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Research Article

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Research on LIS

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ABSTRACT

LIS in hospital is a system which analyses the test data transported by various test instrument produces test reports of the patients' basic information and stores in database through the Internet so that the doctors can see the test results conveniently and immediately. Our hospital embedded LIS in the Hospital Information System in 2008 so that all the test information resources can be fully used and electronized. The system has been operated for a period of time. This article focuses on the structure, process, function and improvement proposal of the system. The work in hospital has been optimized and regulated with improved efficiency and quality.

Key words: LIS, function, improvement proposal

INTRODUCTION

From the view of present application, LIS has become an indispensable part of modern hospital management. With the rapid development of medical test methods, the popularization of information construction, the improvement of living standard and gradual emphasis on health, laboratories in hospital are facing the problem of intensive and massive work. All the new situations need a quick response to different kinds of test applications so as to the clinical doctors can get the information as quickly and correctly as possible. LIS consists of hardware, operating system software, database management software and application software. Hardware: including some peripheral equipment such as server, workstation, printer, barcode printer, barcode scanning gun, etc. Operating system software: it is a bridge connecting hardware with application software. Some common OSes are Microsoft Windows XP (workstation) and Microsoft Windows 2003(server) Database management software: it provides the storage and setting for complex data and the definition, construction and usage of documents. The software can store or pick out data according to different subscribers' special standards. We choose Microsoft SQL Server 2005.

Application software: the main function of LIS is to analyze the test data transported by experiment equipment and then generate test reports. All the data are stored in the Internet so that doctors can see a patient's test results conveniently and immediately. It can also establish a separate LIS database and connect LIS with HIS. So all patients' test data and the entries, storage and usage of materials in different departments can be collected in this system.

WORKING PROCESS OF LIS

Test items are rendered by doctors in doctors' workstation. Nurses will collect specimen of all the items according to test information and print barcode. At the outpatient section there is a special blood sampling room for specimen collection. By reading patients' medical cards, doctors can get the information of the patients and they will print the specimen collection procedure into a barcode. When the barcode is printed, doctors can not modify the test items. If they want to modify, nurses should cancel the binding of barcode and test items. When the specimens are classified, they will be sent to equipment respectively and put in storage with a number on each specimen. At the same time,

the patients' information in HIS server will be called out and transported to the corresponding specimen number, then the test results will be sent back to HIS automatically. The examined reports will be sent to the doctor workstation automatically so that the doctors can check patients' test results in time. It is really timesaving for seeing a patient.

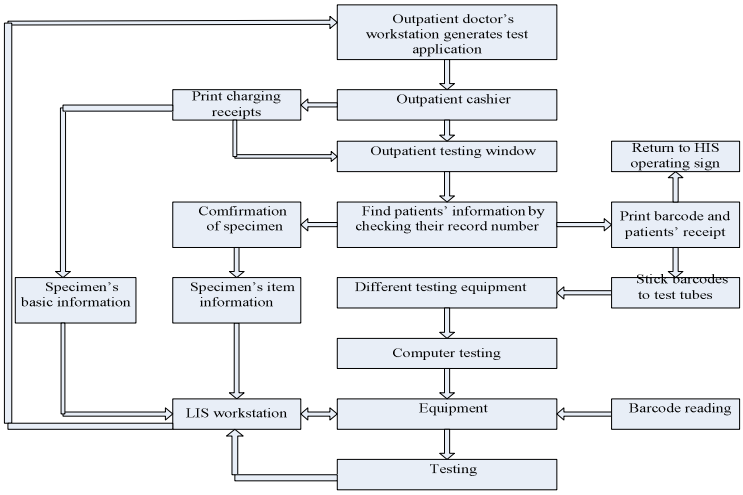

Figure 1: the procedure of outpatients' seeing a doctored

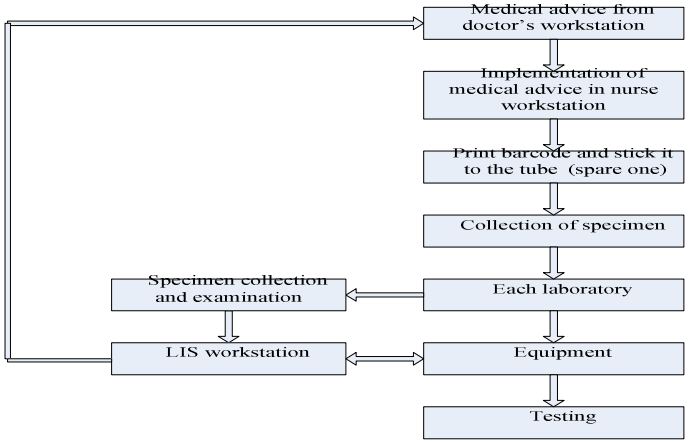

Figure 2: the procedure of inpatients' seeing a doctor

THE FUNCTION OF LIS

Specimen examination

a. register of specimen's information
b. combination of one patient's data with different equipment
c. browsing of all the specimen's information
d. reflection of one patient's testing information during a certain period of time
e. the system will give a sign when there is a big difference between two testing results of one patient in the same testing recently
f. there can be any addition, modification, delete and analysis toward testing items
g. there can be plenty of input, modification and delete
h. getting data from equipment automated or manually and sending the confirmed reports to the corresponding department
i. setting of condition and examine accordingly, such as presetting of abnormal high or low level of serum potassium, glycolic for a reminding
j. setting template and process manual items conveniently
k. examination of charging condition

Specimen's Information

It can input or get patient's basic information from hospital information system. It can also add, modify, copy or remove such information.

Browsing of Specimen
It can browse, examine or print basic information, item information or examination information in great quantity. It can also browse all the specimen's testing item in the form of data list or graphs.

Printing of Reports
Testing reports can be printed in large quantity and different sections

Searching
It can search specimen according to random combination of specimen's basic information and look for or print specimen's detailed results.

Item Analysis:
It can analyze item condition in a certain time according to different categories, including maximum value, minimum value, mean value, standard deviation and coefficient of variation. It can also generate the data in data list or various graphs (histogram, etc.) and analyze them in depth.

Statistics on the Statistical Work and Daily Report
It can count up amount of work during a certain period of time according to different patients' type, department, testing item, experiment combination, submitting physicians, inspection doctor, testing department, etc. in the form of data list or various graphs. It can also output various reports in the form of document (text, spreadsheet, HTML, database, etc.) and print specimen in a summary sheet for the whole day

Quality Control
Multilevel and single level quality control can be conducted. The data can be input manually or automatically and can be counted up in various methods with printing at the same time.

It is used in receiving the specimen and generated in nurse workstation or doctor workstation. Department reads the information, such as patients' basic information, specimen type and determined items in the barcode by code reader.

IMPROVEMENT PROPOSALS OF LIS

Reformation of Print Report
The print report can be delivered at random before the reformation. The department can not restrain inspectors' personal printing and can not count up the amount of work. Since this phenomenon was spotted, there is an addition of control management to the printing module, that is, only the charged testing items can be printed out in a complete testing report. After the rigorous control on the procedure, the hospital can effectively control the evasion of charging. This reformation will save more than one million yuan of the evaded charge per year for the hospital.

A Correction Information Warning of Testing Items
Before reformation, if the doctor wanted to delete the prescribed testing list while the nurse didn't see the deleted testing application and sent it to the testing department, or the department had already tested the specimen, there would be some unnecessary waste. If the doctor knew the testing application had been done, he or she would delete the testing list and repressible a new one. But the testing results could not be transported back to the doctor workstation because the list number we transported back was inconsistent with the existed one. The terrible result was that there would be a non-applied testing item tested by the testing department while the existed one wasn't tested. In order to reduce unnecessary trouble, we design some information warning windows. If the doctors delete a prescribed testing application, there will be a warning window of the deletion about certain patient popping up automatically in nurse workstation. It reads that please delete the barcode. Even if the nurse doesn't notice the information, when the testing department scans the barcode, the system will pop up a window to remind the deleted testing item. By reformation, the difficulty of communication between doctor and testing department is solved and lots of disputation can be avoided.

Flexibility of the testing reports' format
At first the format of reports is the same because of the tidiness. But in real situation, a settled format can not meet different requirements from the inspectors. Because there are various kinds of testing reports，for example, the reference value, there are number range ones, different age or sex ones, description ones, etc. The differences between them are contrasting. If the format is settled, there will be of great convenience in using them. At the beginning, when using the LIS, there is a lot of complaint, such as small characters, so few rows in one page, large space for reference value, etc. In order to solve these problems, we design different testing report module for different character font or paragraph length (especially for the report with large quantity of descriptive testing report). We also allow users to set up their own module with flexibility in adjusting forms with mouse dragging and they can

see new adjusting results immediately. All reformation can meet the needs for the variation of testing reports. We also design a program to adjust the size of the testing paper since the settled size can be a big waste.

The first alteration is to transform the traditional HIS charging into LIS charging. But the charging will be settled at which section of LIS is very important. It is proved by experiment that we transform the charging module into barcode scanning is scientific. If the doctor cancels the barcode before scanning, the system will warn the result automatically. If the barcode is not abolished, the system will charge automatically. Therefore, the testing department will not suffer any loss even if the patient is out of hospital.

CONCLUSION

The LIS has been operated steadily in our hospital for a while. It demonstrates the characteristics of celerity, reliability, easy to maintain, safety and adaptability in testing information system. The perfect function and easy-operation of application software make the testing information shared by the whole hospital. LIS supervises quality management thoroughly so that every procedure has a strong assurance. With certain quality control management module, the statistics and analysis work can be done which guarantees that there's no gap in management during testing, clearly shows the whole process and the person who is in charge of, avoids any shuffles when there are mistakes. The rich data graphs' checking is available, such as the checking about patients' medical history, specimen's receiving time, time for delivering the reports. All can be used in teaching and researching as well. LIS has brought a lot of benefits to our hospital, for example, the improvement in work efficiency, reducing of error rate, strict charging management. With all the results reserved and underused permanently, the transparency in hospital is highlighted. Patients can see a doctor more conveniently with confidence. A large amount of money and management cost can be saved. And for the information management, the hospital can server the patients with much time and high quality.

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REFERENCES

[1]Liu Xiao-lan. *China Sport Science and Technology*. **1984**, 29(13), 46-49.
[2]Luo Yang-chun. *Journal of Shanghai Physical Education Institute*. **1994**, 23(12), 46-47.
[3]Wan Hua-zhe. *journal Of Nanchang Junior Colle*ge. **2010**, 3, 154-156.
[4]Li Ke. *Journal of Shenyang Sport University.* **2012**, 31(2), 111-113.
[5]Zhang Shu-xue. *Journal of Nanjing Institute of Physical Education*. **1995**, 31(2), 25-27.
[6]Pan Li. *Journal of nanjing institute of physical education(natural science).* **2004**, 19(1), 54-55.
[7]Li Yu-he; Ling Wen-tao. *Journal of Guangzhou Physical Education Institute*. **1997**, 17(3), 27-31.
[8] Xu Guo-qin. *Journal Of Hebei Institute Of Physical Education*. **2008**, 22(2), 70-72.
[9] Chen Qing-hong. *China Sport Science and Technology*. **1990**, 21(10), 63-65
[10] Tian Jun-ning. *Journal of Nanjing Institute of Physical Education*. **2000**, 14(4), 149-150.
[11] Zhang B.; Zhang S.; Lu G.. *Journal of Chemical and Pharmaceutical Research*, **2013**, 5(9), 256-262.
[12] Zhang B.; *International Journal of Applied Mathematics and Statistics*, **2013**, 44(14), 422-430.
[13] Zhang B.; Yue H.. *International Journal of Applied Mathematics and Statistics*, **2013**, 40(10), 469-476.
[14] Zhang B.; Feng Y.. *International Journal of Applied Mathematics and Statistics*, **2013**, 40(10), 136-143.