Analysis of Pharmacy Students' Learning in Clinical Pharmacy During Internship

ABSTRACT

The internship is the time when students experience professional practice in a real learning environment. The aim of this study was to assess the knowledge about clinical pharmacy of pharmacy students who experience the Clinical Pharmacy Internship during their undergraduate studies. This research was carried out using a quasi-experimental methodology, in which the participants were 23 pharmacy students who had experienced a clinical pharmacy internship. Data was collected using a questionnaire with answers based on the Likert® Scale, applied before the start of the internship period and at the end of it. The variation between the answers was the determining factor for the knowledge apprehension metric. From the results found, it was observed that the students increased their positive responses in relation to learning the proposed Clinical Pharmaceutical Services. There was a gain in knowledge during the internship period, demonstrating that this is a favorable resource for teaching clinical pharmacy.

Keywords: Learning; Internship; Pharmacy students.

1. INTRODUCTION

The pharmaceutical profession and teaching are considered part and parcel of human history. Since the earliest times, there have been records of compounds being used to treat the physical ailments that afflict humanity. Even so, at that time and in the history that followed, there was no clear differentiation between the pharmaceutical and medical professions, which were practiced together until the mid-19th century[1-4].

Pharmacy is considered a two-pronged area: science and profession. Science, through the study of medicines and their interaction with living beings, and profession, through the activities involved in providing and using medicines[3]. However, the distinction between these strands is tenuous, since the profession and science were carried out together or in parallel until the 20th century. The very discovery of new drugs, very prominent in the last century, was largely motivated by the observation of the effect of certain substances on man, a principle of evidence-based medicine[3, 5, 6].

These discoveries were followed by changes in drug production processes due to the evolution of post-war industries, as well as the isolation of active compounds. In the meantime, new demands were placed on the pharmaceutical professional, who, as he was driven by the new demands of the industrial environment, no longer focused on patient care.The appearance of adverse events in the use of medicines, such as the case of thalidomide, realigned the profession's objectives in relation to the patient, giving rise to the clinical pharmacy branch. At the end of the 1960s, this subject was included in the Pharmacy Degree Course [6, 7].

In the current context, pharmaceutical training aimed at ratifying creativity and innovation is what was recommended by the Argus Commission, of the American Association of Colleges of Pharmacy (AACP), following an evaluation report in the 2012-13 biennium, which showed a deficiency in the development of graduates' competencies. The quest to create constructivist curricula is one of the current concerns around the world[8-10].

Brazil, the Pharmacy course, like other undergraduate courses in the health area, is regulated by the National Curriculum Guidelines (NCG), set out by the Ministry of Education in order to standardize the content covered in the country's public and private universities. The NCG also define the profile expected of pharmacy graduates, as an ethical, humanistic, reflective, critical and problem-solving professional who can meet the demands of the individual, their family and the community. To this end, the Guidelines point to three axes of training, based on the development of competences: Health Care, Technology and Innovation, Health Management [11].

The development of competencies pointed out by the NCG in pharmacy is in line with the approach taken by Sacristán in his book "Educating by Competencies: what's new", where he explains the concepts, advantages and disadvantages of this form of teaching, with the aim of forming utilitarian and constructivist knowledge[12]. The training of critical, reflective and problem-solving pharmaceutical professionals is a challenge that we are trying to overcome through various forms of teaching. One of these ways is the internship or curricular internship, a teaching method based on in-service training, carrying out pre-professional professional practice[12, 13].

The internship, more specifically, is a common practice in medicine and is currently being expanded to other health courses, such as the Pharmacy Degree Course. In the meantime, as a new teaching proposal for undergraduate Pharmacy courses, the aim is to analyze whether this practice is one of the solutions to the demand for constructivist training and the development of competencies. The aim of this study was to assess the knowledge about clinical pharmacy of pharmacy students who experience the Clinical Pharmacy Internship during their undergraduate studies.

2. METHODOLOGY

In order to achieve the proposed objective, a quantitative approach and a quasi-experimental design were used to evaluate the knowledge of students who had taken the Clinical Pharmacy Internship during their undergraduate studies. The study was carried out in two stages: pre-internship, based on the knowledge obtained from the theoretical-practical Clinical Pharmacy courses offered by this university; post-internship, focusing on the evaluation of the gain and mobilization of knowledge by these students. The research was approved by the Research Ethics Committee under number 4.995.407, and was carried out at a university hospital with a trauma care profile, whose main medical specialties are neurology, orthopedics and general surgery, classified as a large, highly complex hospital.The participants in this study were 23 pharmacy students who, during the research, were in the tenth period of their degree and were duly enrolled in the Clinical Pharmacy Internship course. After the participants were informed and signed the Informed Consent Form, they were invited to fill in the questionnaire to obtain the data, which was then compiled and organized for analysis. The information was collected in academic rooms located in the study hospital, in a private manner and respecting the privacy of the participants. The data was collected by the researchers in two stages, before and after the internship, and was answered by hand by the students who agreed to take part in the survey.

The questionnaire was based on a Likert® Scale, to ensure that opinions could be expressed without weighting and to cover the full spectrum of alternatives, both positive and negative. The questionnaire was administered when the group of students entered the Clinical Pharmacy Internship, as well as at the end of the internship period.The questions

were based on the theoretical and practical content discussed and applied in the subjects prior to the internship, as well as common situations in the clinical pharmacy service that the students would experience, such as institutional clinical protocols. In addition, a sociodemographic mapping of the students and their perspectives on the pharmaceutical profession was carried out. The alternatives for the specific questions on the content ranged from a total lack of knowledge on the subject to total mastery of it and were applied equally before and after the internship in order to establish a comparison between the answers.
The results were analyzed using descriptive statistical tools from the questionnaires and the parametric and non-parametric tests indicated for comparing variables with a significance level of 5% using statistical software. The Wilcoxon® test was used and the value of statistical significance analyzed by this test was obtained. The results were obtained using the Bioestat 5.0® statistical program. The Wilcoxon® test is a non-parametric or distribution-free test and is based on the sum of intra-pair differences, so that the greater the distance from the null hypothesis (H0: P1 = P2), in both positive and negative values, the greater the statistical significance (p-value < or = 0.05). With this test, the greater the differences, the greater the significance of the result and three conditions are obtained: increase (+), decrease (-) or equality (=). For this study, the greater the differences with positive values, i.e. the greater the increase (+), the better the students' performance on the question, which means that they have greater knowledge of the content being assessed.

3. RESULTS AND DISCUSSION

The sample consisted of 23 graduating Pharmacy students, in their 10th term, who experienced the Clinical Pharmacy Internship, the subject of this research. In order to assess the students' gain in knowledge from this internship, they were invited to answer a questionnaire before the internship, called the Pre-Internship Questionnaire in Clinical Pharmacy, and after the internship period, the students were invited to answer the questionnaire again, called the Post-Internship Questionnaire in Clinical Pharmacy.
At the beginning of the questionnaire, the students were asked their age. The result was 16 students aged 20-24 and 7 students aged 25-30. The average age was 23.6 ± 2.1 years. This can be explained by the length of the course, as the students are currently completing the Pharmacy course. In terms of age, the average age of the Clinical Pharmacy Internship students was 23.6 years ± 2.1 years, very close to the 24.9 years ± 2.6 years, as shown in Figure 1. This data can be explained by the average age at which the population usually seeks a degree, usually immediately after finishing regular education, which in the case of Brazil is high school[14].

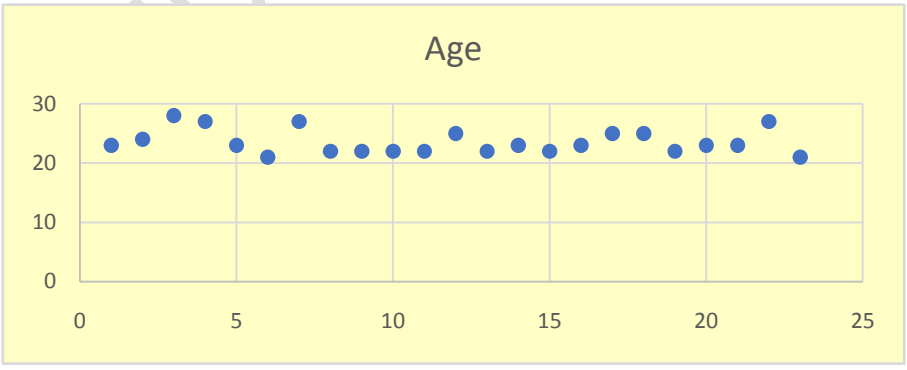

Figure 1 - age dispersion in the sample of students part of the research.
Source: The authors, 2024.

In terms of gender, the students were divided into 17 female students and 6 male students (73.9% and 26.09% of the sample, respectively). This characteristic is explained by the fact that Pharmacy is a course in the health area, which has a greater demand for female students, as corroborated by Yi[15], who found 77.8% of female students in pharmacy courses in China.

When analyzing the five questions dealing with Clinical Pharmaceutical Services, with two sections each, students were asked about their pre- and post-intervention knowledge of "what a service is like" and "what the service routine is like". Clinical services are often the most mysterious content in the eyes of students, as they are the least likely to be applied in theoretical subjects, even though many students reported knowing the services and how they are provided. In addition, the most significant differences in the results of these questions make this knowledge gap explicit, since being involved in practical work reveals to the student which theories are most applicable, what adaptations will be necessary to the reality in which the professional finds him/herself, and how the environment and other external agents can influence this work.

The first question analyzed was about the ICU Multidisciplinary Visiting Service, where the post-intervention breakdown of what the Multidisciplinary Visiting Service is obtained 11 positive points in relation to the pre-intervention questionnaire. Thus, its significance resulted in a value of p=0.0010, demonstrating that the students gained greater knowledge of this sector, as shown in Table 1.

Table 1.Pre and post internship comparative analysis – Multidisciplinary ICU Visit Service

What is a Multidisciplinary ICU Visit?	Pre-internship	%	Post-internship	%
I know and I have already experienced	1	4,3	18	78,3
I know and I am familiar	2	8,6	4	17,4
I know	16	69,6	1	4,3
Heard of	4	17,4		
Grand Total	**23**	**100**	**23**	**100**
Significance				**P=0.0247**

Source: the authors, 2024.

The second breakdown of the question about the multi-visit service found 19 positive responses, with a p-value of 0.0005. The interval difference for this split is shown in Figure 2, demonstrating that the positive responses after the internship were higher, as were the absolute results. Taking into account what was said by Yi[15], who also assessed the gain in knowledge in the Multidisciplinary Rounds and obtained a positive score with the IPEP method employed, it can be said that the interventional method brings gains in knowledge in this type of clinical service.

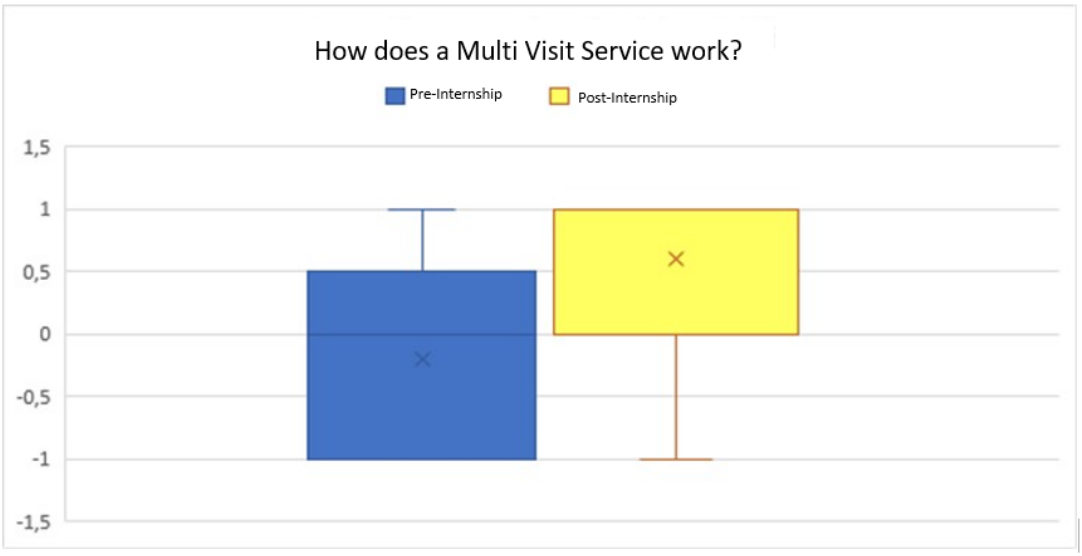

Figure 2. Analysis according to Wilcoxon: interval of answers on how the Multidisciplinary ICU Visit Service works.

The Clinical Pharmacy Internship students were asked about the Target 3 service carried out at the research hospital. Goal 3 is related to the 6 International Patient Safety Goals, namely: Goal 1 - Correct Patient Identification, Goal 2 - Effective Communication between Healthcare Professionals, Goal 4 - Safe Surgery, Goal 5 - Reducing Care-Related Infection, Goal 6 - Reducing Harm from Falls and Goal 3 - Improving the Safety of High-Vigilance Medicines (HVMP), the goal worked on in this internship sector[16]. At the institution we researched, Goal 3 covers even more criteria than high vigilance drugs, considering the risk of Adverse Drug Reactions (ADRs), as well as the omission of doses of prescribed drugs. In the meantime, the students carried out an active search in these two services, ensuring the notification and subsequent resolution of these insecurities in the use of medicines. On this question, the answers obtained for the post-internship questionnaire showed a variance of 43.48% with a significant value of p=0.0097 for the first breakdown, as well as 14 positive answers with a variance of 60.87% and a significance of p=0.0007 according to the Wilcoxon® test, as shown in Table 2: Comparative analysis pre and post intervention - What is International Patient Safety Goal 3. below:

Table 2. Pre and post intervention comparative analysis– What is goal number 3 of the International Patient Safety Goals.

What is goal number 3 of the International Patient Safety Goals	Pre-internship	%	Post-internship	%	Difference
I know and I have already experienced	1	4,3	18	78,3	17
I know and I am familiar	6	26,1	4	17,4	-2
I know	6	26,1	1	4,3	-5
Heard of	9	39,1			-9
Never heard of	1	4,3			-1
Grand Total	**23**	**100**	**23**	**100**	
Significance					**P=0,0097**

Source: the authors, 2024.

Halawany[17] carried out a study on perceptions of patient safety using a version of the Health Professional in Patient Safety Survey (H-PESS) instrument, proposing a Likert scale to assess patient safety learning in Saudi Arabian dental students and postgraduates. The authors assessed 409 participants, who scored above 75% in all the patient safety factors studied, with an emphasis on removing risks in the clinical environment, which scored 84.7 ± 16 points, demonstrating that there was a gain after the intervention proposed by the authors, as well as this research. Therefore, it can be said that after the internship, the students had greater knowledge of these concepts and service, as shown in Table 2.

Goal 3 of Patient Safety is characterized by safety actions throughout the medication chain, from the choice and acquisition of the medication to the post-use period; to this end, the actions of the Clinical Pharmacy are fundamental, since the clinical pharmacist is responsible for monitoring patients after they have used the medication. The actions aimed at Target 3 are considered as a work sector, where there is an active search for Adverse Drug Reactions, as well as auditing the correct administration of medicines with the nursing team[17].

In the analysis of the question about the service of Pharmaceutical Evaluation of Prescriptions According to the Choosing Wisely Initiative, here called Choosing Wisely, the results described in Table 3 were obtained.

Table 3.Pre and post intervention comparative analysis – What is the Choosing Wisely Initiative Prescription Assessment Service.

What is Choosing Wisely	Pre-internship	%	Post-internship	%	Difference
I know and I have already experienced	1	4,3	19	82,6	18
I know and I am familiar	3	13,0	3	13,0	0
I know	9	39,1	1	4,3	-8
Heard of	8	34,8			-8
Never heard of	2	8,7			-2
Grand Total	**23**		**23**	100	
Significance					**P=0,001**

Source: the authors, 2024.

The data shows that the students gained knowledge, since there were more positive responses in the post-intervention questionnaire than in the pre-intervention questionnaire, considering that the significance of the data was p=0.001 for the first breakdown, which asked if the student knew the prescription evaluation service, and a difference of 78.3% in the positive responses.

The same analysis for the other services can be applied here, since the practice of prescription analysis provides students with an apprehension of knowledge about the criteria and which interventions should be carried out. This result is in line with that reported by Goldmann[18], who assessed positive responses to Choosing Wisely recommendations from German medical students, based on learning cases, and found positive results in the 120 students assessed.

As a final question in relation to clinical pharmacy services, the students were asked if they knew the service and if they knew the routine of the antimicrobial stewardship service. In this question, also with two sections, the students showed better responses when asked about the routine of the service, with a difference of 60.9% (p=0.0029) in the positive responses, as shown in Table 3 - Comparative analysis pre and post intervention - what the antimicrobial stewardship service is like.

Table 4.Pre and post intervention comparative analysis – How does the antimicrobial stewardship service work?.

How the antimicrobial stewardship serviceworks	Pre-internship	%	Post-internship	%	Difference
I know and I have already experienced	1	4,3	17	73,9	16
I know and I am familiar	6	26,1	4	17,4	-2
I know	6	26,1	2	8,7	-4
Heard of	7	30,4		0,0	-7
Never heard of	3	13,0		0,0	-3
Grand Total	**23**	100	**23**	100	
Significance					**P=0.0029**

Source: the authors, 2024.

The study by Tarín-Pello[19] on learning about antimicrobial stewardship brought positive results, as did those found in this study. In the Spanish study, students were assessed longitudinally over a period of 5 years. During this period, they underwent practical sessions to detect the identification of microorganisms that produce antimicrobial molecules, antimicrobial resistance and the rational use of antimicrobials. The students were evaluated pre- and post-training in order to assess the difference in knowledge acquired. This study found that among the 70 students assessed, the overall average number of correct answers went from 68.7% (8.2/12 questions) to 82.6% (9.9/12 questions), showing an increase in knowledge. Comparing the results with the literature on the internship, it can be confirmed that there is a gain in knowledge through this teaching method. According to Blitz[20], students' perceptions after completing a medical internship show qualitatively that the students had positive perceptions about the creation of skills, competences and the application of theoretical knowledge. However, in this study, the students showed a passive attitude towards gaining knowledge, expecting it to be provided by their preceptors and that the responsibility for learning would lie with those who teach them. This perception is still mistaken if we consider competency-based learning, where the student "learns to be", which is only possible with the protagonism of their own knowledge.

The Pharmacy internship was based on student-led learning, so students who were protagonists and proactive naturally performed better, but this study was unable to assess

this perception and these results are not described by the research method used. Blitz's[20] studyalso points out that longitudinal internships are expensive and time-consuming, but they have lasting effects on future medical behavior, including more time at the bedside, greater involvement with patients and more opportunities for continuity of care, all of which are interesting characteristics for the clinical care of patients in any health profession.
Blitz's[20] study also points out that longitudinal internships are expensive and time-consuming, but they have lasting effects on future medical behavior, including more time at the bedside, greater involvement with patients and more opportunities for continuity of care, all of which are interesting features of clinical care for patients in any health profession. The study suggests that students have the potential to become health educators for their patients, multiplying and disseminating information for disease prevention.

4. CONCLUSION

The results showed that the pharmacy students had previous knowledge of clinical pharmaceutical services and the purpose of the clinical pharmacy internship was to provide students with practical experience of these clinical services so that they could gain real, practical knowledge of these contents. This was evident in relation to the increase in knowledge acquired during the internship with the intense experience of the content worked on, allowing the student to experience the professional reality of experiencing a practice scenario, which is recognized as a tool for creating competences, especially the competences of knowing how to use and knowing how to be, preparing them to act in a reflective, critical and humanized way.

CONSENT

Does not apply to this work.

ETHICAL APPROVAL

This research was approved by the Ethics Committee of Faculdades Pequeno Príncipe under number 4.995.407.

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