



ORIGINALS

Bilingual edition English/Spanish

2019 SEFH National Survey: service portfolio, care activities, education and research in Spain's hospital pharmacy departments

Encuesta Nacional de la SEFH-2019: cartera de servicios, actividad asistencial, docencia e investigación en los Servicios de Farmacia Hospitalaria en España

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Received 20 November 2020;

Accepted 1 December 2020.

DOI: 10.7399/fh.11611

How to cite this paper

Pérez-Encinas M, Lozano-Blázquez A, García-Pellicer J, Torre-Lloveras I, Poveda-Andrés JL, Calleja-Hernández MA; on behalf of SEFH's 2011-2019 Board of Trustees. 2019 SEFH National Survey: service portfolio, care activities, education and research in Spain's hospital pharmacy departments. *Farm Hosp.* 2021;45(1):32-40.

Abstract

Objective: To report on the results obtained from the 2019 SEFH National Survey regarding the service portfolio, care activities, training programs and research work of Spanish hospital pharmacy departments.

Method: In March 2019, SEFH designed and distributed a questionnaire containing 77 questions grouped into 8 domains to its 368 affiliated hospital pharmacy departments. The questionnaire included an additional section on the activities carried out in 2017 and 2018.

Results: The overall response rate was 54.3%. Sixty-nine percent of hospitals were public and 75% were general hospitals. A total of 88.6% of hospital pharmacy departments provided pharmaceutical care to inpatients, whereas 77.5% and 65% treated outpatients and ambulatory patients, respectively. Sterile formulations were prepared by 70.6% of pharmacy departments, while 12% measured drug levels in bodily fluids; 76.9% of hospitals with more than 1,000 beds prepared pharmacokinetic reports. In 2018, hospital pharmacies provided for a mean of 929 patients a month and 2,680 a year. The amount of formulations (sterile and non-sterile) prepared was 10,394,492, sterile formulations

Resumen

Objetivo: Dar a conocer los resultados referentes a la cartera de servicios y actividad asistencial, docente e investigación de la encuesta nacional de la Sociedad de Farmacia Hospitalaria (SEFH) 2019 en los Servicios de Farmacia Hospitalaria españoles.

Método: En marzo de 2019 se elaboró y envió un cuestionario con 77 preguntas agrupadas en ocho dimensiones a los 368 Servicios de Farmacia Hospitalaria registrados en la SEFH, con un bloque adicional sobre actividad desarrollada en 2017 y 2018.

Resultados: La tasa global de respuesta fue 54,3%. El 69% de los hospitales eran públicos y el 75% generales. El 88,6% de los Servicios de Farmacia Hospitalaria realizaban atención farmacéutica en pacientes ingresados, y el 77,5% y el 65% en pacientes externos y ambulantes, respectivamente. Se elaboraban preparados estériles en el 70,6% de los Servicios de Farmacia Hospitalaria. Se determinaban niveles de medicamentos en el 12% y se efectuaban informes farmacocinéticos en el 76,9% de los hospitales con ≥ 1.000 camas. Los Servicios de Farmacia Hospitalaria atendieron en 2018 a una media de 929 pacientes al mes

KEYWORDS

Hospital pharmacy department; Care activities; Service portfolio; Education; Research; Survey.

PALABRAS CLAVE

Servicio de farmacia hospitalaria; Catálogo de actividades; Portafolio de actividades; Docencia; Investigación; Encuesta.



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accounting for 62.6%. The average amount of clinical trials managed in hospitals with ≥ 500 and ≥ 1000 beds was of 186.2 and 421.8, respectively. The median of number of undergraduate tuition agreements between pharmacy departments and universities was 1 (IQR: 0-2); 21.5% of pharmacy departments had no agreements with any university. The mean number of undergraduate pharmacy students per hospital pharmacy was 4.12 (SD: 8,26). A total of 290 pharmacists were associate professors at some university. Fifteen percent of pharmacists held a certification from the Board of Pharmacy Specialties, 55.3% of them in the specialty of oncology. Hospital pharmacy departments employed a mean of 1.31(SD: 2,23) PhD holders. From those which reported the impact factor of their publications, 60% had an impact factor of zero while in 19.6% the impact factor was ≥ 10 .

Conclusions: Care of out-patients and medication compounding are increasingly the main activities performed in Spanish hospital pharmacies, while there is still considerable room for improvement in the area of clinical pharmacokinetics. Pharmacy departments are generally committed to training as a key activity, while scientific output is still limited despite the increase in the number of PhD pharmacist.

Introduction

Over the last two decades, hospital pharmacy, as a healthcare specialty, has undergone significant changes that have made it a highly scientifically and technically specialized area. Such progress has resulted from the broadening of the specialty's service portfolio and the incorporation of new competencies following the need of more specialized pharmaceutical care. This would not have been possible without the effort and resilience of hospital pharmacists. The broadening of hospital pharmacies' service portfolios required a consolidation of traditional activities such as drug selection and acquisition, dispensing, distribution, compounding and pharmacovigilance under a common legal framework¹.

Once all the different activities related with drug management were addressed, our profession had the insight to move toward a more patient-centered kind of care, at the beginning focusing more on outpatients², but later expanding its scope to inpatients³, and to patients admitted to the emergency room⁴ and to other departments, with the incorporation of pharmacists to the different clinical units in the hospital^{5,6}.

This extensive process has been possible thanks to a comprehensive educational program, which is the mainstay of professional development in the healthcare sector and an indispensable requirement for constant upskilling⁷. Moreover, the research work done at hospitals is one of the tools that best identifies their excellence. Together with the delivery of care and training, research plays a key role in the life of any hospital, particularly university hospitals^{8,9}.

The results of several surveys have been published in the last few years aimed at examining the current situation in specific areas of our profession. Such surveys include those administered by the Spanish Society of Hospital Pharmacists' oncology, emergencies and outpatient care working groups¹⁰⁻¹² and, at an international level, those regularly published by different pharmaceutical societies and associations¹³⁻¹⁷.

In 2014, SEFH conducted a national survey whose results were published in the so-called *Informe sobre la situación de los Servicios de Farmacia Hospitalaria en España: Infraestructuras, recursos y actividad*¹⁸ (Report on the situation of hospital pharmacy departments in Spain: infrastructures, resources and activity). The goal was to provide information on the status of hospital pharmacy departments (HPDs) and on the pharmaceutical profession in general, from the healthcare, technological, educational and investigational standpoints. A similar survey was administered in 2019 to determine the evolution of the situation since 2014¹⁹. The results of this survey in terms of the incorporation of new human and material resources, including technology and information systems (IT), and other general aspects related to HPDs, have recently been published²⁰.

The purpose of this article is to introduce the results of the 2019 SEFH survey on the situation of Spanish HPDs regarding their service portfolio, care activities and educational and research initiatives.

y 2.680 al año. El número de elaboraciones estériles y no estériles fue de 10.394.492, representando las estériles el 62,6%. La media de ensayos clínicos gestionados en los hospitales con más de 500 y 1.000 camas fue de 186,2 y 421,8, respectivamente. La mediana de convenios docentes de pregrado entre universidades y Servicios de Farmacia Hospitalaria era de 1 (rango intercuartílico: 0-2). El 21,5% de los Servicios de Farmacia Hospitalaria no tenía ningún convenio. La media de alumnos de grado de farmacia en los Servicios de Farmacia Hospitalaria fue 4,12 (desviación estándar: 8,26). Un total de 290 farmacéuticos eran profesores asociados en la universidad. El 15% de los farmacéuticos disponía de una certificación Board of Pharmacy Specialties, siendo el 55,3% de oncología. Los Servicios de Farmacia Hospitalaria contaban con una media de 1,31 (desviación estándar: 2,23) doctores. De los Servicios de Farmacia Hospitalaria que refirieron el factor de impacto acumulado de sus publicaciones, en un 60% era cero, y en el 19,6% ≥ 10 .

Conclusiones: La atención a pacientes no ingresados y la elaboración de medicamentos continúan avanzando en los Servicios de Farmacia Hospitalaria españoles, mientras que existe un importante margen de mejora en farmacocinética clínica. Se refleja un compromiso con la docencia, mientras que la producción científica es todavía limitada, a pesar del incremento de doctores en los servicios

Methods

In 2019, SEFH set about conducting a survey with a similar approach to the one they had administered four years earlier¹⁸. The new survey included 77 questions grouped into 8 domains. There was also a section of questions on the activities of HPDs in the course of 2017 and 2018, as defined in the HPD product and payment catalog published by SEFH²¹. The eight domains of the questionnaire were as follows: 1) characteristics of the hospital and the HPDs; 2) service portfolio; 3) human resources; 4) material resources; 5) information systems; 6) quality and accreditation; 7) research, 8) training.

The procedure used for sharing and distributing the survey, as well as the criteria on which the analysis of the data and the statistical analysis were based, were described in a previous article that focused on domains 1, 3, 4, 5 and 6, i.e. general characteristics of hospitals and HPDs; human resources, material resources, information systems; and quality, and accreditation, respectively²⁰. The present study centers on domains 2, 7 and 8, i.e. service portfolio, research, and training, respectively, in addition to the section dedicated to healthcare activities.

Results

Two hundred (54.3%) of the 368 HPDs invited to participate sent in their replies. Table 1 shows the distribution of participating hospitals classified

Table 1. Size, ownership and type of the hospitals participating in the 2019 SEFH National Survey

Variable	Nr of hospitals (%)
Distribution by number of beds	
< 100	33 (16.5)
101-250	65 (32.5)
251-500	51 (25.5)
501-1,000	38 (19.0)
> 1,000	13 (6.5)
Distribution by ownership	
Public	138 (69.0)
Private	62 (31.0)
Distribution by hospital type	
General	150 (75.0)
Surgical	10 (5.0)
Maternity	4 (2.0)
Psychiatric	11 (5.5)
Oncology	2 (1.0)
Rehabilitation	6 (3.0)
Geriatric/long-stay	17 (8.5)

by type of ownership, number of beds, and type of care offered. Sixty-nine percent of participating hospitals were publicly owned, most were in the 101-250 bed range, and 75% were general hospitals. Responses were obtained from hospitals across all Spanish autonomous regions, except for the cities of Ceuta and Melilla. Madrid was the region with most respondents, with 20.5% of the total, followed by Catalonia (11.5%), the Basque Country and Valencia²⁰.

Service portfolio and quality of care

Table 2 includes the survey's results in terms of the service portfolio offered by the different HPDs. As many as 99.4% of hospitals managed medications as off label use; 54.2% of HPDs said they drew up technical reports as part of their public procurement processes, although this figure was only 17% in private hospitals. A total of 81.7% of HPDs dispensed medications to outpatients, and 39.7% and 45.5% dispensed medications in healthcare centers and specialty clinics, respectively. Preparation of sterile formulations was common in 70.6% of HPDs (82.3% in public hospital HPDs), while non-sterile formulations were prepared by up to 79.8% of HPDs (95.4% in public hospital HPDs). A total of 90.3% and 94.5% of HPDs that prepared sterile formulations also prepared cytostatics and parental nutrition mixtures, respectively; 64.5% of all HPDs prepared ophthalmic formulations. Determination of drug levels was an activity performed by HPDs in 12% of the responding hospitals (in 17.5% of public and 3.2% of private hospitals). As regards pharmacokinetic and dose adjustment reports, they were drawn up by 34.1% of all HPDs, and by 76.9% of hospitals with more than 1,000 beds. Pharmacogenetics reports were drawn up by 4.3% of all hospitals, and by 23.1% of the larger centers.

Activities associated with drug safety, identification and reporting of adverse events (AEs) and of medication errors (MEs), as well as those related with the issuance of alerts regarding drugs and medical devices, were undertaken by HPDs in 36.9%, 59.6% and 87.8% of cases, respectively. Pharmacists were active members of the clinical safety committee in 55% of public hospitals.

Activities conducted as part of hospitals' service portfolio in 2018 are presented in table 3. The number of annual requests submitted to phar-

macy and therapeutics committees ranged from a mean of 7.4 in hospitals with less than 101 beds to 21.9 in larger centers. The mean number of outpatients treated monthly at HPDs was 929.1 (SD: 1628.5), ranging from 78.3 in hospitals with less than 101 beds to 4,914.5 in larger ones. Mean annual dispensations to outpatients were 15,258. This figure was higher in public than in private hospitals, and in hospitals \geq 500 beds than in smaller ones.

With respect to patients treated in non-surgical day hospitals, 82.2% were patients suffering from cancer and 7.2% were patients receiving biological therapies for immunomediated diseases. Table 4 shows the number of outpatients and day patients treated at HPDs classified by their conditions. A total of 14.3% of all outpatients sought treatment for a human immunodeficiency virus (HIV) infection; these were followed by patients treated with oral antineoplastics and patients with immunomediated conditions treated with biological therapies. Day hospitals treated 39,143 patients in the latter group, 26.94% of total.

The total number of formulations prepared was 10,394,492, of which 62.6% were non-sterile. The total number of cytotoxic preparations formulated and the number of cycles administered, considering that each cycle corresponds to one day of healthcare, are shown in figure 1, classified by the hospitals' type of ownership. The median number of cytotoxic admixtures prepared by each HPD was 9,492.2 (IQR: 2,534.6-21,673.2).

HPDs managed an annual average of 56.3 (SD: 23.3) drug-based clinical trials, with an average of 186.2 and 421.8 in hospitals with more than 500 and 1,000 beds, respectively; 38.5% of hospitals were not participating in any clinical trial at the time of taking the survey.

A total of 88.6% of HPDs provided pharmacological care (PC) to admitted patients, and 77.5% and 65% to outpatients and ambulatory patients, respectively. In terms of the number of patients benefiting from PC, 53.2%, 81.8% and 45.5% of HPDs administered PC to over 75% of their inpatients, outpatients and ambulatory patients, respectively. Figure 2 shows the percentage of patients benefiting from PC by size of hospital.

Education

Responding HPDs provided both undergraduate and specialized training programs. The mean number of agreements between HPDs and

Table 2. Service portfolio of HPDs, according to the information obtained from SEFH's 2019 National Survey

Characteristic	Total	Ownership		Hospital size (nr beds)				
		Public	Private	\leq 100	101-250	251-500	501-999	\geq 1,000
Clinical management of drug therapy (%)								
- Selection	97.3	97.7	96.7	93.5	98.2	98.2	100.0	92.3
- Acquisition	98.9	99.4	98.1	100.0	98.2	98.2	100.0	100.0
- Drug management in off label use	99.4	100.0	98.5	97.2	100.0	100.0	100.0	100.0
- Technical reports for public procedures	54.2	77.2	17.5	34.3	43.3	65.3	88.2	76.9
Dispensing (%)								
- Admitted patients	97.2	98.9	94.4	100.0	94.5	98.2	100.0	92.3
- Ambulatory patients	81.5	90.9	66.7	76.9	78.7	84.7	90.1	84.6
- Outpatients	81.7	89.6	69.1	84.3	76.9	81.8	90.1	84.6
- Health centers	39.7	56.0	-	20.4	32.1	56.4	61.5	46.2
- Specialty centers	45.5	57.1	-	8.3	38.5	66.4	77.1	76.9
- Extended care facility	40.0	45.1	32.0	25.9	30.3	53.3	60.3	61.5
Preparation (%)								
- Sterile	70.6	82.3	51.9	55.6	62.0	84.7	90.1	84.6
- Non-sterile	79.8	95.4	54.9	47.2	84.1	88.3	95.5	100.0
Pharmacokinetics (%)								
- Measurement of drug levels	12.0	17.5	3.2	0.0	5.4	21.9	26.7	30.8
- Pharmacokinetic reports	34.1	49.2	10.1	3.7	15.8	68.7	64.2	76.9
Pharmacogenetics (%)								
- Analysis	2.2	3.6	0.0	3.7	0.0	0.0	5.3	15.4
- Pharmacogenetic reports	4.3	6.0	1.6	3.7	0.0	2.9	13.4	23.1

Table 3. Activities included in HPDs' service portfolios during 2018, according to the criteria in SEFH's 2019 National Survey

Activitie, mean (SD)	Total	Ownership		Hospital size (nr beds)				
		Public	Private	≤ 100	101-250	251-500	501-999	≥ 1,000
Clinical management of drug therapy								
- Drugs requested from PTC	11.6 (8.7)	13.8	8.1	7.4	8.8	14.8	17.5	21.9
- Drugs approved by PTC	9.1 (7.7)	11.6	5.3	5.4	7.0	10.7	14.8	19.3
- Off-label indications	112.3 (304.0)	174.7	12.9	16.1	12.8	166.6	257.5	750.4
Dispensation to admitted patients								
- Validated medication lines	479,796 (1,062,851)	420,312.4	97,003.7	57,846.7	149,741.1	566,840.6	1,210,926.4	3,007,244.1
- Pharmaceutical interventions	9,290.8 (32,357.0)	14,074.5	1,677.4	1,031.1	2,778.6	19,140.4	19,795.3	24,897.4
Dispensation to outpatients								
- Outpatients/month	929.1 (1,628.5)	1,413.8	157.8	78.3	269.5	1,259.8	2,439.4	4,914.5
- Outpatients/year	2,680.5 (6,081.0)	4,105.0	413.2	516.2	717.3	2,878.7	7,954.7	13,784.6
- Dispensations/year	15,256.4 (21,210.1)	21,072.2	6,000.4	1,223.9	7,041.2	18,560.4	39,973.8	67,421.3
Dispensation to day hospital patients								
- Patients with IMDs on biologics	106.4 (90.8)	166.7	10.5	22.1	46.2	211.9	512.5	983.7
- Patients with IMDs on treatment	20.1 (83.2)	32.0	1.0	1.3	3.1	27.4	63.3	92.4
- Patients on chemotherapy	1,205.1 (6,970.0)	1,828.1	213.7	58.9	1,158.0	1,217.4	2,158.3	4,385.9
Preparation								
- Repackaging of drugs	147,360 (340,800)	208,958.3	49,325.5	29,363.5	62,714.8	185,259.9	520,094.1	968,459.7
- Non-sterile formulations	17,687.8 (165,427)	27,483.4	2,097.7	966.4	6,905.2	8,609.6	86,646.3	42,632.4
- Sterile formulations	10,557.9 (37,678.4)	16,592.2	954.1	1,883.8	2,401.0	19,003.2	35,095.3	56,886.7
Clinical trials								
- Ongoing clinical trials	56.3 (231.3)	86.9	7.4	2.0	13.5	34.4	186.2	421.8
- New clinical trials	11.5 (50.2)	18.0	1.2	0.9	0.3	7.5	34.6	123.5
- Dispensation of CRD	1,124.6 (6,265.8)	1,761.9	110.2	4.4	261.9	1,022.2	2,462.7	12,083.5
Pharmacokinetics								
- Measurement of drug levels	747.1 (13,512.1)	1,215.9	1.0	0.0	0.0	486.8	3,315.0	7,351.0
- Pharmacokinetic reports	552.2 (5,292.3)	890.4	13.9	0.9	1.4	615.6	1,840.7	6,032.0

CRD: clinical research drugs; IMD: immunomediated disease; ME: multiple sclerosis; PTC: Pharmacy and therapeutics committee; SD: standard deviation.

Table 4. Outpatients and ambulatory patients treated at HPDs during 2018

Condition	Nr patients		
	Outpatients	Ambulatory patients	Total
Human immunodeficiency virus	139,403		139,403
Hepatitis B	26,054		26,054
Hepatitis C	27,074		27,074
Multiple sclerosis	38,595	7,381	45,976
Arthropathy	62,161	18,150	80,311
Psoriasis	21,976	3,702	25,678
Inflammatory bowel disease	21,972	17,291	39,263
Growth hormone deficiency	13,480		13,480
Anemia arising from chronic renal failure	44,182	17,207	61,389
Post-chemotherapy anemia/neutropenia	49,150		49,150
Neoplasm	117,817	443,492	561,309
Pulmonary hypertension	5,108		5,108
Severe asthma	5,183	4,744	9,927
Severe dyslipidemia	6,199		6,199
Rare disease	2,751	1,744	4,495
Off-label/foreign	46,427		46,427
Other	172,360	25,478	197,838

Figure 1. Number of cytotoxic admixtures and chemotherapy cycles prepared in 2018 by HPD, according to hospital ownership.

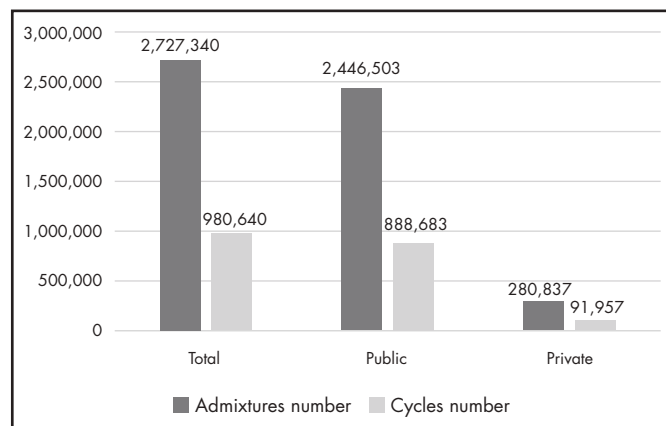
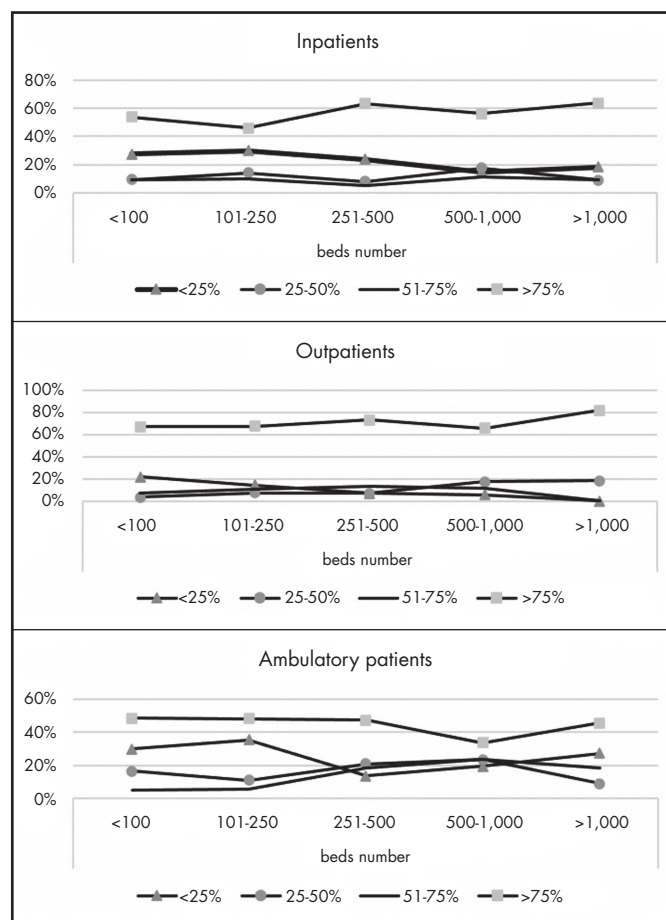


Figure 2. Percentage of patients benefiting from pharmaceutical care by size of hospital.



universities was 1.01 (SD: 0.96) with some variability across the different departments (median value: 1, IQR: 0-2). Specifically, 21.5% of HPDs had no agreements with any university and 27.5% had agreements with more than one. The mean number of undergraduate pharmacy students who were pursuing an internship in a HPD was 4.12 (SD: 8.26) In hospitals between 251 and 500 beds; in those between 501 and 1,000 beds, HPDs had a mean of 8.7 and 21.9 interns, respectively. At the same time, 290 hospital pharmacists held an associate professor at university, equivalent to a mean

of 0.8 (SD: 1.32) per HPD. Fifty-six percent of HPDs did not any associate professor at university.

A total of 29.7% of HPDs were accredited to hold specialized training programs, which were attended by a mean of 5.4 (SD: 2.4) residents per HPD. As many as 52.4% of HPDs accredited to offer residency programs had two tutors.

Two hundred-and-ninety-three pharmacists in all possessed a certification from the Board of Pharmacy Specialties (BPS), of whom the majority (55.3%) were certified for oncology, followed by pharmacotherapy and nutrition (19.1% and 18.0%, respectively). Certifications for mental health, infectious diseases, pediatrics and critical care were also reported.

Research

With regard to the participation of hospital pharmacists in research groups, 1,327 respondents said they participated in at least one group at local, national or international level. HPDs sponsored 248 research projects between 2016 and 2018, of which 4 were of an international nature.

A mean of 1.31 (SD: 2.23) HPD members had a PhD (1.9 in public and 0.3 in private hospitals). The mean number of PhDs per hospital size ranged between 0.7 in hospitals with less than 101 beds to 6 in those with more than 1,000 beds. In the last three years, 209 PhD dissertations had been defended, with a mean per HPD of 0.6 (SD: 1.5). Five hundred-and-eighty-eight final undergraduate year projects and 223 master's theses were completed.

As far as scientific output is concerned, 28.8% of HPDs answered the question on the cumulative annual impact factor (IF) of their 2018 publications. Of these HPDs, 60.7% reported an IF of 0 and 19.6% reported an IF ≥ 10 ; 25.8% of hospitals > 250 beds and 96.4% of those < 250 beds reported an IF of 0.

Discussion

In 2014, SEFH conducted the first survey addressed to the heads of Spanish hospital HPDs. The survey provided insight into the situation of HPDs at a national level¹⁸.

The second survey, conducted in 2019, was completed by over half of Spain's HPDs, which is significantly higher than the response rates obtained by surveys administered by SEFH's European and the American counterparts, which were in the region of only 30%^{14,15,17,22}. Response rates in the section dedicated to quantitative care activities performed between 2017 and 2018 were lower than those for the questions relative to pharmaceutical validation and intervention in admitted patients but similar to those in the sections on drug selection, quantification of care activities in outpatients, compounding, and pharmacokinetics, among others. Moreover, in the section devoted to research, specifically regarding the questions related to scientific output, the response rate was below 30%.

The HPD's service portfolio includes a series of activities around patients and their medications intended to make sure that every patient receives the treatment that is best suited to their clinical needs. Drug selection, the first step in the hospital's medication management system, is one of greatest responsibilities of the hospital pharmacist as it can significantly influence the quality of therapy²³. The survey revealed that drug selection was an activity performed by virtually all HPDs in our healthcare system. At the same time, at least one pharmacist participated in the pharmacy and therapeutics committees (PTCs) of all public hospitals and in nine out of ten of private hospitals. These findings are similar to those obtained by Durán *et al.*²⁴, whose analysis of the situation of PTCs at an international level showed a virtually universal participation of hospital pharmacists in such committees. In the same vein, EAHP's 2016 survey also showed that in 86% of hospitals surveyed at least one hospital pharmacist participated in the PTCs or its equivalent in each country⁵.

According to our survey, the number of drugs evaluated annually by PTCs was directly proportional to the size of the hospital they belonged to, but the proportion of drug evaluations resulting in the inclusion of the drug in the patients' treatment plan did not appear to be correlated with the size of the hospital. Moreover, the percentage of drugs approved by a PTC

obtained in SEFH's survey was similar to that found by Puigventós Latorre *et al.* in a study carried out 10 years earlier²⁵. Another study, carried out with oncological patients, showed a similar proportion of approved and rejected drugs²⁶. This seems to point to a certain uniformity in the evaluation and decision-making criteria of the different HPDs in Spain, probably following publication of the reports by the SEFH's GENESIS (Group of new drugs, standardization and investigation into drug selection) working group²⁷.

Furthermore, the HPDs' participation in drafting technical reports for public procurement processes was limited to one in every two hospitals, larger hospitals being those where hospital pharmacists played a greater role. However, it must be noted that medication tendering processes are normally managed centrally by the different autonomous regions, which means that hospital pharmacists may not always be directly involved.

It is not uncommon for patients to be treated for off-label indications, especially in pediatrics²⁸ and oncology²⁹. The SEFH survey reported over 150 reports by hospital pharmacists for off-label uses of a drug; if only the larger hospitals are considered, the number of reports soars to 700.

Dispensing of drugs to inpatients is part of the service portfolio of the majority of HPDs, together with validation of treatments and pharmaceutical interventions which, according to the survey, interventions were required for 2% of medication lines. Several studies have looked at the impact of pharmaceutical interventions in the case of polymedicated patients and have demonstrated a reduction in medication-related problems³, and even a decrease in hospital admissions. One such study is a metaanalysis that looked into the role of hospital pharmacists, where 55% of studies found a statistically significant reduction in hospital readmissions, ranging from 3.3 to 30%³⁰. Considering the high number of prescriptions dispensed in every hospital, and the substantial resources involved, it is essential to develop the tools required to facilitate treatment validation^{31,32}.

Care of and dispensation to non-admitted patients were performed by 8 in every 10 HPDs, with outpatients accounting for over 75% of beneficiaries of those tasks in over 60% of HPDs. Our data stand in sharp contrast to those reported by studies carried out in the United States, where over half of the HPDs analyzed did not include these activities in their service portfolio, and 18% had the accreditation required to perform them¹⁷. Although the number of outpatients treated at HPDs varied significantly depending on the type of ownership and the size of each hospital, some similarities were observed regarding the number of times patients visited the pharmacy (around 5 times a year). It was also observed that treatment for HIV was the most frequent reason for such visits, followed by cancer treatment and biological therapies, showing an increase with respect to 2014 of 23.7%, 82.7% and 41.7%, respectively¹⁸.

There was also a significant increase as compared with 2014 in the number of sterile formulations prepared, which rose by over 60%¹⁸ as a result of the compounding of cytotoxics and other parenteral admixtures and ophthalmic preparations. The latter were prepared by 7 of every 10 HPDs and by over 90% of HPDs in large hospitals. This shows that the pharmaceutical industry is currently not meeting the needs of all ophthalmological patients, making it necessary for many more HPDs to prepare these medications in aseptic conditions. The sheer amount and variety of preparations was such that in 2018 a consensus document was drawn up between SEFH and the Spanish Ophthalmological Society listing the medications for which off-label indications are backed by scientific evidence and providing a series of general recommendations to prepare them. This has gone a long way toward bridging the many therapeutic gaps that still exist in this realm³³.

The survey indicated that approximately 55 million medication doses were repackaged in 2018, which is in line with the figure for 2014¹⁸. It is important for the pharmaceutical industry and the healthcare authorities to become aware of the burden that unit-drug repackaging represents for HPDs so that the necessary steps are taken to address the problem.

The survey revealed that HPDs were increasingly involved in the management of the clinical trials, whose number doubled with respect to 2014¹⁸. With a total number of over 20,000 clinical trials, it is essential to make sure that HPDs are provided with the time and the resources required to undertake their research. In a study dedicated to evaluating the complexity of clinical trials from the perspective of an HPD, Calvin *et al.* assigned a score to each trial depending on the resources it required and the level of risk it

entailed. They observed that the factors that most statistically significantly contributed to complexity are the actual preparation of drug in investigation within the HPD and the number of professionals involved, determining that approximately half the studies performed in their department were of intermediate complexity³⁴. Development of such scores could be a sound method to estimate the research workload in an HPDs based on the number of studies undertaken. It was striking in this context to find out that despite the complexity involved in management of the clinical trials, HPDs reported poor IT access with just one in every five possessing appropriate research-specific software¹⁹.

Although monitoring the concentrations of certain medications in biological fluids is a recommended practice to establish the optimal dose for each patient, the survey showed that most HPDs were not involved in such monitoring. In fact, only 12% of HPDs monitored medication levels in biological fluids and nearly 35% prepared pharmacokinetic and dose adjustment reports, which was only slightly higher than in 2014¹⁸. A comparison of these results with those of ASHP surveys²² shows a considerable difference, as pharmacists in over half of US hospitals were entitled to request drug level and other laboratory tests, with vancomycin being the most commonly tested medication.

Pharmacogenetics was scarcely implemented in Spanish HPDs, with fewer than 5% of HPDs doing any work in that area. This is in line with the situation in the US where nearly 90% of HPDs do not carry out any pharmacogenetic work.

Several institutions and organizations have recognized that HPDs should play a leading role in any program introduced to ensure drug safety^{35,36}. In our country, SEFH's so-called 2020 initiative emphasizes the important role pharmacists must play in managing drug safety³⁷. SEFH's 2014 survey revealed the involvement of hospital pharmacists in activities related to drug safety with more than 9 out of 10 hospitals operating some kind of system to report adverse events and issue alerts¹⁸. The 2019 survey elicited more specific answers regarding these activities and showed that only 60% of HPDs systematically recorded medication-related errors, and that pharmacists were members of the hospital's clinical safety committee in just over half of responding hospitals. According to the 2007-2011 report on the implementation of safe drug use practices in Spanish hospitals³⁸, reporting of medication errors stood out as one of the key areas for improvement.

The 2019 survey paid special attention to the different levels of education and training within HPDs, i.e. undergraduate and postgraduate education and ongoing training. In Spain, all pharmacy graduate degree programs are required to include at least one supervised practice module to be performed either in a community pharmacy or an HPD under the supervision of a professional tutor. About 80% of HPDs had an agreement with at least one university to help them with their educational program, but the number of hospital pharmacists holding an associate professor position at a university was still low, although the number had increased over the previous five years¹⁹.

As regards the 4-year-long pharmacy residency program (FIR), one in every three HPDs was accredited to deliver the required training. Each of these HPDs had a mean of 5.4 residents and over half of them had at least 2 tutors. An analysis of the US model, where the residency program lasts 2 years, the first one consisting of generic training (PGY1) and the second (voluntary) year allowing residents to specialize in a specific domain (PGY2), shows that 32.7% of staff pharmacists completed the first year and 11.2% the second. These percentages exceeded 60% and 30%, respectively, in hospitals with over 600 beds²². Although SEFH's 2019 survey did not provide information on the number of specialist pharmacists in Spain that acquired their specialist status after completion of the FIR program, taking into consideration that the program was introduced in the 1980's as a prerequisite to become a hospital pharmacist, it is to be expected that virtually all practicing hospital pharmacists have gone through it. The picture in Europe is fairly heterogeneous. While residency programs in France, Italy, Belgium, and the Netherlands are compulsory by law, other countries such as the UK, Germany, and Austria, among others, do not offer residency programs as such. What these countries offer is ongoing pharmacy practice programs addressed to pharmacists who have completed their postgraduate training⁹.

Ongoing training and continuous professional development are essential for any healthcare provider as they are the only way in which they can hone their previously-acquired skills and learn new ones to be able to meet the ever-evolving demands of their job. SEFH's 2015-2019 Strategic Program made specific reference to knowledge management, which was to be implemented through such activities as an ongoing professional development program and training courses aimed toward BPS certification. The 2019 survey showed that about 300 hospital pharmacists were BPS-certified, which the 15% of the total number pharmacist, and twice the amount obtained in 2014¹⁸. Although most respondents were BPS-certified in oncology care and nutrition support, higher numbers of pharmacists were also BPS certified in pharmacotherapy, mental health and, to a lesser extent, in pediatric, infectious diseases and critical care. In a recent study, Pedersen *et al.* found that 29.4% of HPDs in the United States had at least one BPS-certified pharmacist, and 79.7% of HPDs had at least one pharmacy technician holding a PTCEB (Pharmacy Technician Certification Board) certification.

Lastly, the interest of hospital pharmacist in research was evidenced by the increase of the number of PhD in each responding HPD, which increased by 36%, with respect to 2014. Participation of HPD members in directing PhD dissertations, master's theses and final undergraduate year projects experienced an even greater increase¹⁸. HPDs also seem to be more willing to become involved in multidisciplinary research groups, with hospital pharmacists actually leading nearly 250 of such projects over a three-year period. However, this high interest and active participation have not yet reflected themselves in the quantity and quality of publications by HPDs probably because of the time that must elapse between the start of a project and publication of its first results. In any case, the cumulative IF of HPD publications has increased by nearly 20% as compared with 2014¹⁸.

The results of the survey examined in this paper should be interpreted in the light of a few limitations, the most important of which are the survey's voluntary nature and its length and complexity, especially the section devoted to healthcare activities. Some of the questions were not easy to understand and respondents had to figure them out by themselves. Moreover, one in every four HPDs were in monographic hospitals, and some of the questions were not relevant to their specific nature. Although the questions under each of the eight domains made explicit reference to the year 2019, questions in the healthcare activities section referred to 2017 and 2018, which was a different time period. Despite the foregoing, the sample size obtained was large enough to draw valid conclusions and make founded recommendations for improvement. Having said this, comparisons with the 2014 survey must be taken with caution as the universe of HDPs examined in 2014 was different from that in the 2019 questionnaire.

In summary, the data provided by the 2019 survey suggest that Spanish HPDs pay a great deal of attention to non-admitted patients, with very significant year-on-year increases and a special emphasis on patients with cancer and those receiving biological therapies. The survey shows an increase in compounding activities as well as an insufficient involvement of HDPs in clinical pharmacokinetic and pharmacogenetic activities. HPDs are clearly committed to education while in the realm of research, scientific output is still rather limited despite the increase in the number of PhDs working in the HDPs and the high amount of PhD theses directed. SEFH has vouched to regularly update this information to stay abreast of the evolution of the hospital pharmacy profession in Spain.

Funding

This study was funded by the Spanish Society of Hospital Pharmacists.

Acknowledgements

The authors would like to thank the different hospital pharmacy department heads who agreed to take the survey as well as SEFH's regional representatives for their help in making this project known to as wide an audience as possible. Our thanks also go to SEFH's staff members for their continuing support and valuable work.

Conflict of interest

No conflict of interest.

Contribution to the scientific literature

This article provides information about the overall situation of Spanish hospital pharmacy departments regarding their service portfolio and care activities, and the stage of development of their educational and research resources. Despite the existence of questionnaires dedicated to specific aspects of hospital pharmacy services, no questionnaires were available in our country that provided a general overview of such services.

The questionnaire presented in this paper provides a quantification of hospital pharmacy activities according to the products and services defined as essential both by the profession and by the Spanish Society of Hospital Pharmacists. This basic analysis should inspire the design and planning of annual surveys that include the different domains of our specialty, along the lines of what has been done by the European Association of Hospital Pharmacists and the American Society of Health-System Pharmacists. This would not only allow us to benchmark our performance but also to obtain the knowledge required to ensure the advancement of our profession.

Appendix 1. List of participating HPDs

Andalucía: Complejo Hospitalario de Especialidades Juan Ramón Jiménez (Huelva), Complejo Hospitalario Regional Reina Sofía (Córdoba), Hospital Universitario Virgen Macarena (Sevilla), Hospital Comarcal Valle de los Pedroches (Pozoblanco), Hospital Universitario de Puerto Real (Puerto Real), Hospital Universitario de Valme (Sevilla), Agencia Sanitaria Hospital Costa del Sol (Málaga), Agencia Sanitaria Hospital de Poniente (Almería), Hospital Universitario Torrecárdenas (Torrecárdenas), Hospital Dr. Pascual (Málaga), Hospital San Juan de Dios del Aljarafe (Sevilla), Centro Asistencial San Juan de Dios (Málaga), Hospital Mediterráneo Grupo HLA (Almería), Hospital QuirónSalud (Córdoba), Hospital Vithas Xanit Internacional (Benalmádena), Hospital Universitario de Jaén (Jaén), Hospital Punta de Europa (Algeciras), Hospital Santa Ana (Motril), Hospital Cruz Roja Española (Córdoba), Agencia Sanitaria Alto Guadalquivir (Andújar). **Aragón:** Hospital Maz (Zaragoza), Clínica Montpelier (Zaragoza), Hospital San Juan de Dios (Zaragoza), Centro Neuropsiquiátrico N. Sra. del Carmen (Zaragoza), Hospital Viamed Montecana (Zaragoza), CRP Nuestra Sra. del Pilar (Zaragoza), Royo Villanova (Zaragoza), Hospital Real de Nuestra Sra. de Gracia (Zaragoza), Hospital Ernest Lluch (Calatayud), Hospital General de la Defensa (Zaragoza), Hospital Universitario Miguel Servet (Zaragoza), Hospital de Jaca (Jaca), Hospital San José (Teruel), Hospital Clínico Universitario Lozano Blesa (Zaragoza). **Cantabria:** Hospital Comarcal Sierrallana (Torrelavega), Hospital Universitario Marqués de Valdecilla (Santander). **Castilla y León:** Complejo Asistencial de Ávila (Ávila), Complejo Asistencial de Zamora (Zamora), Hospital Universitario de Salamanca (Salamanca), Complejo Asistencial de Soria (Soria), Clínica Santa Teresa (Ávila), Hospital Comarcal Santiago Apóstol (Mirandas de Ebro), Hospital El Bierzo (Ponferrada), Hospital Clínico Universitario de Valladolid (Valladolid). **Castilla-La Mancha:** Hospital Universitario de Guadalajara (Guadalajara), QuirónSalud (Ciudad Real), Complejo Hospitalario Universitario de Albacete (Albacete), Hospital Nacional de Paraplégicos (Toledo), Hospital Virgen de la Luz (Cuenca), Hospital General de Almansa (Almansa), Hospital General La Mancha Centro (Alcázar de San Juan), Hospital General de Tomelloso (Tomelloso), Hospital General Universitario de Ciudad Real (Ciudad Real). **Cataluña:** Hospital Sagrat Cor (Barcelona), Mutual Midat Cyclops (Barcelona), Hospital Sociosanitario Mutuam Güell (Barcelona), Hestia Palau (Barcelona), Hospital Clinic Barcelona (Barcelona), Corporació Salut Maresme i la Selva (Barcelona), Hospital Dos de Maig (Barcelona), Hospital Universitario de la Santa Creu i Sant Pau (Barcelona), Nou Hospital Evangèlic (Barcelona), Hospital Universitario Vall d'Hebrón (Barcelona), Hospital del Mar (Barcelona), Parc Sanitari Sant Joan de Deu (Sant Boi de Llobregat), Clínica Girona (Girona), Hospital de Sant Celoni (Sant Celoni), Institut Català d'Oncologia (Hospital de Llobregat), Badalona Serveis Assistencials (Badalona), Hospital de Terrassa (Terrassa), Hospital Universitari Arnau de Vilanova (Lleida), Hospital Mútua Terrassa (Terrassa), Hospital de Mataró (Mataró), Fundació Hospital Esperit Sant (Santa Coloma de Gramenet), Hospital Sant Joan de Déu (Esplugues de Llobregat), Hospital

Universitario de Bellvige (Hospitalet de Llobregat). **Comunidad de Madrid:** Hospital Universitario de Torrejón (Torrejón de Ardoz), Hospital Universitario Moncloa (Madrid), Hospital Fraternidad-Muprespa (Madrid), Fundación Vianorte Laguna (Madrid), Hospital Universitario La Paz (Madrid), Hospital Universitario La Princesa (Madrid), Hospital Universitario Infanta Sofía (Madrid), Hospital Fuensanta (Madrid), Hospital Universitario Puerta de Hierro (Madrid), Hospital Universitario Severo Ochoa (Leganés), Hospital Universitario de Móstoles (Móstoles), Hospital del Henares (Coslada), Hospital Central de la Defensa (Madrid), Hospital Universitario Infanta Leonor (Madrid), Hospital Universitario Sanitas La Moraleja (Madrid), Hospital Universitario Fundación Jiménez Díaz (Madrid), Hospital Clínico San Carlos (Madrid), Hospital Universitario 12 de octubre (Madrid), Hospital del Tajo (Madrid), Centro Penitenciario Madrid VII (Madrid), Hospital Infantil Universitario Niño Jesús (Madrid), Hospital Virgen de la Poveda (Villa del Prado), Hospital General Universitario Gregorio Marañón (Madrid), Hospital Universitario Príncipe de Asturias (Alcalá de Henares), Hospital Universitario de Fuenlabrada (Fuenlabrada), Hospital de la Zarzuela (Madrid), Hospital Universitario Fundación Alcorcón (Alcorcón), Hospital HM Torrelodones (Torrelodones), Hospital Guadarrama (Guadarrama), Hospital Central de la Cruz Roja (Madrid), Hospital La Fuenfria (Cercedilla), Casa de las Hermanas Hospitalarias del Sagrado Corazón de Jesús (Ciempozuelos), Hospital Universitario Infanta Cristina (Parla), Hospital José Germain (Leganés), Hospital Virgen del Mar (Madrid), Hospital El Escorial (El Escorial), Hospital QuirónSalud San José (Madrid), Hospital Universitario Ramón y Cajal (Madrid), Hospital Universitario del Sureste (Arganda del Rey), Hospital Universitario de Getafe (Getafe). **Comunidad Valenciana:** Hospital Intermutual de Levante (Valencia), Hospital Universitario de Vinalopó (Elche), Hospital Universitario Torrevieja (Torrevieja), Hospital Clínico Universitario de Valencia (Valencia), Hospital Universitario de Sant Joan (Alicante), Sociosanitario La Florida (Alicante), Hospital de La Magdalena (Castellón de la Plana), Hospital de Sagunto (Sagunto), Hospital Universitario Dr. Peset (Valencia), Hospital San Carlos de Denia Grupo HLA (Denia), Lluís Alcanyis (Xàtiva), Hospital General Universitario de Castellón (Castellón de la Plana), Hospital Francesc de Borja (Gandía), Vithas Perpetuo Internacional (Alicante), Hospital Psiquiátrico Penitenciario de Alicante y Centro Penitenciario (Alicante), Hospital General Universitario de Elche (Elche), Hospital Universitario y Politécnico La Fe (Valencia), Hospital Clínica Benidorm (Benidorm), Hospital La Malvarrosa (Valencia), Hospital General Universitario de Alicante (Alicante), Hospital Arnau de Vilanova (Valencia). **Extremadura:** Complejo Hospitalario Universita-

rio de Badajoz (Badajoz), Complejo Hospitalario de Cáceres (Cáceres), Hospital Virgen del Puerto (Plasencia). **Galicia:** Complejo Hospitalario Universitario de Pontevedra-Hospital do Salnés (Pontevedra), Hospital Álvaro Cunqueiro (Vigo), Complejo Hospitalario de Santiago de Compostela (Santiago de Compostela), Hospital Arquitecto Marcide (El Ferrol), Hospital Virxe da Xunqueira (A Coruña), Complejo Hospitalario Universitario de Ourense (Ourense), Centro Médico El Carmen (Ourense), Hospital Universitario Lucus Augusti (Lugo). **Islas Baleares:** Hospital de Llevant (Porto Cristo), Hospital Can Misses (Elvissa), Hospital Comarcal de Inca (Inca), Hospital Universitario Son Espases (Palma de Mallorca), Hospital Manacor (Manacor). **Islas Canarias:** Dr. José Molina Orosa (Arrecife de Lanzarote), Hospital Universitario Dr. Negrín (Las Palmas de Gran Canaria). **La Rioja:** Hospital Universitario San Pedro (Logroño). **Comunidad Foral de Navarra:** Residencia Mayores de San Adrián (San Adrián), Residencia Casa Misericordia (Pamplona), Centro San Francisco Javier (Pamplona), SF Sociosanitario del Servicio Navarro de Salud (Pamplona), Clínica Arcángel San Miguel (Pamplona), San Juan de Dios Residencia Landazabal (Burlada), Clínica Psiquiátrica Padre Menni (Pamplona), Residencia La Vaguada (Pamplona), Hospital Reina Sofía Tudela (Tudela), Complejo Hospitalario de Navarra (Pamplona). **País Vasco:** Clínica La Asunción (Tolosa), Hospital Universitario Basurto (Bilbao), Hospital Zamudio (Zamudio), QuironSalud Bizkaia (Erandio), HUA Xagorritxu (Vitoria), Hospital San Eloy (Barakaldo), Hospital Alto Deba (Arrasate-Mondragón), Hospital de Zumárraga-osi goierri Alto Urola (Zumárraga), Santa Marina (Bilbao), Clínica Imaq Zorrotzaurre (Bilbao), Fundación Onkologikoa (San Sebastián), OSI Bidasoa Hospital (Hondarribia), Hospital de Mendaro (Mendaro), Hospital Ricardo Bermingham (San Sebastián), Hospital de Galdakao-Usansolo (Galdakao), Hospital Urduliz-Alfredo Espinosa (Urduliz), Hospital San Juan de Dios Mondragón (Mondragón), Hospital Universitario Donostia (Donostia- San Sebastián), Hospital Gorliz (Gorliz), Hospital Cruz Roja (Bilbao), Hospital San Juan de Dios (Santurtzi), Hospital Psiquiátrico de Álava (Vitoria-Gasteiz). **Principado de Asturias:** Fundación Hospital de Jove (Gijón), Hospital Universitario Central de Asturias (Oviedo), Clínica Asturias (Oviedo), Hospital Begoña de Gijón (Gijón), Instituto Oftalmológico Fernández-Vega (Oviedo), Hospital Universitario de Cabueñes (Gijón). **Región de Murcia:** Hospital Clínico Universitario Virgen de la Arrixaca (Murcia), Hospital Nuestra Señora del Perpetuo Socorro (Cartagena), Hospital Universitario Rafael Méndez (Lorca), Hospital Los Arcos Mar Menor (San Javier).

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