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# Heterogeneity of the Italian residency training in hospital pharmacy: a pilot study from students' perspective

## Hétérogénéité de l'internat en pharmacie hospitalière en Italie : étude pilote auprès des étudiants

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**Abstract.** Becoming a hospital pharmacist in Europe is nowadays patchy and differs from nation to nation. In Italy, an educational post-graduate program called "School of Hospital Pharmacy" (SHP) is mandatory to work in the National Health System (NHS). SHP was recently renovated and harmonized but considerable differences remain along the nation. We performed a cross-sectional study asking, through a specific questionnaire, the Italian SHP students to indicate the reasons on which lays this lack of homogeneity. We found out that a good relationship with tutors was significantly correlated with the degree of students' autonomy. Higher adherence to study plan can be predicted by year of study, localization of SHP in Northern Italy, and allocation of an academic salary and a good relationship with tutor. Academic salary and year of study also predicted the number of scientific paper published by students.

**Key words :** internship and residency, pharmacy service, hospital, fellowships and scholarships, students

**Résumé.** En Europe, plusieurs parcours de formation permettent d'obtenir le diplôme en pharmacie hospitalière (PH). En Italie, le diplôme d'études spécialisées de pharmacie hospitalière est nécessaire pour travailler dans le système national de santé. Cette formation a beaucoup évolué mais, malgré ces changements, de fortes disparités persistent entre les régions. Nous avons effectué une étude transversale pour identifier et analyser les causes de ces différences, en interrogeant directement les internes en PH au moyen d'un questionnaire. Nous avons observé qu'une bonne relation avec les tuteurs était corrélée à l'autonomie des internes. L'accomplissement du programme d'étude était associé à l'année d'étude, la localisation de l'université au Nord de l'Italie, la présence de bourses d'études et enfin une bonne relation avec les tuteurs. Enfin, le nombre de publications est plus élevé avec l'année d'étude et chez les étudiants qui ont obtenu une bourse d'étude.

**Mots clés :** internat, pharmacie, hôpital, bourses, étudiant

**Abbreviations :** CTF: Common Training Framework, DES: Diplôme d'études spécialisées, EU: European Union, EAHP: European Association of Hospital Pharmacists, F: F-test, HTA: Health Technology Assessment, IQR: Interquartile range, MS: Median Score, Max: Maximum, Min: Minimum, NHS: National Health System, PH: Pharmacie hospitalière, R<sup>2</sup>: R squared coefficient, ReNaSFO: national network of SHP, SD: Standard Deviation, SHP: School of Hospital Pharmacy, UK: United Kingdom, US: United States, UCC: University course credit, P: P-Value

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Nowadays hospital pharmacists interact with physicians and patients to ensure the best possible health outcomes and they frequently support stakeholders in making sustainable decisions and improving the quality of healthcare services. They gained these skills through residency training and a specialist board certification [1].

In Europe, the educational pathway to become a hospital pharmacist is not directly driven by the European Union (EU) but each member state is responsible for providing a qualified program. To overcome these discrepancies the European Association of Hospital Pharmacists (EAHP) has created a European agreement, called Common Training Framework (CTF) that aims to bring education in line with practice and to ensure a harmonized education throughout the EU leading to mutual recognition of diplomas by the member states [2].

Despite the CTF, we still have in Europe different educational programs [3]. For example, in France, post-graduate students can follow a 4-year internship called *Diplôme d'études spécialisées* (DES), supported by an academic scholarship of 1,500-1,800 €/month.

Spain also has a 4-year educational program. It is regulated by the "Real Decreto 2708/1982" which rules the training plan but not the salary paid by the hospital which host the resident. In the United Kingdom (UK), after one year of pre-registration training, students attend a period of paid employment in a community or a hospital pharmacy, which requires to build up a portfolio of evidence to demonstrate their competences. However, a specific post-graduated program for hospital pharmacists is not established.

In Italy the pathway to become a hospital pharmacist establishes that post-graduate students must be enrolled in a School of Hospital Pharmacy (SHP) managed by Universities. After 4 years of training in hospital pharmacies, the students obtain the qualification of hospital pharmacist that is mandatory to work in (National Health System) NHS hospitals. In 2015 SHP was included in the group of medical post-graduate schools [4]. This meant several changes as a renovated study plan and the institution of an academic scholarship for residents. The study plan includes topics such as: Clinical pharmacy, Clinical governance, Drugs and medical devices management, Research, Evidence-Based Medicine, Evidence-Based Healthcare, Health Technology Assessment (HTA), Pharmacovigilance, Drug Information, and public tender of drugs and medical devices. Every student must acquire competencies on these topics during the 4-year residency, translated in 240 university course credits (UCC) (1 UCC=30 hours). Seventy per cent of them are dedicated to practical activities directly in the hospitals while the remaining 30% are related to academic lessons. Students are assigned to at least two different hospital

pharmacies as residency sites and they should rotate in these sites during the internship. Each student have both an academic and a hospital senior supervisors (tutors).

At the end of the fourth year, the student must prepare and discuss a research thesis based on a specific professional topic. Despite this recent harmonization, every University still organises the SHP in different ways. Students often report discrepancies regarding the study plan and/or the fact that the academic scholarship is only granted in some SHP.

This erratic situation suggested to carry out a systematic overview of the Italian SHP to identify the priorities that must be faced in order to harmonize the educational pathway of hospital pharmacists. As the SHP situation is not clearly defined by official data, we designed this study to map the SHP situation using students' reports and perceptions.

## Methods

### Study design

We designed a pilot cross-sectional study to investigate the situation of students enrolled in Italian SHP. Data were collected over one month between September 2016 and October 2016. The study was promoted by a national network of SHP students and participants from 19 Universities were enrolled.

### Materials and subjects

This study used an online survey designed by a committee of SHP students, composed of 20 questions separated into sections, one for each key item of the residency program. The participation was done on a voluntary basis and the only inclusion criteria was to be SHP students. Following data were collected for every participant: demographics (location of SHP, study year), perception to fulfil the study plan, students' opinion on the quality of supervision by tutors, degree of working autonomy, economic compensation, if any, and number of publications.

We asked students to score their adherence perception to the study plan on 11 key topics reported in the national study plan using a 5-point Likert scale (i.e. 1=no, at all to 5=yes, completely). The 11 topics are listed in *table 1*. Likert scale was used also to score whether students felt to be enough and well supervised by their tutors and whether they felt to be autonomous without senior pharmacist's assistance during their working activities.

We asked students if they received an academic scholarship and how much was the pay grade. The academic scholarship is usually paid by the Universities, the Regional Government or, rarely, by a private foundation. When no academic scholarship was given, we asked how

**Table 1.** Scores of students' perception to fulfil the 11 topics of the study plan.

Topic	Description	Overall results				
		Mean	SD	25%	Median	75%
1	Distribution of drugs to patients	3.90	1.33	3.00	4.00	5.00
2	Monitoring appropriateness of drugs' use	3.56	1.32	2.00	4.00	5.00
3	Producing reports about drug use and the related economic sustainability	3.53	1.34	2.00	4.00	5.00
4	Pharmacovigilance and ward's inspection	3.22	1.42	2.00	3.00	5.00
5	Sterile and non-sterile compounding	3.18	1.49	2.00	3.00	5.00
6	Monitoring personalisation of therapy	3.14	1.47	2.00	3.00	4.25
7	Multidisciplinary meetings for pharmaceutical governance	2.88	1.43	2.00	3.00	4.00
8	Clinical trials	2.73	1.44	1.00	3.00	4.00
9	Health technology assessment	2.63	1.40	1.00	2.00	4.00
10	Vigilance on community pharmacy practice	2.49	1.50	1.00	2.00	4.00
11	Ethics committee	2.32	1.40	1.00	2.00	3.00
Total sum of scores		33.5	9.99	26	34	41

Mean, standard deviation (SD), median, 25<sup>th</sup> and 75<sup>th</sup> percentiles are reported for each topic included in the study plan which were included in the questionnaire. Descriptive statistics of total sum of scores is also reported.

students found the financial compensation needed to sustain everyday life expenses.

Regarding research activities, we considered as publications: conference abstracts, posters, reviews, book chapters, and original papers.

### **Technical information**

The national network of SHP students (ReNaSFO) (<https://retenazionale.sfo.wordpress.com/>) was the promoter of the study and spread the questionnaire by email and through social networks. The questionnaire was designed and distributed on the platform Google Forms®.

### **Statistical analysis**

Variables were reported as number and frequencies for categorical variables and as mean and standard deviation for continuous variables, when normally distributed. When distribution was not normal, continuous variables were described with median and interquartile range. We used the Chi-Squared test to compare the level of appreciation of tutors and the degree of independence acquired by students during their residency. We have defined two dependent variables of interest for linear regression: the total sum of scores of students' perception to fulfil the 11 key topics of study plan and the number of scientific publications. These were considered as dependent

variables in linear regression models. We supposed that year of study, localization of SHP, presence of academic scholarship and good supervision by tutors may impact on the variables of interest and they were considered as independent variables (predictors). Localization of SHP may account for possible geographical inequalities known to be present in Italy. Relationship with tutors and type of economic compensation may direct change the perception of students towards their residency. We decided also to include the year of enrolment because we speculated that older students may have a clearer perception of the quality of their educational program. Univariate linear regression was used to test if singular independent variables may predict the dependent variables. Results were further confirmed in a multivariate linear regression model containing all predictors that resulted statistically significant in univariate analysis. Key assumptions of linear regression were respected. Two-sided alternatives with a significance level  $P=0.05$  were considered for all the tests. All analyses performed using MiniTab version 17.1.0 (LEAD Technologies, Inc.) and R version 3.3.1.

## **Results**

172 out of an estimated total number of 258 SHP students (68%) participated to the survey and we obtained

**Table 2.** Characteristics of the study population.

Variable		N	%			
Participants		172	100			
Geographic location of SHP	North Italy	91	53			
	Centre Italy	37	22			
	South Italy	44	25			
Year of enrolment in SHP	First	20	12			
	Second	44	25			
	Third	57	33			
	Fourth	51	30			
Judgement on relationship with tutors (5=max, 1=min)	1	7	4			
	2	31	18			
	3	52	30			
	4	51	29			
	5	33	19			
Receive an academic scholarship	Yes	42	24			
	No	130	76			
Variable	Mean	SD	Median	IQR	Min	Max
Total sum of scores	33.5	9.99	24	26-41	11	55
Number of papers	2.95	3.68	2	0-4	0	21

Variables were reported as number and frequencies for categorical variables and as mean and standard deviation, median, interquartile range, minimum and maximum values for continuous variables.

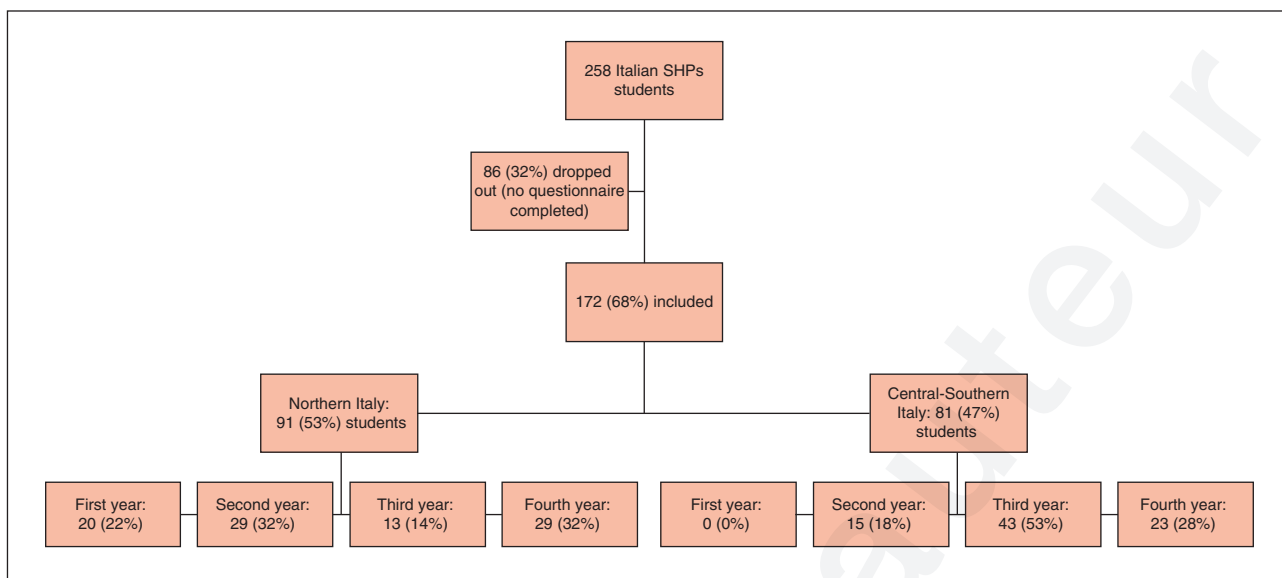
100% answers for all questions included in the survey. Characteristics of the study population are described in *table 2* and population flow-chart is showed in *figure 1*. Participants belonged to 19 universities and most of them attended the 2<sup>nd</sup>, 3<sup>rd</sup>, and 4<sup>th</sup> years of SHP (25%, 33% and 30% respectively). Only 11% of the first year students joined the survey. The cohort was evenly distributed between Northern and South-Central Italy (53% vs 47%). The localization of participating SHP and the number of students enrolled in each SHP are mapped in *figure 2*. Academic scholarship was granted only to 24% of students. Among 42 students receiving the academic scholarship, 36% declared to have a pay grade between 1,000 and 10,000 euros per year, 31% between 11,000 and 20,000 euros per year and 33% between 21,000 and 30,000 euros per year. Students who were not receiving the academic scholarship were forced to earn money besides their internship; 25% of them have found a job in health care centres funded by NHS, 20% were working in community pharmacies and 6% were employed outside the

pharmaceutical field. Twenty-two per cent of all students did not receive any salary at all.

Most students reported good relationship with their tutors: 30% judged sufficient tutors' involvement in their education, 29% adequate and 19% complete. The worst scores were mainly given by students working in community pharmacies (71%).

Seventy-nine per cent of the cohort felt to be independent in working activity after an adequate training, 18% worked only under the direct control of tutors, while a few (3%) could only observe senior pharmacists working. There was a significant direct correlation between the degree of students' independence and their perceived quality of tutoring (Pearson Chi-Square=7,047; DF=1; P=0,008).

*Table 1* shows scores given to each study plan's topics and the total sum of scores. Students felt to accomplish the three following topics: drugs distribution to patients (median score=3.9), monitoring appropriateness of drugs' use and producing reports about drugs' use and economic



**Figure 1.** Flowchart of the study population.

sustainability. The students felt to get poor education in: ethics committee, vigilance on community pharmacy, health technology assessment and clinical trials. The total sum of scores could be predicted by the allocation of an academic scholarship ( $F(1,172)=9.27$   $P=0.003$   $R^2=5.1\%$ ). The geographic location of SHP (either in North or Centre-South of Italy), the sufficient to good tutoring and the year of study also predicted the total sum of scores in univariate linear regression analysis (table 3). Results were further confirmed by multiple regression analysis. A significant regression equation was found ( $F(4,167)=10.80$   $P<0.001$ ). The results of the regression indicated the four predictors explaining about 21% of results. We observed that academic scholarship ( $\beta=3.46$   $P=0.05$ ), enrolment in a SHP of Central-Southern Italy ( $\beta=-3.88$   $P=0.016$ ), having a relationship with the tutors judged “sufficient to good” ( $\beta=7.24$   $P<0.001$ ) and the year of study ( $\beta=2.572$   $P<0.001$ ) were significant predictors of higher total sum of scores.

The median number of publications per student was two, but the distribution of results varied a lot. Fifty per cent of students did not publish any original research. The year of enrolment in SHP ( $\beta=1.76$   $P<0.001$ ) or the presence of academic scholarship ( $\beta=1.455$   $P=0.026$ ) were found to be significant and independent predictors of a higher number of publications also in a multiple linear regression model. A significant regression equation was found in this multivariate model ( $F(4,166)=13,88$   $P<0.001$   $R^2=5.06\%$ ). The geographic location of SHP and quality of the relationship with tutors were not significant predictors of the number of papers published by SHP students.

**Table 3.** Results of univariate linear regression analysis using total sum of scores as dependent variable.

Predictors	F(1.172)	P	R <sup>2</sup>
Receive an academic scholarship	9.27	0.003	5.1%
Geographic location of SHP(North vs Centre-South)	7.77	0.006	4.37%
Judgement on relationship with tutors (scores 1-2 vs 3-4-5)	14.42	<0.001	7.73%
Year of enrolment in SHP	5.53	0.02	3.11%

a: Dependent variable=total sum of scores. Results of the F-test, R squared and level of significance were reported for each independent variable predicting total sum of scores in univariate linear regression model.

Results were shared among participants using the Facebook page of ReNaSFO (<https://www.facebook.com/groups/specializzandifarmaciaospedaliera/>) and were presented during dedicated sections in the national congresses of the two main Italian scientific professional associations (Società Italiana di Farmacia Clinica e Terapia –SIFaCT-. – Società Italiana di Farmacia Ospedaliera e dei Servizi Farmaceutici delle Aziende Sanitarie –SIFO-).

## Discussion

In Europe, most of the studies investigated the educational pathway followed by pre-graduate students of pharmacy, reporting the organisation of their internship in a hospital pharmacy and their opinion towards the assessment



**Figure 2.** Location of participating SHP is represented with red pins. Number and percentage of response in the 6 main SHP are reported.

methods and the competencies acquired [5-9]. The PHARMINE project made a step forward in describing the educational programs for hospital pharmacists and it reports information about the role of hospital pharmacists in EU as described by higher education institutions [3]. On the contrary, our study considers a bottom up approach as it was fully designed and conducted by SHP students with the purpose to figure out the discrepancies between different Italian SHPs and to encourage a wider European recognition of hospital pharmacy training.

As it was entirely developed by students, the study presents some methodological limitations as the use of a non-validated questionnaire originally designed for our purpose. This choice was done to have an instrument that fully investigates the specific strengths and limitations of Italian SHP, but we could have only partially addressed some issues. The main strength of the study is that stu-

dents performed the study in complete autonomy and this granted a very important level of independence in highlighting some of the weaknesses of the SHP. This strength may be also interpreted as a limitation because being supported directly by the SHPs and very little by some professors or tutors. Another possible limitation of the study is the imbalance between the origins of participants, but a deeper investigation of this aspect revealed that the location of SHP was indeed a predictor of different perceptions of adherence to the study plan.

We studied, for the first time, the correlation between salary and students' perception to fulfil the study plan in Europe. We demonstrated that the presence of an academic salary predicts higher scores in adherence to the study plan and a higher amount of publications. It is well documented that financial problems can promote stress and influence the choice to start post-graduate

programs as reported for medical residents [10-12]. Cain *et al.* investigated this topic from the American perspective and supported administrators to ensure students not to be overburdened by the cost of their education [13]. Beyond the relationship between academic salary and publication, we observed that one in two students did not publish any work during the SHP period. To overcome this issue, we encourage the development of research programs as those successfully done by the American Accreditation Council for Pharmacy Education [14].

Finally, we described that a good student-tutor relationship improves students' working autonomy and that it may predict a higher perception of adherence to the study plan. As reported by United States (US) directors of pharmacy residency programs, a good relationship with a tutor is considered one of the most important subjective characteristics in defining a successful resident [15, 16]. On this topic, our results indicated that the relationship between students working in community pharmacies and tutors need to be improved because, as demonstrated by Clark *et al.*, the presence of an academic mentor is vital to maintain interest in academia among community pharmacy residents [17].

## Conclusion

We observed in Italian SHPs a lack of homogeneity in the perception of students to accomplish their study plan, in scientific production and different economic treatment. Higher adherence to study plan can be predicted by year of study, by SHP localization in Northern Italy, by the presence of an academic salary and a good relationship with tutor. Academic salary and year of study also predict the number of scientific papers published. Despite some limitations, this work explores the real-life situation of SHP from students' perspective and it may pave the way for similar studies in other European countries.

*Conflict of interest:* none of the authors has any conflict of interest to disclosure.

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