









Current status of statistical information management for external quality control in Hematology

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ABSTRACT

Introduction: the management of statistical information is not a procedure that can be applied manually; it requires the use of automated means that allow the establishment of the highly complex relationships that exist among the needs of laboratories.

Objective: to determine the current status of statistical information management in external quality control of Hematology in Pinar del Río.

Methods: a descriptive investigation in which research methods, procedures, and techniques—both theoretical and empirical—were applied, based on Leticia Artiles' theory.

Results: the acquisition of information flow derived from established procedures, validated by workers and business actors, with the aim of computerizing processes according to the described methods.

Conclusions: the importance of computerization projects in this field is evident, as well as the use of electronic and automated means, digitization, and data processing, for the progress and growth of statistical information management services.

Keywords: Information; Statistics; Laboratory; Quality; Hematology.

INTRODUCTION

Medical sciences are one of the spheres whose current projection has been oriented towards the systematic, continuous, and progressive linkage of Information and Communication Technologies (ICT), as an economical and viable way to increase the quality of services provided in health institutions.^(1,2)

The introduction and use of these technologies in health systems is aimed at improving the effectiveness and efficiency of the sector, directed towards better patient care, conducting studies, and decision-making by administration and management, constituting one of the objectives of current public policies.² In Latin America, the current situation of laboratories is characterized by an insufficient level of reliability in results, which is why the Cuban Ministry of Public Health has defined the computerization of health services as one of its priorities.

In Cuba, in 1989, an external quality evaluation program was established in primary care level laboratories; subsequently, this activity was not successful.

The computerization of statistics contributes to facilitating better management and collection of health statistics, guaranteeing the reliability of results. As Rodríguez Díaz stated:

"...the health computerization process is comprehensive in its conception and in its project; the fundamental axis and center of the computerization process of the sector is the patient, and the quality, timeliness, and consistency of information is guaranteed..."

Based on the importance of statistical information management, it is considered necessary to refer to its conceptual evolution, as well as to the functions and objectives it has, to make known both its meaning and the need for said system to be implemented in laboratories, with the intention of optimizing the informational resources available. To conceptualize the term, it is important to understand the meaning of the words that compose it; management, information, statistics:

Management: It is the orderly way of carrying out responsibilities over a productive process.
Information: Information is the set of data that configures a message emitted by a sender and that is intended to reach the receiver so that they are informed. It is always carried out through a channel that is the one that one or both interlocutors have chosen.^(2,3,4)

Statistics: It allows collecting, organizing, and analyzing data according to the need you have. Statistical information management is of utmost importance because it is the mechanism of policy that allows entities, citizens, and other interested parties to have relevant, accessible, accurate, timely, and comparable information for decision-making.^(5,6)

Regarding the computerization of statistical information management of external quality control of Hematology, within and outside the country, different information institutions implemented variants adapted to their needs.

There are many examples where automation has largely allowed absorbing the increasingly greater demand for microbiological analysis of clinical samples associated with greater demands regarding quality and response times. The integration of automated systems with LIS (Laboratory Information Systems) and HIS (Hospital Information System) has allowed bidirectional exchange of information, which can be transmitted from the equipment to the laboratory, to the medical

team, and even to the patient themselves, in addition to allowing online work of the medical technologist.^(5,7,8)

Based on the above, it is proposed as **Scientific Problem**: How to contribute to Determining the current status of statistical information management of external quality control of Hematology in Pinar del Rio?

The **General Objective** is proposed: Determine the current status of statistical information management of external quality control of Hematology in Pinar del Rio.

METHODS

Descriptive study where methods, procedures, and research techniques were used, both theoretical and empirical:

Among the theoretical methods, the following were used:

Analysis and synthesis: It was applied throughout the investigative process to arrive at specific and general knowledge of the components of the computerization of statistical information management of external quality control of Hematology, delimiting the essential elements that constitute it, as well as the existing links between them and their most general characteristics.

Induction and deduction: It was used in the study of theoretical references and the collection of empirical material to obtain generalizing conclusions, which allowed the development of the web application and later in the process of empirical validation to arrive at the inferences that were obtained.

Bibliographic Review: It was used in the study of documentation linked to the object of study.

Among the empirical methods:

Documentary analysis: For the study of essential documents of the work with the computerization of statistical information management of external quality control of Hematology.

RESULTS

Description of the entity where the research is developed In 1950, the León Cuervo Rubio Hospital was the most modern in the province, thus burying the one that for almost a lustrum (1855) constituted the most attended and finally called Raimundo Menocal. The Clinical-Surgical Hospital located in the city of Pinar del Río is the institution where assistance, teaching, and research processes linked to medical care are developed integrally. This institution is characterized by love, dedication, and excellence in the services provided to the population.

It has always achieved compliance with statistical indicators, emphasizing the surgical plan and performance per operating room. There is a close interrelationship with primary care in the community projections carried out by each specialist.

The institution has as new challenges and work projections the incorporation of computer technologies for the management and improvement of some statistical systems, especially surgical programming, which will guarantee an improvement in human resources and economic financing, thus speaking of supplies and utilization of operating rooms.

The institution has a total of 270 beds, of which 95 are for surgical services. We have 5 surgical services which are Urology, Surgery, Maxillo-facial, Dermatology, and Gastroenterology, all with specialists with a high level of experience. The hospital's surgical center has 7 operating rooms for major surgeries and 2 for minor surgeries; as functioning rooms, there are 6 rooms because one is closed due to structural problems, in addition, there is 1 room that is destined exclusively for emergencies.

And it has as **Mission:** The institution has a potential of human and technological resources that allows us to provide high-quality medical care in different services, directed to the reliability and veracity of laboratory analytical determinations, training of highly qualified and specialized human resources, developing scientific research, and achieving appropriate execution and control of human, financial, and material resources assigned by compliance with the mission, which allows continuously improving the health status and quality of life of the population in the province of Pinar del Río.

Vision: The hospital is a unit that consolidates itself as the reference institution within the provincial health system, distinguished by continuous improvement and the pursuit of excellence in the professional performance of all its workers, humanism, and compliance with ethical-socialist principles; we present quality services inside and outside the institution, generating satisfaction of users and providers; we play a fundamental role in the training and capacitation of human resources, providing medical improvement courses aimed at professionals and technicians of different levels of care; we work in the continuous improvement of the population's health status with leadership recognized by the community.

General processes that are developed in the institution.

1. Provide medical assistance services in hospitalization and outpatient care.
2. Perform conventional surgical activity and minimally invasive procedures for hospitalized and outpatient patients in surgical services.
3. Implement training programs for medical specialists, academic development of physicians, nurses, technologists, and others.
4. Carry out health promotion actions, epidemiology, hygiene, and hospital microbiology.
5. Develop plans and prepare personnel with the objective of fulfilling the measures foreseen for wartime and disaster reduction.
6. Organize and hold scientific events.
7. Provide diagnostic services such as clinical laboratory, ultrasounds, CT scans, and X-rays.
8. Offer rehabilitation services in hospitalization wards.

Provide NMT services in hospitalization wards and in surgical activity.

Based on this, the strategic or **transversal processes are exposed:**

- Strategic Direction.
- Internal control and risk prevention.
- Human capital management.
- Guarantee the quality of patient care.

Key or mission processes:

- Professional training.
- Science, technology, and innovation.
- Improve the quality of life of patients and the community.

Support processes:

- Economic management
- Investment management
- Internal audit and supervision
- Infrastructure and service.
- Computerization and computer communication.

The "León Cuervo Rubio" Provincial Clinical-Surgical Teaching Hospital has 9 hospitalization services that include 5 surgical specialties.

The institution has an organizational structure composed of a Directorate, three clinical sub-directorates, and one administrative one; it has a human potential of 1156 workers, among doctors, nurses, technicians, workers, managers, and other personnel, distributed among the 42 departments currently existing, including the admission section which is an extension of the Medical Records and Statistics department with a total of 7 workers and 9 in the Medical Records and Statistics department. Information is provided to the sub-directorates and to the Directorate, and in addition, information is issued to the Provincial Directorate of Public Health.

Brief description of processes in the Laboratory: The laboratory is of great importance within the hospital, essential support to guarantee the quality of analytical determinations and perform the quantity and type of analyses that satisfy both patients and the personnel providing medical care.

The Clinical Laboratory has: Licensed professionals, mid-level technicians, basic technicians, an assistant of the assistance department, and general assistants; each of them performs their work so that everything functions and good results are obtained. The department consists of five well-defined areas (Central Secretariat, Departmental Office, Classroom, Basic Hematology, Special Hematology, Coagulation, Quality Control, Clinical Chemistry, Clinical Urinalysis, Pantry, Drying Section, Washing Area, Bathroom, Warehouse, Service Patio).

In the Laboratory, several processes are present in the different areas. The present research will focus on the study, as an object of computerization, of the statistical information management of external quality control of Hematology.

The statistical information management of external quality control of Hematology is carried out in correspondence with the identified needs; it is performed by a specialist designated for the task. This process begins with the identification of the process, definition of the process elements, and elaboration of the flowchart and analysis of the diagram. There are 2 types of processes: central and support processes. Central processes are those related to the generation of products and services for the external client. Support processes are vital but do not add value directly to the product and are destined for internal clients (purchase of reagents, instrument maintenance, cleaning of materials, laboratory network, staff training).

Process identification: it is essential to document what is actually done and not what is believed to be done; there is a gap between theory and reality; despite the fact that processes may vary, it is important to collect all information, decision-making, and reports.

Process elements: the input is the sample that would be in the pre-analytical phase, the transformation of this sample would be the procedure and we would be in the analytical phase, in the post-analytical phase we would give a result that would be the output.

DISCUSSION

With the computerization of information of the external quality control evaluation process in clinical laboratories in the province of Pinar del Río, it has allowed not only to standardize processes, but to improve timeliness in information, laboratory productivity, quality of results, and often reduce costs.

Currently, the automation of these microbiology processes has reached great development, and previously manual methods, such as reading blood cultures, antibiogram, and plate seeding, among others, have been automated, which has freed up staff hours to be dedicated to other activities, mainly management and control, and has improved inter- and intra-laboratory reproducibility.

There are many examples where automation has largely allowed absorbing the increasingly greater demand for microbiological analysis of clinical samples associated with greater demands regarding quality and response times. The integration of automated systems with LIS (Laboratory Information Systems) and HIS (Hospital Information System) has allowed bidirectional exchange of information, which can be transmitted from the equipment to the laboratory, to the medical team, and even to the patient themselves, in addition to allowing online work of the medical technologist.⁽⁸⁾

In the exploratory study carried out, it was found that there is a group of computer tools linked to clinical laboratories with different applications but that the EEC is not present, which confers greater relevance to web applications such as:

Web System for patient registration and follow-up, elaboration and issuance of performed analyses, records and medical, pharmaceutical, and hospital guide case: clinical laboratory - Adolfo Kolping, has as purpose to implement a web system for the ANALIZATE laboratory belonging to the Adolfo Kolping health center.⁽⁹⁾

Control and management system of clinical records supported by mobile devices case: La Paz Medical Center, has as objective to carry out a mobile application to help the administration of clinical records for the La Paz Medical Center.⁽¹⁰⁾

Administration and control system of Clinical Records for the clinical offices of the UMSA, has as objective to implement a clinical records system for students and teachers of the different offices of the UMSA.⁽¹¹⁾

Specialized Clinical Information System (SICE). - Manages the clinical analysis information of patients of the children's hospital. Together with other systems, it helps the administration of hospital information in the children's hospital.

The systems mentioned above, even when linked to clinical laboratories, focus on registering patient analysis information and clinical histories, but not for the evaluation of external quality control of these laboratories. Other computer systems are used in the evaluation of the quality of clinical laboratories but not for external control, as is the case of the computer system of the Immunoassay Center (CIE), where information related to quality control and the functioning of diagnostic programs has been stored for more than 10 years in a database server, to which the SAC 2.0 Server application has additionally been incorporated, which is in charge of receiving messages from regional representations and laboratories.⁽¹²⁾

The implemented web application collects more than 200 fields grouped in sections or tables that are hosted in the database that will be used in the application. These records contain information of what happened during the evaluation carried out on the laboratories, which represents much more information than that registered by previous computer systems.

With this amount of information, it is possible to carry out extensive studies and statistical analyses that may result from the adequate management of the information contained in the system and that are currently not possible. The laboratories registered in the software as part of the External Quality Evaluation Program will be evaluated regularly, so that said participating units will improve their analytical performance, in order to comply with continuous quality improvement in the Clinical Laboratories of Pinar del Río; in this way, a more reliable and efficient complementary report of the patient can be issued regardless of the unit where it is performed, and a historical record of the evaluation of said units will be available.

CONCLUSIONS

With this presentation, it was demonstrated that it is necessary to improve the external quality control evaluation process for Clinical Laboratories in Pinar del Río, favoring decision-making, as well as the improvement of quality standards in the external control process of health units in the province. This provides the possibility of improving the analytical quality of laboratories, showing quantitatively the errors that are committed in the work of an uncontrolled clinical laboratory, and therefore acts as a skeleton that supports continuous education activities aimed at achieving optimal analytical quality. The use of computer systems for external quality evaluation does not cease to be an important and transcendental element in the process of improvement and monitoring of the quality of determinants or samples of a clinical laboratory. All this contributes to information management, which allows the quality of statistics.

BIBLIOGRAPHIC REFERENCES

1. Pacheco Correa Y, Chiroles Cantera M, Reyes Chirino R, Sisto Díaz A. Digitalización de los anuncios e informes operatorios. Rev Ciencias Médicas [Internet]. 2018 Feb [citado 12/09/2019]; 22(1): [aprox. 7p.]. Disponible en: <http://www.revcmpinar.sld.cu/index.php/publicaciones/article/view/3279>
2. González Fajardo I, Díaz Padilla D, Rodríguez Rodríguez L, Sanabria Negrín JG. Evaluación externa de la calidad en química clínica en Pinar del Río. Rev Ciencias Médicas [Internet]. 2018 Abr [citado 21/09/2019]; 22(2): [aprox. 10p.]. Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1561-31942018000200010&lng=es
3. Chiroles Cantera M, Pacheco Correa Y, Reyes Chirino R, Sisto Díaz A. Implementación de una aplicación web para el módulo servicio quirúrgico de la aplicación Behique. Rev Ciencias Médicas [Internet]. 2017 Dic [citado 12/09/2019]; 21(6): [aprox. 7p.]. Disponible en: <http://www.revcmpinar.sld.cu/index.php/publicaciones/article/view/3280>
4. Barquero García J. ¿Qué es Laravel? [Internet]. Copyright © Arsys; 2015 [citado 15/09/2015]. Disponible en: <https://www.arsys.es/blog/programacion/que-es-laravel/>
5. JavaScript. [Internet]. Campus MVP; 2017 [citado 12/09/2019]. Disponible en: <https://www.campusmvp.es/recursos/post/los-5-mejores-frameworks-dejavascript-en-2017.aspx>
6. Burbeck S. Application programming in Smalltalk-80: How to use Model- View-Controller (MVC) [Internet]; 2012 [citado 15/09/2019]. Disponible en: http://www.dgp.toronto.edu/~dwigdor/teaching/csc2524/2012_F/papers/mvc.pdf
7. Nivel1: Manual de Calidad Laboratorio Central HDCQ León Cuervo Rubio.
8. Rhoads D, Novak S, Pantanowitz L. A review of the current state of digital plate reading of cultures in clinical microbiology. J Pathol Inform [Internet]. 2015 [citado 15/09/2019]; 6: [aprox. 23p.]. Disponible en: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4466785/>
9. Llipes M, Adela D. Sistema web de registro y seguimiento de pacientes, elaboración y emisión de análisis efectuados, registros y guía médica, farmacéutica y hospitalaria caso: laboratorio clínico-Adolfo Kolping [Tesis]. La Paz -Bolivia; 2014 [citado 15/09/2019]. Disponible en: <https://repositorio.umsa.bo/bitstream/handle/123456789/8177/T.2854.pdf?sequence=1>
10. Centellas Coarite M. Sistema de control y gestión de historiales clínicos apoyado en dispositivos móviles Caso: Centro Médico La Paz [Tesis]. La Paz -Bolivia; 2015 [citado 15/09/2019]. Disponible en: <https://repositorio.umsa.bo/bitstream/handle/123456789/8729/T.3071.pdf?sequence=1&isAllowed=y>

11. Lozano Flores, R. Sistema de Administración y Control de Historiales Clínicos para los Consultorios Clínicos de la UMSA [Tesis]. La Paz -Bolivia; 2014[citado 15/09/2019]. Disponible en: <https://repositorio.umsa.bo/bitstream/handle/123456789/7824/T.2774.pdf?sequence=1>

12. Rego A, Pérez H, López L, Carlos N. Sistema automatizado para la evaluación de la calidad en los laboratorios de diagnóstico con tecnología SUMA. Vaccimonitor [Internet]. 2012 [citado 21/09/2019]; 21(1): [aprox. 6p.]. Disponible en: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1025-028X2012000100005