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Healthcare professionals' perceptions related to the provision of clinical pharmacy services in the public health sector of Mexico: a case study

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ABSTRACT

Background: In Mexico, the *Modelo Nacional de Farmacia Hospitalaria* (MNFH, or National Hospital Pharmacy Model), published in 2009, mainly aims to promote the provision of clinical pharmacy services in private and public hospitals. However, there is little scientific documentation about the quality of these services.
Objectives: To explore healthcare professionals' perceptions related to the quality of clinical pharmacy services provision.
Methods: A case-study based on a qualitative approach was performed at the pharmaceutical services unit at a public hospital located in Mexico City, which operates under the administrative control of the Ministry of Health. Donabedian's conceptual model was adapted to explore health care professionals' perceptions of the quality of clinical pharmacy services provision. Semi-structured interviews were carried out with pharmacists, physicians and nurses and then transcribed and analyzed via discourse analysis and codification techniques, using the software package Atlas. ti.
Results: Limitations in pharmaceutical human resources were identified as the main factor affecting coverage and quality in clinical pharmacy services provision. However, the development in pharmacy staff of technical competences and skills for clinical pharmacy service provision were recognized. Significant improvements in the rational use of medicines were associated with clinical pharmacy services provision.
Conclusions: The perception analysis performed in this study suggested that it is necessary to increase pharmacy staff in order to improve interprofessional relationships and the quality of clinical pharmacy services provision.

1. Introduction

Quality is a desirable and important attribute for healthcare services. Donabedian identified two principal dimensions for the study and analysis of the quality of healthcare services: the *technical dimension*, referring to "the application of science and medical technologies in such a way that it yields the maximum of benefits for the health of patients without increasing risk"; and, the *interpersonal dimension*, defined as "the attachment to socially defined values and norms that rule individual interaction and to the ethical dictates of healthcare-related professions".[1] Also he identified three types of approach or analysis, "structure, process and result", in which compliance with *structural* criteria is a determinant factor for the attention given to *process* and this is also a determinant for the *results* obtained.[1] To promote continuous improvement, other points of view initially applied to the industrial setting must be constantly incorporated to healthcare quality evaluation.[2,3]

A fundamental aspect of healthcare service quality is the rational use of medicines (RUM), given that, while medicines play a crucial role in the treatment or prevention of disease, they can be a health risk when used incorrectly, which can lead to serious economic and human consequences.[4] An important strategy for promoting RUM is the implementation and operation of clinical pharmacy services (CPS), comprising the activities performed by clinical pharmacists for the improvement of healthcare, mainly in terms of the use of medicines.[5] Some components of CPS are *pharmacotherapy follow-up*, which involves the continuous review and validation of medication with the aim of preventing and controlling adverse drug reactions (ADR) through

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pharmaceutical interventions (PI); *pharmacovigilance*, involving the continuous supervision of suspected ADR; and *health education*, consisting in the provision of proper medicines use-related information and health promotion activities.[6] CPS have been classified as forming part of *Pharmaceutical Care*, which has been defined as "the responsible application of pharmacotherapy with the objective to reach concrete results that improve the patient's quality of life".[7–10] The implementation and operation of CPS have been recommended since they have been demonstrated to generate economic savings at different levels and in different specialties of healthcare.[11–13]

The Mexican health system is divided into two sectors: the public and the private, with the Ministry of Health (*Secretaría de Salud*) acting as the stewardship entity.[14] The public sector is subdivided into two parts: 1) the provision of health services for the formally employed population (41%) through social security institutions [*Instituto Mexicano del Seguro Social* (Mexican Institute for Social Security), *Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado* (Institute for Social Security and Services for State Workers), *Servicios de Salud de Petroleos Mexicanos* (the health services division of Pemex, the State-owned petroleum company), and other special systems for the armed forces], all of which are financed by varying combinations of employees, employers and the State; and, 2) the provision of health services for the non-formally employed population (43.5%), mainly provided by the Ministry of Health and financed by State and small contributions from service users.[14,15] The latter system of healthcare provision has benefited from the *Sistema de Protección Social en Salud* (or the System of Social Protection in Health), which is also known as "*Seguro Popular*", a financing policy which was implemented by the 2003 healthcare reform and promotes universal coverage in the country.[16] The private sector provides healthcare principally for the section of the population that has the capacity to pay for healthcare and which lies mainly outside affiliation to the different forms of institutional health service provision described above (14%); this sector has expanded through ambulatory care provision at doctor's offices attached to private pharmacies.[14,15,17]

In context described above, ambulatory and hospital pharmacy practice in Mexico still face many challenges, due to the fact that the implementation and operation of pharmacy services can be different between -and within- the institutions comprising the healthcare system. The academic formation of pharmacists oriented around clinical roles is growing but still limited in pharmacy faculties (whose curricula are formally based on the industrial production of medicines and chemical analysis). Furthermore, there is a lack of information on the pharmacists that perform, both totally and partially, clinical roles in the institutions and services of the health system, as well as their work conditions and remuneration.[18,19]

In the context of the lack (or limitation) of CPS practice in ambulatory and hospital settings, the incorrect use of medicines in both has been documented.[20] This led, in 2009, the Ministry of Health to publish the *Modelo Nacional de Farmacia Hospitalaria* (MNFH, or National Hospital Pharmacy Model), which promotes the implementation and operation of CPS in public and private hospitals, an initiative which would require the involvement of clinical pharmacists.[21] This model is based on a national normative framework.[22–24] However, the implementation and operation of CPS in hospitals is still under development and several barriers have been identified in the public sector: the lack of pharmacist empowerment; the low levels of acceptance by administrative staff and healthcare professionals; financial problems; the absence of internal regulations that facilitate the inclusion of pharmacists; and the lack of methods with which to evaluate pharmacy services (information provided in the presentation *The Case of Regional Hospitals of High Specialty*, at the 4th International Pharmacovigilance Conference, Puebla, Pue, Mexico, 2010). In this context, the quality analysis of CPS in terms of its technical and interpersonal dimensions is of vital importance for its continuous improvement.

A valuable resource in the study of healthcare services quality is the exploration of the perceptions of both healthcare professionals and patients, as this enables a more sophisticated understanding of the situation on the ground.[25,26] Moreover, exploring these perceptions could facilitate the identification of quality improvement opportunities. In light of these potential opportunities, the objective of this study was to analyze the perception of healthcare professionals (pharmacists, physicians and nurses) regarding the quality of clinical pharmacy services provision under three research themes adapted from Donabedian's model (structure, process and result) at a public hospital in Mexico.

2. Methods

2.1. Design and theoretical approach

Considering that CPS implementation in Mexican public sector hospitals is not uniform (even within the same health subsystem), a single-case study design was performed under an integrated (holistic) analysis perspective.[27] In this study phenomenology was the main theoretical approach, based on the exploration and analysis of the perception of participants in relation to their experiences with the phenomena of study.[28]

2.2. Study site

The research was performed at the Pharmaceutical Services Unit (PSU) of a public hospital (180-bed) in Mexico City that provides inpatient and ambulatory care, under the auspices of the Ministry of Health. This hospital was selected as a "success case" based on the results of a survey conducted on the implementation of MNFH components (particularly CPS) in the public and private hospitals of Mexico. The timeframe of the study was September 2014 to December 2014.

PSU Overview: The PSU pharmacy staff comprises 3 pharmacists who provide CPS for different hospital services (metabolic emergencies, general surgery, internal medicine, plastic and reconstructive surgery, gynecology and obstetrics, traumatology and orthopedics, and urology) and also non-clinical pharmacy services such as reformulation, conditioning and distribution of medication in special doses (for neonates or pediatric patients). The PSU continuously supports the hospital by issuing reports giving information on medication and providing adverse drug reaction (ADR) notification to the Mexican regulatory authority. The PSU coordinates the Pharmacy and Therapeutics Committee (PTC) bimonthly and updates the institution's Essential Medicines List. The unit participates on decision-making related to the promotion of RUM in the hospital. The operational activities involving the procurement, storage and distribution of medicines are outsourced to an external private company, which is continuously audited and supervised. The structure and operation of CPS at this hospital was presented with more detail in a previous publication.[29]

2.3. Data collection

This research was conducted under a non-participant observation performed at the PSU,[29] in which semi-structured interviews[25,26] were conducted by the study's lead author (who is trained in the application of qualitative research, a qualified pharmacist, a holder of a master's degree in Pharmaceutical Sciences, and, at the time that the fieldwork was conducted, a doctoral student in Public Health). Interview guidelines were designed with items (questions) formulated to explore three research themes corresponding to the quality dimensions of "structure, process and result", taking a previous adaptation of Donabedian's conceptual framework for health services quality assessment as a basis.[1] Using this framework, categories, subcategories and types of informants were proposed to design the interview guides (Table 1). These interview guides were able to be adapted during the fieldwork stage in order to explore the research themes.

Table 1
Themes, categories, subcategories and informant types considered deductively for the construction of interview guides.[a,b]

Themes	Categories	Subcategory	Informants
Structure	Pharmacists' working conditions	• PSU infrastructure • Human resources staff for hospital needs • Hiring conditions • Salary and benefits • Access to medicines information systems • Access to patient's clinical information • Training • Work roles • Workload • Improvement opportunities	• Pharmacists • Physicians • Nurses
	Other healthcare professionals' knowledge of pharmacists and CPS	• Identification and knowledge of pharmacists' clinical roles • Recognition of the importance of CPS provision in the hospital • Improvement opportunities	• Pharmacists • Physicians • Nurses
Process	Physicians' and nurses' perceptions of technical quality in CPS provision	• Adequacy and technical integrity of PI • Clinical enrollment by pharmacists • Participation of pharmacists in daily meetings with physicians • Improvement opportunities	• Physicians • Nurses
	Acceptance by and interprofessional relationship with medical staff	• Acceptance of CPS by medical staff. • Interpersonal and interprofessional relationship between pharmacists and physicians. • Improvement opportunities	• Pharmacists • Physicians • Nurses
	Acceptance by and interprofessional relationship with nursing staff	• Acceptance of CPS by nursing staff. • Interpersonal and interprofessional relationship between pharmacists and nurses • Improvement opportunities	• Pharmacists • Physicians • Nurses
Result	Perceptions of changes in medication use	• Medicines supply/distribution changes • Changes in prescription habits (physicians) • Changes in medication administration habits (nurses).	• Pharmacists • Physicians • Nurses

[a] PSU: Pharmaceutical Services Unit; CPS: clinical pharmacy services; PI: pharmaceutical interventions.
[b] These themes, categories and subcategories were used also as codes for the data analysis.

2.4. Participant recruitment

The first phase comprised interviews with the entire PSU's pharmacy staff (three pharmacists) in order to explore the themes and categories through pharmacists' perceptions. Interviews were then conducted with the physicians, who were selected via stratified purposeful sampling[30] of the hospital services where CPS are provided considering the level of engagement (first-year resident, second or third-year resident, and chief physician). Pharmacy staff helped to identify the physicians with whom they had worked or to whom they had advised during pharmaceutical interventions (PIs), in light of the strata described above. Finally, interviews with nurses were performed on a similar basis and using the same sampling strategy employed with the physicians, considering level of engagement (floor nurse or chief nurse). For physicians and nurses, an important inclusion criterion was to have been involved in at least one pharmaceutical intervention (PI) by the pharmacy staff.

The interviews were scheduled with the selected subjects, who had previously approved verbally a consent to be audio-recorded. In the consent form, all the relevant information on the objectives, rights and general information related to the study was provided. The interviews were performed in private settings at the hospital, with the 3 PSU pharmacists ("pharmacy staff"), 13 physicians (comprising 8 residents in different medical specialties, 4 heads of service and 1 manager), and 6 nurses (mainly chief nurses) from the different hospital services.

2.5. Data analysis

The recordings were transcribed into text and analyzed using Atlas.ti 7.0 software, applying discourse-analysis and codification techniques taken from grounded theory.[31,32] The codes were taken directly from the categories and subcategories initially proposed or those identified during the study; moreover, the proposed framework, which is based on Donabedian's model, was able to be modified or adapted by means of data analysis to include emerging categories or subcategories. The significant illustrative verbatim quotes were tabulated by category and by healthcare profession. Participant identity was protected using alphanumerical codes, with *P* assigned for pharmacists, *D* for medical doctors and *N* for nurses.

Prior to the fieldwork being conducted, the research protocol was approved by the Research Ethics Committee of the National Institute of Public Health (Mexico).

3. Results

3.1. Theme: structure

Table 2 shows some verbatim quotes related to theme *Structure*.

3.1.1. Pharmacists' working conditions

Except for the head of the PSU, the professional pharmacists working at the PSU are contracted on a monthly basis as technical personnel. There is no work description of "pharmacist" at the hospital recognizing the rights and responsibilities of this type of clinical practitioner. Pharmacists work at the hospital from 7 a.m. to 3 p.m., Monday to Friday, with some benefits such as social security, holidays and a Christmas bonus, and with access to the dining facilities as an additional benefit.

During the interviews, pharmacists reported the need for both better hiring and working conditions through the recognition of their clinical work, the payment of a fair salary, and better contractual conditions.

> "...I have monthly contracts ... my work is not permanent here... which means that the pharmacist still does not have a base, a key role in hospitals... many hospitals see this as a need for certification... there is no basis for us ... " [talking about pharmacist's

Table 2
Verbatim quotes illustrating findings related to the *Structure* theme in the study.[a,b]

Pharmacists	Physicians	Nurses
Pharmacists' working conditions:		
"...I have monthly contract... my work is not permanent here... which means that the pharmacist still does not have a base, a key role in hospitals... many hospitals see this as a need for certification... there is no basis for us ... " (P2) "...having few members of staff greatly limits us, we could give more and better services". (P1, PSU Chief) "...we need many references and a bibliography in order to be able to make our interventions..." (P2) "being a pharmacist for me is an important part because I feel glad to be able to contribute to the care of the patients..." (P2) "...I like what I do... I know it is of use. Although what I do is not seen, it helps the patients... helps people... helps the doctors to be better... I support patient safety... the nurses acquire more knowledge..." (P3)	"... the patients can be admitted in the night... at the weekend and there are no suggestions [pharmacist interventions] to make any changes [to the pharmacotherapy] until we arrive on Monday..." [talking about the lack of pharmacists working on nights shifts and weekends] (D2, Physician ME) "... what can be improved has nothing to do with them [pharmacists], it has to do with having more staff [pharmacists] in order that they have more time in which to intervene and that doctors are more accustomed to reconciliation [medication reconciliation process]" (D11, Physician chief, Infectology service)	"... the visits [pharmacists' visits to the hospital services] should be more frequent. They come sometimes once a week or when I call them. I think this is because there are insufficient staff numbers [referring to pharmacy staff]. So, I think that, while doctors become accustomed to doing things right, I think it would be better if there were more [pharmacy] staff to supervise the doctors" (N4, Chief Nurse GC) "Well, I think they should actually come every day, from my point of view, because there are always going to be details... but I do not think two are sufficient [referring to the two pharmacists who mainly carry out visits to the selected hospital services]" (N3 Chief Nurse, G&O)
Other healthcare professionals' knowledge of pharmacists and CPS:		
"...in the past, it was more difficult to communicate with them [the nurses] because they didn't know us … then you explain... but little by little, over time and with the work of everyone, they have been getting to know us... they know that they can ask us questions... they know that we can give them information…" [example of nurses' lack of knowledge of the clinical role of the pharmacist] (P3)	"...Doctors need to be educated … Therefore they should teach us the pharmacology of basic medicines..." [example of the identification of the pharmacist as a pharmacology specialist who could have a teaching role] (D5 Resident IM)	"...if we detect a problem, we communicate it to the chemist [pharmacist] and then the chemist [pharmacist] in turn communicates it to the doctor [chemist refers to pharmacist] … " (N4 Chief Nurse GS)

[a] Acronyms: CPS: Clinical Pharmacy Services, PSU: Pharmaceutical Services Unit, ME: Metabolic Emergencies, IM: Internal Medicine, GS: General Surgery, PRS: Plastic and Reconstructive Surgery, T&O: Traumatology and Orthopedics, G&O: Gynecology and Obstetrics, Uro: Urology.
[b] Alphanumeric codes for informants: P: pharmacists, D: physicians (doctors); N: nurses.

working conditions] (P2) (Look at the complete verbatim quote at Table 2)

They also identified the need for increases to the number of pharmacy staff in order to cover the different areas of the hospital and offer improved service. Talking about the infrastructure and resources for daily working, while the pharmacists stated that there was the necessary infrastructure at their place of work, they identified the need for improved access to specialized medicines information databases or reference books. Despite this context, they described being content in performing their professional activities and collaborating in the provision of patient care.

The physicians interviewed agreed on the need for increased pharmacy staff to cover the different services and shifts at the hospital and identified the necessity for all prescription validation to be performed by pharmacists, avoiding work overload. The nurses also identified the need for pharmacists to visit their areas of responsibility more frequently, in order to “supervise” medical prescriptions and monitor the proper preparation and administration of medication.

3.1.2. Other healthcare professionals' knowledge of pharmacists and CPS

While PSU pharmacy staff are primarily identified as “chemists” by medical and nursing staff, they are also identified as “experts”, “specialists”, “monitors” or “supervisors” in the clinical use of medication. Most of the informants recognized the importance of CPS provision in the hospital and its potential impact on the quality of service and, thus, on patient health.

3.2. Theme: process

Table 3 shows some verbatim quotes related to theme *Process*.

3.2.1. Physicians' and nurses' perceptions of technical quality in CPS provision

The physicians acknowledged that PIs have been carried out in a timely and adequate manner in terms of prescription, medication dosage, duration of treatment and administration, thus preventing any potential errors from reaching patients.

> "Do they need more training? From the experience I have had with them and what they have shown me, the answer is no, they are trained" [about the training and capabilities of pharmacy staff] (D11, Physician chief, Infectology service)

However, some physicians mentioned the need for more complexity in these interventions, such as the identification of potential medicine interactions. Also stressing the need for more clinical enrollment with patients, and pharmacist-physician clinical liaison during the morning and evening meetings (to discuss patients' progress and inform patients' admissions or discharges).

> "...they do it very well, but I think that there is a lack of clinical orientation that could be given to the patients, it could be better that they [the pharmacists] know a little more about the patient. They should have the morning visit with us at the daily clinical meetings [referring to the healthcare professionals' daily clinical meetings with every patient]" (D4, Resident GS)

The nurses interviewed perceived a high level of technical quality in the PIs as relating to the preparation and administration of medications, such as the selection and use of the correct types of containers or solutions, the appropriate compatibility between medicines in the preparation of injectable mixtures, and the recommended times and schedules for medicines administration. In addition, they also perceived a high level of technical quality in the PIs aimed at optimizing medical prescriptions.

Table 3
Verbatim quotes illustrating findings related to the *Process* theme in the study.[a,b]

Pharmacists	Physicians	Nurses
Physicians' and nurses' perceptions of technical quality in CPS provision:		
This category was explored from the perspective of doctors and nurses.	"Do they need more training? From the experience I have had with them and what they have shown me, the answer is no, they are trained" [about the training and capabilities of pharmacy staff] (D11, Physician chief, Infectology service) "...they do it very well, but I think that there is a lack of clinical orientation that could be given to the patients, it could be better that they [the pharmacists] know a little more about the patient. They should have the morning visit with us at the daily clinical meetings [referring to the healthcare professionals' daily clinical meetings with every patient]" (D4, Resident GS)	"they are more trained because it is their specialty... we don't know how long the half-life of some medicine is, or if half of the dose can be used, sometimes we do not know if [the pharmaceutical preparations] can be kept for later use or if they must be discarded, so in this sense they provide us sufficient support" (N4, Chief Nurse, GS) "they have resolved our doubts, at least on the medicine that are indicated here" (N3, Chief Nurse, G&O)
Acceptance by and interprofessional relationship with medical staff:		
"At first it was a bit complicated, there were many examples of friction because they [the physicians] were reluctant to accept our interventions. They would say to me: "Who are you? Why are you debating an idea with me?" Then when they started to see that we were presenting the scientific basis and knowledge of pharmacology and pharmacotherapy, they began to accept our interventions. Then the interaction began to be more friendly and characterized by more teamwork. However, here in the hospital the turnover is high, so when new physicians arrive at the hospital we start again with the whole story" (P2)	"...in this environment, still there is a lot of egotism, so many [doctors] will not accept that someone else is telling you about something you have studied for years... but I think we have to expand or be open minded to new information and to new support" (D1, Resident ME) "Probably, there has been certain resistance, although there are benefits for the patient and healthcare. It is not that we don't want the best treatment for patients, but it requires extra workload … [medication reconciliation process]" (D11, Physician chief, Infectology service) "...I think they could get involved a bit more in talking to the treating physicians, in order that we can all learn" (D10, Geriatrics)	"…for them, it is more work overload [referring to the medication reconciliation process as additional work], they don't attach much importance to the seal [referring to the pharmacy seal on which pharmacists write their intervention]" N5, Chief Nurse, PRS). "With the doctors, I think there has been friction, mainly because they [the pharmacists] come and tell them about the medication reconciliation and there is some resistance to accepting that they are being corrected [referring to physicians' resistance to accepting pharmacists' interventions]" (N4, Chief Nurse, GS)
Acceptance by and interprofessional relationship with nursing staff:		
"At first, the nurses resisted someone who comes and tells you how to do something. However, once they see that you can support them in how to do something better, in how to prepare something better, they rely on you, many of them start to rely on us and start asking us: How should I prepare this? What concentration? etc. At the hospital, we now have a very good level of acceptance; however, sometimes, because of the workload, it can also be stressful for us to use their work material and they think that we are delaying their processes [referring to the indication sheets or clinical records that are used by the nurses during their work]" (P2)	The physicians said that they were not aware of the interprofessional relationship between pharmacists and nursing staff.	"I haven't noticed that there is some friction with the work group [nursing staff]. I believe that my co-workers have already realized that it is good for us to have the oversight" (N3, Chief Nurse, G&O) "they should collaborate more with the work team [nursing staff] ... they go directly to the doctors, so there is little relationship with nursing" (N1 Chief Nurse, ME)

[a] Acronyms: CPS: Clinical Pharmacy Services, PSU: Pharmaceutical Services Unit, ME: Metabolic Emergencies, IM: Internal Medicine, GS: General Surgery, PRS: Plastic and Reconstructive Surgery, T&O: Traumatology and Orthopedics, G&O: Gynecology and Obstetrics, Uro: Urology.
[b] Alphanumeric codes for informants: P: pharmacists, D: physicians (doctors); N: nurses.

3.2.2. Acceptance by and interprofessional relationship with medical staff

The pharmacists perceived that they had won the trust and acceptance of other health professionals through their provision of CPS; nevertheless, they also described still perceiving "resistance" to them. They mentioned that continuous communication and training for physicians as relating to the hospital's CPS was needed due to constant physician turnover, with new entrants unaware of the clinical services offered by the hospital's pharmacists, as well as the *medication reconciliation* process, which involves the stricter control of medication use for patients admitted to the hospital.

While resident physicians perceived a cordial and respectful working relationship with the pharmacy staff, some informants expressed the need for more contact and communication with them. In addition, some mentioned the need for feedback on errors identified, emphasizing that the current lack of communication and feedback could lead to repeated mistakes.

The nurses perceived the need for more pharmaceutical actions that would promote acceptance by resident physicians, identifying the residents' workload as a factor preventing them from paying sufficient attention to pharmacist interventions. They also identified inadequate supervision by medical chiefs.

3.2.3. Acceptance by and interprofessional relationship with nursing staff

The pharmacists perceived that they have been able to achieve more acceptance from nurses by helping them resolve doubts, mainly about medicine preparation, which has also served to gain more of their respect. However, they indicated that there remain some cases in which the acceptance and recognition of pharmacists' clinical work has been very difficult to obtain, which they mainly attributed to resistance from those nurses who perceive themselves as being "monitored" or "supervised".

In most hospital services, nurses stated that there is an adequate level of acceptance and interprofessional work between themselves and the pharmacists. However, it seems that there are some hospital services that have not fully accepted CPS, with one informant mentioning that pharmacists were even seen like "police" by nurses, while another nurse stated that pharmacists had "no right" to make observations or suggestions (interventions) in clinical records, despite the fact that hospital statutes do make PSU pharmacy staff responsible for pharmaceutical interventions.

Table 4
Verbatim quotes illustrating findings related to the *Result* theme.[a,b]

Pharmacists	Physicians	Nurses
Perceptions of changes in medication use:		
"From pharmacoepidemiological studies that we have performed, we have been detecting some problems in medicines use, especially antiemetics, some antibiotics and analgesics. With analgesics, we have achieved more control, because they are the easiest to observe and the easiest to correct. With antibiotics, we work closely with the infectology service. With regard to anticoagulants, we have achieved improved use of enoxaparin." (P1, PSU Chief) "… especially in medicines preparation and dosage intervals, the pharmacists' interventions have been well accepted. Currently, I no longer find the errors that I would find before" (P1, PSU Chief)	"…we have been able to implement actions in situations that were not previously considered, such as medication reconciliation. Better planning has been achieved in terms of medicines procurement. Thanks to them [the pharmacists], it was possible to create an *Essential Medicines List*. Also, better communication has been achieved with the administrative areas for the planning and acquisition of medicines" (M14, Medical Director) "…the medical residents have been forced a little more to use the names correctly [use of generic names instead of trade names of medicines], avoiding falling into the habit of prescribing medicines based on trade names. On the other hand, we have noticed that there has been an improvement in the administration of certain medicines. These are recommendations that they have given us and there has been some impact" (M2, Physician chief, ME)	"…we used to request and request medicines [from the pharmacy] until they would expire [in the hospital services] so, through all these new changes, we are now limited to requesting only what is needed [referring to CPS implementation and its impact on medicines distribution in the hospital]" (E3, Chief Nurse, G&O) "…at times they [the physicians] used to prescribe analgesics and wouldn't realize that the patient had either hepatic or nephrotic impairment [talking about the perceived changes in physicians' awareness related with the patient clinical situation for prescribing]" (E4, Chief Nurse, GS)

[a] Acronyms: CPS: Clinical Pharmacy Services, PSU: Pharmaceutical Services Unit, ME: Metabolic Emergencies, IM: Internal Medicine, GS: General Surgery, PRS: Plastic and Reconstructive Surgery, T&O: Traumatology and Orthopedics, G&O: Gynecology and Obstetrics, Uro: Urology.
[b] Alphanumeric codes for informants: P: pharmacists, D: physicians (doctors); N: nurses.

3.3. Theme: result

Table 4 shows some verbatim quotes related to theme *Result*.

3.3.1. Perceptions of changes in medication use

The pharmacists identified significant changes in the use of medicines as associated with CPS operation in the hospital, such as the correction of errors in the use of various pharmacotherapeutic groups (i.e. analgesics, anticoagulants, antibiotics) through the application of pharmacoepidemiological studies and daily work protocols devised with the medical staff.

The medical staff identified various favorable changes related to the pharmacists' presence at the hospital and the operation of the Pharmacy and Therapeutics Committee, such as the development of an Internal Essential Medicines List, the development of policies to promote RUM (like the *medication reconciliation*) in the hospital, and the improved planning in medicines acquisition, which benefits supply. They also perceived improvements in medicines prescription through the adoption of good prescribing practices, such as the use of generic names, and greater care in the prevention of medication errors.

> "…we have been able to implement actions in situations that were not previously considered, such as medication reconciliation. Better planning has been achieved in terms of medicines procurement. Thanks to them [the pharmacists], it was possible to create an *Essential Medicines List*. Also, better communication has been achieved with the administrative areas for the planning and acquisition of medicines" (M14, Medical Director)

The nurses perceived improvements in not only medicines use, but also the control of medicines supply to hospital services in order to avoid the overstocking of inventory, the preparation of medicines (mainly injectables and intravenous), and even medical prescription.

Fig. 1 shows the adapted Donabedian's conceptual framework, constructed for the quality analysis of CPS provision undertaken in this study. Furthermore, using an approach related to root cause analysis (RCA),[33,34] Fig. 2 presents a diagram constructed in order to synthesize the different contextual factors that could directly or indirectly promote or limit the clinical results related to CPS practice. These factors were grouped into the technical and interpersonal quality of CPS provision, the acceptance by physicians and nursing staff, and the specific contextual factors related to the hospital setting.

4. Discussion

This study found several challenges to promote the integration of pharmacist and CPS in the health services provision systems, principally related with the social and cultural context in which these health services operate in a daily basis. Some of the problems identified in this study was a lack of knowledge of the pharmacist's clinical roles by nurses and physicians, principally when they have not received a special information or a pharmaceutical intervention previously, reflecting the lack of interprofessional academic training with this professional. This can be explained by the historical context of the pharmacist profession in Mexico, in which the training and professional activity of the pharmacist was, for a long time, oriented to the industrial manufacture and chemical analysis of medicines, although several clinical pharmacy programs have recently been created or adapted for the training of pharmacists for clinical practice.[35–37] Similar results have been shown in other countries in the context of the evolution of pharmacy practice towards clinical and public health roles, although it is important to say that the context in Mexico is different than developed countries since the professional dispensation has been omitted in the health system for a long time and the MNFH purpose implies the direct leap towards CPS provision.[38,39]

Likewise, while good interprofessional collaboration was perceived by the majority of informants, it was found that “resistance” to CPS provision persisted. This problem can be explained by analyzing the change in the cultural and organizational context of CPS implementation in Mexican hospitals, which requires the incorporation of a new clinical profession into healthcare provision, representing both a paradigm-shift and a new teamwork model, in which the pharmacist must participate in clinical decision-making. However, the findings of this study indicate that progressive interaction between pharmacists, physicians and nurses through CPS provision promotes knowledge of these services and their potential benefits. Therefore, the perceptions of physicians and nurses and their attitudes toward CPS could change generating increased acceptance, overcoming the form of “undervaluation” that this profession has experienced and the potential dissatisfaction of those health professionals who describe feeling “watched” or “supervised”. Similar results have been identified in other public hospitals in Mexico,[21,40,41] and in other countries as well, when CPS are implemented for the first time (principally in primary care settings), implying the adoption of new models of care and their respective processes.[42–46]

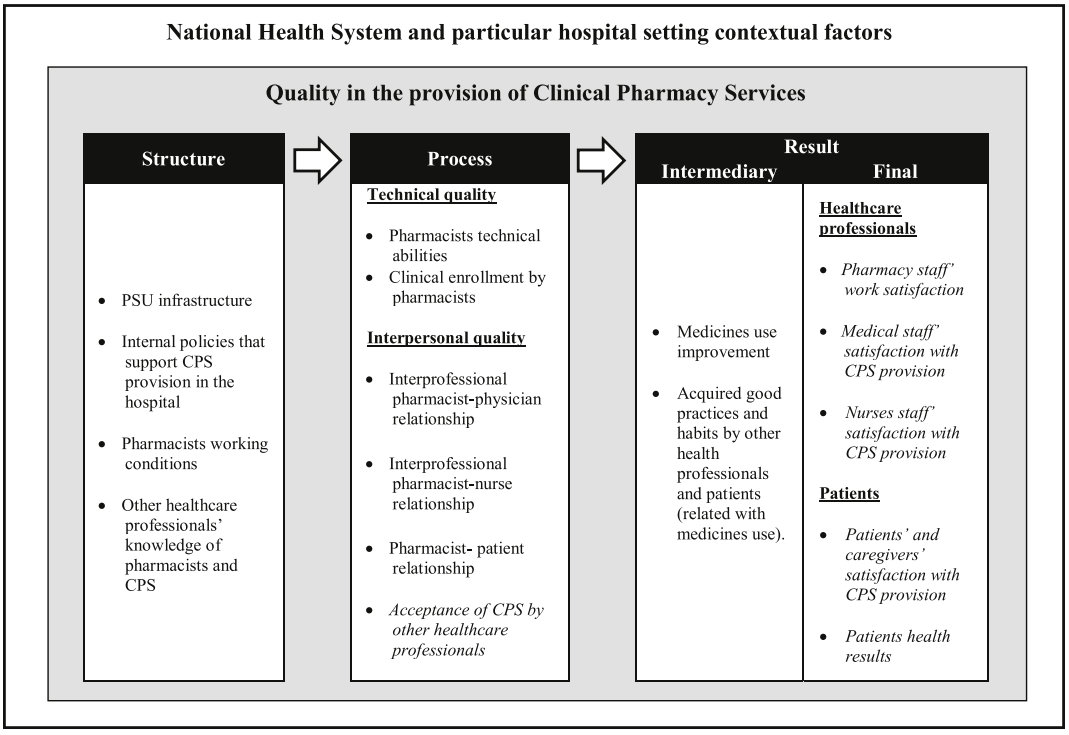

Fig. 1. Adapted Donabedian's conceptual framework for quality analysis in clinical pharmacy services provision.[a,b,c]
[a]Acronyms: PSU: Pharmaceutical Services Unit; CPS: clinical pharmacy services
[b]Adapted from Donabedian' model and modified through data analysis (inductively constructed categories are shown in italics).
[c]Patients perceptions were not explored in this study, however some categories related are shown in this framework for future research purposes.

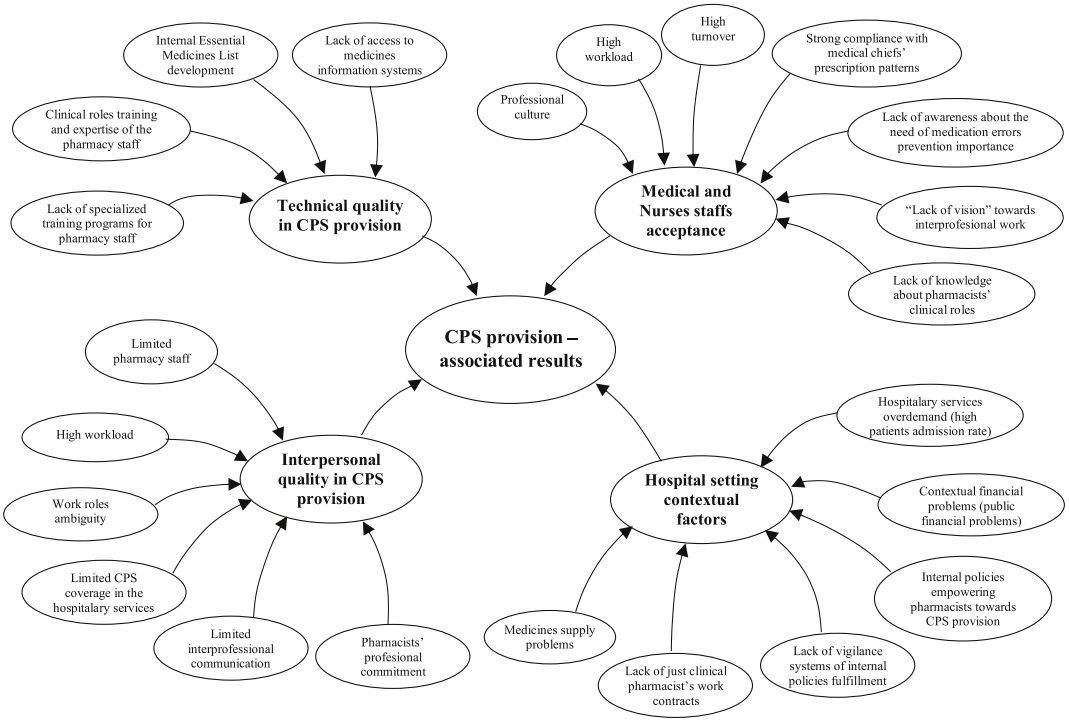

Fig. 2. Factors influencing the CPS provision-associated results.[a, b]
[a]Acronyms: PSU: Pharmaceutical Services Unit; CPS: clinical pharmacy services
[b]Diagram constructed inductively from data analysis.

Thus, through the progress and establishment of collaborative practice, physicians and nurses perceived adequate technical quality in pharmaceutical interventions and the potential of CPS to promote RUM and quality of healthcare, generating an acknowledgement towards pharmacists' clinical work that could promote their acceptance of pharmacists and CPS. This appraisal and recognition has been shown too in other studies from other countries as a result of interprofessional collaboration.[47–49]

The analysis performed in this study allowed the inductive construction and analysis of categories linked to theme *Results*, such as pharmacists' job satisfaction, and physicians' and nurses' satisfaction with CPS provision (Fig. 1). Regarding pharmacists' job satisfaction, from an organizational approach to *role theory* (which is based on the study of roles or activities performed by individuals in organizations and factors or conditions that could affect their performance, or "stressors"),[50] this study found that there are some stressors that could compromise pharmacists' job satisfaction, such as: the limitation of human and material resources and the consequent workload this generates; the performance of multiple roles (both clinical and medication-oriented); poor hiring conditions; and, their identification and acceptance by other health professionals. However, in accordance with other studies based on quantitative approaches, several factors were identified that could increase pharmacist satisfaction in spite of the factors mentioned above, such as the pharmacists' professional commitment, their autonomy, as well as their teamwork within the PSU.[51–53]

Regarding physicians' and nurses' satisfaction with CPS provision, in this study was found that further to perceive technical quality in CPS provision, healthcare professionals' job satisfaction is closely related to interprofessional interaction with pharmacy staff. Similar results have been found in other studies that have identified the perception of a lack of CPS coverage.[54] In this sense, as a qualitative approach of root causes analysis (RCA)[33,34] (Fig. 2), one of the main identified opportunities for improvement was to increase the pharmacy staff, in order to improve CPS coverage in the hospital and to promote more and better interprofessional interaction with other healthcare professionals and patients.

In order to ensure trustworthiness and validity,[55–57] this study included several triangulation methods as classified by Cresswell[55]: 1) As methods triangulation, the fieldwork was performed under a non-participant observation at the PSU, which enabled an in-depth exploration of the case study; 2) In the interests of data triangulation, the study included perspectives from different informants spanning different roles and positions, thus facilitating in-depth research and a better level of understanding; 3) During the course of the study, peer debriefing was conducted by researchers with expertise in both qualitative research and quality in healthcare (acknowledged in this paper) as an approximation to analysis triangulation; and 4) Theory was triangulated by exploring several categories under a broad conceptual model (adapted Donabedian's conceptual framework) that encompassed other theoretical frameworks, such as role theory and job satisfaction models. Additionally, applying techniques that use the lens of the study participants,[55] member checking of the findings was incorporated, also a prolonged engagement was used. Finally, this research applied techniques that used the lens of individuals external to the study[55] using audit trail techniques during fieldwork (same external researchers mentioned above).

As limitations of this study, it was designed based on a single case study, which could have limited the external validity of the findings, excluding other institutions within the health system where the administrative context is different, such as the institutions that provide health services for the employed population. Besides, a "success case" hospital was chosen, so the results of this study are most likely to be biased to "positive" findings than the results that would have been obtained if the study had been performed in a different setting, such as a hospital with an even lower level of CPS implementation. Moreover, the interviewed PSU-external professionals may have had a positive attitude to CPS since they had experience of such collaboration (inclusion criterion), future studies may explore with more detail the barriers and facilitators to first implementation of CPS and interprofessional collaboration including pharmacists. Finally, patient perceptions were no explored, that was due to the methodological difficulty on exploring CPS quality as an isolated service, when patients receive care on an integral way (interacting with physicians, nurses and other healthcare professionals or technicians).

5. Conclusion

The perception analysis performed in this study enabled the exploration of various components of CPS quality through the adapted Donabedian's conceptual framework constructed. Some factors that limit pharmacists' work satisfaction were identified, such as poor work conditions and the lack of knowledge of pharmacists' clinical roles on the part of other healthcare professionals. Also, this study found that restricted pharmacy staff numbers is an important factor that compromises interprofessional relationships between pharmacists and other healthcare professionals and could limit their acceptance and satisfaction. This study suggests the need to implement strategies that promote more knowledge, acceptance and interprofessional collaboration with pharmacists as a new clinical professional in the health system of Mexico towards an improved use of medicines.

Declarations of interest

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