ISSN : 1533-1520

GARDEN JOURNALS

Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics

Issue 18 . No.2 2018

Evaluating Coding and Interoperability Standards in Healthcare: A Study of the AmiHealth Project

Dr. Carlos Fernandez Lopez

Institute of Marine Biology and Oceanography, University of Barcelona, Spain

ABSTRACT

In the area of health, interoperability in information and communication technologies is the ability of information systems to communicate, exchange data and use them in a health system. Interoperability standards in the health sector have created a boom parallel to the development of information systems, web applications and mobile phones, and have increased the quality of care, experience and safety of the user or patient by allowing access of your personal clinical data from any point, without exposure to risks of said information. This article describes interoperability standards from their use in messaging, terminology and documentation as a fundamental point for the development of information systems in general. Likewise, it presents aspects for the security of patient data, users of said systems. Each of the interoperability standards is broken down individually, so that you can know which one to use in a respective case. Finally, a general evaluation is carried out in the AmIHEALTH project, which allows the control and monitoring of health data, using the *Fast Healthcare Interoperability Resources* standard as a basis for the exchange of user data on a web platform together with a mobile application, without putting the security of this data at risk.

Keywords: Clinical; coding; eHealth; standard; interoperability

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

INTRODUCTION

The development of mobile applications focused on health has had completely exponential growth in recent years, and has resulted in around 97,000 health applications that can be downloaded today, according to The *mobile health global market report 2013- 2017: the Commercialization of mHealth apps* .[1] Of these, 70% are intended exclusively for patients and the rest for professional use. These applications help access patient data for different purposes, such as medication control, tracking and monitoring, diagnosis, among others.

The use of these applications is of utmost importance for health professionals. Among the benefits that we can find when using applications focused on this area, we have the most precise diagnoses and treatments, since we have a lot of patient information, whether recorded locally by their clinical history or a more global compilation such as the Big Data (massive data). We also have greater efficiency and productivity on the part of health professionals, since they are mobile applications, which optimize the work for access to the data of their related patients, in addition to having better coordination between specialists. Lastly, we have patient safety; The latter facilitates and allows the tracking and monitoring of his health status. Through this mobile tool, nurses and doctors can make non-arbitrary decisions without having to be in the hospital, as long as the technology developed is based on the standards provided and suggested by the World Health Organization (WHO). However, the rapid development of these mobile applications may show concern or insecurity on the part of patients and health professionals, among others, as mentioned in the report “Review of interoperability standards for eHealth in Latin America and the Caribbean". [2]

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

Health data is generally sensitive; That is why a greater degree of confidentiality is needed by ensuring their privacy and protecting them. For this reason, it is necessary to implement security techniques or solutions, such as encryption of patient data, prior authentication before accessing the data and other encapsulation techniques to increase information security, according to *J. Alonso. Arévalo* and *A. Mirón-Canelo* , in the article "Mobile applications in health: potential, security regulations and regulation." [3]

This article describes interoperability standards from their use in messaging, terminology and documentation as a fundamental point for the development of information systems in general. Likewise, aspects for the security of patient data, users of said systems, are presented. Each of the interoperability standards is broken down individually, so that you can know which one to use in a respective case. Finally, a general evaluation is carried out in the AmIHEALTH project, which allows for the control and monitoring of health data, using the *Fast Healthcare Interoperability Resources* (FHIR) standard as a basis for the exchange of user data on a web platform. together with a mobile application, without putting the security of said data at risk.

METHODS

For this article, the priority was to search for works, research, contributions, among others, that referred to standards used to establish interoperability between different clinical systems efficiently. These include aspects of mobile e-health, web development, detailed exemplification and implementation of interoperability standards, security structures and protocols, and emphasize security services such as confidentiality, availability and data integrity. Publications from SciELO -

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

Scientific Electronic Library Online, Congress Proceedings of the Technological University of Panama, Sensors, official sources of the standards themselves, reports from the World Health Organization, among others, were considered primary sources of information.

IMPORTANCE OF STANDARDS IN eHEALTH

In Information and Communication Technologies (ICT), standards are guiding rules or norms established by autonomous entities or organizations with the purpose that the exchange of information between different systems, regardless of their architectures, equipment or technologies, is successful. . We can make an analogy referring to the Tower of Babel, mentioned by *J. Montón* .[4] A set of entities that contain two or more systems with different standards applied and wish at some point to interoperate their data with each other will not be able to, since they have incompatible standards. However, if the same standards are established, the interoperability of said information will be carried out satisfactorily without any problem.

Some of the benefits that can be taken advantage of by applying interoperability standards are: individual and population benefit, Health Organization benefit, government benefits and economic benefit.

Individual and population benefit level

Access to jointly ordered patient data among members of a healthcare facility facilitates and enables those members to make non-arbitrary and concrete decisions to facilitate the diagnostic process. In addition, aspects such as disease prognoses are established thanks to the medical history that the patient has (therapeutics, population, regional or national statistics and citizen education) that can allow

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

raising health awareness. With specific, organized and updated information you can support and contribute to better health care. This provides help to improve care, the possibility and the opportunity to detect possible errors so that lives can be saved, and give an adequate diagnosis, according to "Review of interoperability standards for eHealth in Latin America and the Caribbean." [2]

Health Organization Benefit Level

The benefit at an organizational level can be contemplated at the moment when a complete and accurate integration of patient data between information systems is implemented with the help of ICT, since these use different programming languages, communication protocols. , operating systems, measurement units, patient identifiers and electronic interfaces. All these systems use and share the same stored information that is distributed on different servers or computers, which facilitates the exchange of massive data. The use of interoperability standards allows each system to be incorporated in an easy and simple way with one or a few interfaces that work as an adapter for the exchange of information between them, which reduces maintenance, design and implementation costs.

Government Benefit Level

Generally, the functioning of public health is based on data reported by health service providers and insurers; However, these entities frequently must enter the information, but manually, a process that can run the risk of uploading the information incorrectly, incomplete or too late, in addition to being tedious and cumbersome.

This is why standards-based interoperability with the interconnection property allows you to completely replace manual data entry; That is, all processes are

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

automated with these standards, which add a layer of security and lower the level of risk of loading inaccurate and erroneous data. Some of the potential uses of such information are those related to mandatory reporting diseases, antibiotic resistance, community morbidity, reporting or reporting of statistics on population diseases and pathologies, among others, as mentioned in the report "Review of standards of interoperability for eHealth in Latin America and the Caribbean. [2]

Economic profit level

Interoperability contributes to better management of resources and public services. In order for this to be accomplished, we can mention as an example undoing specific clinical studies, when certain studies regarding this have already been done; that is, eliminate redundant studies. All of these benefits can be focused on various subsectors, such as medication requests, imaging studies and surgical indications, unscheduled visits to emergency centers or other rooms, which greatly reduces the entity's expenses.

Classification of standards for interoperability in eHealth

The primary function of interoperability standards is to encode and transmit health information. The most common or most used interoperability standards are HL7 and DICOM, mentioned in the publication "Interoperability standards in healthcare: essential guide - Caduceus Software". [5] However, it is important to know the rest of the standards, their purposes and what category or taxonomy they are classified into.

Messaging standards

Messaging interoperability standards serve to determine that the transmission of information between systems is consistent. The main function of these standards is

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

to define the structure, data type and format so that systems, using these rules, exchange data securely and efficiently.

HL7

The HL7 interoperability standards describe how information will be exchanged and the way in which said information will be organized between different systems. These describe the types of data, its structure and language so that there is no conflict between the systems. Within the most important HL7 standards we can find HL7 V2, HL7 V3, CDA, HL7 FHIR and CCOW.

HL7 V2

The HL7 V2 standard is active and the most widely used. Within it there are different types of messaging or versions defined by v2.x; The most used is v2.5 according to the writing "HL7 Messaging Fundamentals V. 2.x". [6] Regardless of the version, the most used message types in an abstract sense are patient management (ADT), orders (ORM) and results (ORU).

F. Portilla [6] mentions that this version has a very primitive appearance and structure, that is, it is not developed in an object-oriented aspect or with hierarchies. The relationships between the fields are not very clear; It does not have a reference model regarding the information, and its syntax is defined by *pipes* . Its characteristic appearance can be exemplified in figure 1 .

```
MSH|^~\&|ESTANDARESSALUD|INSTITUTEBONAPARTE|URGENCIA||
ORM^O04|0000|D|2.3.1|||CED|4-757-XXXX||JUSTIN-GONZALEZ||
62524756|M|||||||||||||||||||
ORC|NW||||^^^20185478514851^^MEDIUM||DR||JOSE-CERRUD||
OBR||332155|^^^87455^INTESTINO DELICADO^CR
```

Source: F. Portilla. [6]

Fig. 1 Characteristic appearance of HL7 V2

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

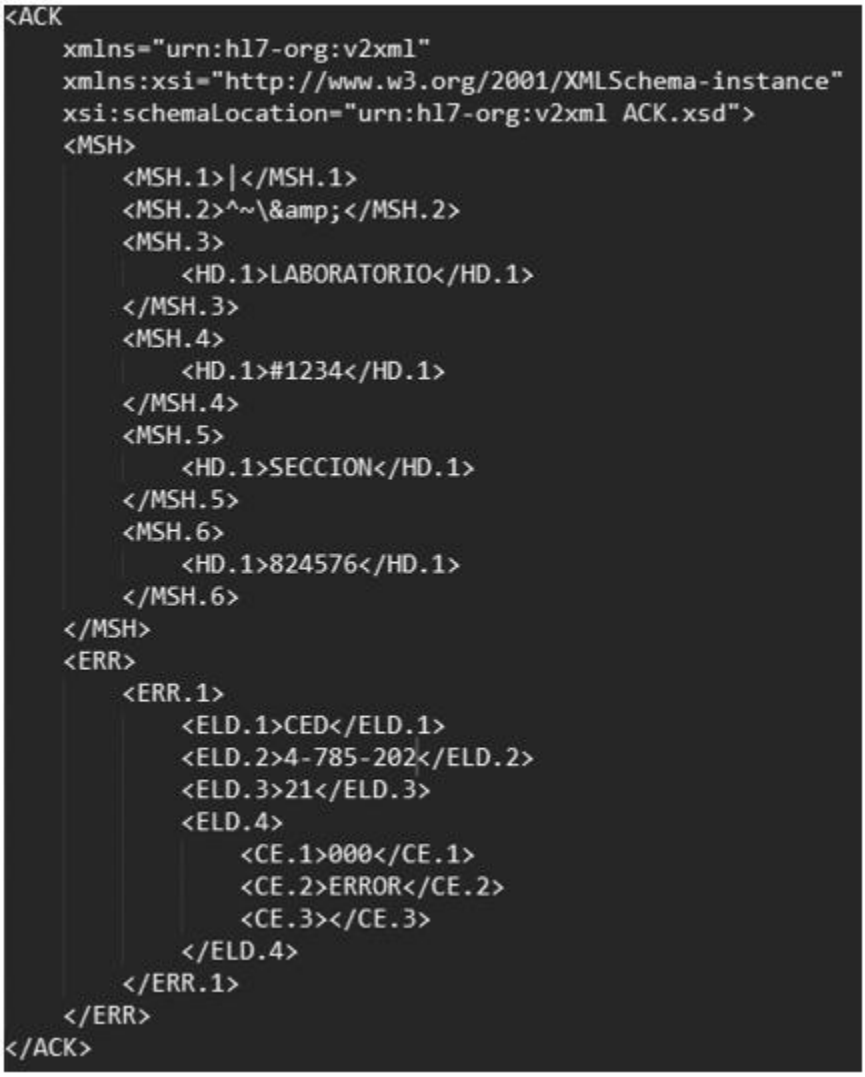
HL7 V3

Version V3 of HL7, unlike V2.x, which uses pipes, focuses on a new representation of data exchange in *Extensible Markup Language* (XML) syntax, better known as Extensible Markup Language. This version of HL7 is based on domains, trigger events, interaction designs, hierarchical message descriptors (HMDs), and a prose description of each component. [7] Some of the benefits, determined in the publication "HL7 Standards Product Abstract", [7] that we can take advantage of from this version are:

- It is focused on semantic interoperability.
- It is structured and designed for universal application.
- Establishes a consistent representation of data.
- It allows implementers to use and take advantage of the latest technologies available, at any time.
- Ensures consistent development. Additionally, it allows specifications to be stored and manipulated in fully robust data repositories instead of plain text documents.

The characteristic appearance of HL7 V3 in XML, according to ANSI [8] and *P. Knaap*, [9] can be seen in Figure 2 .

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520



```
<ACK
    xmlns="urn:hl7-org:v2xml"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="urn:hl7-org:v2xml ACK.xsd">
    <MSH>
        <MSH.1>|</MSH.1>
        <MSH.2>^~\&amp;</MSH.2>
        <MSH.3>
            <HD.1>LABORATORIO</HD.1>
        </MSH.3>
        <MSH.4>
            <HD.1>#1234</HD.1>
        </MSH.4>
        <MSH.5>
            <HD.1>SECCION</HD.1>
        </MSH.5>
        <MSH.6>
            <HD.1>824576</HD.1>
        </MSH.6>
    </MSH>
    <ERR>
        <ERR.1>
            <ELD.1>CED</ELD.1>
            <ELD.2>4-785-202</ELD.2>
            <ELD.3>21</ELD.3>
            <ELD.4>
                <CE.1>000</CE.1>
                <CE.2>ERROR</CE.2>
                <CE.3></CE.3>
            </ELD.4>
        </ERR.1>
    </ERR>
</ACK>
```

Source: ANSI. [8]

Fig. 2 Characteristic appearance of HL7 V3.

HL7 FHIR

Health Level Seven Fast Healthcare Interoperability Resources (HL7 FHIR), is an interoperability standard that combines the best aspects of HL7 V2 and HL7 V3. In addition, it focuses on facilitating its implementation using XML syntax, *JavaScript Object Notation* (JSON) and *Hypertext Transfer*

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

Protocol (HTTP) to represent resources. In Figure 3 you can see an example of the JSON syntax for obtaining data. The resources contain common characteristics, as mentioned by *P. Gonzalo* in the publication "What is FHIR and why should I care?": [10]

- A URL that identifies the resource.
- Some metadata in common.
- A human-readable Abstract.
- An extensibility framework.

Source: Json - FHIR v4.0.0. [eleven]

Fig. 3 Example of JSON HL7 FHIR syntax.

For resource sharing, manipulation and extraction, FHIR uses a Restful API (*Representational State Transfer Technology - Application Programming Interface*) web service. With this API you can implement all the functions of a CRUD (create, delete, read and modify). An example to create a new patient using the API would be: "POST https://server-URL/Patient ". POST is the sending method, https://server-URL is the base URL of the server and Patient is the endpoint to rescue the resources. Finally, an analysis of the work related to

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

authorization services, presented in the article “Interoperability in the authorization process of health services based on HL7-FHIR”, [12] can be seen represented in Table 1 .

Table 1 Abstract of observations on technologies and standards used in related works

Aspectos	Descripción de las tendencias
Interoperabilidad técnica	REST en lugar de SOAP.
Interoperabilidad semántica	FHIR como nueva alternativa sobre HL7 V2 y HL7 V3.
Interoperabilidad de procesos	No se encontraron trabajos relacionados en los cuales se use FHIR apoyado en SOA y BPM.
Implementación	El uso de Cloud Computing y Móvil soportado con FHIR.
Seguridad	Los trabajos relacionados a partir del año 2013 han incluido la seguridad. El estándar usado ha sido o OAuth.

Source: *Boris González* . (12)

DICOM

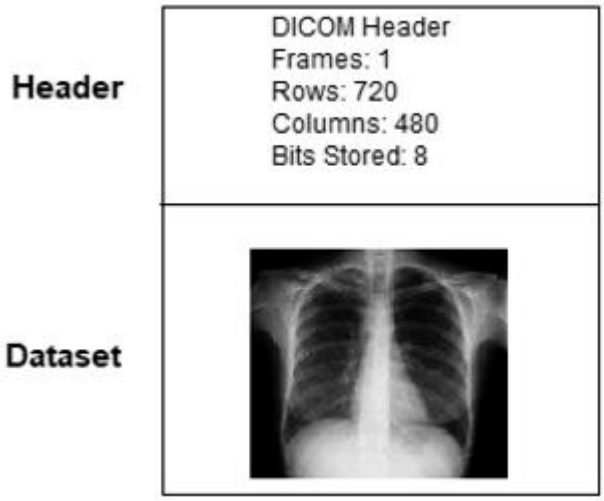
The DICOM (*Digital Imaging and Communications in Medicine*) standard is a set of rules that transforms communication and data transmission into a single digital format, based on the TCP/IP protocol, thus allowing storage , the printing, handling and transmission of images, generated by medical equipment, in various formats, as described in the publication What is the DICOM standard? [13]

Currently, a medical image by itself does not provide sufficient information. For this image to be totally efficient, it needs to be accompanied by patient and

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

acquisition data. This is why common image formats such as .jpg, .jpeg, .bmp or .png are not feasible for the required purpose.

As A. Vilchis Rojas says , in the publication "Computer Crimes: DICOM Images", [14] the DICOM format has IOD objects (*Information Object Definition*), formed by both the image itself and the image information, in this case the of the patient or other data, and DIMSE (*DICOM Message Service Element*), operations that can be performed on a specific object. By joining IOD and DICOM you get SOP, which is the functional unit of DICOM. Figure 4 shows the exemplified structure of a DICOM file.



Source: *A. Vilchis Rojas* . [14]

Fig. 4 Example of a DICOM file

Finally, the characteristics of DICOM and its implementations have made this standard recognized worldwide for the management, manipulation and transmission of medical images.

Terminology standards

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

According to "Review of interoperability standards for eHealth in Latin America and the Caribbean", [2] the terminology standards ensure that the vocabulary used is understandable for all systems, that is, they provide a basis for the use of a language in common to describe symptoms, diagnoses, and treatments, thus allowing for clear interpretation in the event that the context of the information is lost. Within the terminology standards we can find two categories: classifications and terminologies. The classifications allow for further studies and analysis for public health, billing or research. For example, ICD-10/ICD-10 and LOINC. Finally, terminologies allow a term to be assigned to a medical act that is being performed. An example of this is SNOMED-CT.

SNOMED-CT

SNOMED (Systematized Nomenclature of Medicine - Clinical Terms) is a terminology standard that has an extensive vocabulary that allows coding clinical findings, diseases, procedures and others. Thanks to its more than 300,000 terms, it covers the entire health spectrum, combining and relating them. According to the publication "Basics of SNOMED CT - SNOMED International Release Management - SNOMED Confluence", [15] said standard is completely complete, flexible and scalable, that is, it consists of extensive coverage of health-related topics. When studied delicately, they can be used to describe the details of a medical procedure, a patient's clinical history, among others.

The primary mission of a SNOMED CT translation is to provide accurate representations of each concept in a clear and understandable manner. Translators, when analyzing terms, must take into account the full description and context of the concept, as well as its hierarchy and relationships with other concepts, allowing

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

for a translation with coherent meaning based on frequently used and understood phrases. In all countries.

ICD-10/ICD-10

The ICD-10 standard (International Statistical Classification of Diseases) can be used to classify and code diseases and other types of health problems, whether signs, symptoms, abnormal findings, among others, according to The revision of international statistical classification of diseases and related health problems. [16] The number following the acronym is the version of the classification. Today the ICD has become an international standard diagnostic classification for all general epidemiological and many other health administration purposes. This encompasses the study and analysis of the general health situation of a population, and the tracking and monitoring of the prevalence of diseases and other health problems. It should be noted that, although the ICD was specially designed to classify diseases and other health problems, it cannot categorize each problem to contact specialized health services. As a consequence of this small problem, the ICD, as mentioned by the Pan American Health Organization, [16] offers additional alternatives for a broad registry of symptoms, abnormal findings, signs, etc.

LOINC

The universal Logical Observation Identifiers Names and Codes (LOINC) standard provides a comprehensive classification of clinical observations for determining medical laboratory results. According to *Mandirola* and *I. Fernando Portilla* , in the article "LOINC Interoperability", [17] contains two main parts: laboratory LOINC and clinical LOINC. The main objectives of this standard are:

- Data sharing of laboratory results and clinical observations.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

- The grouping of practices.
- Processing of the results.

For the use of LOINC, a general format is established for the description of clinical laboratory results. Table 2 exemplifies this format. According to USNL of Medicine, [18] in 1999 LOINC was identified by HL7, as a set of reference codes for laboratory test names in the exchange organizations.

Table 2 Anatomy of the LOINC code

5193-8 Hepatitis B virus surface Ab:Acnc:Pt:Ser:Qn:EIA	
5193-8	**Código LOINC**
Hepatitis B Virus surface Ab	Determinación
Acnc	Propiedad de medida
Pt	Intervalo de tiempo
Ser	Muestra
Qn	Escala
EIA	Método

Source: LOINC Interoperability. (17)

Documentation standards

We can assume that messaging standards are sufficient for clinical data exchange; However, this is not the case, as documentation standards help determine the document type of information and its location. [5] They are generally used to specify the structures of evolutions, epicrises, discharge reports, interconsultations and other clinical documents. In addition, they have certain characteristics that make them very useful:

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

- Readable by humans.
- It includes complete information to cover the associated medical procedure.
- It has legal validity.
- They are objects whose exchange the health professional is accustomed to.

To standardize our clinical information with documentation standards, we can use CDA, CCR and CCD.

CDA

Clinical Document Architecture (CDA) is a documentation standard based on XML markup language, with the purpose of facilitating interoperability by specifying the structure and semantics of clinical documents, according to with the report "Guide for the development of CDA documents Technical Subcommittee V3-CDA HL7 Spain". [19] This type of document can be associated with any type of clinical document such as, for example, discharge reports, radiology tests, patient examination, among others. The characteristics established for a clinical document are:

- Persistence.
- Administration.
- Potential for authentication.
- Context.
- Integrity and human readability.

To implement a clinical document using the XML syntax, you must start by opening the <ClinicalDocument> element , and the CDA schema must be referenced.

CCR

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

Continuity Care Record (CCR) provides a standard format for data exchange. This allows the most relevant clinical information about a patient to be exchanged between institutions, organizations and others, according to *WR Braithwaite* . [20] In addition, it serves as a bridge in a different environment, that is, sometimes new medical personnel need to care for a patient; However, he knows nothing about said patient. CCR will allow you to know all your clinical information, from a starting point in the organized basic data set. It should be noted that for the interpretation of said data to be efficient, the following general CCR structure must be followed:

- Patient identification.
- Clinic history.
- Medication.
- Allergies.
- Recommendations for the care plan.

Below is a general breakdown structure with each of the points of a CCR document provided by *WR Braithwaite:* [20])

1. CCR Identification Information:
    - Information about "from/to" providers/clinicians.
    - Document date.
    - Purpose.
2. Patient identification information.
3. Patient insurance/financial information.
4. Patient's health status:
    - Family history.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

- Adverse reactions/allergies/etc.
- Social history and health risk factors.
- Medicines.
- Immunizations.
- Vital signs/physiological measurements.
- Laboratory results/observations.
- Procedures/Imaging.

5. Advanced Directives.
6. Care documentation.
7. Care plan.
8. Practitioners.

CCD

The Continuity of Care Document (CCD) is a working union between HL7 and ASTM (*American Society for Testing and Materials*), which encourages the interoperability of patient clinical information between providers without the risk of information being lost. meaning. In addition, it allows improving patient care. [21] CCD uses properties and features of CDA, HL7 V3 and HL7 V2. The main feature of CCD is that it contains a wide range of Abstract templates for patient clinical information, allowing these to be reused for different types of CDA documents. Among the benefits of using CCD we can find:

- Send electronic medical information without loss of meaning.
- Provides a "snapshot in time," to allow restriction of a Abstract of clinical, demographic, and administrative data relevant to a specific patient.
- Represents recommendations from the professional society.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

AmIHEALTH PROJECT

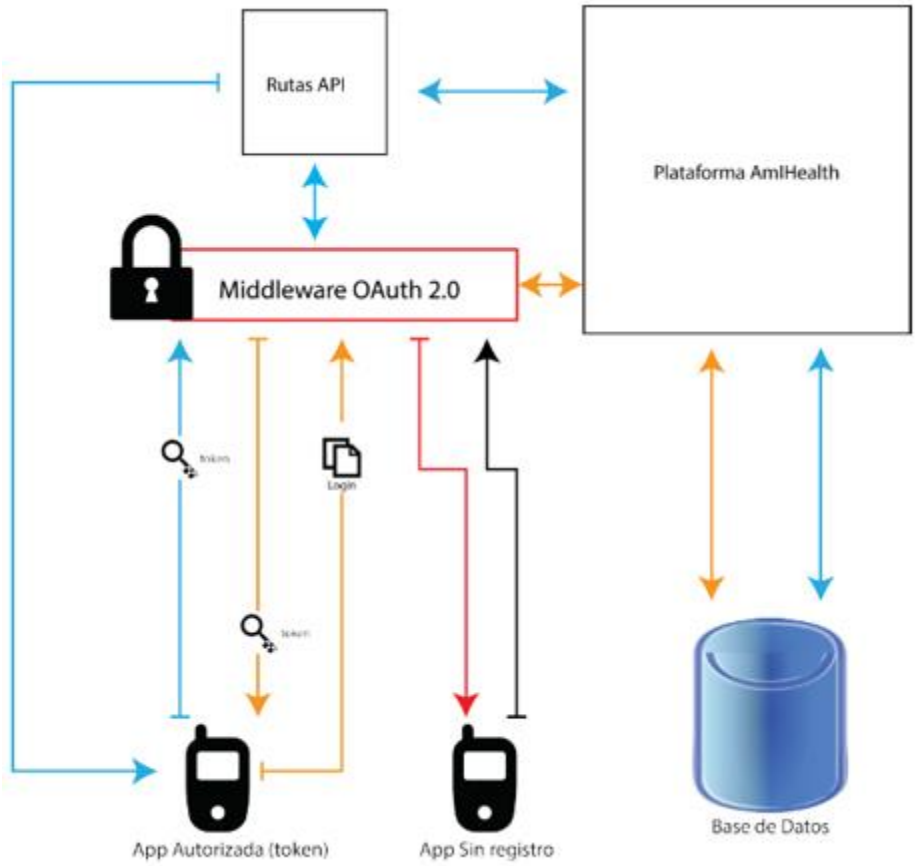
According to *M. Samudio* and *V. Villarreal* , in the article " *AmIHEALTH* : Web platform for the monitoring and control of patients with high blood pressure problems in Panama", [22] chronic non-communicable diseases currently constitute the main cause of death in many regions of the world. The development of *AmIHEALTH*, [23] proposes a web platform for tracking and monitoring patients' arterial hypertension through portable or desktop devices. It thus stores a medical history of the patients, where the data can be monitored by the doctor associated with said patient from the comfort of their office, to provide help and better control over the disease. It should be noted that this project has not been developed with the purpose of curing diseases, but it does allow the diseases incorporated into the platform for tracking and monitoring to be more bearable in the patient's life. Finally, a generic, remote and mobile solution is obtained in an adaptive way, which will allow the incorporation of new care modules for other diseases.

In the security aspect of the *AmIHEALTH* platform , the applied technologies of the HL7 FHIR standard that we could mention are OAuth 2.0 (*Open Authorization*), which allows the secure authorization of an API in a standard and simple way for desktop, mobile and web applications, which achieves user interaction with the *AmIHEALTH* platform and its different functionalities. It also has the JSON syntax to obtain resources through the HTTP protocol in a secure and structured way. Finally, there is an encrypted database to provide greater data security for the patient.

The process of using the AmIHEALTH platform service by users is quite simple through temporary tokens. The user, through the application, sends an initial

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

request token along with their credentials to the platform; said token is unique for both the mobile application and the web application. If the token matches the one registered on the platform, the credentials are verified; If these are correct, then the system sends a temporary token to the user so that they can access the services and functionalities of the platform. Upon expiration of the token, the user will have to do the entire process again. It should be noted that, if the initial request token does not match the one registered, it is inferred that the application is not registered on the platform; Therefore, the user will not be able to access the functionalities and services of the platform. In Figure 5 you can see the architecture of the platform service represented in a graphical way.



GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

Source: *V. Villarreal.* [22]

Fig. 5 *AmIHEALTH* service architecture .

Taking the above as a reference, the *AmIHEALTH* platform suggests, in terms of usability, a totally intuitive user interface, in such a way that the user can interact with it and thus establish a relationship that is easy to use and quick to learn. In addition, this platform, in a comprehensive manner, offers multiple benefits to users; In the case of the patient, a more bearable life with respect to the disease, thanks to the diagnoses offered by the platform with the assistance of the doctor associated with said patient. On the part of the doctor, the benefit is also obtained by monitoring and controlling the disease of his patients in a non-face-to-face manner. Finally, the characteristics that the platform currently contains allow that, in the future, in the aspect of interoperability, a data gateway can be created from the platform to external systems, such as public organizations, entities and others, taking into account It has adequate standards and their correct implementation for secure and efficient data exchange.

CONCLUSIONS

The implementation of interoperability standards in eHealth is totally decisive for the optimization of available resources and the respective service, which together with the benefits of ICT can be implemented for an endless number of positive purposes at different levels of entities or patients.

In the aspect of data exchange of different systems, interoperability is such a means that helps determine specific purposes, since thanks to the standards described above, great potential and efficiency in their use is obtained. However, in the health area, many systems have determination problems when establishing a

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

standard, which makes interoperability between different systems difficult in the future. This is why each of the standards must be adequately studied and the policies and guides to be implemented must be defined.

The standards as such are classified because their purposes are different; However, together they establish efficient and effective interoperability. Messaging standards establish a formal structure so that information is consistent and can arrive and be read without problem at its destination. Terminology standards create a uniformity of reading of terms referring to diseases, treatments and diagnosis; That is, they create a common language for reading terms. Finally, documentation standards make messaging standards more robust, and define formal, detailed, and understandable information structures. It is then known that each of these different types of standards is totally important for interoperability between systems.

Taking interoperability standards into account, it is intended to use the HL7 FHIR standard for the *AmIHEALTH* project in the future , which has the necessary and optimal characteristics for the exchange, manipulation and extraction of information in a secure and efficient way. .

Limitations and future proposals

Considering the different external parties in the development of *AmIHEALTH* , this project does not have the implementation of the standards described in this article, mainly HL7 FHIR, but it is intended to be implemented in the future together with a national centralized service, to exchange clinical data and bring a fully complete electronic health record.

REFERENCES

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

1. Research2guidance. Mobile Health Market Report 2013-2017. Berlin, Germany: Research2guidance; 2017 accessed: 12/21/2018]: approx. 5 p.]. Available at: http://research2guidance.com/product/mobile-health-market-report-2013-2017/

2. Pan American Health Organization. Review of interoperability standards for eHealth in Latin America and the Caribbean Internet]. Washington DC: PAHO; 2016 accessed: 12/14/2018]. Available at: http://iris.paho.org/xmlui/bitstream/handle/123456789/28188/9789275318812_spa.pdf

3. Alonso-Arévalo J, Mirón-Canelo JA. Mobile applications in health: potential, safety regulations and regulation. Rev Cubana Inf Cienc Salud Internet]. 2017 accessed: 12/21/2018];28(3). Available at: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S2307-21132017000300005&lng=es

4. Montón J. Interoperability: The tower of babel of health systems. Madrid, Spain: Hackathonsalud; c2019 accessed: 12/24/2018]: approx. 7 p.]. Available at: http://laesalud.com/hackathonsalud/2016/interoperability/interoperability-informacion-echcos-sistema-salud/

5. Caduceus Software. Health interoperability standards. Malaga, Spain: Essential Guide - Caduceus Software; c2019 accessed: 12/14/2018]: approx. 25 p.]. Available at: https://www.caduceus.es/estandares-interoperaibilidad-salud-guia/

6. Portilla F. Fundamentals of Messaging HL7 V. 2.x. HL7 messaging course; 2017 accessed: 12/24/2018]. Available

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

at: https://eva.fing.edu.uy/pluginfile.php/123521/course/section/13441/Clase4-mensajeriaHL7_v1.pdf

7. HL7 International. Product overview of HL7 standards. USA: HL7 product suite version 3; c2007-2019 accessed: 12/24/2018]: approx. 11 p.]. Available at: http://www.hl7.org/implement/standards/product_brief.cfm?product_id=186

8. ANSI. XML_Encoding_Rules_for_HL7. ANSI; 2011 accessed: 12/24/2018];2. Available at: https://www.hl7.org/documentcenter/public/wg/xml/XML_Encoding_Rules_for_HL7_v2_Messages v02.doc

9. Knapp P. Comparison of Valid HL7 V3 Message in XML. Document; 2012 accessed: 12/24/2018]: approx. 29 p.]. Available at: http://wiki.hl7.org/images/5/5c/Comparison_of_Valid_HL7_V3_Message_in_XML_May_2012.doc

10. Gonzalo Q. What is FHIR and why should I care? Talking about eHealth. 2015 accessed: 12/24/2018]: approx. 5 p.]. Available at: https://hablandoesalud.wordpress.com/2015/03/23/que-es-fhir-y-por-que-deberia-presegurame/

11. JSON. FHIR v4.0.0. US: JSON; c2007-2019 accessed: 12/24/2018]: approx. 8 p.]. Available at: https://www.hl7.org/fhir/json.html

12. González B, Duarte H. Interoperability in the authorization process of health services based on HL7-FHIR. UTP Congress Reports; 2016 accessed: 12/14/2018];1(1): approx. 18 p.]. Available at: http://www.revistas.utp.ac.pa/index.php/memoutp/article/view/1280/1718

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

13. Blog. What is the DICOM standard? Recife, Brazil: Blog; c2015 accessed: 12/24/2018]: approx. 5 p.]. Available at: http://www.mv.com.br/es/blog/-que-es-el-estandar-dicomr

14. Vilchis Rojas A. Computer crimes: DICOM images; 2016 accessed: 12/24/2018]: approx. 5 p.]. Available at: http://delitosinformaticosarturovilchis.blogspot.com/2016/12/imagenes-dicom.html

15. Atlassian. Basic aspects of SNOMED CT. SNOMED International Release Management; 2017 accessed: 12/21/2018]: approx. 5 p.]. Available at: https://confluence.ihtsdotools.org/pages/viewpage.action?pageId=47687570

16. Pan American Health Organization. International Statistical Classification of Diseases and Related Health Problems. Washington, DC: Scientific Publication No. 554. ICD-10. Manual; c2019 accessed: 12/21/2018]; Available at: http://ais.paho.org/classifications/Chapters/pdf/Volume2.pdf

17. Mandirola H, Fernando Portilla I. LOINC interoperability. Repository; 2017 accessed: 12/21/2018]: approx. 43 p.]. Available at: https://www.hospitalitaliano.org.ar/multimedia/archivos/repositorio/11/recursos/877_Interoperaibilidad Loinc - Mandirola.pdf

18. USNL of Medicine. Logical Observation Identifiers Names and Codes (LOINC(r)). Bethesda, MD; 2018 accessed: 01/08/2019]. Available at: https://www.nlm.nih.gov/research/umls/loinc_main.html

19. Technical Subcommittee V3-CDA HL7. Guide to the development of CDA documents; 2007 accessed: 12/21/2018]. Available

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

at: http://www.hl7spain.org/wpcontent/uploads/2011/06/GuiaElementosMinimosCDA.pdf

20. HL7 International. Continuity of Care Record. USA: HL7 International; c2007-2019 accessed: 12/21/2018]: approx. 4 p.]. Available at: http://www.HL7.org

21. HL7 International. HL7 Standards Product Brief - HL7/ASTM Implementation Guide for CDA(r) R2 -Continuity of Care Document (CCD(r)) Release 1. USA: HL7 International; c2007-2019 accessed: 12/21/2018]: approx. 3 p.]. Available at: http://www.hl7.org/implement/standards/product_brief.cfm?product_id=6

22. Samudio M, Villarreal V. AmIHEALTH: Web platform for the monitoring and control of patients with high blood pressure problems in Panama. UTP Congress Reports; 2017 accessed: 12/21/2018]: approx. 16 p.]. Available at: http://revistas.utp.ac.pa/index.php/memoutp/article/view/1467/pdf

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

Telemedicine in the Rehabilitation of Paraplegic Patients within the Framework of Primary Healthcare

Dr. Isabella Costa Silva
Department of Linguistics, Federal University of Rio de Janeiro, Brazil

ABSTRACT

Finding cost-effective strategies for the rehabilitation and education of patients with paraplegia, based on their needs, is necessary for a comprehensive approach, as well as for the reduction of direct and indirect costs. Telemedicine could be a suitable tool. This work aimed to carry out a critical review of the literature on the usefulness of telemedicine for the rehabilitation and management of patients with paraplegia, in the context of Primary Health Care. A search was performed in the PubMed, Medline and EMBASE databases, with MeSH and DeCS type descriptors. No filter of temporality, language or age group was applied. 134 articles were collected. The search and selection criteria were based on the PICO elements. After the content analysis of each one, 29 articles were chosen. The critical analysis of the literature was carried out using the PRISMA elements. Telemedicine and telerehabilitation are tools that could be useful for paraplegic or quadriplegic patients; However, there is no literature or evidence on this type of interventions in this population. Interventions in patients with neurological diseases other than paraplegia show that telemedicine could potentially have benefits and reduce rehabilitation costs. Technological and telemedicine tools in paraplegic patients could potentially favor their rehabilitation

ISSN : 1533-1520
GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics

and the efficient use of resources; However, it is necessary to carry out studies in the area to determine the real benefit of telemedicine as a Primary Health Care strategy in patients with paraplegia and quadriplegia.

Keywords: Telemedicine; telerehabilitation; paraplegia; primary health care; eshealth strategies; medical informatics applications; needs assessment; neurological rehabilitation

INTRODUCTION

Paraplegia and quadriplegia are neurological conditions produced secondary to damage to the spinal cord that causes a loss of strength and sensitivity below the area corresponding to the injury. [1] This entity can be caused by a large number of systemic or primary pathologies, such as spinal cord trauma, which is generally associated with falls and traffic accidents. Worldwide, spinal cord injuries have a prevalence of 490 to 526 patients per million inhabitants, and an incidence of approximately 13 to 163.4 people per million inhabitants with a maximum of 220 per million in undeveloped countries. [2]

Spinal cord injuries may initially present with pain, dysesthesia and weakness, suddenly or gradually, depending on the causal etiology. However, the degree of involvement and severity of this injury will determine the magnitude of the consequences and the type of disability. In the case of paraplegia or quadriplegia, complete paralysis of the extremities is accompanied by loss of sphincter control and, in some cases, multi-organ dysfunction. [1, 2] The prognosis may vary in each patient. In cases associated with trauma, variability in motor and sensory deficit has been documented from days to months and up to 2 years, during which time both deterioration and improvement of symptoms can be observed. [3] It has even

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

been shown that those patients who recover some type of functionality in the first 72 hours have better results in terms of disability prognosis. [2,4]

Given the extensive compromise of functionality and independence of these patients, the rehabilitation process after the acute stage is extremely relevant, since it allows achieving the highest degree of functionality and independence possible; reintegrates the patient into society and decreases the risk of medical complications. [1] However, neurological recovery and functional improvement in the majority of patients with paraplegia tends to cause large costs in terms of rehabilitation, readmissions and prolonged hospital stay, especially in older adults, who report much higher expenses than young patients. with similar prognostic indices. [5] In the prospective study published by *A. Kawu* and other authors, it is shown how the approximate amount of costs in the acute stage of the disease, for patients treated conservatively for 6 weeks, is close to $1,598.29, where Only 14.9% of this figure corresponds to hospitalization expenses. [6] However, this economic deficit not only occurs in the initial phase of the disease, but on the contrary, it has been observed that in the post-acute and chronic stage (2 years after the injury) high costs are still invested in health care. health. [7]

The integration of new information and communication technological tools into the health system seeks to meet needs and strengthen cost-effective outreach policies that promote equity and social justice. The World Health Organization recognizes this strategy under the term eHealth, which has emerged from the economic challenges that governments face due to the increase in demand from chronic patients and the reduction of health resources. [8] The advent of technology has transformed the way people relate and interact, as well as the perception of time

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

and distance in the medical field. [9] . The globalization of these instruments has resulted in a new health care model that allows receiving care remotely through telemedicine applications, mainly in remote or dispersed locations. [8, 9]

The US Health Resources and Services Administration defines telehealth as the interaction of electronic technologies and telecommunications in the support of long-distance medical care, health education of both patients and professionals, as well as public health administration. [9, 10] The Centers for Medicare and Medicaid Services define telemedicine as those actions aimed at real-time communication and interaction between health professionals or between doctor and patient. [9] These two terms should not be used indiscriminately, since they belong to different contexts. In the first instance, the term telehealth refers to the health system that makes use of electronic services, focused not only on patient care, but also on education, prevention and monitoring. On the other hand, telemedicine, as an element of telehealth, refers to telecommunications services solely related to health care. [10]

The telerehabilitation model in chronic diseases, under the digital advice of health professionals, emerges as a viable, effective and non-inferior alternative to traditional rehabilitation methods, with the advantage that it could potentially reduce costs of travel and care in centers. hospitable. [11] However, information related to rehabilitation in neurological disease, and specifically in spinal cord injuries, is very limited. Despite these limitations, the few studies support the selective implementation of telemedicine as a rehabilitation method. [3, 12]

Given that the consequences of paraplegia not only deteriorate the patient's health status, but also lead to an imbalance in terms of economic burdens, functionality of

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

the person and family financial systems, new mechanisms must be designed not only focused on the prevention of injuries. trauma, but also cost-effective programs aimed at caring for affected patients and their families. Telemedicine and technological tools, such as Primary Health Care strategies, could be useful as part of the rehabilitation of patients with paraplegia, which could improve equity in care, reduce direct and indirect costs, find support groups for these patients, interconnect them and overcome barriers to their care. [1, 13] Consequently, the present work aims to carry out a critical review of the literature on telemedicine as a tool in rehabilitation processes and multidisciplinary management of patients with paraplegia, under the context of Primary Health Care.

METHODS

An exhaustive review of the literature was carried out through a bibliographic search in the PubMed , Medline and EMBASE databases . The search criteria was based on the MeSH and DeCS descriptors: *Telerehabilitation; Paraplegia; Primary Health Care; Telemedicine Medical Informatics Applications; Neurological Rehabilitation; Needs assessment.* All the articles found were gathered in an Excel bibliographic matrix, followed by a unified and invited search of the previously described terms. No filters were used regarding the year of publication or age groups; Articles written in English, Spanish, Portuguese and German were included.

In total, 134 articles were collected and duplicates were removed. The search and selection criteria were based on the PICO elements after the content analysis of each one: documents carried out in humans, with relevant telemedicine and telehealth data oriented to the epidemiological description, social context in

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

patients with paraplegia, patient needs , economics, cost analysis, bioethical implications, rehabilitation-telerehabilitation and Primary Health Care. The final number of studies chosen was 29 articles for the working group.

In accordance with the objectives of this article, 3 categories of analysis were established, in which the selected documents were distributed to proceed with the review, analysis and synthesis of the information: needs of the patient with paraplegia; Primary Health Care and telemedicine; telerehabilitation and neurorehabilitation. In this order, the results were organized and written. The discussion was developed based on the critical analysis of the literature through the PRISMA elements and the study of the variability, reliability and validity of the information. In addition to the literature search carried out with the previously described strategy, the record of information regarding the telemedicine programs used in the articles found was expanded.

ANALYSIS OF THE RESULTS

Needs of the patient with paraplegia

The physiological and psychosocial changes that patients with paraplegia present generate special needs as an individual and as a social being during their care. [14] In the first instance, the doctor-patient relationship must be strengthened, since specifying the best care scenario, in which the points of view of both the patient and the health personnel are taken into account, improve outcomes. [fifteen]

In New Zealand, a qualitative descriptive study was carried out on 18 patients from rural and suburban areas with disabilities of less than 12 months, who had completed their rehabilitation work in order to develop a telerehabilitation program, based on the experience of the patient and the professional. that offers the

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

service. [16] It was found that the detailed use of technological aids, graphic material with adequate explanation of the therapy exercises, the participation of family and friends in rehabilitation programs that favor constant motivation, support from the therapist, persistent feedback on the objectives achievements and hope are markers of improvement in the well-being of the patient in rehabilitation. [16]

On the other hand, avoid barriers to access to health such as travel problems; physical barriers represented in facilities not suitable for the disabled; The ethical course in decision-making and psychological support guarantee better care and adherence to management. [14, 17] At this point, telemedicine could reduce these access barriers and promote improvement in the quality of life of patients with paraplegia. The latter becomes the main therapeutic objective in this type of patients today. [15, 16]

Other psychological problems include acceptance by family and friends, personal dignity, resistance to motivation for activities of daily living, and vocational rehabilitation. [18] This means that the care centers of these users present specific challenges. A leading example is the Swiss Paraplegic Center, which established an ethics forum to offer support in difficult situations on topics such as communication with the patient, death and suicide, training of essential people in the process about decision-making. ethical decisions and communication with patients. [14] These strategies decreased problems in meeting the needs of patients with paraplegia. [14] Emotional needs could also be addressed through telemedicine and psychological support for patients and caregivers.

Parallel to this, the needs of caregivers appear, directly involved in the care process of paraplegic patients. Some of the main points lie in the overload of

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

responsibilities and hospital readmissions explained, among other things, by addiction to the hospital and the care facilities that health services offer; the impossibility of adapting spaces at home and economic difficulties or denial of their family member's illness. [18] From this vision, telemedicine has the potential to reduce costs for families and to offer support, rehabilitation and psychological assistance services for patients and caregivers, even with the possibility of forming care networks and support groups. [10, 11]

Finally, other considerations appear in the needs of these patients such as work resistance. Thus, for example, in patients with an active working life or great community participation, returning to work is presented as a major problem, given the physical and mental limitations and the lack of adaptation of work environments for people with a disability. [19, 20] Given this, technologies could encourage work participation of patients with paraplegia, and telerehabilitation could help them gain functionality and skills to carry out these tasks. [19, 20]

Primary Health Care and telemedicine

With the emergence of new health technologies, guidelines have been defined that any type of technology in patient health care should comply with. *Schwamm* mentions 6 basic pillars of these services: safe, effective, patient-centered, timely, efficient and equitable. [10] These principles are in congruence with the principles of Primary Health Care, understood as health care that uses simple technologies as its axis that are within the reach of the general population, which are sustainable for the country and the health system. [twenty-one]

However, the question arises as to whether these health technologies generate any type of impact on health systems. One of the methods that has been studied most

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

frequently is medical advice by telephone after discharge from the emergency department, in order to reduce readmissions that generate million-dollar costs for the health system. The results are statistically significant in favor of its use; That is, a significant reduction in readmissions to the emergency room is estimated when telephone advice is provided, especially in chronic diseases that include cardiovascular and neurological pathologies as the most frequent events. [12] These positive results can be extrapolated to other areas of medicine with a positive perception by patients and health professionals. [eleven]

The rehabilitation of different chronic pathologies requires patients and families to have a certain availability of time and financial resources to travel to health centers, and health care is restricted to health institutions, in many cases without follow-up by part of the medical staff. [11] All of these points are optimized by the use of technologies, especially because in the specific case of patients with paraplegia, mobilization represents great difficulty for their caregivers and an increase in the use of resources. [10]

Although telehealth and telemedicine services cannot replace medical personnel, these tools can be aimed at improving the opportunity for health care in the face of the shortage of human resources trained in primary care in rural areas. [22, 23, 24, 25, 26] These resources make it possible to achieve clinical and behavioral controls adapted to the patient's needs and environmental factors, address home care for the treatment of chronic diseases, increase preventive medicine campaigns, and improve communication between professionals. , with the aim of reducing costs and high rates of unjustified consultation in emergency services in rural areas. [22, 23, 24, 25, 26]

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

In recent decades, the use of technological aids has been implemented in primary care services in developed countries, which has demonstrated greater efficiency in management processes, which highlight system security, maintenance of privacy and confidentiality, and others such as the integration of health centers and the interconnection of different systems and programs. [27] However, a low level of adherence of medical personnel to these programs has been identified, attributed to traditional medical practice, which has highlighted the need for motivation and continuous training for all team members as a requirement. [27]

Likewise, telemedicine has the potential to allow health systems to offer better medical and patient-centered care, with increased efficiency in the use of resources; greater availability of patient care time; with specific strategies such as the promotion of long-distance clinical care; education in prevention and health promotion for patients, caregivers and professionals and carrying out public health activities and administrative matters. [9] Despite this, some critics report discomfort given the risk of compromising privacy and confidentiality, the limitation on performing physical examinations electronically, and the risk of deteriorating the doctor-patient relationship and reducing human interaction. [9]

Telerehabilitation and neurorehabilitation

Telerehabilitation is a new medical tool that allows almost universal access for patients with neurological injuries to quality rehabilitation and monitoring through virtual means. [28] This ensures highly complex patients have transversal follow-up and better health care. [29] This intervention is promising in this population, since patients have a marked limitation in their extremities that prevents adequate transportation and mobilization to care centers . In the majority of patients with

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

neurological disease included in the studies, telerehabilitation has good acceptance and adherence, even greater than traditional rehabilitation, since it requires fewer resources from the patient and their caregivers; However, it does require responsibility and motivation to obtain good results. [30] Due to the above, not all patients are candidates for telerehabilitation; They also require preparation and technological resources to comply with this program. [31]

Currently, there are no analytical studies, controlled clinical trials or observational studies that demonstrate equal or greater effectiveness, safety and acceptability of telemedicine and telerehabilitation compared to usual care seen in patients with paraplegia and quadriplegia. However, there are observational and experimental studies, as well as systematic reviews that include patients who have suffered a cerebrovascular attack (CVA) or neurological pathologies such as cerebral palsy, which evaluate and compare conventional therapies with telerehabilitation. Among the outcomes evaluated are: the recovery of gross and/or fine motor skills; the recovery of daily living skills and cognitive and neuropsychiatric abilities. These studies allow us to have an optimistic vision about the potential of telemedicine and telerehabilitation in patients with paraplegia. [32, 33, 34, 35, 36, 37, 38]

Chen and other authors concluded that the evidence was moderate and limited, with similar effects of telerehabilitation in any of its approaches, in terms of gains in daily living skills and motor functionality compared to conventional rehabilitation, measured with the Barthel index . and the *Fugl-Meyer Extremity scale.* [32] *Sarfo* and other authors found statistically significant differences in patient functional recovery in those in telerehabilitation compared to conventional therapy; However, they did not find differences for other outcomes (higher cortical

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

dysfunction, depression, and caregiver burden). [33] *Sarfo* discovered, in a cross-sectional study in Ghana, that patients have high acceptance of telerehabilitation (80-93%), however, they have limitations in access to technologies. [34)] It was like that for *Likitlersuang* too . [35]

Levy et al., in addition to finding significant improvement in the functional independence measure (FIM) and satisfaction with the telerehabilitation experience, also showed a reduction in an average of 2,774.7 ± 3,197.4 miles of journey; 46.3 ± $1,326.9 dollars in money per trip and 46.3 ± 53.3 hours of time, which could suggest that there is a reduction in costs, time and travel with telerehabilitation programs. [36] In the study by *Dodakian* et al., improvement in motor function, skills in the use of computers, and improvement in patient education on stroke prevention was found in patients with stroke. [37] Regarding other related studies, *Baque* et al evaluated the implementation of a Web-based training program (MitiiTM) compared to usual therapy in children older than 12 months with acquired brain injury. The authors found a significant difference in favor of telerehabilitation in the maximum functional strength test score, with no differences in secondary outcomes. [38]

The telemedicine elements found in the rehabilitation programs for neurological patients without paraplegia focused on the creation of specialized software in physical therapy and gain of functionality, as well as educational material for the patient and their caregivers; the use of the internet, computers, tablets, specialized USB port devices and smartphones; communication and constant support between patients and health personnel in real and delayed time with the use of special communication technologies, email, video calls and telephone calls; the necessary

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

technical support; home visits and to a lesser extent visits to health centers. [12, 23, 31, 32, 33, 34, 35, 36, 37, 38]

The software used stands out: HCAD, MoURehab, STARFISH application, the NeuroPersonalTrainer platform, STeleR, Carr and Shepard, the HIPAA *compliant and used Polycom Converged Management Application client software* and the Mitii TM, all related to the gain of skills of the daily life, functionality and motor recovery of the extremities. [32 - 38] The devices that stood out for their innovation were the *Hand Mentor Pro* used to gain gross and fine motor skills in the upper limbs; [32 - 34] the *Home Care Activity Desk* as a tool to gain functionality in activities of daily living (occupational therapy); [34] the use of 3D games [32 - 34] and camera systems. [35]

In the same way that the use of innovative technologies is essential for telerehabilitation, so is the training of patients and their caregivers in computing, telecommunications, use of devices and even in the use of smartphones or email. [31] In general, the duration of the education, rehabilitation and follow-up programs ranged from 15 hours to 24 weeks, with follow-up by telephone calls, videoconference, online chat, email and home visits. [12, 23, 31, 38] The acceptability of the programs was good, especially in remote places or places without resources (annex 1). [12, 23, 31, 32, 33, 34, 35, 36, 37, 38]

DISCUSSION

Telemedicine and the use of remote electronic health care systems could help reduce costs for the health system, for the patient and for their family. For their proper functioning, these new care processes require the imperative of meeting patient needs, the availability and maintenance of technology at a reasonable cost,

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

ensuring the privacy, reliability and security of information; the presence of technical and communications service and training for health professionals, patients and caregivers for the use of this type of systems. Some medical specialties that report use of telerehabilitation and telemedicine are Adult Medicine, Cardiology, Pulmonology, Obstetrics, Traumatology, Rheumatology, Psychiatry, Geriatrics, Gerontology and Neurology. [39] Telemedicine has advantages and disadvantages that must be taken into account for the correct functioning of these processes (annex 2).

It has been documented that patients with paraplegia/quadriplegia present less commitment at a family, social and financial level when their health status is less affected (physical and psychological), they have a greater degree of independence and receive support and rehabilitation. [40, 41] However, it is evident that the financial expenses are disproportionate to the labor income obtained after the injury, especially due to the high unemployment rates that force the patient to depend on family resources; even more so when they present medical complications and hospital readmissions that delay the rehabilitation processes, and with this the reintegration into working life. [40, 41] Thus, telemedicine, by reducing readmissions, favoring the gain of skills and reducing inequality in care for less advantaged patients (for example, rural areas or without economic resources), fulfills a function of vindication and equity in health never seen before for this type of patients.

In general, telemedicine improves access to information and could potentially meet several of the physical and emotional needs of the patient and their caregivers by creating care networks for these people. [28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38] In this way,

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

it could positively impact the quality of life and the gain in functionality of these patients. The latter are the two main therapeutic objectives in people with paraplegia. Among health professionals, it favors the provision of care not previously offered; It improves access and care, represented by greater availability of time and under an appropriate approach, and even promotes the doctor-patient relationship, all this without jeopardizing the patient's gain in functionality. [8, 9, 10, 11, 22, 23, 24, 25, 26]

Finally, for health systems, telemedicine and telerehabilitation could promote equity in the processes of access to services, regardless of the socioeconomic limitations of the patient and their family; This translates into the optimization of health care, a good perception of these programs by patients and potentially a reduction in costs for the system. [23, 42] The above is especially true for patients who are confined to their home, who live in rural or marginalized areas, or who suffer from other limitations that make access to care difficult. [8, 9]

The disabled patient presents needs derived from the physiological and psychosocial changes of his condition, and must be taken into account for the rehabilitation process, whether conventional or via telemedicine. Trained personnel must always participate in these processes; There must be a good doctor-patient relationship that promotes an adequate care scenario; There must be sufficient technological tools and sufficient motivation on the part of the patient, caregivers and health service providers. The main efforts in this area have focused on the generation of software for remote rehabilitation and patient education. For this, the main tools used in the studies were telecommunications and technologies easily accessible to patients such as computers, tablets or smartphones.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

Thus, the use of technological and telemedicine tools in paraplegic patients could potentially favor their rehabilitation and the efficient use of resources, especially when the patient is in remote locations or in rural or suburban areas. However, this hypothesis is obtained from studies with patients undergoing neurological rehabilitation for causes other than paraplegia, given that studies in this population are non-existent. Therefore, it is necessary to carry out studies in the area to determine the real benefit of telemedicine as a Primary Health Care strategy for the rehabilitation of patients with paraplegia and quadriplegia.

REFERENCES

1. Daroff R, Jankovic J, Mazziotta J, Pomeroy S. Bradley's Neurology in Clinical Practice. Philadelphia: Elsevier Saunders; 2012 accessed: 10/10/2018]. Available at: https://www.elsevier.com/books/bradleys-neurology-in-clinical-practice-2-volume-set/daroff/978-0-323-28783-8

2. Kang Y, Ding H, Zhou H, Wei Z, Liu L, Pan D, Feng S. Epidemiology of worldwide spinal cord injury: a literature review. J Neurorestoratol. 2017 accessed: 10/14/2018]. Available at: https://www.dovepress.com/epidemiology-of-worldwide-spinal-cord-injury-a-literature-review-peer-reviewed-article-JN

3. Dobkin B, Apple D, Barbeau H, Basso M, Behrman A, Deforge D, et al. Weight-supported treadmill vs. over-ground training for walking after acute incomplete SCI. Neurology. 2006 accessed: 10/14/2018];66(4):484-93. Available at: https://www.ncbi.nlm.nih.gov/pubmed/16505299

4. Fawcett JW, Curt A, Steeves JD, Coleman WP, Tuszynski MH, Lammertse D, et al. Guidelines for the conduct of clinical trials for spinal cord injury as developed by the ICCP panel: spontaneous recovery after spinal cord injury and

statistical power needed for therapeutic clinical trials. Spinal Cord. 2007 accessed: 10/10/2018];45(3):190-205. Available at: https://www.nature.com/articles/3102007

5. Cifu DX, Huang ME, Kolakowsky-Hayner SA, Seel RT. Age, outcome, and rehabilitation costs after paraplegia caused by traumatic injury of the thoracic spinal cord, conus medullaris, and cauda equina. J Neurotr. 1999 accessed: 10/14/2018];16(9):805-15. Available at: https://www.liebertpub.com/doi/abs/10.1089/neu.1999.16.805

6. Kawu AA, Olawepo A, Salami AO, Kuranga SA, Abdulhameed S, Esenwah VC. A cost analysis of conservative management of spinal cord-injured patients in Nigeria. Spinal Cord. 2011 accessed: 10/10/2018];49(11):1134-7. Available at: https://www.nature.com/articles/sc201169

7. French DD, Sabharwal S, Nelson AL, Palacios PA, Gavin-Dreschnack D. Health care costs for patients with chronic spinal cord injury in the Veterans Health Administration. J Spinal Cord Med. 2007 accessed: 10/10/2018];30(5):477-81. Available at: https://www.ncbi.nlm.nih.gov/pubmed/18092564

8. World Health Organization and International Telecommunication Union. National eHealth Strategy Toolkit Overview. 2012 accessed: 10/10/2018]. Available at: https://www.who.int/ehealth/en/

9. Chaet D, Clearfield R, Sabin JE, Skimming K, et al. Ethical practice in Telehealth and Telemedicine. J Gen Int Med. 2017 accessed: 10/10/2018];32(10):1136-40. Available at: https://www.ncbi.nlm.nih.gov/pubmed/28653233

10. Schwamm LH. Telehealth: seven strategies to successfully implement disruptive technology and transform health care. Health Affairs. 2014 accessed: 10/10/2018];33(2):200-6. Available at: https://www.healthaffairs.org/doi/full/10.1377/hlthaff.2013.1021?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub%3Dpubmed&

11. Raney L, Bergman D, Torous J, Hasselberg M. Digitally driven integrated primary care and behavioral health: How technology can expand access to effective treatment. Current Psychiat Rep. 2017 accessed: 10/14/2018];19(11):86. Available at: https://link.springer.com/article/10.1007%2Fs11920-017-0838-y

12. Jayakody A, Bryant J, Carey M, Hobden B, Dodd N, Sanson-Fisher R. Effectiveness of interventions utilizing telephone follow up in reducing hospital readmission within 30 days for individuals with chronic disease: a systematic review. BMC Health Serv Res. 2016 accessed: 10/10/2018];16(1):403. Available at: https://www.ncbi.nlm.nih.gov/pubmed/27538884

13. Vyshka G, Muzha D, Papajani M, Basho M. Recent advances on acute paraplegia. J Acute Dis. 2016 accessed: 10/10/2018];5(6):445-9. Available at: https://www.sciencedirect.com/science/article/pii/S2221618916301500

14. Scheel-Sailer A, Felleiter P. Akutmedizin und Rehabilitation für Menschen mit einer Querschnittlähmung - Herausforderungen aus ethischer Perspektive. Therapeutische Umschau Revue therapeutique. 2017 accessed: 10/10/2018];74(2):55-60. Available at: https://econtent.hogrefe.com/doi/abs/10.1024/0040-5930/a000882

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

15. Foulon BL, Lemay V, Ainsworth V, Martin Ginis KA. Enhancing physical activity guidelines: a needs survey of adults with spinal cord injury and health care professionals. Adapt Phys Activ Q. 2012 accessed: 10/10/2018];29(4):329-45. Available at: https://www.semanticscholar.org/paper/Enhancing-physical-activity-guidelines

16. Saywell N, Taylor D. Focus group insights assist trial design for stroke telerehabilitation: a qualitative study. Physiother Theor Pract. 2015 accessed: 10/10/2018];31(3):160-5. Available at: https://www.tandfonline.com/doi/abs/10.3109/09593985.2014.982234?journalCode=iptp20

17. Yuen HK, Wolf BJ, Bandyopadhyay D, Magruder KM, Selassie AW, Salinas CF. Factors that limit access to dental care for adults with spinal cord injury. Special care in dentistry. Official publication of the American Association of Hospital Dentists, the Academy of Dentistry for the Handicapped, and the American Society for Geriatric Dentistry; 2010 accessed: 11/04/2018];30(4):151-6. Available at: https://europepmc.org/abstract/med/20618781

18. Kazi ZK, Qureshi A. Psychological and social problems of paraplegics in Pakistan. Paraplegia. 1972 accessed: 11/03/2018];10(2):107-10. Available at: https://www.nature.com/articles/sc197218

19. Damanski M. The Paraplegic Patient as a Social Problem. Paraplegia. 1964 accessed: 11/03/2018];2:169-77. Available at: https://www.nature.com/articles/sc196431

20. Groah SL, Charlifue S, Tate D, Jensen MP, Molton IR, Forchheimer M, et al. Spinal cord injury and aging: challenges and recommendations for future

research. Am J Phys Med Rehabilit. 2012 accessed: 11/03/2018];91(1):80-93. Available at: https://journals.lww.com/ajpmr/Abstract/2012/01000/Spinal_Cord_Injury_and_Aging__Challenges_and.10.aspx

21. World-Health-Organization. Primary health care: report of the International Conference on Primary Health Care; 1978. Alma-Ata, Kazakhstan, old USSR, Geneva: WHO; 1979 accessed: 10/12/2018]. Available at: Available at: https://www.who.int/publications/almaata_declaration_en.pdf

22. McCarthy D. The virtual health economy: telemedicine and the supply of primary care physicians in rural America. Am J Law Med. 1995 accessed: 10/12/2018];21(1):111-30. Available at: https://heinonline.org/HOL/LandingPage?handle=hein.journals/amlmed21&div=9&id=&page

23. Raven M, Butler C, Bywood P. Video-based telehealth in Australian primary health care: current use and future potential. Austr J Prim Health. 2013 accessed: 10/12/2018];19(4):283-6. Available at: https://www.researchgate.net/publication/258054174_Video-based_telehealth_in_Australian_primary_health_care_Current_use_and_future_potential

24. Fortney JC, Pyne JM, Turner EE, Farris KM, Normoyle TM, Avery MD, et al. Telepsychiatry integration of mental health services into rural primary care settings. Internat Rev Psychiatr. 2015;accessed: 10/13/2018];27(6):525-39. Available

at: https://www.tandfonline.com/doi/abs/10.3109/09540261.2015.1085838?journalCode=iirp20

25. Brainard JS, Ford JA, Steel N, Jones AP. A systematic review of health service interventions to reduce use of unplanned health care in rural areas. J Eval Clinic Practice. 2016 accessed: 10/12/2018];22(2):145-55. Available at: https://onlinelibrary.wiley.com/doi/abs/10.1111/jep.12470

26. Radhakrishnan K, Xie B, Berkley A, Kim M. Barriers and Facilitators for Sustainability of Tele-Homecare Programs: A Systematic Review. Health Serv Res. 2016 accessed: 10/12/2018];51(1):48-75. Available at: https://www.ncbi.nlm.nih.gov/pubmed/26119048

27. Tomasi E, Facchini LA, Maia MF. Health information technology in primary health care in developing countries: a literature review. Bull World Health Organ. 2004 accessed: 10/13/2018];82(11):867-74. Available at: https://www.ncbi.nlm.nih.gov/pubmed/15640923

28. Dobkin BH, Dorsch AK. The Evolution of Personalized Behavioral Intervention Technology: Will It Change How We Measure or Deliver Rehabilitation? Stroke. 2017 accessed: 11/08/2018];48(8):2329-34. Available at: https://www.ncbi.nlm.nih.gov/pubmed/28679855

29. Fluet GG, Kizony R. Virtual rehabilitation in 2016 - a maturing field with a broadening horizon. Disab Rehabilit. 2017 accessed: 11/08/2018;39(15):1502]. Available at: https://www.tandfonline.com/doi/full/10.1080/09638288.2016.1252797

30. Dobkin BH. Behavioral self-management strategies for practice and exercise should be included in neurological rehabilitation trials and care. Curr Opinion

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

Neurol. 2016 accessed: 11/08/2018];29(6):693-9. Available at: https://www.ncbi.nlm.nih.gov/pubmed/27608301

31. Gul S, Ghaffar H, Mirza S, Fizza Tauqir S, Murad F, Ali Q, et al. Multitasking a telemedicine training unit in earthquake disaster response: paraplegic rehabilitation assessment. Telemed J e-health. 2008 accessed: 11/08/2018];14(3):280-3. Available at: https://www.liebertpub.com/doi/abs/10.1089/tmj.2007.0042

32. Chen J, Jin W, Zhang XX, Xu W, Liu XN, Ren CC. Telerehabilitation Approaches for Stroke Patients: Systematic Review and Meta-analysis of Randomized Controlled Trials. J Stroke Cerebrovasc Dis. 2015 accessed: 11/08/2018];24(12):2660-8. Available at: https://www.strokejournal.org/article/S1052-3057(15)00500-5/fulltext

33. Sarfo FS, Ulasavets U, Opare-Sem OK, Ovbiagele B. Tele-rehabilitation after stroke: An updated systematic review of the literature. J Stroke Cerebrovasc Dis. 2018 accessed: 11/09/2018];27(9):2306-18. Available at: https://www.strokejournal.org/article/S1052-3057(18)30231-3/fulltext

34. Sarfo FS, Adamu S, Awuah D, Sarfo-Kantanka O, Ovbiagele B. Potential role of tele-rehabilitation to address barriers to implementation of physical therapy among West African stroke survivors: A cross-sectional survey. J Neurol Sci. 2017 accessed: 11/09/2018];381:203-8. Available at: https://www.ncbi.nlm.nih.gov/pubmed/28991682

35. Likitlersuang J, Sumitro ER, Theventhiran P, Kalsi-Ryan S, Zariffa J. Views of individuals with spinal cord injury on the use of wearable cameras to monitor upper limb function in the home and community. J Spinal Cord Med. 2017

accessed: 11/09/2018];40(6):706-14. Available at: https://www.ncbi.nlm.nih.gov/pubmed/28738759

36. Levy CE, Silverman E, Jia H, Geiss M, Omura D. Effects of physical therapy delivery via home video telerehabilitation on functional and health-related quality of life outcomes. J Rehabilit Res Develop. 2015 accessed: 11/09/2018];52(3):361-70. Available at: https://www.rehab.research.va.gov/jour/2015/523/pdf/JRRD-2014-10-0239.pdf

37. Dodakian L, McKenzie AL, Le V, See J, Pearson-Fuhrhop K, Burke Quinlan E, et al. A Home-Based Telerehabilitation Program for Patients With Stroke. Neurorehabil Neur Repair. 2017 accessed: 11/09/2018];31(10-11):923-33. Available at: https://www.ncbi.nlm.nih.gov/pubmed/29072556

38. Baque E, Barber L, Sakzewski L, Boyd RN. Randomized controlled trial of web-based multimodal therapy for children with acquired brain injury to improve gross motor capacity and performance. Clin Rehabilit. 2017 accessed: 11/09/2018];31(6):722-32. Available at: https://journals.sagepub.com/doi/abs/10.1177/0269215516651980

39. Mohammadzadeh N, Safdari R. Patient monitoring in mobile health: opportunities and challenges. Med Arch. 2014 accessed: 11/09/2018];68(1):57-60. Available at: https://www.ncbi.nlm.nih.gov/pubmed/24783916

40. Berns SH, Lowman EW, Rusk HA, Covalt DA. Spinal cord injury-rehabilitation costs and results and follow-up in thirty-one cases. JAMA. 1957 accessed: 11/11/2018];164(14):1551-8. Available at: https://jamanetwork.com/journals/jama/article-abstract/321161

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

41. Kalyani HH, Dassanayake S, Senarath U. Effects of paraplegia on quality of life and family economy among patients with spinal cord injuries in selected hospitals of Sri Lanka. Spinal Cord. 2015 accessed: 11/08/2018];53(6):446-50. Available at: https://www.nature.com/articles/sc2014183

42. Hjelm NM. Benefits and drawbacks of telemedicine. J Telemed Telecare. 2005 accessed: 11/08/2018;11(2):60-70]. Available at: Available at: https://www.researchgate.net/profile/Nils_Hjelm/publication/7908107.pdf

FINANCING

The manuscript in its development and preparation has not received any specific grant from agencies in the public, commercial or non-profit sectors.

ANNEXES

ANNEX 1 - ELEMENTS OF TELEMEDICINE AND TELEREHABILITATION

Applied studies:

Jayakody A, Bryant J, Carey M, Hobden B, Dodd N, Sanson-Fisher R; 2016 [(12)]

- Support patients with chronic illnesses via telephone to help prevent unnecessary readmissions.
- Duration: survival 30 days after discharge.
- Educate the patient regarding self-care skills or what to do if they are not feeling well and assess the patient's experience in transitioning care and their understanding of the hospital stay.
- Raven M, Butler C, Bywood P; 2013(23).
- Video consultation “Telemedicine in primary health care”, in Australia.
- The video consultation resulted in significantly higher patient satisfaction.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

- Scaling up video conferencing consultation to remote communities (where many Aboriginal people live) is still difficult because of some technical challenges, including image quality, which is crucial for cross-cultural assessment.
- Video consultation may be more effective if it will be used primarily for follow-up appointments rather than diagnosis.
- Video consultations are not intended to completely replace standard consultations but, on the contrary, to provide timely access when there is some type of limitation.
- Gul S, Ghaffar H, Mirza S, Fizza Tauqir S, Murad F, Ali Q, et al; 2008(31).
- Training of paraplegic patients in computer science and telecommunications in a telemedicine training center, teaching skills to support the rehabilitation process through telemedicine.
- Course of six workshops.
- They were trained in the use of Microsoft Office, telemedicine software, telemedicine website facilities, and use of email.
- The trainings included the use of a digital camera to capture images of progress in their rehabilitation plan.

Chen J, Jin W, Zhang XX, Xu W, Liu XN, Ren CC; 2015 [32]

- Activities of daily living in patients with stroke.
- Duration: 4- 20 weeks.
- Telephone calls with home visits to guide therapies or for patient and family education, medication management and monitoring.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

- Messaging devices to instruct patients in functional exercises and adaptive strategies.
- Video calls.
- HCAD rehabilitation system.
- Videoconferencing systems.
- Instructional videos.
- Online chat sessions.
- Use of email.

Sarfo FS, Ulasavets U, Opare-Sem OK, Ovbiagele B; 2018 [33]

- Efficacy of rehabilitation interventions for motor recovery, higher cortical dysfunction and post-cerebrovascular event depression.
- Duration: 15 hours - 24 weeks.
- Physical exercises and electromyography-activated neuromuscular stimulation (ETNS).
- Virtual reality therapy program on smartphones, tablets, tablet PC (MoU-Rehab).
- Behavior change intervention based on a mobile application (STARFISH).
- Training program for caregivers with information technology supports.
- Robot-assisted therapy (Hand Mentor Pro robotic device) + HEP (home exercise program).
- Computerized cognitive rehabilitation (Guttmann, NeuroPersonalTrainer telerehabilitation platform) + RHEP (right hemifield eye patch).
- Functionality-based exercises and adaptive strategies: STeleR intervention. (stroke telerehabilitation).

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

- Videoconferences and audiovisual materials.
- Home exercise program (Carr and Shepherd "Motor Learning Program" + kiosk).
- Tele-physical rehabilitation program (3-D animated exercise videos + 3-D interactive games).
- Web-based intervention to alleviate depression. Home intervention condition (professional guidance, educational videos, online chat sessions, email and message board, and resource room).
- Home Care Desk Exercise Training System.
- VVR (3-D motion tracking system) therapy program at home.
- Computerized tracking training.

Sarfo FS, Adamu S, Awuah D, Sarfo-Kantanka O, Ovbiagele B; 2017 [34]

- Patient with stroke to improve motor, cognitive and neuropsychiatric function.
- Duration: 2-24 weeks.
- Telephone-guided physical exercise and neuromuscular electromyography.
- Virtual reality therapy on cell phone, computer or tablet (MoU-Rehab).
- Cell phone application based on behavioral interventions (STARFISH).
- Training for caregivers through e-health with the use of tablets.
- Assisted robotic therapy (The Hand Mentor Pro robotic device) with in-person physiotherapy.
- Computerized cognitive rehabilitation (Guttmann, NeuroPersonalTrainer tele-rehabilitation platform) + patch in the right ocular hemifield.
- Functionality exercises and telephone-based adaptive strategies (STeleR).

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

- Telephone-monitored robotic-assisted therapy for depression outcome.
- Video conferences combined with face-to-face interventions.
- Home exercise program with telemonitoring in digital kiosks (Carr and Shepherd "Motor Learning Program" + kiosk).
- Telerehabilitation program for physical activity (3D animations and interactive games) with the use of computers.
- Using physical therapy training videos.
- Home Care Activity Desk training system-exercise as physical training for the hand.
- Likitlersuang J, Sumitro ER, Theventhiran P, Kalsi-Ryan S, Zariffa J; 2017(35)
- Wearable camera systems to measure functional hand use at home to guide neurorehabilitation strategies.
- Study session: approximately 2 hours.
- When carrying out the activities, the participants used 3 portable cameras for subsequent automated analysis of hand use and to design appropriate rehabilitation strategies.

Levy CE, Silverman E, Jia H, Geiss M, Omura D; 2015 [(36)]

- Functionality, satisfaction and quality of life in a group of war veterans in a rural area with musculoskeletal disorders, multiple sclerosis or stroke.
- Rural Veterans TeleRehabilitation Initiative (RVTRI).
- Duration: average 12 weeks.
- Physical, occupational and recreational therapy.
- Nursing and psychological services.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

- Use of special devices and software: Cisco E20 videophones (Cisco Systems Inc; San Jose, California).
- Technical support team.
- Computers, smartphones and internet connectivity.
- Videoconferences.

Dodakian L, McKenzie AL, Le V, See J, Pearson-Fuhrhop K, Burke Quinlan E, et al.; 2017 [37]

- Gain of upper limb and hand motor function after stroke.
- Duration: 4 weeks.
- Game-based approach: 18 games and 67 exercises.
- 5 minutes daily of patient education with quiz.
- Regular video conferences: 3 times a week.
- 6 face-to-face visits: in the second, a contract of objectives and duties was carried out.
- An instruction manual for the therapy, the devices used, and a telephone contact information were provided in case technical support was required.
- HIPAA compliant and used Polycom Converged Management Application client software was used for communication between the laboratory and the patients' home.
- Technology required: 24″ × 48″ table, bridge chair, Dell Latitude E5420 computer (14″ display, internal webcam and fisheye lenses), Verizon wireless USB modem, USB blood pressure cuff, custom-made USB mat measurement that uses touch-sensitive switches, USB wrist splint with sensor, accelerometer and a musical glove.

ISSN : 1533-1520

GARDEN JOURNALS

Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics

Scarcity Of Theses Aligned With Health Research Priorities In A Medical School In Peru

Dr. Sofia Ramirez Rodriguez,
Center for Advanced Research in Biotechnology, University of Buenos Aires, Argentina

ABSTRACT

The objective of this work was to determine the proportion of undergraduate theses from a medical school that were framed within the national or Arequipa region's Health Research Priorities (PIS) agenda. A cross-sectional study was carried out, in which 624 undergraduate theses from a Peruvian university were evaluated in the period 2011 to 2017. 23.4% (110) of the theses from the years 2011 to 2015 were framed in the 2011 national PIS. -2014 and 36% (55) of those corresponding to the years 2016 and 2017 were located in the national PIS 2015-2021. 9.6% (4) of the theses from the years 2011 to 2015 were framed in the PIS of the Arequipa region 2011-2014 and 36.6% (56) of theses from the years 2016 and 2017, in the PIS of the Arequipa region 2015-2021. It was concluded that a low proportion of the theses studied address health research priorities.

Keywords: Academic thesis; health priority agenda; undergraduate education in medicine

ABSTRACT

The purpose of the study was to determine the proportion of undergraduate theses written in a medical school which were framed within the national health research priorities (HRP) agenda or dealt with priorities of the Arequipa region. A cross-

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

sectional study was conducted of 624 undergraduate theses written in a Peruvian university from 2011 to 2017. Of the theses written from 2011 to 2015, 23.4% (110) had to do with the national 2011-2014 HRPs, whereas 36% (55) of those written in 2016 and 2017 responded to the national 2015-2021 HRPs. Of the theses written from 2011 to 2015, 9.6 % (4) had to do with the 2011-2014 HRPs for the Arequipa region, whereas 36.6 % (56) of those written in 2016 and 2017 were framed in the 2015-2021 HRPs for the Arequipa region. It was concluded that a low proportion of the theses studied address health research priorities.

Key words: academic thesis; health priorities agenda; undergraduate medical education

INTRODUCTION

Well-directed, quality research at the local level is essential to improve population health and accelerate socioeconomic development in low- and middle-income countries. [1] In Peru, the National Institute of Health developed research agendas in priority areas, known as Health Research Priorities (PIS), in order to optimize the use of limited research resources, with a view to improving the health system, health indicators and policy development. [2,3] The first list of PIS was made for the period 2010-2014 - the same one that was updated for the period 2015-2021 - based on the previous period. [4)] It is necessary to mention that in the preliminary phase of preparing the national PIS, the PIS were also established for each of the regions of the country. [2)] On the other hand, the research carried out in Peruvian universities should respond to the needs of the national reality. [5)] Consequently, research done in universities should mostly align with national and regional PIS to generate greater local social impact. This should be reflected in the theses

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

produced in Peruvian universities, given that theses represent the majority of scientific production in this context.

Theses are documents that present the results achieved after completing a research work; They reflect the scientific contribution made and the direction of research of many universities. This is especially important in those where the presentation of a thesis is mandatory to obtain the degree or professional title, which is why it represents the culmination of the undergraduate degree. [6,7] The analysis of scientific production allows us to know the dynamics of knowledge production (trends), which is why it is important for the management of the scientific and academic policy of universities. The analysis of theses provides a more complete understanding of scientific production than the analysis of scientific articles in universities where the publication of articles in indexed journals is low. In the health area, there are few studies that evaluated the scientific production of theses through bibliometric analysis [6,7] or their publication in indexed journals. [8,9,10,11] Only three publications showed the relationship between theses and PIS. [7,12,13] It is known that, in general, Peruvian universities have contributed little to the national PIS. [14] However, it is unknown how much of the research carried out in provincial universities focuses on the PIS in their region.

Thus, it is important to know scientific production through undergraduate theses and see its contribution to the PIS, especially in regions where universities are the only institutions that carry out research; that is, the only ones with the potential to generate evidence for better decision-making at the local level. The objective of this work was to determine the proportion of undergraduate theses from a medical

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

school that were framed within the national or Arequipa region's Health Research Priorities (PIS) agenda.

METHODS

The Faculty of Medicine of the National University of San Agustín (UNSA) is located in the city of Arequipa, Peru. At this university, the only way to obtain a professional degree is to support a thesis. A descriptive observational study was carried out during the months of March and April 2018.

We studied the undergraduate theses supported and approved at the Faculty of Medicine of the UNSA during the period 2011 to 2017. The undergraduate theses that were approved in the period 2011-2017, registered in the database of the library of the UNSA, were included. university. Theses that were not available in the physical library or in the digital repository were excluded. No sampling or sample size calculation was carried out, since it was census-based.

The PIS of Peru and the Arequipa Region considered as an evaluation reference were those established for the period 2010-2014 and 2015-2021, respectively. [2. 3. 4] – –

Health Research Priorities in Peru established for the period 2010-2014 and for 2015-2021

National research priorities 2010-2014

1. Research to understand human resources problems.
2. Research to better understand the problems of mental health.
3. Evaluation of the impact of state and non-state social programs on the reduction of child malnutrition.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

4. Impact evaluations of current strategies and interventions on maternal mortality.
5. Operational research in communicable diseases.
6. Impact evaluations of current interventions in communicable diseases.
7. Impact evaluations of new interventions in communicable diseases.

1. National research priorities 2016-2021
2. Maternal, perinatal and neonatal mortality.
3. Cancer.
4. Malnutrition and anemia.
5. Mental health.
6. High blood pressure, dyslipidemia, cardiovascular diseases.
7. Health policies and management.
8. Mellitus diabetes.
9. Tuberculosis.
10. Human Resources.
11. Respiratory infections and pneumonia.
12. Traffic accidents.

1. Research priorities 2010-2014 in the Arequipa Region
2. Impact evaluation of the implementation of neonatal obstetric functions to reduce maternal and perinatal morbidity and mortality.
3. Research to understand the prevalence, risk factors and economic and sociocultural conditions of malnutrition and anemia in children under 5 years of age.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

4. Operational study of the processes developed in the prevention of vertical transmission of HIV.
5. Research that evaluates the impact of training and various forms of training on job performance in access to health services.
6. Research to determine the characteristics (physical, chemical and biological) of indoor drinking water in Arequipa.

Research priorities 2016-2021. Arequipa Region

1. Non-communicable diseases: cancer, diabetes mellitus, high blood pressure.
2. Malnutrition: obesity, anemia, malnutrition.
3. Maternal, perinatal and neonatal mortality.
4. Communicable diseases: respiratory infections, tuberculosis, sexually transmitted diseases, HIV/AIDS, acute diarrheal diseases.
5. Traffic accidents.
6. Human Resources.
7. Mental health.
8. Oral health.
9. Health Policies.

The theses supported and registered between the years 2011 and 2015 were evaluated with the PIS 2010-2014, and the theses from the years 2016 and 2017 with the PIS 2015-2021, since the PIS 2015-2021 were published at the end of 2015. Other characteristics of the theses were also studied: research area, study design, place of execution of the study, sample size and approval by an ethics committee.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

In relation to the theses that were reviewed in the following sequence, the title and objectives were evaluated, then the methodology and then the conclusions of each of them. *An ad-hoc* data collection form was used , which took into account previous studies. [6,7,12,13] Then, a preliminary analysis was carried out to control data quality: search for missing values and recover them from the data collection sheets. Furthermore, if there were inconsistent results, they were verified according to the information on the data collection sheets.

A descriptive analysis was carried out for the variables described through the calculation of frequencies. The quantitative variables were described as mean and standard deviation or median and interquartile range, according to the distribution of the data, which was evaluated with the Shapiro-Wilk test. The data were organized and analyzed in the *Microsoft Excel 2016*® program .

This study was carried out guided by the principles of scientific integrity. [15] The approval of an ethics committee was not necessary, since the data used (thesis reports) are freely accessible.

RESULTS

The UNSA library recorded 634 undergraduate theses from the medical school; Ten of the theses were not located, so we worked with 624 theses (98.4%). All of these (100%) had a single author or principal investigator. Thesis production per year had a mean of 89.1 (standard deviation 19.7). The year 2015 was the year with the highest production, but the number of theses that aligned with the national PIS and the Arequipa region did not increase in relation to the total theses, as can be seen in the figure .

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

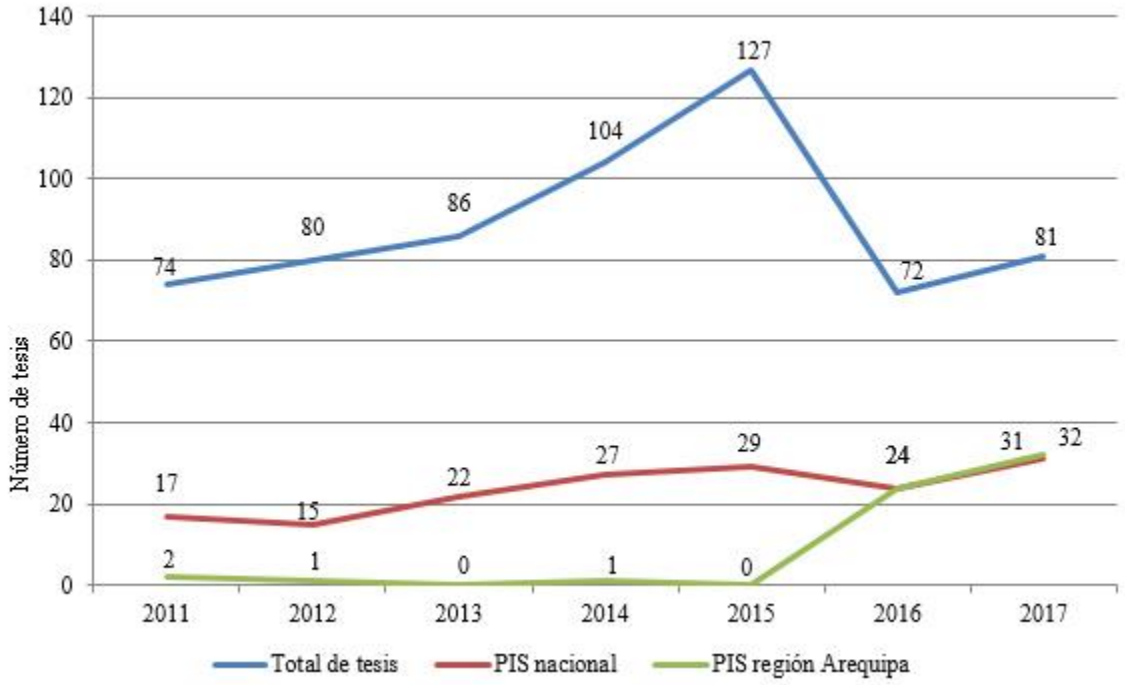


Fig Thesis of the Faculty of Medicine of the National University of San Agustín. Period 2011-2017

Table 1 shows the proportion of the number of theses framed in health research priorities over the years.

Table 1 Undergraduate theses from the Faculty of Medicine of the National University of San Agustín framed in health research priorities, in the period 2011-2017

Year	Theses that address a national PIS		Theses that address a PIS of the Arequipa region		thesis number	
	n = 165	%	n = 60	%	n = 624	%
2011	17	10.3	2	3.3	74	11.9
2012	fifteen	9.1	1	1.7	80	12.8

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

Year	Theses that address a national PIS		Theses that address a PIS of the Arequipa region		thesis number	
	n = 165	%	n = 60	%	n = 624	%
2013	22	13.3	0	0	86	13.8
2014	27	16.4	1	1.7	104	16.7
2015	29	17.6	0	0	127	20.4
2016	24	14.5	24	40	72	11.5
2017	31	18.8	32	53.3	81	13

PIS: Health research priority.

Table 2 and Table 3 show the proportion of theses that addressed a national PIS and a research priority of the Arequipa region, respectively.

Table 2 Theses from the Faculty of Medicine of the National University of San Agustín framed in a national health research priority

Thesis	n	%
Theses framed in a national PIS	165	26.4
Theses framed in the national PIS 2011-2014 *	110	23.4
Research to better understand mental health problems	96	20.4
Research to understand human resources problems	7	1.5
Impact evaluations of current interventions in communicable diseases	6	1.3
Impact evaluations of new interventions in communicable diseases	1	0.2
Theses framed in the national PIS 2015-2021 **	55	36
Mental health	twenty-	13.7

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

Thesis	n	%
	one	
Mellitus diabetes	9	5.9
Malnutrition and anemia	7	4.6
High blood pressure, dyslipidemia, cardiovascular diseases	6	3.9
Cancer	4	2.6
Human Resources	4	2.6
Respiratory infections and pneumonia	2	1.3
Maternal, perinatal and neonatal mortality	1	0.7
Tuberculosis	1	0.7

* Calculated for thesis from 2011-2015. **Calculated for thesis of 2016 and 2017. PIS: Health research priority.

Table 3 Theses from the Faculty of Medicine of the National University of San Agustín that were framed in a health research priority of the Arequipa region

Thesis	n	%
Theses framed in a PIS of the Arequipa region	60	9.6
Theses framed in the regional PIS 2011-2014 *	4	0.9
Research that evaluates the impact of training and various forms of training on job performance in access to Health services.	3	0.6
Impact evaluation of the implementation of neonatal obstetric functions to reduce maternal and perinatal morbidity and mortality.	1	0.2
Theses framed in the regional PIS 2015-2021 **	56	36.6
Non-communicable diseases: cancer, diabetes mellitus, high blood	twenty	13.1

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

Thesis	n	%
pressure.		
Mental health.	19	12.4
Malnutrition: obesity, anemia, malnutrition.	7	4.6
Communicable diseases: respiratory infections, tuberculosis, sexually transmitted diseases, HIV/AIDS, acute diarrheal diseases.	5	3.3
Human Resources.	4	2.6
Maternal, perinatal and neonatal mortality.	1	0.7

*Calculated for thesis from 2011-2015. *Calculated for thesis of 2016 and 2017.

PIS: Health research priority.

There is little development of research in basic sciences as well as in medical education. The cross-sectional study design was the most used; No cohort, ecological, community or field trial studies were found. Only a small number of theses were approved by an ethics committee (table 4).

Table 4 Focus of the theses of the Faculty of Medicine of the National University of San Agustín, in the period 2011-2017

Thesis	n	%
Investigation area	-	-
Clinic	424	68
Public health	169	27.1
Basic sciences	18	2.9
Medical Education	13	2.1
Study design	-	-

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

Thesis	n	%
Cross-sectional studies	518	83
analytical cross-sectional	349	55.9
descriptive cross-sectional	169	27.1
Cases and controls	48	7.7
Concordance studies	twenty	3.2
Preclinical study (animal, cellular, genetic)	fifteen	2.4
Diagnostic tests	10	1.6
Clinical trial	9	1.4
Longitudinal studies (monitoring and surveillance)	4	0.6
Study execution location		
Hospital	496	79.5
School	32	5.1
Pre-university academy	28	4.5
University	24	3.9
Community	fifteen	2.4
Clinic	13	2.1
Others*	16	2.6
Sample size**	101	58 - 200
Ethics committee approval		
Yeah	18	2.9
No	606	97.1

* Orphanages, nursing homes, clubs, companies.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

**Median and interquartile ranges.

DISCUSSION

A constant thesis production was found. It is one of those that produced the highest number of theses per year (89.1) compared to what was reported in other medical schools in the country: National University of Trujillo (88.5 theses per year), [16] Universidad Peruana Cayetano Heredia (64 theses per year), [10] others (less than 35 theses per year). [6,7,9,11,13] This would respond to the different number of students that graduate from each faculty or medical school, as well as the alternative degree modalities to thesis support (specific to each institution).

Regarding the national PIS, only 110 - which represents 23.4% of the total theses from the period from 2011 to 2015 - were adjusted to the 2011-2014 national PIS. Slightly lower than what was found at the Pedro Ruiz Gallo National University of Chiclayo (27.1%), [7] and at the San Antonio de Abad National University of Cusco (27.3%). [12] But higher than what was reported at the National University of Piura (10%). [13] This situation observed in universities coincides with Peruvian scientific production developed in accordance with national research agendas, where it represented 24.4%. [14] The most studied national PIS was mental health, as in Piura. [13] but different from what was reported in Chiclayo and Cusco, where maternal mortality and human resources in health led respectively. It is observed that in none of these universities did the 2011-2014 national PIS study set the thematic direction of the theses. This would be explained by the lack of knowledge of undergraduate students about the PIS, when choosing a thesis topic, and even the lack of knowledge on the part of their advisors, which would happen as a consequence of the lack of a coordinated process of multisectoral

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

implementation and socialization. of prioritized research, [14] so the PIS would not have expected results in local and national scientific production. [14] This fact was taken into account for the current process of the national PIS 2015-2021, which incorporates an implementation, monitoring and evaluation plan. [4]

A significant increase is observed in the proportion of theses framed in the national PIS 2015-2021: from 23.4 to 35.9% (calculated for the last two years). This would be explained by the current list of PIS, which is more diversified and perhaps more in line with reality, considering that PIS have not been actively promoted institutionally. The most studied PIS continues to be mental health, although to a lesser extent. However, this increase in theses focused on PIS is still insufficient, considering that there are unstudied priorities.

In relation to the PIS of the Arequipa region 2011-2014, a minimum contribution was found, as was found in Piura (0.7%). [13] There is also a striking increase in the proportion of theses that address the PIS of the Arequipa region 2015-2021: from 0.9 to 36%. This would be explained, once again, by the new parameter (PIS 2015-2021), considering that there was no institutional drive to address the PIS. Assuming that part of the theses are formulated based on the local problems observed, then how much can health problems change in a region in a few years? Could it be that the PIS of the Arequipa region 2011-2014 were not well formulated. If not, is the university so indifferent to the needs of the community? There are no more reports on the contribution of provincial universities to the PIS of their respective regions, but it is likely that it is also scarce, equal to the contribution they make to the national PIS. [7, 12 - 14]

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

The theses framed within the PIS 2015-2021 (national and regional), despite showing an increase, continue to be a minority. So how involved are universities in the process of implementing the PIS 2015-2021 in the Arequipa region? All of the above poses an important challenge for prioritized research to achieve its objective, in such a way that the errors of non-implementation are not repeated in this new period, a challenge that all institutions must assume, especially universities since it is possibly the only alternative solution to the problems of their region.

On the other hand, most of the theses had a cross-sectional design, a finding similar to previous studies. [6,7] Probably because it is a design that requires little time, is less expensive and less complex. The hospital environment was the most frequent place of execution, as was previously found, [7] which would respond to the ease of obtaining data, since they spend most of their last year (medical internship) in hospitals. It would also reflect the little interest in researching and working on issues related to primary health care (developable in health centers and in the community). In relation to the sample size, it could be due to the fact that the studies are carried out in local populations (monocentric) or to the premeditated reduction in the sample size as a result of the urgency with which data is intended to be collected. This possibly responds to the fact that students begin their thesis project by finishing the year of internship, which - added to their desire to immediately obtain a position in the Rural and Urban Marginal Health Service - would generate a rush to support their thesis and obtain the degree. [17] Therefore, alternatives must be sought so that the theses are not developed in a short time, and prevent this from affecting their methodological characteristics and even their quality.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

The study had the limitation of being limited to a faculty of only one university, so its external reproducibility is debatable. However, it is one of the few approaches that examines the approach to PIS within the scientific production of gray literature (thesis) in Peru. In addition, it is the first to observe scientific activity in relation to the PIS 2015-2021. We recommend more studies that delve into the problem of the scientific contribution of social impact by the theses done in Peruvian and Latin American universities. We also recommend that research be encouraged in priority and impact areas from the undergraduate level. [18]

In conclusion, the number of theses per year produced in the Faculty of Medicine studied is one of the highest among the medical schools in Peru; However, only one in four was addressed in a national health research priority and one in ten theses was framed in a priority of the Arequipa region. That is, a low proportion of the theses studied address health research priorities.

REFERENCES

1. World Health Organization (WHO). The World Health Report 2013: Research for universal health coverage. Luxembourg: WHO Press; 2013.

2. Caballero P, Yagui M, Espinoza M, Castilla T, Granados A, Velásquez A, et al. Regional and national health research priorities, Peru 2010-2014: a process with a participatory and decentralist approach. Rev Per Med Exp Public Health. 2010;27(3):398-411

3. Yagui M, Espinoza M, Caballero P, Castilla T, Garro G, Yamaguchi LP, et al. Advances and challenges in the construction of the national health research system in Peru. Rev Per Med Exp Salud Publ. 2010;27(3):367-72.

ISSN : 1533-1520
GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics

4. National Institute of Health. Health research priorities 2015-2021. Lima: National Institute of Health; 2015. Accessed: 3/21/2018. Available at: http://www.portal.ins.gob.pe/es/prioridades-de-investigacion-en-salud/147-ogitt/investigacion-en-salud/prioridades-de-investigacion-en-salud-2015 -2021

5. Congress of the Republic of Peru. New University Law. Lima, Peru: Congress of the Republic of Peru; 2014. Accessed: 3/25/2018. Available at: http://www.leyes.congreso.gob.pe/Documentos/Leyes/30220.pdf

6. Valle R, Salvador E. Bibliometric analysis of undergraduate theses from the Faculty of Medicine of the Universidad Nacional Mayor de San Marcos. An Fac Med. 2009;70(1):11-8.

7. Castro-Maldonado B, Callirgos-Lozada CC, Caicedo-Písfil MK, Plasencia-Dueñas EA, Díaz-Vélez C. Characteristics of undergraduate medical theses from a public university in Peru. Horiz Méd. 2015;2(15):34-9.

8. Arriola-Quiroz I, Curioso WH, Cruz-Encarnacion M, Gayoso O. Characteristics and publication patterns of theses from a Peruvian medical school. Health Info Libr J. 2010;27(2):148-54.

9. Taype-Rondán Á, Carbajal-Castro C, Arrunategui-Salas G, Chambi-Torres J. Limited publication of undergraduate thesis in a medical school in Lima, Peru, 2000-2009. An Fac Med. 2012;2(73):153-7.

10. Osada J, Loyola-Sosa S, Ruiz-Grosso P. Publication of course completion work by medical students from a Peruvian university. Rev Bras Educ Med. 2014;38(3):308-13.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

11. Atamari-Anahui N, Roque-Roque JS, Robles-Mendoza RA, Nina-Moreno PI, Falcón-Huancahuiri BM. Publication of undergraduate thesis at a medical school in Cusco, Peru. Rev Med Hered. 2015;26(4):217-21.

12. Atamari-Anahui N, Velásquez-Cuentas L. National health research priorities in undergraduate thesis of a medical school Cusco, Peru, 2011-2013. Rev Cuer Méd. HNAAA. 2014;7(1):52-3.

13. Purizaca-Rosillo N, Ramos-Cedano E, Melendres-Huamán N. Health research priorities in medicine theses at the National University of Piura, 2010-2014. Horiz Med. 2016;16(2):49-53.

14. Romaní-Romaní FR, Roque-Henríquez J, Vásquez-Loarte T, Mormontoy-Calvo H, Vásquez-Sopiopuco H. Bibliometric analysis of Peruvian scientific production on national research agendas in Peru 2011-2014. An Fac Med. 2016;77(3):241-9.

15. Kleinert S. Singapore Statement: A global agreement on responsible research conduct. The Lancet. 2010;376:1125-27.

16. Zavaleta-Reyes C, Tresierra-Ayala M. Methodological quality of bachelor's degree work in a medical school. Educ Med. 2017;18(4):233-41.

17. Mandujano-Romero E, Grajeda-Ancca P. Quality of the theses to obtain the title of surgeon, National University of San Antonio Abad del Cusco - Peru, 2000-2009. Acta Med Per. 2013;30(2):70-4.

18. Quispe-Juli CU, Velásquez-Chahuares LG, Meza-Liviapoma J, Fernández-Chinguel JE. How to promote a scientific society of medical students? Educ Med. 2019;20(S1):175-85.

ISSN : 1533-1520

GARDEN JOURNALS

Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics

Evaluation Policies and Publishing Practices in the Field of Health Sciences in Brazil

Roger E. Hunter
Center for Advanced Materials Research, Osaka University, Japan

ABSTRACT

Theoretical studies support the existence of epistemic cultures in academic communities, as well as the influence that evaluation policies have on them. This work deepens the analysis carried out by the authors in previous studies to improve the understanding of changes in Health Sciences publication practices in Brazil between 2000 and 2014. Quantitative-qualitative, non-experimental and longitudinal research. Data on scientific production in Health Sciences are collected from the Directory of Research Groups of the National Council for Scientific and Technological Development and the historical series of articles, monographs and complete works in annals are graphically represented, as well as the reasons for articles national/international and articles/monographs, to identify and compare patterns. Documents from Area Commissions (Capes) and Health Sciences Advisory Committees (CNPq) are analyzed, identifying, examining and classifying the evaluation criteria used. The results indicate that the evaluation criteria contribute to promoting changes in the publication practices of Health Sciences researchers, specifically, a significant increase in the percentage

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

contribution of international articles and a reduction in national articles, monographs and complete works in annals.

Keywords: Epistemic cultures; publishing practices; assessment policies; Health Sciences; Brazil

INTRODUCTION

Studies on the sociology of scientific knowledge [1,2,3,4] show the existence of epistemic cultures within academic communities. *Knorr-Cetina* defines them as "(…) those sets of practices, arrangements, and mechanisms bound together by necessity, affinity, and historical coincidence that, in a given area of professional expertise, make up how we know what we know. Epistemic cultures are cultures of creating and warranting knowledge". [3] According to this author, epistemic cultures are "knowledge construction machines", [3] ie, combinations of cognitive, rational or technical elements (e.g. nature of the phenomena studied, object of study, methodologies, models, theoretical paradigms) and social (e.g. evaluation systems, selection of communication vehicles). Epistemic cultures are rooted in the notion of practices; they refer to the standards and dynamics of researchers in their daily tasks, ie, they are norms or conventions that govern the production of knowledge, and being a scientist implies fitting into these practices.

The influence of technical, rational or cognitive elements is indicated by several studies [5,6,7,8] that show consensus on the existence of two great epistemic cultures: "hard" sciences (Exact, Natural, Medical, Engineering) and "soft" sciences " (Human, Social, Artistic). The "hard" ones deal with phenomena in the physical world (outside the human mind), which are more universal, predominantly deterministic (it is possible to establish direct cause-and-effect

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

relationships between the variables involved) and can be observed and verified through experiments; consequently, it is simpler to achieve consensus, as well as the emergence of dominant theoretical paradigms. The "soft" ones study mental states or conditions for these states, phenomena that are mostly stochastic (the cause-effect relationship is probabilistically mediated) and are quite dependent on the sociocultural context; therefore, it is more difficult to reach consensus and different theoretical paradigms emerge.

As a result, the methods and theories that work within the "hard" and "soft" sciences differ, which is reflected in the way research results are communicated. [8,9,10,11,12] The "hard" ones work under a dominant theoretical-methodological paradigm, their research is less flexible, more quantitative and rigorous, they communicate their results through a highly codified language, which uses uniform symbol systems ; therefore, they produce knowledge at a higher speed, requiring faster updating from researchers. Articles respond better to these requirements: they are publications in a short, standardized, synthetic format, enabling faster writing, publication and reading; periodic dissemination allows rapid updating and broad dissemination reaches a more international audience.

For their part, the "soft" ones, when studying stochastic phenomena, which are more dependent on the local or regional context, develop research under the influence of different theoretical currents, with a more qualitative focus, communicating their results through a less codified language. and uniformed, which requires greater elaboration and argumentation and produces knowledge at a slower speed. Monographs respond better to these requirements: they are longer publications, writing, editing and reading take more time; its degree of updating is

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

lower; their dissemination does not reach the level of articles, which makes them more appropriate for exposing more complex and settled knowledge, which requires more space.

As a result, two hyperareas (clusters of large areas) are formed: "hard" (Exact, Natural, Medical, Biological, Engineering), which communicate their research results, predominantly, through articles in journals (~6.5 to 8.5 articles for each book/chapter); "soft" ones (Social, Humanities, Linguistics, Literature, Art) that show greater balance in the production of articles and monographs (~0.8 to 1.5 in the same ratio). [9, 10, 11, 13, 14, 15]

However, the social component of epistemic cultures also plays an essential role. The option for one or another communication vehicle does not depend solely on rational, technical or cognitive elements, but also on social elements, mainly on obtaining recognition from peers and external pressures linked to evaluation by employing or development institutions. *As Knorr-Cetina* states , [1)] the notion of practice emphasizes acts of knowledge creation, including how researchers generate and "negotiate" their research results. The perspective of "negotiation" is also mentioned by *Bourdieu* [16] when he asserts that the behavior of scientists responds to the notions of "accumulated scientific capital" and "scientific profit"; Researchers seek personal satisfaction and professional success by forming intellectual alliances with colleagues to obtain recognition, status and power, in the form of publications, funding, etc.

Systems that determine research funding and recognition based on academic performance influence publishing practices in two ways. First, they lead researchers to consider obtaining good results in evaluations as an end that they

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

need to achieve at any cost; the link between reputation/funding and the number of publications encourages them to publish more at the expense of quality. [17] Second, when, induced by the evaluation criteria, researchers introduce changes to their publication practices. According to several studies, [13, 18, 19] the emphasis on the use of citation indicators from journals indexed in the main commercial databases as research evaluation criteria, particularly the Impact Factor (IF) of the *Journal Citation Report* (JCR), is promoting changes in these practices, especially a progressive concentration on journal articles, including in "soft" sciences. Researchers realize that publishing in high-IF journals brings greater rewards than publishing in other types of documents (books, chapters, event papers) and begin to prioritize it. Additionally, *Laudel* and *Glässer* [20] show that the competitive context, in which researchers work, makes them use such indicators to display their performance, feeding back this type of evaluation.

However, despite the arguments presented in the previous paragraphs, the main research funding bodies in Brazil, the Coordination for the Improvement of Higher Education Personnel (Capes) and the National Council for Scientific and Technological Development (CNPq), focus their attention, predominantly, in articles published in magazines and favor the IF to build the Qualis Periódicos (QP) and evaluate the intellectual production of Postgraduate Programs (PPGs) and researchers. [10] Such behavior can influence areas of knowledge differently, generating distortions in the processes of evaluation, production and publication of science. [21, 22]

In previous studies [9, 10] we used data from the Directory of Research Groups (DGP) on censuses of scientific production by Brazilian doctoral researchers in the

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

period 2000-2014, to identify the publication practices of the eight major areas of knowledge of the CNPq, grouping -them into two hyperareas ("hard" and "soft"), already characterized here, according to their similarities. In the first, there was a balance between monographs, complete works in annals and articles (predominantly national ones). In the "hard" ones, articles dominated, mostly international ones, with a significant decrease in works in annals and an insignificant volume of monographs.

In this general context, a peculiarity was observed in the publication pattern of Health Sciences (CdS) researchers. Between the 2000-2006 censuses, the production of national articles predominated, however, from 2008 onwards, the increase in these began to be lower than that of international articles, which became the main form of communication in the 2008-2014 censuses. . While in the 2000 census the ratio between national and international articles was three to two, it was reversed in the 2014 census, becoming two to three (attachment).

This work deepens the analyzes carried out in previous studies, [9,10] in order to better understand this change. The discussions are based, on the one hand, on the graphic representation of historical series of Brazilian scientific production and on the identification and comparison of patterns in publication practices. On the other hand, in the identification, classification and analysis of the evaluation criteria used in the broad area of CdS. Section 2 details the methodological procedures; section 3 analyzes and discusses the results and, in section 4, the final considerations are presented.

METHODS

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

This is a quantitative-qualitative, non-experimental and longitudinal study. The research was carried out in two phases. In the first, data on Brazilian scientific production were collected, processed and graphically represented by type of documents and major area of knowledge, based on censuses carried out by CNPq between 2000 and 2014. This representation made it possible to identify, characterize and compare publication practices of CdS and "hard without CdS" and "soft" hyperareas. In the second phase, a documentary analysis was carried out to identify the evaluation criteria used by the Capes Area Commissions (CAs) in the triennial evaluations of the PPGs (2010 and 2013), as well as documents from the CNPq Advisory Committees (CAS) to evaluate the granting of productivity grants. Finally, these criteria were related to the patterns identified in publication practices. The procedures are detailed below.

Collection, processing and graphical representation of scientific production by type of document

For the selection of the source, the collection of data, as well as the choice and calculation of the variables represented graphically, we started with the methodology used in previous studies. [9 - 10] *Publication practices* are defined as the particular ways in which researchers communicate their results. It is a complex phenomenon, made up of several dimensions, which were operationalized by several families of variables. While families *a*, *b* and *c* *were used in previous studies, in the present work a fourth family (d*) was added :

a. *Absolute quantity of each of the following types of publication:* national articles (A_n); international articles (A_i); complete works in annals (T); book chapters (M_c); and books (M_l).

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

b. *Total absolute quantities:* of articles (A) (national plus international); of monographs (M) (books plus chapters); and production (P) (sums of the quantities of all products).
c. *Percentage contribution:* of national articles (a_n); of international articles (a_i); of complete works in annals (t); of book chapters (m_c); and books (m_l) for the total production of the area.
d. *Reasons:* between total articles and monographs ($R_{A/M}$) and between total national and international articles ($R_{An/Ai}$).

The variables in item *a* were extracted manually (in September 2017) from the DGP (http:/lattes.cnpq.br/web/dgp/producao-cta), *Scientific, Technological and Artistic Production (CT&A) tables of Brazilian doctoral researchers* , available according to the type of production and the broad area of knowledge (the system does not offer data by area or subarea), and correspond to the censuses completed in the years 2000, 2002, 2004, 2006, 2008, 2010 and 2014. The transfer of data into an Excel document allowed the creation of seven spreadsheets, one for each of these censuses, with the help of which the variables mentioned in items *b*, *c* and *d* were calculated . Still using Excel, graphs of the historical series of variables were constructed for each large area, and the "soft", "hard" and "hard without CdS" hyperareas. The following stand out in this work:

- Scientific production in *articles* (national + international), *monographs* (books + chapters) and *complete works in annals* in the CdS and in the "soft" hyper-areas (Social, Humanities, Linguistics, Literature and Arts) and "hard without CdS" (Extas and Land, Agrarian, Biological, Engineering and Computing).

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

- Percentage contributions to the total production of *articles* (national + international), *monographs* (books + chapters) and *complete works in annals* in the CdS, and in the "soft" and "hard without CdS" hyper-areas.

Document analysis

Document analysis was not carried out in the two previous studies. It is now used to characterize the evaluations of productivity scholarship holders, carried out by CNPq, and that of PPGs, carried out by Capes, in the large CdS area. The search for documents took place in September 2017, having recovered: from CNPq (http://cnpq.br/criterios-de-julgamento/), the Nursing CAS documents; Pharmacy; Medicine; Physical Education, Speech Therapy, Physiotherapy and Educational Therapy; Dentistry; Public Health and Nutrition, corresponding to the analyzes for granting productivity grants in the period 2015-2017; from Capes, the documents from the Physical Education CAs; Nursing; Pharmacy; Medicine I; Medicine II; Medicine III; Nutrition; Dentistry and Public Health, corresponding to the 2010 and 2013 triennial assessments (http://www.capes.gov.br/avaliacao/sobre-as-areas-de-avaliacao). In both cases, there were no other documents corresponding to the period analyzed.

The documents were downloaded, read and analyzed one by one, allowing the identification and classification of the evaluation criteria according to the funding body (Capes or CNPq), the analysis period (2010, 2013, 2015-2017) and the evaluation area (CA or CAS of Nursing, Nutrition, etc.). The types of publications considered in the evaluations (articles, monographs or works in annals) and the specific requirements for each one were identified. In the case of CNPq, the criteria

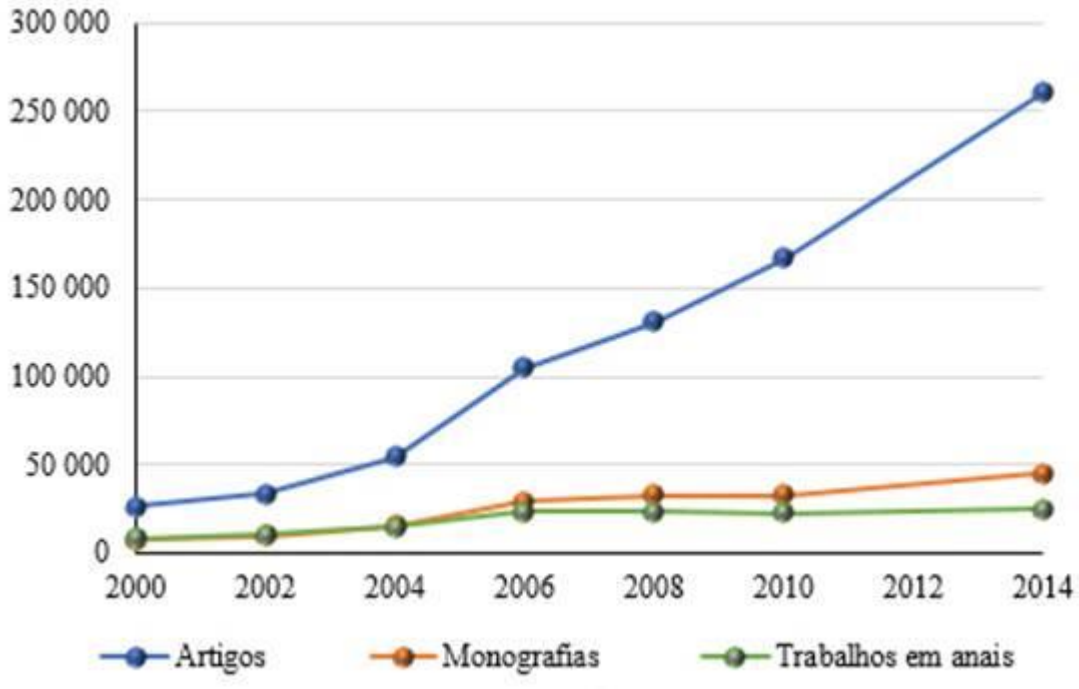
GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

were further categorized considering the type of productivity fellow PQ1A, PQ1B, PQ1C, PQ1D, PQ2; Senior Research Productivity Fellows (PQ-Sr) were not considered. In Capes, given that there was data from the 2010 and 2013 triennial assessments, the existence of quantitative or qualitative changes from one to the other was analyzed.

RESULTS AND DISCUSSION

Standards in publishing practices

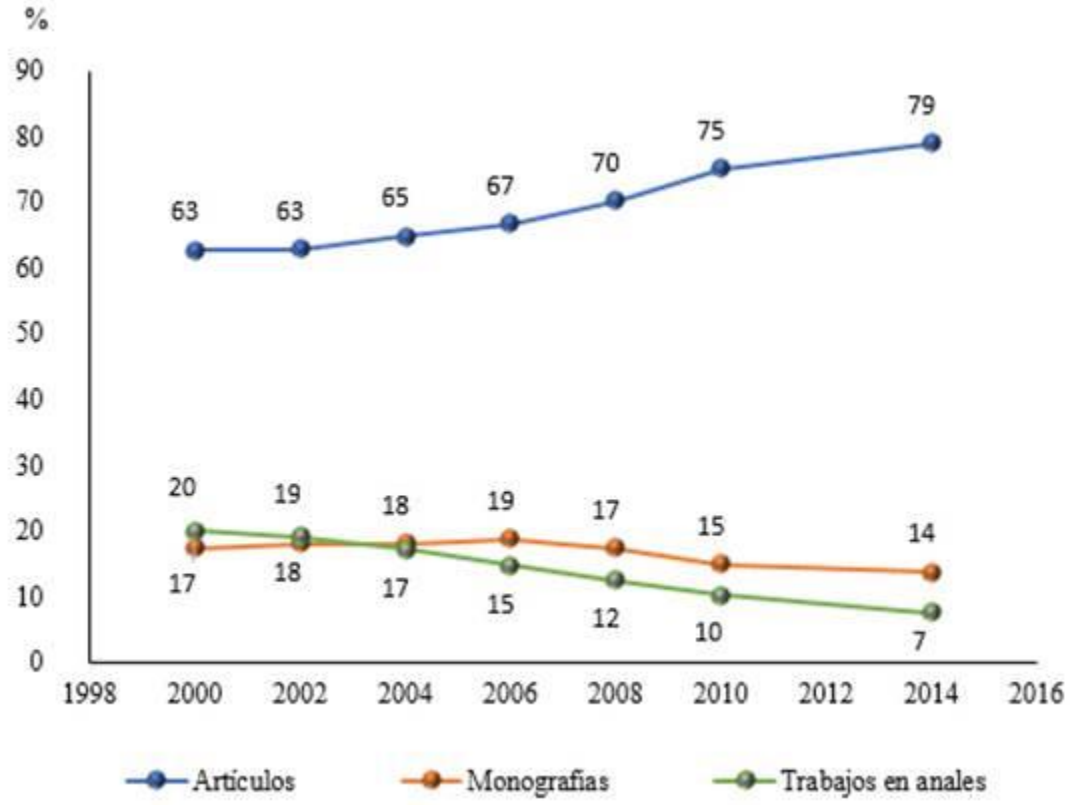
In figures 1 , 2 , 3 and 4 , the historical series of absolute production and the corresponding percentage contribution of articles, monographs and works in annals, in the CdS and in the "hard without CdS" and "soft" hyperareas, respectively, are presented. The data can be found in the annex.



Source: Research data (2017).

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

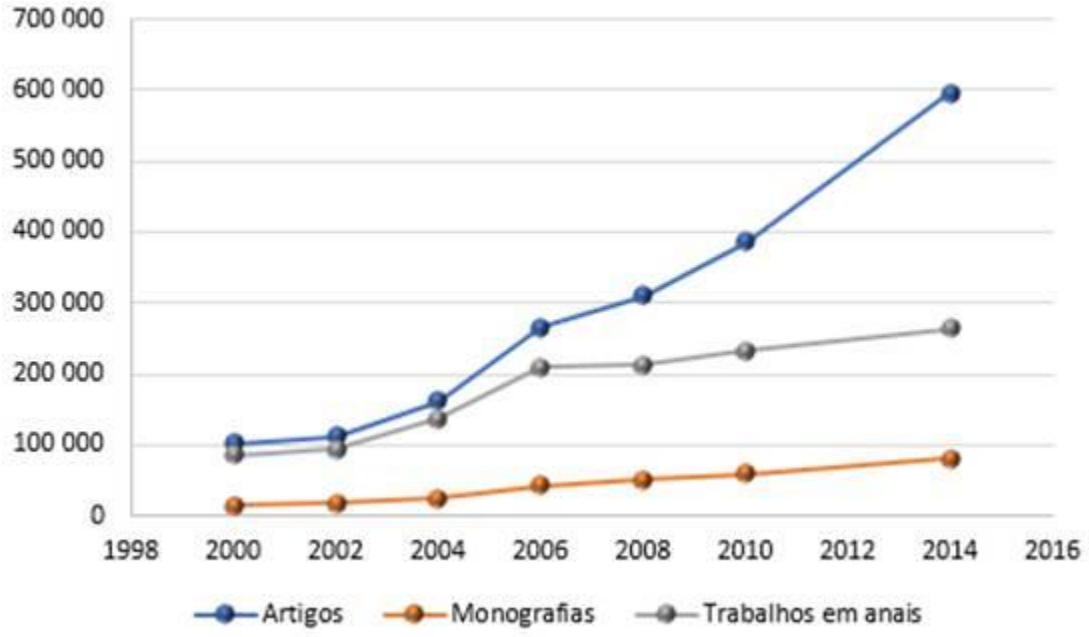
Fig. 1 Production in articles, monographs and works in CdS annals (2000-2014 censuses).



Source: Research data (2017).

Fig. 2 Percentage contribution of articles, monographs and works in annals to the total production of CdS (census 2000-2014).

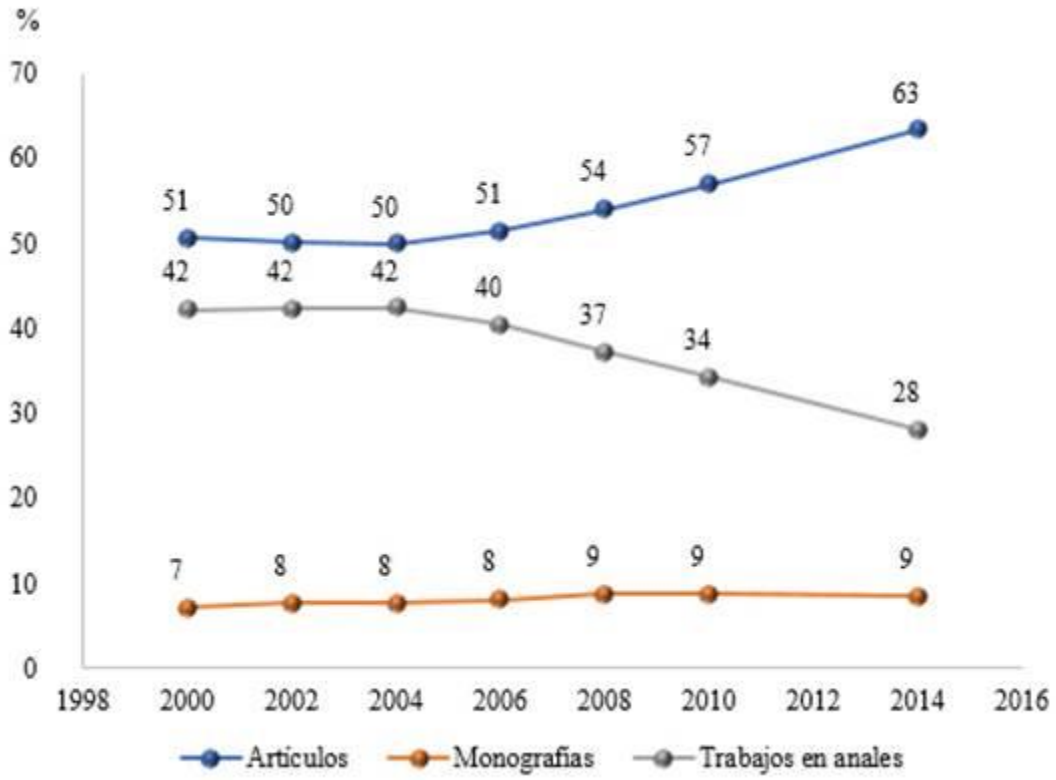
GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520



Source: Research data (2017).

Fig. 3 Production in articles, monographs and works in annals of "hard sciences without CdS" (census 2000-2014).

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520



Source: Research data (2017).

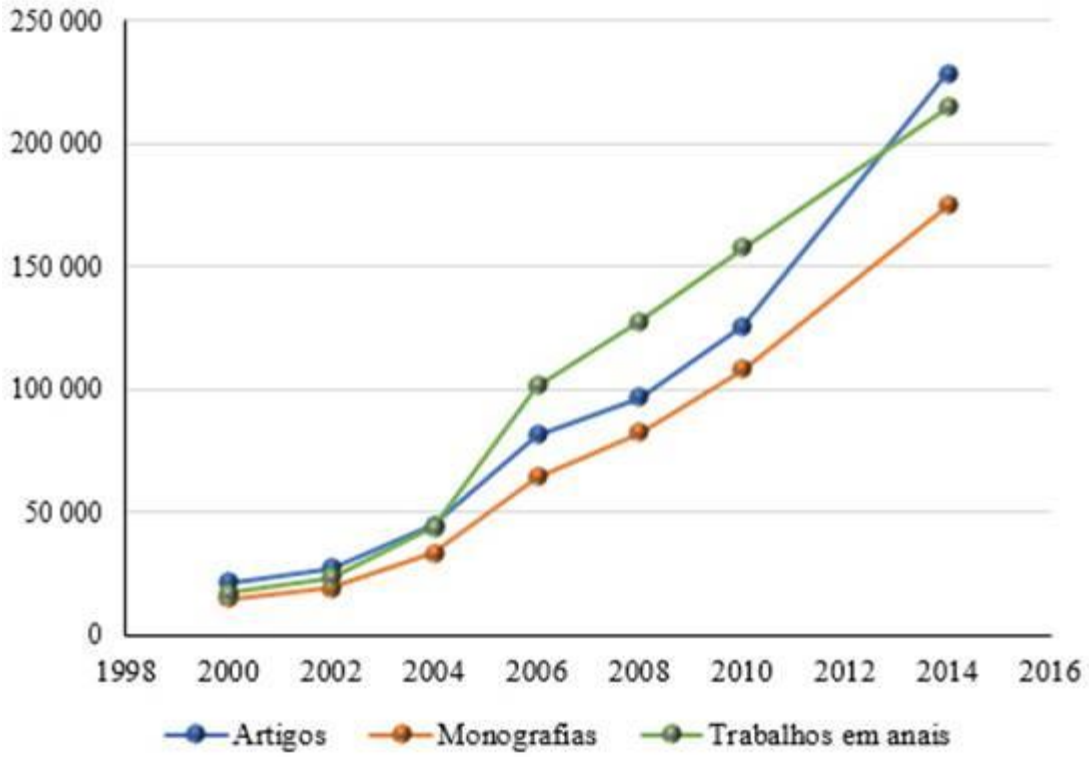
Fig. 4 Percentage contribution of articles, monographs and works in annals to the total production of "hard sciences without CdS" (census 2000-2014).

The figures allow us to identify similar patterns in the publishing practices of CdS and "hard sciences without CdS" throughout the period analyzed. In both cases, articles constitute the main type of product, contributing mostly and increasingly to the total production. In CdS its contribution went from 63% in the 2000 census to 79% in the 2014 census and in the "hard sciences without CdS" from 51% in 2000 to 63% in 2014. Likewise, the contribution of works in annals decreases significantly in a and others; in CdS it decreased from 20% in the 2000 census to just 7% in 2014, being included below monographs; in "hard courses without CdS"

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

the decrease went from 42% in 2000 to 28% in 2014. Finally, the variation in the contribution of monographs is not very pronounced; in CdS it varies between 14 - 19% and in "hard without CdS" between 7-9%.

Differently, in the "soft" sciences (Fig. 5 , annex), a balance is identified between the three types of publication. Articles and works in annals alternate as dominant, the former contributing 37-40% of total production in the 2000-2004 and 2014 censuses and the latter accounting for 40-42% of this production between 2006 and 2010. The contribution of monographs it is stable, but much more significant (26-28%) than in the "hard" ones.



Source: Research data (2017).

Fig. 5 Production in articles, monographs and works in annals of "soft" sciences (2000-2014 censuses).

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

Despite the similarity in the patterns of CdS and the "hard without CdS" hyperarea, additional analyzes show that the publication practices of the former did not faithfully correspond to those of the latter. The annex presents the ratios $R_{A/M}$ (between total articles and monographs) and $R_{An/Ai}$ (between international and national articles) for the CdS and the "hard without CdS" and "soft" hyperareas, respectively.

In the 2000-2006 censuses, the $R_{A/M}$ ratio in CdS presents a value very close to 3.60, that is, they produced ~3.50 articles for each book or chapter, an intermediate value between those in the "hard sciences without CdS" (average 6.6) and "soft" ones (average 1.4). From then on, it started to grow, reaching 5.78 in 2014, already very close to the "hard" standard; ie, from the 2006 census onwards, the CdS began to change their publication profile, increasing the production of articles more significantly than the production of monographs. It should be noted that the production of articles in CdS grew from 104,806 in the 2006 census to 260,543 in the 2014 census (~249%), while that of monographs increased from 29,322 to 45,080 (~53%) in the same period.

The guidance on publishing articles has also undergone an important change. Data on the $R_{An/Ai}$ ratio in the CdS show that, in the 2000-2006 censuses, its value ranged between 1.20-1.90 (average 1.52, or ~3 national articles for every two international ones), different values, both the "hard without CdS" pattern (average 0.75) and the "soft" standard (average 6.09), but reflecting a typical characteristic of the latter: mostly national orientation. However, also from the 2006 census onwards, $R_{An/Ai}$ values began to decrease, indicating a more pronounced growth in international orientation, reaching 0.65 in 2014, equivalent to the average value of

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

"hard sciences without CdS" (average 0.66) and further from the "soft" ones (average 5.98). During this period, while the production of national articles increased by ~79%, from 57,141 (2006) to 102,309 (2014), that of international articles increased much more (~332%), going from 47,665 to 158 234.

The non-correspondence of CdS publication practices with any of the two hyperareas ("hard without CdS" or "soft") in the 2000-2006 censuses is sustained due to the coexistence of areas with distinct epistemic cultures (Medicine, Dentistry, Pharmacy, Nursing , Nutrition, Public Health, Speech Therapy, Physiotherapy and Operational Therapy and Physical Education), which entails the use of different publication practices. [23] Medical areas (e.g. Medicine, Dentistry) deal with objects of study and use theoretical-methodological tools that are more in tune with those of "hard" sciences, prioritizing the publication of articles. Other areas (e.g. Public Health, Physical Education) include objects of study more linked to social problems (e.g. health services, sexually transmitted diseases), whose methodological and conceptual development receives many contributions from Social and Human Sciences; therefore, they present greater balance in the production of articles, works in annals and monographs. *Carvalho* and *Manoel* [24] show that, between 2000-2003, Nursing, Physical Education, Speech Therapy and Public Health had several lines of research focused on social problems.

However, these arguments are equally valid for the 2008-2014 censuses, when there is a growing approximation of CdS publication practices to those of "hard sciences without CdS". Evidently, the causes are multifactorial and the present work does not intend to provide a total answer to this question. However, based on

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

the theoretical elements already presented, it is plausible that one of the essential factors is evaluation policies, a hypothesis that is discussed below, based on the results of the documentary analysis.

Capes and CNPq evaluation policies

Both Capes and CNPq evaluate Brazilian science; however, the first has a collective focus, as it evaluates PPGs, while the CNPq is individual, aimed at researchers. The CA (Capes) documents indicate that five dimensions are evaluated:

- *PPGs proposal:* coherence; consistency; scope, updating of concentration areas; research lines; ongoing projects; curriculum proposal; PPG future planning; infrastructure for teaching, research and extension; self-evaluation.
- *Faculty:* faculty profile (titles, experience, number of permanent faculty, etc.); dedication of permanent professors to research and teaching; distribution of research and teaching activities among permanent professors; contribution of permanent professors to research and teaching activities (supervision, etc.).
- *Faculty, theses and dissertations:* relationship between the number of theses and dissertations defended and the permanent faculty; balanced distribution of guidance (theses, dissertations) among permanent teachers; quality of theses and dissertations considering the resulting publications (articles, books, etc.); proportion between training time and obtaining doctoral and master's degrees.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

- *Intellectual production:* quality of the intellectual production of permanent professors (articles in qualified journals, books, etc.); balanced distribution of production by permanent teachers; technical production, patents, etcetera.
- *Social insertion:* PPG's responsibility and commitment to regional or national development; contribution to improving the quality of teaching (relying on research groups, educational and scientific dissemination actions, etc.); integration and cooperation with other PPGs (joint research projects, joint publications, organization of events, etc.); visibility and transparency of PPGs activities (website with updated information).

CNPq evaluates researchers who request funding for research in different modalities (research productivity, technological development, etc.). In particular, researchers who receive funding in the productivity modality are highly recognized scientists in their respective areas of activity, holding significant scientific capital, which is why they are the subject of analysis. Four dimensions are evaluated:

- *Scientific production and technological innovation:* number of publications (articles, complete works in event annals, patents, etc.).
- *Human resources training:* post-doctoral supervision; supervision of theses and dissertations; ongoing guidance; participation in newsstands.
- *Research projects:* direction and participation in research projects.
- *Relevant activity in S&T:* member of committees and councils; Awards and titles; scientific leadership; ad hoc advice; event organization; coordination of PPGs; post doctoral; international insertion; participation in editorial, scientific management or administration activities of institutions and centers of excellence.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

As happens in other major areas, each CA and CAS of the CdS evaluates these dimensions independently, assigning each one a specific weight that varies (0 - 100%); however, scientific production is the most valued element, reaching 35-40% in CA and 50-70% in CAS. The evaluation of the latter is carried out through a group of tools known as the "Qualis family": Qualis Periodicals (QP) for publishing articles; Qualis books (RCL) for monographs (books, chapters); Qualis Artístico (QA) for artistic production (music, visual arts, etc.) [25,26,27] and until 2009, Qualis Eventos (QE) for works presented at a selection of congresses, workshops, etc. [27] However, both in the case of Capes and CNPq, the predominant use of QP as an evaluation tool is evident.

Table 1 allows us to appreciate that, while 100% of the CAs considered articles in the evaluations of PPGs in 2010 and 2013, with monographs or works in event annals the situation is different. Only Physical Education, Pharmacy and Public Health (33%) considered the monographs in 2010 and 2013; Nursing stopped considering monographs in 2013; Nutrition was created only in this assessment. Of these, only Physical Education and Pharmacy did not establish requirements for their assessment; Nutrition and Public Health only accept publications of a scientific nature; other types of publications (technical, dissemination, didactic) are not considered. The rest of the CAs (67%) consider monographs as technical production or another type of production and, therefore, do not score in the evaluations. The contrast increases with the works in annals; no CA considers this type of publication.

Table 1 CA of the CdS that consider articles, monographs and works in annals in the evaluations of PPGs (2010 and 2013 three-year periods)

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

CA	Artigos				Monografias				Trabalhos co	
	Consideram		Requisitos específicos		Consideram		Requisitos específicos		Consideram	
	2010	2013	2010	2013	2010	2013	2010	2013	2010	2013
E Física	X	X	X	X	X	X	-	-	-	-
Enfermagem	X	X	X	X	X	-	X	-	-	-
Farmácia	X	X	X	X	X	X	-	-	-	-
Medicina I	X	X	X	X	-	-	-	-	-	-
Medicina II	X	X	X	X	-	-	-	-	-	-
Medicina III	X	X	X	X	-	-	-	-	-	-
Nutrição*	-	X	-	X	-	X	-	X	-	-
Odontologia	X	X	X	X	-	-	-	-	-	-
S Coletiva	X	X	X	X	X	X	X	X	-	-

* The Nutrition CA did not exist in the 2010 triennial assessment.

Source: Documents from the CA (Capes) of the CdS in the three-year assessments (2010 and 2013).

In turn, table 2 shows that, while all CAS require researchers to have published a specific number of articles, only Public Health and Nutrition accept monographs; however, they only score monographs published by university or commercial publishers of recognized prestige. No CAS considers works in annals.

Table 2 CAS (CNPq) that consider articles, monographs and works in annals in the evaluations for the granting of productivity grants (2015-2017)

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

CAS (CNPq)	Exigem artigos			Exigem monografias
	Quantidade	Estratos do QP	Em revistas com FI	
Enfermagem	P2–10 nos últimos 5 anos; P1D-25 anos último 10 anos; P1C e P1B-30 nos últimos 10 anos; P1A-35 nos últimos 10 anos	A1; A2; B1; B2	X	-
Farmácia	P2-20 nos últimos 5 anos; P1D, P1C e P1B-40 nos últimos 10 anos; P1A-70 nos últimos 10 anos	Não especificado	X	-
Medicina	P2-6 nos últimos 5 anos; P1D, P1C, P1B e P1A-10 nos últimos 10 anos	Não especificado	X	-
E Física, Fonoaudiologia, Fisioterapia e Terapia Ocupacional	P2-8 nos últimos 5 anos; P1D-15 nos últimos 10 anos; P1C, P1B e P1A-20 nos últimos 10 anos	Não especificado	X	-
Odontologia	P2-5 nos últimos 5 anos; P1D, P1C, P1B e P1A-20 nos últimos 10 anos	Não especificado	X	-
S Coletiva e Nutrição	P2-10 trabalhos científicos nos últimos 5 anos; deverão ser artigos ou monografias (livros ou capítulos) Os artigos em periódicos A1, A2, B1 e B2 As monografias publicadas por editoras reconhecidas universitárias ou privadas P1D, P1C, P1B, P1A-30 trabalhos científicos nos últimos 5 anos; deverão ser artigos ou monografias (livros ou capítulos) Os artigos em periódicos A1, A2, B1 e B2 As monografias publicadas por editoras reconhecidas universitárias ou privadas			

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

Source: Documents for the granting of productivity grants from the CAS (CNPq) of the CdS in the period 2015-2017.

The discussion presented in the preceding paragraphs shows the preponderance attributed to articles in the evaluation of CdS, the relative little importance given to monographs and the total disregard of works in annals. These elements are in accordance with the percentage production patterns identified and analyzed in section 3.1: more pronounced growth in article production; stable production, but not very representative of monographs and; rapid decrease in the contribution of works in annals.

Qualis Periodicals: criteria and questions

The importance given to articles implies that the form of organization of the QP influences the behavior of researchers. The classification is organized by each CA and is available online through the Sucupira platform (https://sucupira.capes.gov.br/sucupira/). Provides a list of journals in which PPGs in a given area have published a minimum number of publications. The magazines are classified into strata indicating quality - A1, the highest; A2; B1; B2; B3; B4; B5 and C. Each stratum assigns a certain number of points for each article that was published in a journal that falls within it (for example, A1 = 100, A2 = 85, ..., B5 = 10), except C , which scores zero. The quality of the articles is defined based on the classification of the journals in which they were published and, adding the scores for all permanent professors, there is an evaluation of the PPG's scientific production in this regard. [27]

This mechanism promotes publication in journals located in the upper strata of the QP; the greater the number of publications from a PPG in these strata, the higher

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

the score the program will obtain in the evaluation. From this perspective, it is essential to clearly delimit the strata in order to classify journals and score articles. *To this end, the four dimensions of quality of scientific journals identified by Trzesniak* are essentially considered : [28]

- *Technical-normative:* compliance with technical standards (national or international) that must be complied with by journals. *Criteria:* have ISSN; editorial board; responsible editor; editorial policy; rules for presenting articles; offer information about the authors, their institutional affiliation, Abstract, keywords, etc.
- *Purpose of the magazine:* ensures that the magazine meets its purpose with the highest possible quality. *Criteria:* peer review; have a highly qualified, institutional and geographically diverse Scientific Editorial Board; ad hoc consultants; Institutional Support; among other elements.
- *Production process:* associated with the execution of editorial procedures in a systematic, complete, efficient, effective and transparent manner. *Criteria:* have regulations; parameters established for the selection of editors; peer review forms; editorial process flowchart; quality procedures manual; regular periodicity, etcetera.
- *Market:* quality that authors, consumers or users attribute to journals. *Criteria:* use of quantitative citation count indicators (JCR IF, Scopus h Index, etc.); indexing in highly visible databases (WoS, Scopus, etc.); publication in electronic format, among others.

Each CA freely defines the criteria to evaluate these dimensions and, on this basis, classifies the journals into the corresponding strata. Table 3 shows the distribution

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

of the criteria most used by CAs in the 2010 and 2013 assessments. Table 4 details the most used databases. It is observed that there are criteria considered by all CAs, specifically, those that "formally" characterize a scientific journal (technical-normative and peer review). Quality publications that do not meet these requirements are not designed; establish minimum criteria for including a journal in strata A1-B5 and consequent scoring for the articles published in it. Non-compliance places the magazine in stratum C, whose articles do not score. However, these criteria do not define the gradation of the strata; This considers market dimension criteria, highlighting quantitative indicators and indexing in databases due to their majority use. Among the quantitative indicators, the FI (JCR) used by all CAs predominates; the H index and Citations per document are much less used and are always monitored by the FI. An increase in this trend was observed from 2010 to 2013; Pharmacy, Medicine I, II, III, and Dentistry increased the value of the IF that delimits the upper and lower level of the strata and the number of strata that require publications with IF; Public Health reduced the number of strata defined by FI, but increased its value; Nursing did not increase the value, but the number of strata defined by FI. Only Physical Education did not make changes.

Table 3 Quality criteria most used by the CdS CAs to classify journals in the QP (2010 and 2013)

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

CAs (Capes)	Técnico-normativa		Finalidade		P produtivo		Merc			
			Revisão por pares		Periodicidade regular		FI (JCR) e suas variantes		Índice H (Scopus)	
	2010	2013	2010	2013	2010	2013	2010	2013	2010	2013
Educação Física	X	X	X	X	-	-	X	X	X	-
Enfermagem	X	X	X	X	-	-	X	X	X	X
Farmácia	X	X	X	X	X	X	X	X	-	-
Medicina I	X	X	X	X	-	-	X	X	-	-
Medicina II	X	X	X	X	-	-	X	X	-	-
Medicina III	X	X	X	X	-	-	X	X	-	-
Nutrição*	-	X	-	X	-	-	-	X	-	X
Odontologia	X	X	X	X	-	-	X	X	X	-
Saúde Coletiva	X	X	X	X	-	-	X	X	X	X

*Nutrition did not exist in the 2010 evaluation. FI (JCR) and its variants - in addition to using FI (JCR), some CA combine this indicator with the median FI of all magazines analyzed.

Source: CA documents (2010 and 2013).

Table 4 Databases most used as stratification criteria in the CdS QP (2010 and 2013)

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

CAs (Capes)	A1		A2		B1		B2		B3		B4
	2010	2013	2010	2013	2010	2013	2010	2013	2010	2013	2010
E Física	1, 2	1	1, 2	1	1, 2, 3, 6	1, 3, 4, 6	3, 5, 6	1, 3, 5	5, 6	1, 3, 4, 5, 6	6
Enfermagem	1, 2	1, 2	1, 2	1, 2	1, 2, 6	1, 2, 6	3, 6	3, 6	5, 6	5, 6	6
Farmácia	1	1	1	1	1	1, 2	1	1, 2	1, 2	1, 2	2
Medicina I	1	1, 2	1	1, 2	1	1, 2	1	1, 2	6	1, 2	3
Medicina II	1	1, 2	1	1, 2	1	1, 2	1	1, 2	1, 6	1, 2	3
Medicina III	1	1, 2	1	1, 2	1	1, 2	1	1, 2	1, 6	1, 2	3
Nutrição*	-	1, 2	-	1, 2	-	1, 2	-	1, 2	-	3, 6	-
Odontologia	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2	1, 2, 3	1, 2	2, 3, 6	1, 2, 3, 6	5, 6
Saúde Coletiva	1, 2	1, 2, 3	1, 2	1, 2, 3	1, 2, 3	1, 2, 3	2, 3	1, 2, 3	2, 3,	1, 2, 3	2, 3, 5, 6

* Nutrition did not exist in 2010. Legend: 1-WoS; 2-Scopus; 3-SciELO; 4-SJR; 5-LILACS, 6-Others (CUIDEN, Medline, PUBMED, EMBASE, ERIC, LATINDEX, SPORT DISCUSS, etcetera).

Source: CA documents (2010 and 2013).

Indexing in databases is also a criterion used by all CAs; It is recognized that the greater the number of indexings of a journal, the greater the visibility of its articles,

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

increasing the possibility of them being found, consulted and cited. However, it is observed that the classification in the upper strata of the QP (A1-B1) favors journals indexed in the most recognized commercial databases (WoS and Scopus), belonging to private companies in the northern hemisphere. In 2013, only Public Health included SciELO in strata A1, A2 and B1; Physical Education incorporates Medline, SciELO and SJR in B1 and Nursing also incorporates CUIDEN in B1. In the lower strata, other bases appear, such as SciELO, LILACS, etcetera.

The preponderant use of IF and indexing in WoS and Scopus as essential criteria to stratify scientific production, contribute to the identified publication patterns, particularly with regard to the accelerated growth of international articles, in relation to national ones; one must consider the productivity requirements to which PPGs and researchers are subjected and the disproportion between the number of international and Brazilian journals that meet these requirements.

The situation described so far indicates that evaluation in CdS is dependent on three criteria that, according to the analyzes carried out, contributed to changes in publication practices: the preponderant use of QP as an evaluation tool, the IF (JCR) and indexing in WoS and Scopus, as essential indicators of the quality of publications. The materialization of these changes reflects the effectiveness of Capes and CNPq evaluation policies aimed at increasing the visibility of Brazilian science.

However, it also raises problematic issues. As *Santos* and *Kobashi* state "(...) scientific activity cannot be reduced to the production, circulation and consumption of journal articles and, much less, confuse the quantitative growth of articles with the cognitive development of science". [29] By placing monographs and works in

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

annals in the background, a portion of the scientific production of CdS is disregarded, which, despite being intentionally devalued, in the 2014 census still represented 21% of the total volume of production (Fig. 2) .

Monographs and works in event annals are traditional forms of scientific communication that respond to certain requirements of the processes of production and dissemination of knowledge. The first allow the exposure of more complex knowledge that requires greater elaboration and space; the second presents preliminary results allowing researchers to obtain feedback and fine-tune their work. Arguing that these are types of publications that do not undergo rigorous review processes is a generalization that does not fully adjust to reality; as shown by *Meadows* , [12] , there is evidence that this happens, but also that many publishers and events subject communications to evaluation processes as severe as those of magazines. The real problem is the lack of indicators to evaluate both types of production. Evaluators need to review many publications in a short period of time, therefore, they rely on bibliometric “shortcuts”; while for articles there is a variety of indicators available, in the case of monographs and works in annals this is not the case.

Another problem is the basis that supports the QP. Evaluating scientific production based on the quality of journals takes the focus away from the essential issue: the quality of articles. Journals are predominantly evaluated through the IF. However, when this indicator reaches prominent values it does not mean that all articles in the journal are of high quality; It is enough for an article to reach a high number of citations for the “success” to be transmitted to the journal and, “automatically”, to the other articles published in it. The FI does not guarantee the quality of the

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

articles, which, strictly speaking, invalidates its use as an essential criterion to delimit the upper strata of QP.

Additionally, taking the IF and indexing in WoS or Scopus as a basis for stratification compromises the inclusion of Brazilian CdS journals in the upper layers of the QP, subjecting national science to the interests of private companies. A similar approach may favor areas closer to "hard" sciences, however, it has a negative impact on those that develop research more linked to local or regional social problems. [21, 22]

And there is even more. The Qualis tools were created within the scope of Capes to evaluate the production of PPGs, currently four-yearly and three-yearly until 2013. Once this evaluation was completed, Qualis for the finalized evaluation period fulfilled its role, and could be extinguished. Although it is expected that a magazine well ranked in a certain edition of QP will maintain its position in the next, there is no guarantee in this regard. For example, there are percentage limits for presence in strata A1, A1+A2 and A1+A2+B1. So, if new magazines enter A1 and/or A2, some of the ones that were there may fall to B2 or worse.

The first question is whether the tool for evaluating PPGs (collectives) can be applied to the evaluation of researchers (individuals). The second is that, in longer-term evaluations, a journal's ranking may have changed, so CAS would have to look at the publication date of each article and consider the PQ at the time. Most Capes areas generate two editions of the QP in each evaluation period, one intermediate and one final. To evaluate the PPGs, the final is worth it. For researchers, which one is worth it?

CONCLUSIONS

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

In the period 2000-2014, CdS publication practices changed: in percentage terms, the contribution of international articles increased and that of national articles, monographs and complete works in annals decreased (all increased, however, in absolute numbers). The evaluation criteria used by Capes and CNPq are one of the factors that influenced this behavior. But the strategy that bases such criteria - privileging scientific production in high IF journals - rests on the presumption that this increases the quality of Brazilian science, a premise that, in the authors' view, still lacks foundation to be indiscriminately extended to all the areas. Scientific research not only has an intellectual impact (contribution to the common body of knowledge) but also a social one. Starting from an elitist vision may perhaps increase the impact of Brazilian science in the world, but it certainly does not motivate research aimed at solving social problems. Social interest is subordinated to that of commercial publishers whose main objective is often to make a profit.

A compromise solution, capable of considering these two visions in balance, would be for the areas that carry out research with greater social impact in Brazil to include, in the upper strata of the QP, a greater number of national journals, which publish quality articles, through rigorous editorial processes. . Additionally, Capes and CNPq must promote and value publications that have a significant social impact. A way to achieve this is discussed by Trzesniak. [22]

REFERENCES

1. Brosnan C. Epistemic cultures in complementary medicine. Health Sociol Rev. 2016; 25(2):171-86.

2. Ganeri J. Well-Ordered Science and Indian Epistemic Cultures: towards a polycentered history of science. Isis. 2013;104(2): 348-59.

GARDEN JOURNALS
Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics
ISSN : 1533-1520

3. Knorr-Cetina K. Culture in global knowledge societies: knowledge cultures and epistemic culture. In: Jacobs MD, Hanrahan NW, editors. The blackwell companion to the sociology of culture. Malden MA: Blackwell Publishing Ltd; 2005. p.65-79.

4. Knorr-Cetina K. Epistemic cultures. How the sciences make knowledge. Cambridge Massachusetts: Harvard University Press, 1999.

5. Trzesniak P. Quantitative indicators: how to obtain, evaluate, criticize and improve. Navus - Rev Gest Tecnol, Florian SC. 2014;4(2):5-18.

6. Charlot B. Educational research between knowledge, policies and practices: specificities and challenges of an area of knowledge. Belo Horizonte: Rev Bras Educaç. 2006;11(31):7-18.

7. Alexander JC. The importance of the classics. In: Giddens A, Turner J, organizers. Social theory today. São Paulo: Editora UNESP; 1999. p. 23-89.

8. Becher T. The significance of disciplinary differences. Stud High Education. 1994;10(2):151-61.

9. Caballero Rivero A, Santos RNM, Trzesniak P. Characterization of publication practices in large knowledge areas in Brazil. Rev Cubana Inform Cienc Salud. 2017;28(4):1-19.

10. Caballero Rivero, A. Characterization of publication practices in major areas of knowledge in Brazil. Dissertation]. Recife: Federal University of Pernambuco (UFPE); 2017.

11. Puuska HM. Scholarly publishing patterns in Finland: a comparison of disciplinary groups. Thesis]. Tampere: School of Information Science, University of Tampere; 2014.

ISSN : 1533-1520

GARDEN JOURNALS

Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics

12. Meadows A.J. Scientific communication. Brasília, DF: Briquet de Lemus; 1999.

13. Adams J, Gurney K. Evidence for excellence: has the signal overtaken the substance? London: Digital Science; 2014.

14. Piro FN, Asknes DW, Rørstad K. A macro analysis of productivity differences across fields: challenges in the measurement of scientific publishing. J Am Soc Inform Sci Technol. 2013;64(2):307-20.

15. Trzesniak P. The issue of free access to articles published in scientific journals. Opened. 2012;25(87):77-112.

16. Bourdieu P. Symbolic power. Rio de Janeiro: Editora Bertand Brasil SA; 1989.

17. Council of Canadian Academies (CCA). Informing Research Choices: indicators and judgment. Ottawa: Council of Canadian Academies; 2012.

18. Ware M, Mabe M. The STM Report: An overview of scientific and scholarly journal publishing. The Hague: International Association of Scientific, Technical and Medical Publishers; 2015.

19. Research Information Network (RIN). Communicating knowledge: how and why UK researchers publish and disseminate their findings. RIN Report. London: RIN; September 2009.

20. Laudel G, Glässer J. Tensions between evaluation and communication practices. J Hig Educat Pol Manag. 2006;28(3):289-95.

21. Santos RNM, Caballero-Rivero A, Sánchez-Tarragó N. Publication and evaluation practices in Social Sciences and Humanities: contradictions and challenges. P2P&Innovation. 2018;4(1):18-34.

ISSN : 1533-1520

GARDEN JOURNALS

Journal of Qualitative Research in Business Law, Eco-Fin, Accounting, and Statistics

22. Trzesniak P. Qualis in four quarters: history and suggestions for the Administration, Accounting and Tourism area. Rev Contab Financ. 2016; 27(72):279-90.

23. MT Light. Specificity of the contribution of knowledge and practices from Social and Human Sciences to health. São Paulo: Health and Society. 2011;20(1):22-31. 24CarvalhoYMManoelEJBeyond production evaluation indicatorsMovimento2006123193-225

24. Carvalho YM, Manoel EJ. In addition to the indicators for evaluating Movimento production. 2006; 12(3):193-225

25. Coordination for the Improvement of Higher Education Personnel (Capes). Brazil: Guide for book classification. Capes; 2009.

26. Coordination for the Improvement of Higher Education Personnel (Capes). Brazil: Communiqué No 002/2013- Arts Area - Music. Capes; 2013.

27. Coordination for the Improvement of Higher Education Personnel (Capes). Qualis. Capes; 2015. Accessed: 3/16/2018. Available at: http://www.capes.gov.br/acessoainformacao/perguntas-frequentes/avaliacao-da-pos-graduacao/7422-qualis

28. Trzesniak P. The dimensions of the quality of scientific journals and their presence in an instrument in the area of education. Rev Bras Educ. 2006;11(32): 346-61.

29. Santos RNM, Kobashi NY. Bibliometrics, scientometrics, informetrics: concepts and applications. Brasília: Pesq Bras Ci Inf. 2009;2(1):155-72.