Design and Implementation of Financial Management Analysis Based on Big Data Platform of Psychiatric Hospital

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Abstract. Improve the hospital's core competitiveness such as service level, medical quality, management level and financial indicators through information construction. The improvement of financial management also depends on the development of information technology. Use the construction of a big data platform as an opportunity to realize the informatization of financial management. This article mainly introduces the technical difficulties of data collection and data fusion in the construction of hospital big data platform. It uses ETL data collection tools to collect data, builds the operation data center ODR, and designs the software architecture of the big data platform. And customize the data collection requirements and business realization functions of the big data platform through the characteristics of data requirements in financial management, and also consider data security in the construction of the platform. Use the hospital's big data platform to improve the hospital's clinical, management, and scientific research capabilities.

Keywords: Psychiatric specialty · Big data · Financial management

1 Introduction

The improvement of medical service level is inseparable from medical information construction. With the rapid development of information technology, more and more hospitals are accelerating the implementation of various information construction projects based on the medical information platform HIS system of artificial intelligence, big data analysis and the Internet of Things [1]. To improve the core competitiveness of hospitals such as service level, medical quality, management level, and financial indicators [2, 3]. Informatization can not only improve the efficiency of doctors, but also give doctors more time to serve patients. Improve the hospital's management level and comprehensive development strength, and show the image of a high-tech hospital [4]. The improvement of financial management level also depends on the development and construction of information technology [5].

At present, big data is not only a simple new technology, but also another disruptive technological innovation in the ICT industry after the mobile Internet and cloud computing. It is also an important part of the current national information technology development strategy [6]. To build the big data platform of Guangji Hospital based on

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the relevant opinions of the Suzhou Municipal Health Commission's big data platform construction guidance. Use the big data platform to solve and improve the hospital's clinical, management, and scientific research capabilities [5, 7].

With the comprehensive development and deepening of hospital informatization in the past 20 years, hospital business data has exploded, showing the characteristics of big data. In the era of big data, how to obtain as much useful data as possible from big data requires consideration of hospital financial management, and the implementation of decision-making must be closely connected with the hospital's financial management software system [8, 9]. At the same time, it is necessary to combine the actual problems that need to be solved in the development of the current psychiatric hospital [10]. Business-oriented, according to the status quo of the hospital's financial management, such as the hospital's financial management capabilities, revenue and expenditure status, and the actual situation of budget management, grasp the development direction of the hospital's financial management and determine the information requirements of the system [11].

2 Research Status

At present, the characteristics of financial data collection: the diversity of various systems in the hospital, each system is separated, the system is closed, forming an information island [12]. Various systems generate a large amount of data, but the data utilization rate is low, and the degree of sharing is poor. Data collection related to multiple systems is difficult, and there is no unified channel. The reports generated by each system are single and the availability is poor [13].

Problems to be solved in data integration: (1) Multi-source data collection, data comes from almost all business systems, HIS, LIS, PACS, ECG, EEG, emergency, financial systems, etc. [14–16]. (2) Heterogeneous data conversion, the existing business system data dictionary is independent, the data dictionary is inconsistent, data conversion takes up a lot of resources. Such as marital status, judgment of the outcome of illness, etc. (3) The degree of data standardization is low, and the data sources and calculation methods of each business system are different, resulting in inconsistent data. Such as age and admission time are calculated differently [17–19]. (4) Unstructured data, a large amount of freely entered unstructured data, data is not standardized, data utilization rate is low, basically in a state of sleep, unable to play value for hospital management and financial analysis [20, 21].

3 Financial Management Function Requirements

Public welfare is a characteristic of public psychiatric hospitals. The source of funds for hospitals is also the financial balance allocation. Public welfare is a basic principle that must be used in the process of carrying out various medical activities. Hospitals undertake a large number of public functions such as prevention, intervention, rehabilitation, publicity and education of mental and psychological diseases, rather than simply for obtaining more economic benefits. Therefore, in the process of financial management, public psychiatric hospitals should consider how to maximize the use of funds,

reduce operating costs as much as possible, and ensure that the benefits they can obtain are always within a reasonable range and will not increase. The burden of patients is of great significance to the sustainable development of the hospital. Specifically, the importance of financial management for public hospitals is mainly reflected in the following aspects: First, the results of financial management can reflect the status of the hospital in terms of operation, capital flow and profitability. And then continue to adjust the management method. Secondly, through financial management, we can better achieve the financial budget goal, that is, to ensure that the financial structure is always scientific, which also helps managers understand the shortcomings and potentials of the hospital in the operating process. And then reasonably allocate resources. Third, through the first-stage results of financial management, a preliminary estimate of subsequent benefits can be made. Fourth, public psychiatric hospitals must not only follow the basic principles of public welfare, but also ensure the rationality of income. This requires cost accounting to be controlled to minimize operating expenses.

4 Platform Outline Design

4.1 System Architecture and Hardware Configuration

The big data integration platform of Guangji Hospital mainly relies on the original physical infrastructure and basic business systems. The server adopts Dell R730 R930 high-end model, 20 servers and 50T storage. Using distributed storage, distributed computing, and Hadoop database, the transmission rate and transportation rate are qualitatively higher than traditional methods. A server resource pool is built for big data computing and big data mining, which provides data security while ensuring data operation speed. And related medical information system (HIS), structured electronic medical record system (EMR), inspection system (LIS), nursing management system (NIS), electrocardiogram, electroencephalogram system (ECG), medical image system (PACS), Office (OA) system has 18 data sources as big data integration platform. Create a set of storage devices through the ODC data storage tool to store the basic business database and the operation process data ODS. Through the above physical architecture and data storage as the underlying framework, a big data integration platform for Guangji Hospital is built (Fig. 1).

4.2 Financial Data Collection and Model Establishment Based on Big Data

(1) Among them, ETL data collection tools are mainly used to extract data from each original data, etc., combined with the his table structure to establish a relatively standard data system, centrally convert, clean and transfer to a standardized data model to form a data set: Patient Master Index (EMPI), Master Data Management (MDM), etc., to solve the problem of reducing repeated statistics and discrepancies in the standards of each system, unify the statistics, and improve the quality of data.

(2) All data generated by clinical activities are extracted, converted, cleaned and transferred to a standardized CDR data model through ETL technology to form a clinical data center CDR, an operation data center ODR, and a scientific research data center RDR. Achieve data sets that are organized by field and are easy to use.

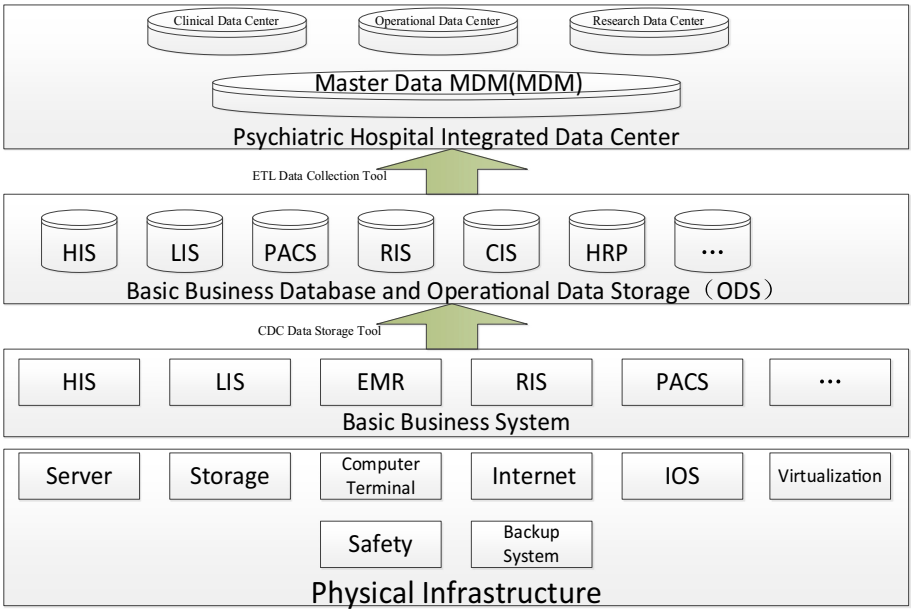

Fig. 1. Data center architecture model of psychiatric hospital

4.3 Data Analysis and Mining

Data analysis is responsible for real-time streaming data processing, non-real-time/offline data processing, supporting structured and unstructured processing, and supporting distributed parallel processing of PB-level data. Therefore, building a healthy data warehouse based on a massively parallel processing architecture, through a number of big data processing technologies such as column storage and coarse-grained indexing, combined with the highly efficient distributed computing mode of the massively parallel processing architecture, completes the support room for analytical applications. In terms of analysis algorithms, it supports machine learning algorithm libraries such as Apache.Mahout and mlib, analyzes big data that is common in business applications, and categorizes and develops them according to different business topics or related entities, comprehensively uses statistics and data mining techniques, and uses multiple To build a feature database, batch processing model database, and real-time processing model database for large-scale data.

4.4 Data Exchange and Sharing

The data exchange and sharing platform must not only meet the data sharing integration function, realize the centralized collection of data, sort and push down, etc., but also need to support the distributed-oriented SOA architecture, and support multiple modes based on Web Service, documents, and DB. More extensive data exchange. Realize the tight coupling within the business and the loose coupling between the businesses, support the unified standards and interface specifications issued by the competent department,

and realize the unified and orderly management. Based on the Service Bus (ESB), the core basic service platform and the integration and data exchange and sharing of various application systems are realized internally. Provide external access service interfaces that comply with national standards to achieve interconnection with the existing three-level population health information platform, medical insurance information platform, medical management information platform, and medical and health institutions at all levels. From the perspective of technical architecture, the integrated exchange and sharing platform includes three major parts: management services, operation services, and monitoring services.

5 Business Functions

See (Fig. 2).

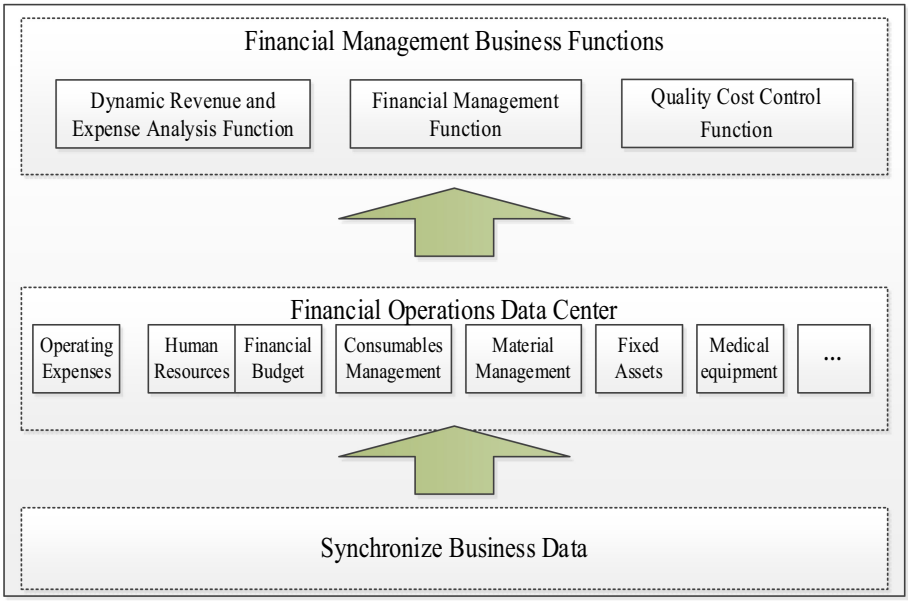

Fig. 2. Schematic diagram of data center financial management functions

5.1 Dynamic Revenue and Expense Analysis Function

The economic benefits generated in public hospitals at regular intervals are usually reflected in the income and expenditure summary table and the corresponding income and expenditure sub-table. The so-called income and expenditure sub-tables are actually the financial statements of the hospital. The accumulated amount and operating results can be directly expressed. The most intuitive is to show the profitability of the hospital during this time interval. In particular, the income and expense statement belongs to the

balance sheet, which reflects actual data within a fixed time interval of the hospital, and dynamic information can also be reflected in the income and expense statement. Including the income, cost, and balance of each department, outpatient, and hospitalization within a fixed time interval of the hospital can be displayed. Understand the income and expenditure expense table, in fact, also understand the operation of the hospital for a period of time, the time interval is selected by the manager. The dynamic income and cost analysis function not only supports the reports that can be queried by the existing HIS, but also provides more custom parameter selection and settings to help managers make financial analysis decisions.

5.2 Financial Management Analysis Function

Through financial analysis, managers can further understand the past, present and future development of hospital operations, and analyze problems in hospital operations. And through the corresponding financial indicators to determine business decisions, and use data to make auxiliary decisions. Take effective measures to solve current problems. The financial analysis function can help the hospital administrator to further refine the data and provide the status of the hospital's past and current financial operation indicators. Analyze and list financial indicators for data differences to help analyze problems and indicator fluctuations in hospital operation decisions. And through financial indicators forecast and analysis of operating conditions, early warning. Help managers to take effective measures to solve the operational problems they face and will face. In practical applications, it can be found that the role of financial analysis is mainly to evaluate financial indicators and weigh operating conditions, which is very important for the development of the hospital. It can be said that financial analysis is a very effective way to tap potential, achieve financial management goals and improve work, and is also an important basis for rational decision-making. Based on big data financial management analysis, all information can be displayed in the form of indicators, so that goals and basic values can be set. And set warning thresholds, track financial indicators in hospital operations, and analyze the trend of later revenue growth and cost management.

5.3 Quality Cost Control Function

The smooth implementation of financial management is inseparable from cost management. According to modern management theory, cost management is not only a simple cost reduction, but also its more important role is to optimize management. In the past, the cost management of hospitals was to reduce indicators, which could easily put a lot of pressure on department heads, and even produce opposite emotions. Under the new situation, hospital financial management should focus on improving the quality of medical services and optimizing the cost structure. The idea of cost management should pay more attention to process improvement and adjustment related links, rather than pure low indicators. Through the revenue and expenditure indicators of medical service projects provided by big data, we will strengthen the optimal allocation of resources to a certain extent, reduce costs, and solve public expensive medical problems.

6 Security and Disaster Tolerance Design

The information security design establishes a private cloud platform, and at the same time desensitizes related medical business data to ensure application and data security. The business of each hospital is constructed under the strategy of three-level guarantee standards to meet the data integration security of each system. In the process of system construction, in order to ensure the security of system data and business continuity, the important role of disaster tolerance processing and rapid system recovery is gradually highlighted. According to the "Information System Disaster Recovery Specification", there are six levels of disaster handling. Building fast disaster recovery and recovery processing technology on the software architecture design can quickly restore data switching, which is very important for the financial system.

7 Summary

With the promulgation and implementation of the "National Financial Management Regulations" and the advancement of the general accounting system, the development of modern financial management requires the integration of traditional financial accounting management models into the era of knowledge economy. Taking the opportunity of informatization development and the construction of big data platform to realize the upgrade of financial data analysis, statistics, management and other functions. Update the concept of financial management to meet the needs of hospital managers for science and fine management.

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