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Efficiency of implementing modified multi-component system "1C: Enterprise"

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Automated record keeping and control system "1 C: Enterprise" is widely used in Russia in order to optimize the control of material and technical resources. Medical organizations, in accordance with the main objectives of the activity, bring in various addendums into it. For many years medical information system based on 1C and including electronic medical records, is successfully used in the Scientific Center of Children Health (SCCH, Moscow). In 2014, an innovative product was developed – an additional section on inventory holdings record keeping. ***Research objective:*** *to conduct a sociological study on the results of the first stage of implementing the modified multi-component system "1C: Enterprise".* ***Methods:*** *the research was conducted in from October 2014 to June 2015. Analytical, survey and expert methods were used. A special questionnaire was designed for the survey. Clinic employees, departments and services that are both directly and indirectly related to the operating with the system, gave the answers assessed.* ***Results:*** *the study results witness that the multi-functional, adapted to the features of the SCCH activities system "1 C: Enterprise" enables more efficient control of medicine usage, consumables and other inventory holdings related to patients, simplification and automation of employees work with the inventories control system and generation of financial statements for the period in the context of the patient/department/clinic. At the same time, the survey revealed technical, informational and motivational problem areas. This is confirmed by the degree of involvement/personal interest of the employees in the result, the motivation priorities for high-quality work.* ***Conclusion:*** *the research of the attitude of people, responsible for inventory holdings, to changes in record keeping policy of SCCH, was the basis for developing measures in system-employee work optimization. These measures include carrying out learning process in the workplace, personalized incentives.*

Keywords: *management, inventory holdings, record keeping and control, staff motivation.*
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RATIONALE

The development of the market of medical services imposes the health institutions on the need to develop strategies to increase competitiveness [1-3]. Concurrently, the effectiveness

of innovation in determined by not only technical equipment, but also involving the staff in the development and implementation of the new product; process approach identified for each patient; marketing of a competitive environment [4-6]. In this context, important indicators of financial management evaluation are the prime cost of a treated patient, break-even and profitability, which strongly depend on organization strategy and efficiency of the systems, which control the expenditure of medicine, consumables and household supplies [7-9]. Automated record keeping and control system "1 C: Enterprise" is widely used in Russia in order to optimize the control of material and technical resources.

System enhancement is associated with:

- a large number of errors in drawing up orders and workflow in MS Excel, Word, which is time-consuming when setting up uniform standards;
- inefficient operational control over the expenditure of medicines, consumables and other inventory holdings, which prevented from timely providing the institution managers with information necessary to assess the situation and take decisions;
- absence of medical services prime cost calculations taking into account the consumption of materials and medicines in relation to the patient;
- obtaining financial results only after the fact of usage of consumables and medicines.

Organization strategy means the set of decisions and actions related to the selection, distribution and control of resources consumption, aiming to achieve the objectives of the Scientific Center of Children's Health (SCCH, Moscow). In this regard, medical information system was established, based on of program "1 C: Enterprise", and has been successfully used for many years; it includes electronic health records, containing the spectrum of health care and scientific research.

Currently, an additional section has been developed, consisting of processes for prompt registration of inventory holdings orders (medicines, consumables and household supplies), management of their inventories, monitoring the expenditure efficiency in each SCCH clinical department, which allows to respond flexibly to the patients' needs.

Responsible people have been appointed and trained to work with the new software product in this section; training control of activities has been organized, aiming to identify problem areas for the staff during their work and adopting measures to eliminate these problems.

The hypothesis of the research: the efficiency of functioning of the modified system depends on the motivation of the professionals at work to participate in its enhancement, visualization of results and availability of significant incentives that, on the one hand, contributes to reducing costs improving work productivity and quality of medical care, and, on the other hand, improves the industrial climate and increases the competitiveness of SCCH on the market of medical services.

The aim of the research was to examine the efficiency of the first phase of implementation of a modified multi-component system "1C: Enterprise" in a multidisciplinary clinic of high technology.

METHODS

RESEARCH DESIGN

A continuous instantaneous research was conducted.

CONDITIONS

SCCH with a total capacity of 641 beds. Including:

- Research Scientific Institute of Pediatrics — 286 beds of 24-hour stay, and 170 beds of day hospital, operating in 2 shifts; consultative diagnostic center, intended for 400 receptions per shift;
- Research Scientific Institute of Pediatric Surgery — 185 beds of 24-hour stay, extra unfolded 15 resuscitation beds (extrabudgetary).

19 clinical departments are based on the beds of 24-hour stay, 11 clinical departments are based on the beds of day hospital.

DURATION OF STUDY

October 2014 — June 2015 г.

SURVEY

The quality of processes included in the system of prompt registration of orders for inventory holdings supply, management of the inventory, monitoring the expenditure efficiency of in each clinical department of SCCH were evaluated by a survey carried out by the staff participating in reports preparation and inputting data into the upgraded system "1 C: Enterprise".

The survey was carried out on a specially designed questionnaire, which consisted of 10 questions, divided into 3 sections. The first section of the questionnaire was presented with questions that reflect the assessment of the efficiency of the new system of record keeping and inventory holdings expenditure from the perspective of the executive. The second section consisted of questions, the answers to which would allow identifying problem areas for users in their work. The third section gave an idea of training efficiency and the most essential measures of motivating the staff involved in the process of operating with the system.

METHODS OF RESULTS ASSESSMENT

Assessment of the anonymous survey results was carried out in two stages. In the first stage, the responses of all the participants were assessed. In the second stage, assessment of the responses was produced differentially, the respondents were divided into the following groups: senior doctors, heads of departments and medical specialists; principal, senior and medical nurses; medical hostesses; engineering group. Differentiation of the respondents can be explained with the fact that the first group are doctors and the individuals who are performing the quality management function of the diagnostic and treatment processes. Their main task is planning of medical and economic activity, plan implementation, execution control and consecutive corrective actions [10]. Nurses, who are making up the most numerous group of users, perform the data input. Computerized workplaces are equipped for them, an educational training was held, the engineering group is monitoring errors during the work with the system.

Examination of typical errors during the work with the system was carried out, also the reasons which prevent users from operating with a new block of a multi-component system of record keeping and inventory holdings expenditure were examined. The experts were three professionals of the automatic record keeping department, who were training the employees of clinical departments to work with the system.

RESULTS

SURVEY PARTICIPANTS

In total, 86 employees were surveyed, including senior doctors, heads of offices and medical specialists — 20 (23.3%), principal, senior and medical nurses — 43 (50%), medical hostesses — 17 (19.7%), engineering group - 6 (7%) people.

EFFICIENCY OF THE UPGRADED CONTROL SYSTEM FOR INVENTORY HOLDINGS RECORD KEEPING

The survey showed that over 2/3 of the individuals who work with the system "1C: Enterprise", considered its development and implementation to be significant for SCCH in terms of inventory goods economy. The rest 1/3 either believed that it was not efficient enough or were undecided (table 1). Only 40% of respondents believed that the work is organized efficiently in the system. The same number of respondents had the opposite opinion, and one in five respondents found the question difficult to answer.

The assessment of the situation, related to the workflow between the structural units of SCCH, allowed identifying difficulties in coordination of the activity at the following levels:

- department–department;
- department–department of material and technical supplies;
- department–accounting.

The survey showed the presence of a prominent problem area on the level of department–accounting. Only one in three respondents rated the workflow between these subdivisions as an efficient one. The most marked positive effect was in the workflow of department–department and department– department of material and technical supplies (table. 1).

The attitude of the respondents to the creation of its constituent documents appeared to be as follows. The maximum positive assessment was given to the documents that were created for the write-off of consumables, economic and medicine supplies. On average, 60% of the respondents considered, that these documents were efficient. The documents, developed for internal orders, were assessed as less efficient (one in two of the respondents believed they were efficient). The least successful was the creation of the document "Internal orders for services", which was assessed as an efficient one by less than half of the specialists.

Table 1. Assessment of efficiency of the system of inventory holdings control and expenditure

Questions	Number of respondents who answered the question	The proportion of people, who answered the question about efficiency of the system, %		
		Efficient	Not efficient enough	Undecided
Do you consider the development of 1C system valuable for SCCH?	86	69,8	11,6	18,6
How efficiently is operating in 1C system organized?	81	39,5	39,5	21,0
Has operating in the system facilitated workflow between the structural units of SCCH?	78	59,0	17,9	23,1
• department–department	79	57,0	25,3	17,7
• department–department of material and technical supplies	74	33,8	35,1	31,1
• department–accounting				
Is operating with the system beneficial: inventory holdings record keeping?				
• Creating a document for medicines write-off	81	56,8	16,0	27,2
• Creating a document for consumables	83	62,6	16,9	20,5

and household supplies write off	79	57,0	17,7	25.3
• Creating a document on internal orders for medicine	83	57,8	20,5	21,7
• Creating a document on internal orders for consumables and household supplies	82	47,6	21,9	30,5
• Creating a document on internal orders for services	80	60,0	20,0	20,0
• Creating reports				

The survey showed that among the number of persons responsible (n = 60), who were directly involved in data input, 30 (50%) spend more than 20 minutes of the working time, 19 (31.7%) spend 11-19 minutes of the working time, 11 (18.3 %) - spend up to 10 minutes of working time on this work. In order to reduce the time of working with the program and overcome the arising difficulties, the respondents suggested:

- put the units of medicine write off in order;
- review the advisability of writing off consumables in the resuscitation department;
- optimize the search time on name registers.

Every second respondent — 43 (49%) — answered the question "Does the section "Internal orders" provide monitoring correct, timely input, approval and execution of the orders (for medicine, consumables, household supplies and services)," positively.

EFFICIENCY OF MOTIVATION AND 1C SYSTEM TRAINING

The majority of respondents — 69 (80%) — considered 1C training and the maintenance of this activity to be efficient, while 54 (63%) of respondents expressed the need for periodic training.

Among the measures for material and non-material motivation of the employees for error-free operation in the program, the leading place it taken by such type of incentives as quarterly bonuses for the performance (table. 2). The fifth, sixth and seventh places with the same number of respondents answered were taken by such types of incentives, as free meals, valuable gifts and corporate events (joint holidays, travel).

Table 2. The rating of incentives according to their value (the respondents' answers)

Type of incentive	Rating	Answers, abs. (%)
Quarterly bonuses for the work performance	1	69 (80%)
Services for the employees and their children at preferential rates	2	54 (63%)
Verbal encouragement in the presence of the colleagues	3	–
Career growth	4	–
Free meals	5	46 (53,4%)
Valuable gifts	6	45 (52,3%)
Corporate events (joint holidays, travel)	7	45 (52,3%)

SUBGROUP ANALYSIS

12 (60%) physicians, 33 (76.7%) nurses, 12 (70.5%) medical hostesses and 3 (50%) employees of the engineering group believe that the system implementation is necessary for SCCH. Besides, the system is considered to be efficient by 12 (60%) physicians, 16 (37%)

nurses, (3 (17.6%) medical hostesses and 1 in 6 (17%) of the employees of engineering group.

Due to the fact that the prominent problem area is the workflow between the department and the record keeping department, we analyzed the situation in relation to the selected groups. It was discovered that the workflow is considered efficient by 4 (20%) physicians, 15 (37%) nurses, 2 (12%) medical hostesses and 3 (50%) employees of the engineering group.

Medical hostesses spent the largest amount of time on working with the program: over 20 minutes for this purpose were spent by 16 (94%) respondents in this category, compared to 6 (30%) physicians, 6 (14%) nurses and one (16.7%) employee of the engineering group.

The following information was obtained while analyzing the responses to the question: "Does the section "Internal orders" allow monitoring proper, timely input, approval and execution of orders". Only 12 (60%) of the surveyed physicians answered the question about medicine, and only one of them estimated the section "Internal orders" in the part "Medicine" as efficient. 22 (75%) respondents gave their opinion on the consumables section, two of them estimated the section as efficient. Both sections "Household supplies and services" and "Medicine" are considered to be efficient by 1 of 14 (7.1%, table. 3) physicians. The nurses' answers analysis showed the section of medicine supplies records, the section with consumables and the general business services section were found convenient for users by 43 (51%), 51 (62%) and 46 (58.5%) respondents respectively. In contrast to the doctors and nurses, all medical hostesses gave their opinion on the issue of the "Internal orders" section. It is considered efficient by 75 (73.2%) respondents.

The opinion of the members of the engineering group was equally spread (table 3).

Table 3. Efficiency of the unit «Internal orders» according to the respondents'

Respondents	List of orders								
	Medicine supplies			Consumables			Household supplies and services		
	Yes	No	N/A	Yes	No	N/A	Yes	No	N/A
Physicians (*n* =20), abs.	1	2	9	2	4	9	1	4	9
Nurses (*n* =43), abs.	20	10	9	26	10	6	24	10	7
Medical hostesses (n =17), abs.	11	3	3	10	5	2	12	4	1
Engineering group (n =20), abs.	2	–	3	4	–	2	3	–	3

Note. N/A — undecided.

The question "Are there any positive aspects in operating with the program "1C inventory holdings record keeping" received more optimistic answers from the physicians, it concerned the whole spectrum consisting of 6 sub-items and answers to questions on creating write-off and order documents. Besides, the questions were answered by 95 to 100% of the physicians, among those 35 to 45% answered positively, the same number failed to estimate the issue.

The respondents noted the need for the following proposals to improve operating with the system "1 C: Enterprise":

- more prompt contact with the accounting;
- more stable contact with program staff;
- inventory holdings write-offs to the department (not to the patient) in resuscitation department;
- installation of computers at the executives' workplaces;

- nursing worksheet and electronic process mapping

DISCUSSION

It should be reminded, that workflow was assessed to be efficient by 33.8% of respondents of the undifferentiated group. Such variable workflow efficiency assessment is problematic and requires targeted work with each group of specialists. It can be assumed that the assessment of the medicine and consumables situation is based on work contacts with health executives and communication with patients.

Training for specialists, focused on the following key points, contributed to eliminating the revealed problem area:

- creative attitude to work;
- management and team team cohesion;
- staff development (mastering new skills);
- reducing losses, which result from inefficient, impractical, unqualified actions related to inventory holdings supplies for clinical departments.

The modified 1C system employment contributes to cost reduction, increase in productivity and quality of medical care, visibility of results; it also improves the work environment and raises competitiveness of SCCH on the market of medical services; furthermore, it creates optimal conditions for the patient treatment and scientific research.

CONCLUSION

Upgrading of "1C: Enterprise" system, adapted to the features of FSAI SCCH allows recording the use of medicine supplies, consumables and other inventory holdings in relation to the patient; facilitate and automate the work of the employees in the system of inventory holdings record keeping; generate financial statements for the period patient/department/clinic. In the course of the implementation, there were established automated workplaces for professionals, responsible for record keeping and expenditure of inventory holdings in subdivision, and there was developed the algorithm of electronic workflow, which included request enrollment, their negotiation, procurement, purchasing, delivery to a warehouse, a division and write-off. The survey revealed the problem areas of technical, informational and motivational nature. This is confirmed by the degree of involvement/personal interest of employees, eventually, the priorities of the motivation for high quality work. The research of the attitude of people, responsible for inventory holdings, to the change in record keeping policy of SCCH, was the basis for the development of measures to optimize the employees' operation with the system. These include extra studies in the workplace, more targeted incentives.

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CONFLICT OF INTEREST
The authors of this article have confirmed the absence of conflict of interest worth reporting.

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