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Application of Project Management Thinking in the Implementation of Paperless Online Physical Examination Reports in Grassroots Health Management Centers

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Abstract

Realizing paperless online medical examination reports is an important task in the informationization construction of medical examinations. This study starts with the many difficulties that grassroots health management centers face during the implementation process, such as single machine version physical examination systems, single machine equipment, multiple supporting departments, personnel shortages, and multiple docking systems. It elaborates on how to apply project management thinking to the construction of this information system. The implementation of paperless online medical examination reports has saved a lot of manpower and material resources in departments, advocated for green environmental protection, optimized the report issuance process, improved the work efficiency of medical personnel, and enhanced the customer experience and satisfaction of medical examinations. This study also provides some directions and specific operational references for the informationization construction of grassroots health management centers.

Keywords

Paperless Report, Project Management, Grassroots Health Management Center, Single Machine Equipment, Information Construction

1. Introduction

With the rapid development of the economy in China, the health awareness and health literacy of the whole population is improving, and the social attention of health checkup and health management services is also enhanced (Chen et al.,

2019). Health examination and health management have shown obvious effects in preventing diseases, regulating health care, and reducing medical costs (Fuchsv, 1966). The health examination report is a medical document that records important basic information and examination results through systematic examination, which can correctly, timely and objectively reflect the state of health and provide an important basis for carrying out health management and disease diagnosis and treatment (Chen et al., 2022). The ability to manage physical examination reports directly reflects their technical level and service capability, affecting the experience of medical examiners, and is of great significance in accelerating the digital management of physical examination reports. Traditional paper physical examination reports have played an important role for a long time, but the problems of poor readability, inconvenient storage, difficulty in information sharing and slow updating not only affect the timeliness and accuracy of physical examination results, but also restrict the efficiency and quality of medical services (Chen et al., 2022). Therefore, it has become imperative to seek a more efficient and convenient way of medical examination reports.

Paperless online physical examination report stores and transmits physical examination information electronically, which can effectively shorten the completion cycle of the physical examination report, facilitate the preservation and query of the physical examination report, and carry out comparisons of previous years' physical examination data (Shi, 2019). Although the paperless online physical examination report has improved the timeliness of the report and the efficiency of the physical examination process to a certain extent, the current report management tool is a one-way process management, focusing on ensuring the integrity of the process and the report, and lacks a closed-loop management and feedback and evaluation mechanism for the continuous improvement of the quality of the report, which makes it difficult to safeguard the quality of the physical examination report. Therefore, the implementation and application of paperless online medical examination reports need to be systematically planned and scientifically managed.

Project management is the application of specialized knowledge, skills, tools and methods in project activities to effectively control the five processes of project initiation, planning, implementation, control and evaluation, so that the project is able to achieve or exceed the set needs and expectations with limited resources (Suhonen & Paasivaara, 2011; Wang & Xie, 2014). Project management, as a scientific management method, has nine major areas of intelligence covering scope management, time management, cost management, quality management, information management, human resource management, risk management, procurement management and general management. Previous studies have shown that the application of project management not only improves the efficiency of project implementation, but also guarantees the quality of the project and reduces project risk (Zhong et al., 2017; Sharikh et al., 2020). Additionally, previous studies have shown that the use of project management in medical examination centers can effectively reduce the waiting time for medical

examinations and improve service quality (Dong et al., 2019). However, the application of project management in paperless online medical examination reports of medical examination centers in China is still in the preliminary stage, lacking more mature experience and management mode. Therefore, this study aims to explore the application effect of project management ideas in the implementation of paperless online medical examination reports in primary health management centers. The remaining of the study is structured as follows:

- Methods
- Project initiation stage: set up the management team;
- Project planning stage: clear project difficulties and task division, and formulate progress plan;
- Project implementation phase: put forward solutions and implement them at the three levels of equipment, information and Microsoft terminal for the project difficulties;
- Project control phase: formulate control standards to ensure the quality of implementation.
- Project evaluation phase, evaluating the number of abandoned paper reports, cost savings, satisfaction and report issuance time.
- Results
- Project evaluation phase: Evaluated in terms of the number of paper reports forgone, cost savings, satisfaction and time to produce reports.
- Discussion
- Conclusion

2. Methods

2.1. Project Initiation

The leaders in charge of the hospital took the lead, and the heads of the Health Management Center, Medical Information Department, Physical Examination System, HIS System, and relevant medical technology departments participated in the project kickoff meeting. It was ultimately determined that the Health Management Center would take the lead in implementing the project, with the head nurse of the Health Management Center serving as the project leader, and designated personnel from other systems and related personnel participating in the project team. The above personnel formed the project management team. Formally declare the project through the hospital A8 process.

2.2. Project Plan

The project management team held a meeting to brainstorm and review relevant literature based on the current status of the department's physical examination reports. Firstly, the main focus and difficulties in achieving paperless physical examination reports were identified.

1) The main difficulties in achieving paperless online medical examination reports are as follows:

a) Equipment issues: The medical examination involves multiple inspection equipment, some of which are single machine devices (Zhang et al., 2021), and data and graphic reports cannot be uploaded.

b) System issue: Our department's ultrasound, radiology, pathology and other examination items are all provided by relevant medical technology departments, so the physical examination involves the integration platform docking of multiple systems such as HIS, LIS, PACS, etc. (Zhao & Li, 2021), and some supporting departments' systems cannot effectively transmit data or graphic reports back to the physical examination system.

c) Functional issue: The customer's WeChat account currently does not have an online report viewing module and has not implemented electronic signature for medical examination reports (Li et al., 2021).

d) Security issues: Medical examination reports involve a large amount of customer privacy and require high information security (Cui, 2019). 1.5 Habit issue: Staff have become accustomed to single machine equipment and system operation modes, and need to constantly adapt and accept new functions and modules in implementation. At the same time, the customer's habit of viewing paper reports for many years has changed to a mindset shift and habit development of viewing reports online.

2) The project is divided into three working groups: based on the analysis of the main key and difficult points, group members are grouped, and a total evaluation and construction period of 8 months is set according to the content to be implemented. The responsibilities of each group are clearly defined, and each group formulates relevant work progress based on their own tasks.

a) Equipment docking group: responsible for equipment cleaning, docking with equipment manufacturers, and applying for new equipment.

b) System Integration Team: Responsible for the integration of various data and functions of the physical examination system, HIS system, LIS system, and PACS system, as well as information security assessment and implementation.

c) WeChat Connection Team: Responsible for the development of paperless online reporting WeChat client functions, etc.

2.3. Project Implementation Process

2.3.1. The Main Implementation Content of the Equipment Docking Group as Follows

1) The department equipment administrator serves as the team leader, and one medical engineering personnel and department nurse who is in charge of our department are team members. Clean up all standalone devices and devices that cannot transmit data back to the physical examination system in the department.

Difficulty: There are many equipment manufacturers and merchants involved, with varying degrees of cooperation. At the same time, the technical capabilities of developing ports and virtual printing queues vary (Zhou et al., 2015).

Solution: Strengthen communication with the medical engineering depart-

ment of the hospital, and require their dedicated personnel to be responsible for contacting the medical equipment vendors to conduct functional research and development with the ultimate goal of ensuring that the final examination data and images can be returned to the medical examination system.

Results: Some devices have completed docking, but there are still some devices that cannot meet the requirements due to aging and technical strength.

2) Update device: After the first step of technical docking with the equipment manufacturer, the device still cannot automatically transmit data and graphic reports. List these devices and communicate with hospital leaders, medical engineering departments, etc. repeatedly to apply for equipment updates.

Difficulty: There is an annual budget for purchasing equipment, and the government's procurement process is lengthy, which affects the progress of the project.

Solution: The project leader should strengthen communication with hospital leaders and medical engineering departments to ensure the quantity of equipment updates and expedite the approval process and execution of various processes.

Result: Some devices with near service life and expiration date have been updated, but some devices that cannot be connected still cannot be purchased for updates in the near future.

3) Scan and Return Single Machine Device Inspection Results: For devices that cannot be updated and docked, the single machine inspection results are transmitted back to the medical examination system through the development of ports and the use of scan recognition technology.

Difficulty: Scanning recognition technology extracts and sends back the corresponding customer information to the physical examination system, requiring a unified identification standard, such as the barcode of the physical examination number on the examination report. However, there are some parts of the single machine examination report in our department that do not have the barcode of the physical examination number implanted, making it difficult to effectively recognize the examination report.

Solution: Using the medical examination number two microcode on the medical examination guide as the extraction element, stack all the examination reports of the customer for scanning and matching. Simultaneously developing a project matching function to store each examination result in a location related to the examination path, making it convenient for staff to view and review.

Result: The function of sending single machine reports back to the physical examination system has been completed, but errors still occasionally occur during project matching and scanning recognition. Staff need to strengthen verification during the audit.

2.3.2. The Main Implementation Content of the Information Docking Group as Follows

The hospital information department personnel in charge of our department are the team leader, one system engineer from each department, and one medical

staff member from each department.

1) Sort out the inspection items for which the data or images of various supporting departments such as HIS system, LIS system, PACS system, etc., such as ultrasound, radiology, pathology, and laboratory, cannot be automatically transmitted back to the physical examination system, and make a list. Convene several system engineers to discuss system issues, technical difficulties, and solutions that cannot be automatically transmitted back.

2) New device system integration: After the installation of each new device is completed, relevant system engineers need to cooperate with information science teachers to integrate the system according to the requirements of the medical staff.

3) Function Development: Develop relevant functions based on specific requirements during the implementation process, such as scanning and recycling technology (recycling each inspection item in the examination path for easy review and viewing by staff), virtual printing technology, development docking port, examination progress, examination report electronic signature, examination electronic report template, and other series of functions.

4) Ensuring Information Security: Assess the risks associated with the implementation of various information functions, ensure customer privacy, and avoid information leakage. Difficulties: Inconsistent forms of storage results among various systems, lack of electronic signature in some supporting departments, lack of information work experience among medical staff, and unfamiliarity with medical examination modes among system engineers, resulting in unequal information and low communication efficiency, as well as difficulty in coordinating time among system engineers. Solution: Each system engineer should try to develop a storage format of data + graphics and text to ensure the necessary extraction for physical examination. Communicate and negotiate with relevant departments and system engineers to achieve electronic signatures as soon as possible. At the same time, the team leader (information science teacher) should follow the class to understand the specific functional requirements of the physical examination, in order to effectively communicate and connect with various system engineers. Result: The vast majority of examination and testing results from supporting departments can be automatically transmitted, but there are still individual projects such as drug group screening series involving pathology and drugs that require review and signature, making it impossible for both departments to use electronic signatures.

2.3.3. The Main Implementation Content of the WeChat Docking Group

The administrator of the WeChat official account of the department is the team leader, and the WeChat company, the physical examination system and the teachers of the information department are the team members.

1) Develop a WeChat based physical examination report query module, design an online report template format, set push nodes, query and re push the results of the physical examination system, and provide online report query re-

minders and other functions.

2) Implementation of privacy protection (Wu, 2015): Setting online report query conditions (ID number + system reserved phone number + verification code) Difficulties: WeChat operators are weak in the development of this area, and the function development progress is slow. Solution: Coordinate with medical examination system engineers to assist in completing functional development. Result: The WeChat report query has been basically completed, but the electronic report query is unstable. After expansion and interface processing, occasional electronic reports from individual customers require manual processing in the WeChat backend.

2.4. Project Control Process

1) Each group leader establishes various WeChat groups for different tasks and purposes, and each task requires a completion time and responsible person to be listed. Responsibilities are fully implemented, and the group leader controls the progress of various tasks in the group; Hold online meetings from time to time based on work conditions.

2) The project team leader convenes an on-site meeting with each team leader every month to summarize the implementation status of each team's work, strictly control the work progress, and focus on discussing the problems, difficulties, and required resources in the work.

3) The project leader coordinates various resources to solve difficult problems for each team based on the actual situation.

4) Develop a project reward and punishment system, linking the team's monthly performance with work progress and completion quality. The completed project steps are shown in Table 1.

Table 1. Project implementation process.

<table>
<tr><th>Project initiation</th><th colspan="2">Project planning (Zhang et al., 2021; Zhao & Li, 2021; Li et al., 2021; Cui, 2019)</th><th colspan="2">Project implementation (Zhou et al., 2015; Wu, 2015)</th><th>Project control</th><th colspan="4">Project evaluation</th></tr>
<tr><td rowspan="6">Analysis of key and difficult points in project application
↓
Project initiation work group
↓
Establish a project management team</td><td rowspan="3">Equipment docking group, equipment docking port development</td><td rowspan="3">Equipment docking group</td><td>Equipment docking port development</td><td rowspan="6">Monitoring indicators evaluation
↓
Work group stage report
↓
Complete functional trial feedback</td><td colspan="4">Monitoring indicators evaluation</td></tr>
<tr><td>Updating old equipment</td><td rowspan="6">Abandoning paper reports</td><td rowspan="6">Cost saving</td><td rowspan="6">Customer satisfaction</td><td rowspan="6">Report issuance time</td></tr>
<tr><td>Resolve stand-alone report back issues</td></tr>
<tr><td rowspan="3">Task division</td><td rowspan="3">Information docking group</td><td>Resolve single machine report feedback</td></tr>
<tr><td>New device system integration</td></tr>
<tr><td>Work group progress plan</td><td>Work group progress plan</td><td rowspan="2">Wechat interface team</td><td>Develop query modules</td></tr>
<tr><td></td><td></td><td>Implement security protection</td></tr>
</table>

2.5. Project Evaluation

This study evaluated the project by abandoning 4 aspects: the number of paper report copies, cost savings, satisfaction and report issuance time.

Satisfaction evaluation was done by using the "Post-examination Report Management Satisfaction Questionnaire" developed by the center to compare the time of issuing post-examination reports and the accuracy of the reports, and the satisfaction questionnaire included 2 items, which were classified as very satisfied, generally satisfied, and unsatisfied. Satisfaction rate = (number of very satisfied cases + number of generally satisfied cases)/total number of cases × 100% (Chen et al., 2022).

3. Results

3.1. Abandoning the Number of Paper Reports

After the completion of paperless online electronic reports, the department continuously promotes and promotes, and the number of customers who give up paper reports increases month by month, accumulating 2435 within six months.

3.2. Cost Savings

According to departmental calculations, the average cost per paper physical examination report is 20.8 yuan (including paper, printing ink, printer wear and tear, physical examination report cover, hot pressing cost, labor cost, etc.), resulting in a cost savings of 50,648 yuan within six months of implementation. The larger the promotion area, the more significant the cost savings.

3.3. Customer Satisfaction

Enable telephone and online interpretation of medical examination reports to reduce the time or shipping costs for customers to collect reports from the department. At the same time, electronic report preservation has more advantages than paper report preservation. Therefore, regarding the issuance of medical examination reports, the satisfaction rate of medical examination customers increased by 5.64% compared to before the implementation of electronic reports.

3.4. Report Issuance Time

Through the development of electronic reports, more information functions have been improved and the process of issuing medical examination reports has been continuously optimized. The average time for issuing a medical examination report is about one day ahead of schedule.

4. Discussion

The paperless online medical examination report is the foundation of the development of hospital medical examination informatization to a certain extent. It is a further optimization of existing workflow, a reasonable demand constantly raised by customers, and an important lever for practicing environmental aware-

ness. Therefore, in the early stage, we should increase the promotion of the significance of implementing paperless online reports. Only when management personnel, medical staff, and system engineering technicians recognize the importance and urgency of paperless physical examination reports, can we better promote the implementation of this project together. After the implementation of this project, it was found that the higher the level of informationization in physical examinations, the more unified the top-level design of hospital informationization, the fewer centralized departments for physical examination items, and the lower the implementation difficulty coefficient; During the integration of various systems, various accidents will constantly occur, which will affect daily work. Therefore, after the development of various functions, it is necessary to repeatedly test them. It is very necessary to prepare emergency plans during the initial trial process. During the project implementation process, it may be found that some special equipment and situations require strong communication with hospital leaders and functional departments. Only with strong support can the project progress be effectively promoted. Choosing a good medical software company is also very important, as its development ability, efficiency, cooperation, and execution will be higher. At present, some equipment inspection reports need to be printed, scanned, and connected to the physical examination system in order to display a complete electronic report. It has not been fully paperless, so the hospital needs to further improve this part of the work.

5. Conclusion

The implementation of paperless online medical examination report saves a lot of manpower and material resources invested in the department, advocates green environmental protection, optimizes the report issuance process and improves the efficiency of the medical staff, and also enhances the feeling and satisfaction of medical examination customers. At the same time, hospitals should increase the promotion of the use of electronic reports through multiple channels and directions, strengthen customer environmental awareness, change customer habits, and fully implement paperless reporting.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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