Perceptions of the RPC Presented in the SBEP for the Specialty "Pharmacy" (Specialist)**

| RPC | Assessment, score (*Me*, *IQR*) | | | | |
|---|---|---|---|---|---|
| | Target cohort | | | | |
| | C1, *n*=70 | C2, *n*=72 | C3, *n*=72 | C4, *n*=71 | C5, *n*=74 |
| Can solve professional tasks in pharmaceutical activities in the field of circulation of medicines for veterinary use (RPC-1) | 3 (2-4) | 3 (2-4) | 3 (2-4) | 3 (3-4) | 3 (3-4) |
| Can take part in research to assess the efficiency and safety of medicinal products (RPC-2) | 5 (3-5) | 5 (3-5) | 5 (4-5) | 5 (4-5) | 5 (4-5) |
| Can develop methods of quality control (RPC-3) | 4 (3-5) | 4 (3-5) | 4 (4-5) | 5 (4-5) | 5 (4-5) |
| Can participate in formulation design studies (RPC-4) | 4 (3-5) | 4 (3-5) | 5 (3-5) | 5 (4-5) | 5 (4-5) |
| Can participate in studies to assess the effectiveness of dosage forms(RPC-5) | 5 (3-5) | 5 (3-5) | 5 (3-5) | 5 (4-5) | 5 (4-5) |
| Can take part in studies to optimize medicines formulation and technology, including for different age groups of patients (RPC-6) | 5 (4-5) | 5 (4-5) | 5 (4-5) | 5 (4-5) | 5 (4-5) |
| Can analyze and publicly present scientific data (RPC-7) | 5 (4-5) | 5 (4-5) | 5 (4-5) | 5 (4-5) | 5 (4-5) |
| Can participate in scientific research (RPC-8) | 5 (3-5) | 5 (4-5) | 5 (4-5) | 5 (4-5) | 5 (4-5) |
| Can participate in pharmacogenetic research to meet the challenges of personalized medicine (RPC-9) | 2 (1-2) | 2 (1-3) | 2 (1-4) | 3 (3-4) | 4 (3-5) |

| | | | | | |
|---|---|---|---|---|---|
| Can participate in the development and research of biological medicines (RPC-10) | 4 (3-5) | 4 (3-5) | 4 (3-5) | 5 (3-5) | 5 (4-5) |
| Can participate in research to develop methodologies for chemotoxicological analysis (RPC-11) | 3 (2-4) | 3 (2-4) | 4 (3-4) | 4 (3-4) | 4 (3-5) |
| Can perform activities to control (supervise) the activities of legal and physical entities holding licenses for pharmaceutical activities to comply with the following licensing requirements (RPC-12) | 2 (1-2) | 2 (1-3) | 3 (3-4) | 4 (3-4) | 4 (4-5) |
| Can participate in activities to ensure the quality of medicines in industrial production (RPC-13) | 4 (3-5) | 4 (3-5) | 5 (3-5) | 5 (3-5) | 5 (4-5) |
| Can take part in the selection, justification, and implementation of the optimum technological process for the manufacture of medicinal products for medical use (RPC-14) | 4 (3-5) | 4 (4-5) | 5 (4-5) | 5 (4-5) | 5 (4-5) |
| Can perform quality control of clinical laboratory tests of the third level of complexity at various stages of a chemotoxicological study (RPC-15) | 3 (3-4) | 3 (3-4) | 4 (3-4) | 4 (3-4) | 4 (3-5) |
| Can perform environmental assessment tests during the manufacture of medicinal products (RPC-16) | 2 (1-3) | 2 (1-3) | 2 (1-4) | 3 (2-4) | 3 (3-4) |
| Can perform validation activities in pharmaceutical manufacturing (RPC-17) | 3 (2-4) | 3 (2-4) | 4 (3-4) | 4 (3-4) | 4 (3-4) |
| Can organize a provision of medicinal vegetative raw material with consideration of rational use of medicinal plant resources (RPC-18) | 4 (3-4) | 4 (3-4) | 4 (3-5) | 5 (4-5) | 5 (4-5) |
| Can organize quality control of clinical laboratory tests of the third level of complexity (RPC-19) | 3 (2-4) | 3 (3-4) | 4 (3-4) | 4 (4-5) | 5 (4-5) |
| Can assist in organizing the work of chemotoxicological laboratory staff and maintain records (RPC-20) | 2 (2-3) | 3 (2-4) | 4 (3-4) | 4 (3-4) | 4 (3-4) |
| Can organize the supply of medicines and medical devices to support the population during emergencies and medical evacuations (RPC-21) | 4 (3-5) | 4 (3-5) | 5 (3-5) | 5 (4-5) | 5 (4-5) |

The total sufficient number of MPC and RPC for professional activity in the specialty "Pharmacy" (specialist), according to the respondents, ranged from 10 (3.3%) to 27 (62.3%). The number of senior students (target cohorts C4 and C5) who perceived all 27 professional competencies to be in their future profession was equal in target cohort C4 – 66.2% and in target cohort C5 – 78.4%.

## *Respondents' perception of vocational competence development*

To establish the formation of MPC and RPC, the participants of the survey were offered to use the indicators of achievement of professional competencies presented in the SBEP and the cover letter. The assessment of the competencies was carried out according to the Likert scale.

The results of the survey showed that the ability of respondents to independently perform each MPC, as would be expected, increases as their course of study increases **(Table 2)**. Thus, the highest proportion of responses among students in the target cohorts C1 and C2 corresponded to "completely capable" (68-87%). Participants in the C3 cohort responded to questions about their readiness to perform the MPC as follows: "completely capable" 3-65%, "rather capable" 3-57%, "difficult to answer" 11-33%, "rather capable" 8-28%, and "completely capable" 0-64%. The results of MPC formation among senior students (target cohorts C4 and C5) are quite high. Thus, the proportion of respondents in cohort C5 who answered "completely capable" for professional competencies MPC-1, MPC-2, MPC-3, MPC-4, and MPC-6 corresponded to 81-87%. The absence of the answers "completely capable" and "rather capable" among the participants of the C5 target cohort is noteworthy. Significant differences in the level of competence formation between target cohorts C1 and C4, C2 and C4, C1 and C5, C2 and C5 were established for all MPC for the statements "completely capable" and "completely incapable" ($p<0.05$).

**Table 2. Students' Perceptions of Various Courses of Study Regarding the Development of their MPC as Presented in the SBEP for the Specialty "Pharmacy" (Specialist)**

| MPC | Target cohort | Percentage of Respondents Agreeing with the following Assessment, % | | | | |
|---|---|---|---|---|---|---|
| | | Completely capable | Rather capable | Difficult to answer | Rather incapable | Completely incapable |
| Can manufacture medicinal products and participate in the technology of manufacturing finished medicinal products (MPC-1) | C1, *n*=70 | 0 | 8.6 | 11.4 | 4.3 | 75.7 |
| | C2, *n*=72 | 0 | 9.7 | 7.0 | 12.5 | 70.8 |
| | C3, *n*=72 | 15.3 | 56.9 | 16.7 | 11.1 | 0 |
| | C4, *n*=71 | 57.7 | 29.6 | 8.5 | 4.2 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | C5, *n*=74 | 81.1 | 16.2 | 2.7 | 0 | 0 |
| Can solve professional tasks in the distribution and sale of medicines and other pharmacy products through pharmaceutical and medical institutions (MPC-2) | C1, *n*=70 | 0 | 11.4 | 8.6 | 4.3 | 75.7 |
| | C2, *n*=72 | 0 | 18.0 | 11.1 | 2.8 | 68.1 |
| | C3, *n*=72 | 13.9 | 26.4 | 31.9 | 15.3 | 12.5 |
| | C4, *n*=71 | 74.7 | 16.9 | 5.6 | 2.8 | 0 |
| | C5, *n*=74 | 83.8 | 13.5 | 2.7 | 0 | 0 |
| Can provide pharmaceutical information and counseling for the distribution and sale of medicines for medical use and other pharmacy products (MPC-3) | C1, *n*=70 | 0 | 12.8 | 8.6 | 2.9 | 75.7 |
| | C2, *n*=72 | 0 | 20.8 | 9.7 | 1.4 | 68.1 |
| | C3, *n*=72 | 5.5 | 43.1 | 15.3 | 15.3 | 20.8 |
| | C4, *n*=71 | 66.2 | 25.4 | 7.0 | 1.4 | 0 |
| | C5, *n*=74 | 86.5 | 12.2 | 1.3 | 0 | 0 |
| Can participate in monitoring the quality, efficiency, and safety of medicinal products and herbal raw materials (MPC-4) | C1, *n*=70 | 0 | 10.0 | 8.6 | 5.7 | 75.7 |
| | C2, *n*=72 | 0 | 19.4 | 8.3 | 2.8 | 69.5 |
| | C3, *n*=72 | 65.3 | 15.3 | 11.1 | 8.3 | 0 |
| | C4, *n*=71 | 69.0 | 19.7 | 11.3 | 0 | 0 |
| | C5, *n*=74 | 82.4 | 14.9 | 2.7 | 0 | 0 |
| Can perform clinical laboratory tests of the third level of complexity, including the implementation of new research methods and techniques (MPC-5) | C1, *n*=70 | 0 | 0 | 8.6 | 4.3 | 87.1 |
| | C2, *n*=72 | 0 | 0 | 11.1 | 13.9 | 75.0 |
| | C3, *n*=72 | 2.8 | 2.8 | 12.5 | 18.0 | 63.9 |
| | C4, *n*=71 | 66.2 | 21.2 | 9.8 | 2.8 | 0 |
| | C5, *n*=74 | 73.0 | 18.9 | 8.1 | 0 | 0 |
| Can participate in the planning and organization of resources for a pharmaceutical organization (MPC-6) | C1, *n*=70 | 0 | 5.7 | 10.0 | 2.9 | 81.4 |
| | C2, *n*=72 | 0 | 12.5 | 12.5 | 2.8 | 72.2 |
| | C3, *n*=72 | 11.1 | 18.1 | 33.3 | 27.8 | 9.7 |
| | C4, *n*=71 | 71.8 | 21.2 | 4.2 | 2.8 | 0 |
| | C5, *n*=74 | 81.1 | 14.9 | 4.0 | 0 | 0 |

The students' RPC proficiency increased during their higher pharmacy education. The overall trend of respondents' readiness to perform RPC was similar to that of MPC. **Figure 1** shows the transition of students' self-assessment regarding RPC formation from "completely incapable" in the target cohorts C1 and C2 (78.6±18.9 and 73.6±18.2 respectively) to "completely capable" in cohorts C4 and C5 (53.5±15.4 and 68.9±19.7, respectively).

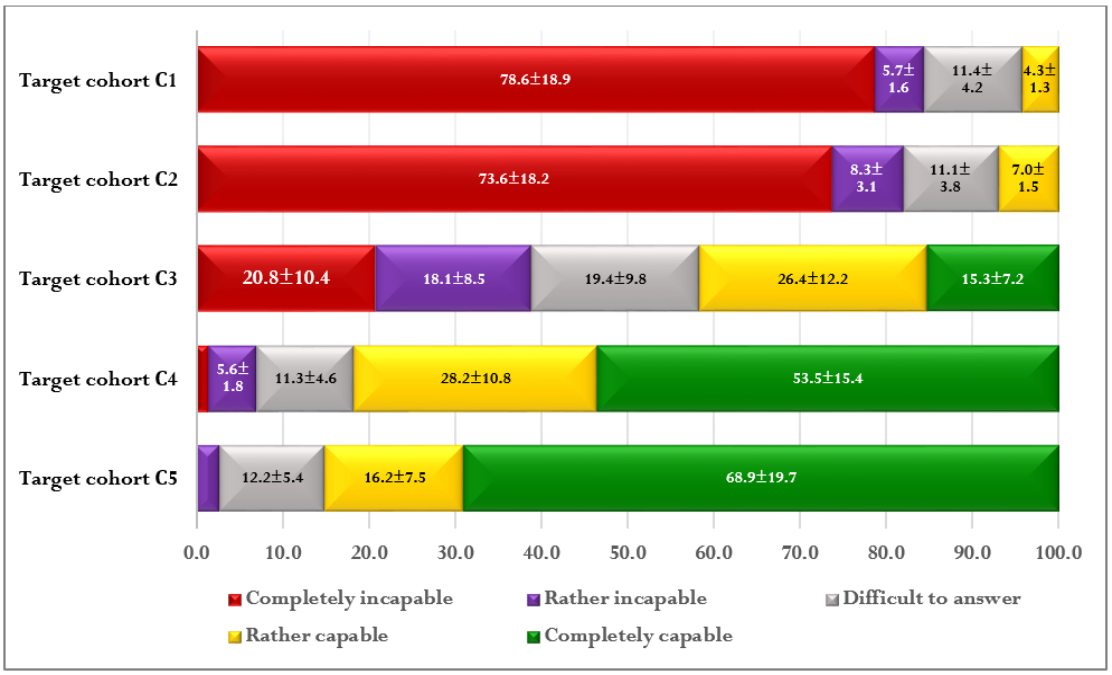


**Figure 1.** Students' Perceptions of Various Courses on the Development of the RPC presented in the SBEP for Specialty "Pharmacy" (Specialist) (*M* ± *SD*, %)

The participants of the survey of the target cohorts C4 and C5 felt most prepared for the following RPC: RPC-7 (rated "completely capable" by 70.4% and 83.8% of students, respectively) and RPC-8 (69.0% and 82.4%, respectively). The next most developed RPCs among the C5 cohort respondents were RPC-18 (with a "completely capable" rating of 78.4% of students), RPC-5 (75.7%), RPC-13 (73.0%), and RPC-14 (71.6%). Among the professional competencies for which the C4 and C5 survey participants were the least prepared were RPC-9 (rated as "completely capable" by 28.2% and 40.5% of students, respectively) and RPC-15 (31.0% and 45.9%, respectively). In the target cohort C5, there was no "fully incapable" response. The level of RPC formation between the undergraduates (groups C1 and C2) and graduates (group C5) was significantly higher for all professional competencies ($p<0.05$).

## *Overall assessment of satisfaction with the acquired professional competencies*

The level of satisfaction with the acquired professional competencies was assessed using the Likert scale. The opinions of the respondents of the target cohorts C1 and C2 on their satisfaction with the acquired professional skills and abilities were practically similar to the data on the levels of MPC formation. The responses of the C3 cohort participants were distributed as follows: "completely satisfied" – 31.9%, "rather satisfied" – 27.8%, "difficult to answer" – 18.1%, "rather unsatisfied" – 13.9%, "completely unsatisfied" – 8.3%. It is necessary to emphasize a rather high degree of satisfaction with the formation of professional competencies among respondents of the target cohorts C4 and C5. The answer "completely satisfied" was noted by 71.8% of the respondents of the C4 and 81.1% of the C5 cohorts, "rather satisfied" by 19.7% and 14.9%, respectively. There was no "completely unsatisfied" response among the respondents of the target cohorts C4 and C5.

The most frequent answers to the questionnaire question "What would you like to do in the future to apply your professional competencies?" were: marketing director (18.9% of respondents with the possibility to choose one or several answers), drug registration manager (14.8%), clinical trials manager (10.9%), promotion group manager (7.5%), and pharmaceutical production director (6.7%). Only 4.7% of respondents said they would like to work in a pharmacy.

To the question of the survey "Do you plan to continue professional training in the specialty 'Pharmacy?'", the majority of respondents answered positively. This answer implied further training for professional development (49.0% of survey participants with an option of one or more answers), the internship and postgraduate training (47.9% and 15.9%, respectively), an internship abroad (19.2%), and others.

Professional competencies, which are presented in the SBEP for the specialty "Pharmacy" (specialist), are multifunctional, multidisciplinary, and multidimensional. The formation of these competencies occurs at all stages of the educational process, during classroom and extracurricular activities, and depends on the individual and personal characteristics of the student and their ability to use the available opportunities and capabilities. The procedure of professional competence assessment is covered in detail in the methodological and scientific literature [19-22]. Several methodological recommendations on the development of professional competencies and assessment tools have been developed [23, 24]. In SBEP, the professional competencies are divided into the following main types of pharmacist activity: pharmaceutical (MPC-1-MPC-3, RPC-1), expert-analytical (MPC-4, MPC-5, RPC-15-RPC-17), managerial (RPC-6, RPC-18-RPC-21), research (RPC-2-RPC-11), supervisory-permission (RPC-12, RPC-13), and production (RPC-14) [17].

This study has shown that in general, in students from 37 higher education institutions in Russia, studying in the specialty "Pharmacy" (specialist), MPC are perceived as topical, relevant, and necessary in various conditions of their professional activities, regardless of the course of study (*Me* 5, *IQR*: 4-5). The greater variability in the perception of RPC was, in our opinion, due to the greater lack of awareness of the role and responsibilities of the pharmacist by undergraduate students (target cohorts C1 and C2), as well as the specificity of the higher education institution in training pharmacy professionals. For example, RPC -9 (*Me* 2-4), RPC-12 (*Me* 2-4), and RPC-16 (*Me* 2-3) have a narrow focus and a small number of indicators for their achievement (2-4).

The respondents assessed the level of professional competence formation using MPC and RPC achievement indicators. The SBEP presents from 2 to 7 achievement indicators for each competence [17]. When assessing the readiness to perform professional competencies, a small proportion of undergraduate students (target cohorts C1 and C2) answered: "rather capable" (6-21%). This response was likely to be largely related to their previous secondary vocational education in the specialty "Pharmacy". The proportion of such respondents in cohorts C1 and C2 corresponded to 24-29%.

The wide range of responses of the C3 cohort on the formation of MPC was probably related to the different time sequences of studying the disciplines responsible for the formation of certain competencies. The lower assessment by the respondents of senior year (target cohorts C4 and C5) of MPC-5 formation (66.2% and 73.0%, respectively) compared to other MPCs can be explained by the new interpretation of the competence, in particular, the provision "to perform clinical laboratory tests of the third category of complexity". This clause was absent in the previous Federal State Educational Standard for the specialty "Pharmacy" (specialist) dated 11.08.2016. Perhaps, this reason also caused a low level of readiness of students in higher training for professional activities in RPC-9 and RPC-15, as well as the insufficient elaboration of these competencies for the implementation and introduction into the system of higher pharmaceutical education.

In assessing the satisfaction of the survey participants of the target cohort C3 from the formed professional competencies, some discrepancy between the results obtained and the data on

the degree of competence formation was noted. This can be explained by the fact that 3rd-year students (cohort C3) undergo only learning practices that are partially related to professional competencies but do not give full confidence to perform them independently.

## Conclusion

1. The study of the opinion of pharmacy students of different courses from 37 higher education institutions in Russia on their perception of the professional competencies presented in the SBEP showed that all MPCs are understandable, topical, relevant, and necessary for future professional activity (*Me* 5, *IQR*: 4-5). The degree of respondents' perception of RPC was in a wide range, which was probably due to insufficient awareness of the role and responsibilities of a pharmacist by undergraduate students (target cohorts C1 and C2) and the specificity of the higher education institution in training pharmacy professionals.
2. Assessing the level of formation of professional competencies in students-pharmacists, it was found that their ability to independently perform each MPC and RPC increases with an increasing course of study. It should be noted quite high results of MPC formation among senior year students: scores "completely capable" and "rather capable" in the target cohort C4 were equal to 90%, in the cohort C5 – 96%. The general trend of growth of respondents' readiness to perform RPC was similar to MPC.
3. The analysis of pharmacy students' satisfaction with the formed professional competencies showed that in the target cohorts C1 and C2 the obtained results were almost similar to the data on the levels of MPC formation. It is necessary to emphasize a rather high degree of satisfaction with the formation of professional competencies among senior year students: the answers "completely satisfied" and "rather satisfied" were noted in the target cohort C4 with 92% of respondents, in the cohort C5 – with 96% of respondents. There was no "completely unsatisfied" response among the participants in the C4 and C5 target cohorts.

The feedback received from students-pharmacists is valuable information for reconciling expectations and identifying priorities in the development of the main educational programs of each higher education institution in the system of pharmaceutical education in Russia. This study adds to the accumulating evidence that the list of professional competencies, both mandatory and recommended, is perceived by current students of all years of study to be directly relevant to their pharmaceutical practice.

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