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CALCULATION OF EXPENDITURE ON THE CREATION
OF UNIFIED HEALTH INFORMATION SYSTEM AT THE REGIONAL LEVEL

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The purpose is to calculate expenditure on the creation and implementation of a unified information system at the hospital district level.

Materials and methods. The study uses methods of system approach and descriptive modeling. Initial data calculations include data on the required number of automated workplaces in every healthcare facility in the hospital district; necessary licensed software; employees who must be trained; needs for the maintenance of information systems.

Results. The article presents the calculation of financial needs for creating a segment of a unified healthcare information system at the hospital district regional level.

Conclusions. A comprehensive healthcare informatization at the hospital district level requires an expenditure of 4,500 thousand UAH, and the functioning of the system needs 180 thousand UAH per year.

Key words: unified information system, hospital district, expenditure.

INTRODUCTION

In Ukraine, the mass introduction of personal computers (PC) was at the beginning of the 1990s when almost every medical institution in a city or regional center could purchase computers. At the same time, the level of computerization fluctuated around zero at the district level.

Historically, the development of medical information systems in Ukraine occurred in several ways [2]:

a) the creation of standardized medical and outpatient records on the basis of which computerized medical documentation was developed;

b) the development of automated workplaces (AWPs) for medical specialists;

c) the development of specialized software to aid doctors in making decisions (expert systems).

Since the beginning of mass distribution of personal computers, computerization process of healthcare facilities (HCF) has become chaotic. The development and implementation of various information and software tools, systems and AWPs were also uncontrollable. There was widespread development of software products that solved only highly specialized tasks such as: support for compiling statistical reports in the departments of medical statistics [5], AWPs for medical specialists that were subsequently placed on the software market and offered to be widely distributed. Various and incompatible software products were developed or purchased for the different departments in the same hospital, and they definitely made the work easier for a particular specialist whereas it had no significant effect on the institution as a whole. Some of these AWPs, which were mainly developed by hospitals' programmers or enthusiast doctors, continue to work until now. The usage of others faded due to the changes in technology and the lack of support from developers, so it was inevitably accompanied by large financial losses. This period can be described as the «wild» automation. Unfortunately, this period continues in Ukraine up to now [1, 3, 4, 6, 7].

The purpose is to calculate expenditure on the creation and implementation of a unified information system at the hospital district level.

MATERIALS AND METHODS

The study uses methods of system approach and descriptive modeling. Initial data calculations include data on the required number of AWPs in every HCF hospital district; necessary licensed software; the number of employees who must be trained; needs for the maintenance of information systems.

RESULTS AND DISCUSSION

Creating a complex information system is a difficult process which is not easy to describe and standardize and must be thoroughly planned.

The architecture of the information system involves the creation of a single control center that is responsible for organizing the collection, processing, storage, transmission and analysis of information and providing consulting services. Each of the 25 (twenty-five) regional and 2 (two) city centers provides for a central information hub that is self-contained and provides online work with all components of the system. The basic version is supposed to connect client workplaces to the system using interfaces that are responsible for a particular part of it.

Calculations of 1 (one) client workstation (hardware and software) is shown in Table 1, and it includes system software with basic office and antivirus programs installed in the client application.

Every fifth workplace is provided with a multifunction device (scanning, printing and copying) that work with an A4-format paper (the cost of 2,000 UAH / unit). Other workplaces are equipped with a laser printer for A4-size documents (the cost of 1,000 UAH / unit).

Table 1

Calculations of the client workplace (workstation) cost

Description	The cost of one workplace, UAH
Workstation (system unit + monitor)	5,000.0
UPS	500.0
Licensed operating system	1,500.0
The package of licensed office software	1,000.0
Antivirus software	500.0
Total	8,500.0

The average cost of creating structured cabling is 2,500 UAH. To calculate the cost of switching equipment for healthcare facilities in one hospital district, the following data are taken in Table 2.

To calculate the cost of switching equipment for the regional centers (central information nodes), the data are given in Table 3.

Calculations of the cost of the hardware platform of the central information units are given in Table 4.

Adaptation, configuration, installation and configuration of the systems involve the purchase of software for each of the modules and a contractor who performs work on adaptation, configuration and installation. The estimated cost of licenses for each node (27 (twenty-seven) regional units and 1 (one) central unit) is 10 million UAH. The cost of work related to adaptation, configuration, installation and configuration of systems is approximately 2 million UAH.

Table 2

The cost of installing switching equipment in HCF, thousand UAH

Description	Number of objects in hospital district	The cost of one object	The total cost
Switching equipment in HCF (up to 50 users)		20.0	100.0
Related equipment	5	10.0	50.0
Installation and configuration		1.0	5.0
Total		31.0	155.0

Table 3

The cost of installing switching equipment at the central information node, thousand UAH

Description	Number of objects	The cost of one object	The total cost
Switching equipment		150.0	4,050.0
Related equipment	27	100.0	2,700.0
Installation and configuration		10.0	270.0
Total		260.0	7,020.0

Table 4

The cost of the hardware platform of the central information units, thousand UAH

Description	Quantity	The cost of one object	The total cost
Ministry of Health of Ukraine	1	500.0	500.0
Regional data centers	27	100.0	2,700.0
Total			3,200.0

The study found that the cost of computer literacy course for medical staff is 1,000 UAH per person.

The cost of training the personnel of one hospital district, who potentially should have skills to work with the modules of the system, is given in Table 5. Data are based on the maximum numbers: 50 (fifty) workstations in one institution; 1 (one) workstation run potentially by 3 (three) doctors and 6 (six) nurses (1 (one) doctor and 2 (two) nurses during a shift) and 1 (one) manager.

Table 5

The cost of training the personnel working with the system

Description	Number of staff units	Number of workstations	Number of institutions	Tuition, thousand UAH
Medical personnel	9	50	4	1,800.0
Managers	1		1	50.0
Total				1,850.0

Administrative and technical support for the information system includes the overall coordination and implementation of the project on creating the healthcare information system at the regional level:

– capital expenditure on the purchase of telecommunications, computer and other equipment, office furniture;

– staff costs;

– taxes and other obligatory payments;

– costs of personnel training system;

– other direct costs (utilities, rent, fuel and lubricants, expendable materials, etc.);

– payment for telecommunications services (a lease on dedicated channels and the Internet) and services on supporting the system (technical support for system, network and application software and equipment);

– travel and other overhead costs.

The administration will be done by the personnel of the information-analytical center and by the employees of the engineering department within the hospital district.

Training and retraining of specialists must be carried out in the following groups:

– system administrators of supporting basic hardware and software platform systems (servers, communication equipment, operating systems, database management systems, etc.);

– experts at troubleshooting that can support and develop individual applications to informatization of regional and local offices of the Department of Health;

– personnel of the regional territorial offices;

– medical personnel of HCF.

Supporting includes the costs of maintaining the network channels (Internet access and dedicated channels) in hospital districts (Table 6). Permanent loading up to 100 Mbit/s is supposed to be at the regional level and the channels of central information units should provide loading at least at the speed of 900 Mbit/s.

Table 6

The costs of supporting network channels, thousand UAH/year

Description	Cost
Payment for the channels of network workstations	90.0
Payment for the network channels of central information nodes	60.0
Updates and support for systems (20% of their value)	30.0
Total	180.0

Thus, a comprehensive healthcare informatization at the hospital district level requires an expenditure of 4,500 thousand UAH, and the functioning of the system needs 180 thousand UAH per year.

CONCLUSIONS

The implementation of the proposed innovation in comparison to the existing situation will allow to:

– create modern information healthcare facilities that meet international standards through their complex informatization;

– improve the system of healthcare administration at all levels through optimized flow of documentation and improve the statistical medical information;

– increase productivity of doctors' performance with patients by reducing the amount of time spent on the work with accounting records;

– create a single medical information space in the country, thereby reducing data loss while moving patients between HCF;

– improve the quality of medical care through the introduction of automated control over the implementation of medical treatment and diagnostics standards;

– forecast and plan further development of the health system at the regional level.

Prospects for further research are seen in updating calculation data and studying the possibility to implement proposed innovation.

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Розрахунки видатків на створення єдиної інформаційної системи охорони здоров'я на регіональному рівні

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Мета – розрахувати обсяг видатків на створення та впровадження єдиної інформаційної системи охорони здоров'я на рівні госпітального округу.

Матеріали та методи. У дослідженні застосовано методи системного підходу та описового моделювання. Вихідні дані для розрахунків включають дані про необхідну кількість автоматизованих робочих місць в кожному ЗОЗ госпітального округу; необхідне ліцензоване програмне забезпечення; працівників, які підлягають навчанню; потреби на технічне обслуговування інформаційної системи.

Результати. Наведено розрахунки фінансових потреб на створення сегменту єдиної інформаційної системи охорони здоров'я на регіональному рівні на рівні госпітального округу.

Висновки. Для здійснення комплексної інформатизації охорони здоров'я на рівні госпітального округу необхідні видатки в розмірі 4500,0 тис. грн, для функціонування системи – 180 тис. грн на рік.

КЛЮЧОВІ СЛОВА: єдина інформаційна система, госпітальний округ, видатки.

Расчеты расходов на создание единой информационной системы здравоохранения на региональном уровне

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Цель – рассчитать объем расходов на создание и внедрение единой информационной системы здравоохранения на уровне госпитального округа.

Материалы и методы. В исследовании применены методы системного подхода и описательного моделирования. Исходные данные для расчетов включают данные о необходимом количестве автоматизированных рабочих мест в каждом учреждении здравоохранения госпитального округа; необходимом лицензированном программном обеспечении; работниках, подлежащих обучению; потребности на обслуживание информационной системы.

Результаты. В статье приведены расчеты финансовых потребностей на создание сегмента единой информационной системы здравоохранения на региональном уровне на уровне госпитального округа.

Выводы. Для осуществления комплексной информатизации здравоохранения на уровне госпитального округа необходимые расходы в размере 4500,0 тыс. гривен, для функционирования системы – 180 тыс. гривен в год.

КЛЮЧЕВЫЕ СЛОВА: единая информационная система, госпитальный округ, расходы.

ВІДОМОСТІ ПРО АВТОРА

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