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The development of the automated information system of pharmaceutical staff management

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Abstract

Background: The automated evidence of any systemic personal data represents an important tool to provide good functionality of that system. It absolutely refers to the pharmaceutical system as well, which is a part of the health system. Purpose of the study: To elaborate and argue the need to implement the automated information system of pharmaceutical staff management (AIS PSM) within the health system of the Republic of Moldova.
Material and methods: Statistical data on the pharmaceutical system; systemic approach by applying statistical analysis, and system programming methods.
Results: The automated system contains and ensures the processing of the following categories of personal data: first name, last name; date of birth; gender; occupation; graduation diploma; graduated institution; the employee workplace /the pharmaceutical company address; continuous education training; professional association membership fee; special references. The confidentiality of the personal data and the possibility of extending the categories of data is ensured, as well as the possibility of integration the developed system in the national health systems and statistical systems. Recommendations regarding the need of implementation of the AIS PSM in pharmaceutical units were worked out.
Conclusions: In the Republic of Moldova, the automated pharmaceutical staff management information system was developed and proposed, though its implementation was largely discussed. There were also arguments on the recommendations to ensure the functionality of the system by elaborating sequential diagrams.
Key words: automated information system, pharmaceutical staff.

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Introduction

Currently the Information Technology register is well known for its most dynamic evolution, which is applied more and more frequently in the data processing processes, in the decisional, management, computerizing processes etc.

Practically, there is no field in which at least one information system is used, as a support in ensuring the functionality and / or control of different parts of the activity in those fields [1].

Medicine compared to other science fields is the one of the domains, which implements modern information technologies more cautiously and also with a delay. This is determined by the major responsibility in the use of medical and a pharmaceutical information technology, which is related to human health and life.

Unlike some of medical staff, pharmacists have a great experience in using computer systems, both regarding the issuance of medicines and collaboration with insurance companies, as well as for keeping stock records and performing orders to pharmaceutical warehouses. Due to the diverse use of information technologies in the pharmaceutical activity, pharmacists can be considered leaders in the implementation of IT in their professional activity.

The role of the pharmacist in society is constantly growing; pharmacy itself is a constantly changing profession. Over the last 100 years, the profession of pharmacy has evolved from a dispensing model focused on the formulation and delivery of a drug product to a patient, care model focused on individualizing drug therapy and delivering direct patient care [2].

Nowadays, there is a shortage of pharmaceutical staff in the Republic of Moldova, which significantly diminishes the quality of pharmaceutical services provided.

At the same time, the lack of a register of pharmacists does not allow the registration of pharmaceutical staff.

In the current operating conditions of the pharmaceutical system, the operative and statistical recording of the pharmaceutical staff is of great importance.

The purpose of this study was to develop and reason the need to implement the automated information system of pharmaceutical staff management (AIS PSM) within the health system of the Republic of Moldova.

Material and methods

The statistical data in the field of the pharmaceutical system as well as the "pharmaceutical framework" subsystem served as study materials. The methods applied included the systems approach, study of factors and processes, statistical analysis, decomposition and construction of systems, elaboration of information system design and components and programming the automated information system of pharmaceutical staff management.

Results and discussions

Some fields of activity in the Republic of Moldova have developed and operate IT systems for personnel records. Thus, the personnel record in the public authority, which contains general data, was elaborated as a methodological support in the process of organizing and carrying out the personnel record activities in the public authorities [3].

The information system for registering health personnel was developed and integrated in collaboration with the International Organization for Migration. The database of this system was created for the correct management of resources by local authorities [4]. The system was created following a similar model of a Finnish software, and its purpose was to monitor the activity and migration of medical staff [5].

The "Human Resources Management Information System" ensures the collection, administration, processing and interpretation of data by issuing lists, text reports, statistical and comparative data, as well as improving communication within the organization by better organizing the flow of information between departments of Human Resources and other subdivisions. The system ensures good data accessibility and significantly reduces the time required for administrative activities on personnel management [6].

The experience gained in other areas, as well as the following general principles were considered during the process of developing the AIS PSM:

- The principle of *legality* of the system implies the operation of the system in accordance with the legislation in force;
- The principle of *respect for human rights* provides system operating in strict accordance with national normative documents and within the limits of the stipulations of international treaties and conventions on human rights, to which the Republic of Moldova is a party;
- The principle of the *first person* / *of the unique center* implies the existence of a highly qualified leader who is adequately empowered to adopt decisions and coordinate system creating and operating works;
- The principle of *data authenticity* implies the introduction of data in the system only on the basis of entries in qualified documents as sources of information;
- The principle of *data integrity*, completeness and veracity, according to which:

1) Data *integrity* means that data keeps its content and its uniform interpretation under the influence of random factors. Data is considered to maintain its integrity if it has not been distorted or destroyed (not deleted);

2) Data completeness means the volume of information collected, registered and authorized in accordance with the normative acts;

3) Data *veracity* means its degree of correspondence to the computer memory or to documents which render the real situation of the reflected objects from a certain system domain.

- The principle of *state identification of the objects of registration*, according to which each subject of registration is given a unique identification number [7, 8].

The processes of creation, implementation and operation of AIS PSM must not contradict the normative acts on the pharmaceutical activity in force at the time of elaboration [9, 10].

The developed system is provided with a user-server architecture, based on web technology. It is designed modularly and the development of the modules can be done simultaneously. Any user can connect to the application server and use the system according to their rights.

The authentication module guarantees safe access of users to the system. To log in, users have a username and password, which they use to access the system. The authentication model guarantees the user exclusivity within the system:

- The system ensures that the authentication module is an operating one and provides messages / helps in case of incorrect entry of authentication data (incorrect username / password). The messages are explicit, short and coherent, in Romanian version, so that they do not confuse the users;
- The login interface contains information on the access conditions of the users in the system and a message which informs the users on non-compliance with access conditions that might be sanctioned according to the law;
- Once logged in, users have exclusively those rights, which they need to carry out their activity;
- The system has an access control mechanism, which allows users, by default, a minimum number of actions without the intervention of administrators, this being included only for the granting of special rights when necessary [9].

In the following approaches, the notion of "user" refers to a person with valid permissions to operate within the system, and the notion of "roles" defines some responsibilities. Thus, the role of "user" belongs to a responsible person within the pharmaceutical unit, and the role of "administrative" – to a responsible person within the institution responsible for the management and maintenance of the information system.

Users will have usage restrictions, so they will only be able to access certain fields to complete them, and administrative roles by performing actions on the management

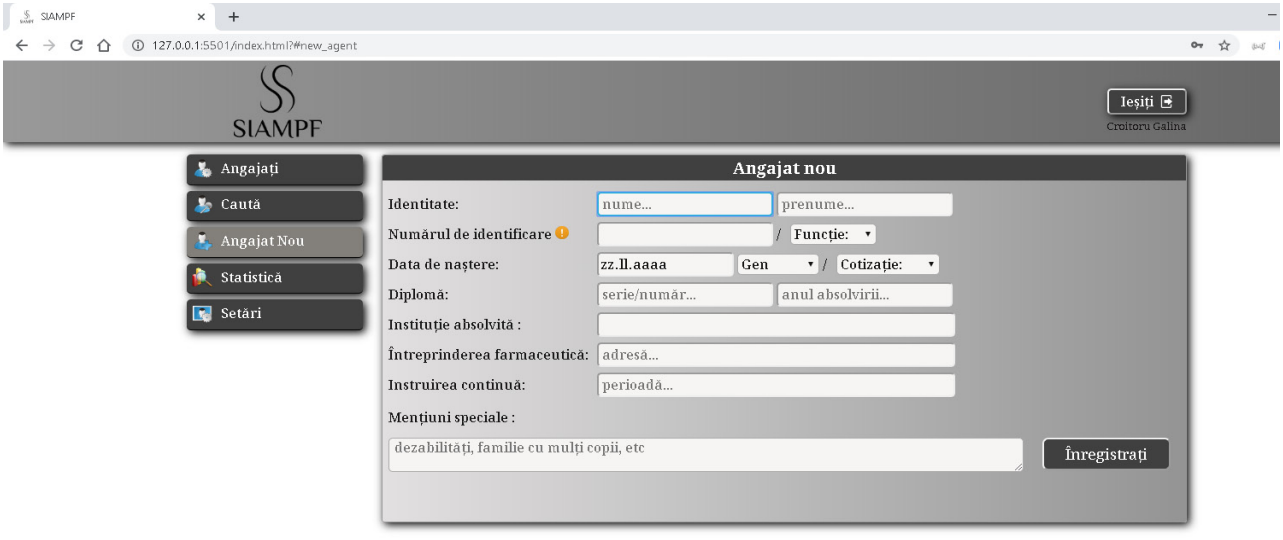

Fig. 1. Graphical interface of the pharmacy user when a new employee is being introduced

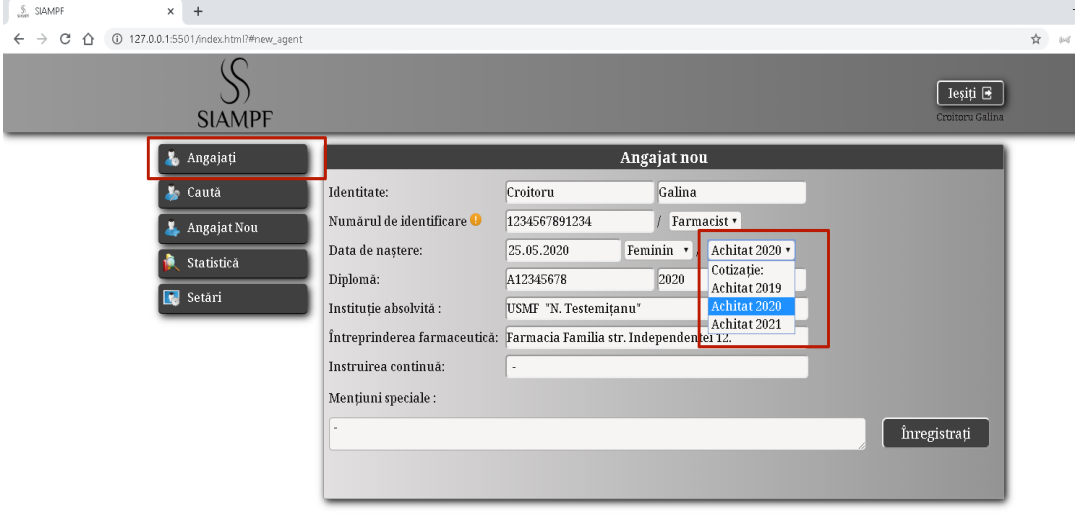

Fig. 2. Graphical user interface for the person responsible for the APhRM

of already registered information, including filling in new information, as well as searching and retrieving the necessary information.

The user of the pharmacy computer system has the function of entering the personal data regarding the new employee engagement within a definite unit. Fig. 1 shows the interface for the pharmacy user when enrolling a new employee. When accessing the "*New Employee*" button, the personal data entry appears.

The following categories of personal data are processed within the AIS PSM:

- Name, surname;
- Date of birth; Gender;
- Pharmacist / Assistant Pharmacist position;
- Diploma (series, number, year of graduation);
- Graduated institution;
- Pharmaceutical company / address;
- Continuous training (period);
- Membership fee of the Association of Pharmacists of the Republic of Moldova (APhRM);
- Special mentions (disabilities, family with many children, etc.).

If the employee is already introduced into the system, access the "Employees" button and enter the name and surname of the employee. It will enable to access the complete personal file, allowing the user to modify only the necessary data.

The graphical interface of the responsible person within the Association of Pharmacists of the Republic of Moldova is presented in fig. 2. It ensures the management of the data system access in order to modify the information referring to the payment of the annual fee.

In order for the information managed by the system to be truthful and current, the data is constantly renewed, for example: when changing the address / company where the person works; when paying the annual fee; when conduct-

ing continuous training; changes in personal data; when special references are required, etc. After each data change, the system is updated and presents a new version.

The system functionality cycle contains 4 stages (fig. 3):

I. *Data entry* represents the process of data collection, verification, coding and transmission;

II. Data *processing* involves various activities of classification, sorting, performing mathematical-logical calculations, selective archiving of data and processing results, in order to find and further process them;

III. *Information extraction* that is performed in three steps: 1 – retrieving the results from memory; 2 – decoding the results and presenting them in a comprehensible format; 3 – sending the information to the place requested by the user;

IV. *Feedback mechanism* is the information obtained after processing that may or may not meet the requirements; Therefore, an evaluation of the processing results may take place, according to which a series of changes will be made in the data entry or processing phase. It can be considered that this stage has the role of a feedback mechanism, which allows proper functioning of the system, giving it the characteristics of a cybernetic system [11].

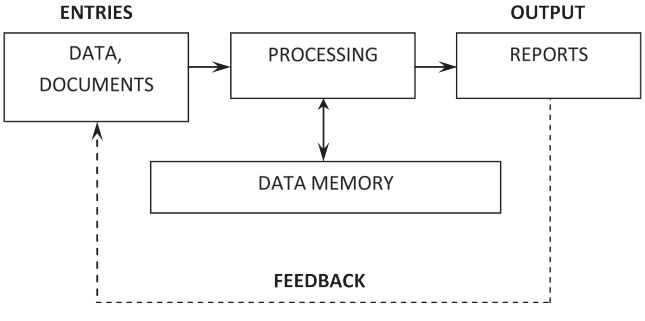

Fig. 3. Data processing flow in AIS PSM

The improvement of the existing information system must be considered and elaborated continuously. The requirements imposed at the national level must also be complied with the existing information systems at the level of economic agent, territorial region or field. Consequently, the modernization of the information system will also enhance the improvement of the information systems with which it interferes. The data exchange between different compartments, hierarchical levels or external partners should be provided through computer networks, in conditions of uniformity regarding the way of preparation and presentation of reports and in order to achieve data comparability.

Soon, due to additional data included within the system, it will be possible to generalize data related to other personnel procedures. The implementation of this database will allow a faster obtaining of the requested information and its truthful reporting.

AIS PSM will be able to be integrated within the health system of the Republic of Moldova as well as in the national statistical system.

The implementation of the AIS PSM, developed for recording the pharmaceutical staff, will provide benefit for the parties involved from the following aspects:

- *Medicines and Medical Devices Agency:*
  - Fast and guaranteed access to accurate data referring to pharmaceutical staff;
  - Access to statistical data;
  - Accessing and verifying in real time the data regarding the pharmaceutical staff working in the pharmaceutical enterprises / units;
  - Monitoring information on the pharmaceutical unit related to the licensing, assessing and accreditation process;
  - Accurate assessment of the continuous introduction of data regarding human resources from the pharmaceutical system.
- *Association of Pharmacists of the Republic of Moldova:*
  - Managing the information regarding the continuous development of professional activity of the pharmaceutical staff;
  - Analysis of staff stability in pharmaceutical units;
  - Checking the payment of the fee and data update;
  - Extraction of statistical reports;
- *Faculty of Pharmacy of Nicolae Testemitanu* State University of Medicine and Pharmacy:
  - Providing possibility of strategic planning of the pharmaceutical staff training within the health system;
  - Evidence of employment and evolution of graduates in employment;
- *Pharmaceutical units, enterprises and institutions:*
  - Introducing information on pharmaceutical staff by the duty-bound person;
  - Updating the information regarding the pharmaceutical staff;
  - Reporting the necessary information to the Agency for Medicines and Medical Devices.

Conclusions

The Automated Information System of "Pharmaceutical staff management" was developed for the first time in the Republic of Moldova and proposed for its implementation.

In order to facilitate the use of AIS PSM, the stages of data entry in the developed system and the way of their management by various users were developed and described.

Recommendations were made to ensure the functionality of the system by sequentially describing the stages of the cycle.

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Authors' contribution
VS, SA drafted the first manuscript; GC designed the compartments of the automated information system of pharmaceutical staff management; VS, SA developed and piloted the automated information system of pharmaceutical staff management and revised the manuscript critically. All the authors revised and approved the final version of the manuscript.

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Ethics approval and consent to participate
No approval was required for this review study.

Conflict of Interests
The authors have no conflict of interests to declare.