

Medical Equipment Acceptance Management Mode Based on Low-code Platform Under The Background of Multi-hospital

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Abstract

With the continuous development of modern hospitals, more and more hospitals have developed into a multi-hospital management model, which has brought many challenges to the management of medical equipment in hospitals, especially the acceptance management of medical equipment. By building an online acceptance integrated management system based on low-code platform, this paper breaks the impact of multi-hospital space distance barrier, reduces operating costs, significantly improves work efficiency, realizes the homogenization and fine management of medical equipment acceptance under multi-hospital mode, and promotes the high-quality development of hospitals.

Keywords

Multi-hospital area; professional equipment acceptance; Low-code platform.

1. Introduction

In June 2021, the "Opinions of the General Office of the State Council on Promoting the High-quality Development of Public Hospitals" (No.18 issued by the State Office) was issued, and for the first time, some powerful public hospitals were supported by documents at the national level to build and develop multi-hospital districts on the basis of controlling the size of individual hospitals, and at the same time, to meet the needs of the broad masses of the people. China's major hospitals, especially public hospitals, have developed rapidly, generally showing a trend of collectivization, forming a multi-hospital management model[1-3], which has brought great challenges to the homogenization and refinement of medical equipment acceptance management, and the cost of centralized on-site acceptance involved in the traditional management model has been increasing. And there are a series of problems[4-8], such as incorrect provision of acceptance data, non-standard filling of acceptance report, and decline of acceptance timeliness.

Acceptance is an important part of the whole life cycle management of medical equipment, and is the key core link to ensure that new medical equipment meets all standards and is put into clinical use in compliance and safety. Therefore, exploring the acceptance management mode of medical equipment suitable for the development of multi-hospital districts has become an urgent problem to be solved in the development of hospitals[8-9]. In this study, by building an integrated management platform for online acceptance, the efficiency of medical equipment acceptance was improved, and the standardized, homogeneous and refined management of medical equipment acceptance was realized.

2. System Architecture Design

The core of the online acceptance integrated management system built in this study is based on the low-code platform. According to the business process logic of multi-hospital integrated management, the low-code platform is built in a zero-code way. The completed acceptance management platform and other online management platforms are centralized in an application program, collectively referred to as "Medical Engineering Online". In addition, apply for and set up a WeChat official account named after the hospital's medical equipment management department, and launch the "Medical Engineering Online" application in the WeChat official account as the entrance of the business process. The medical engineering department, the procurement department, the user department, the medical equipment supplier and other medical equipment acceptance related personnel can exchange information through the official account and handle business online. At the same time, The "Medical Engineering Online" low code platform application management program is set up in the DingTalk application for in-house staff, and the managers are responsible for checking and accepting the daily operation of the integrated management platform, setting all kinds of management authority of managers, and realizing the centralized security management of data. The overall system architecture is shown in Figure 1.

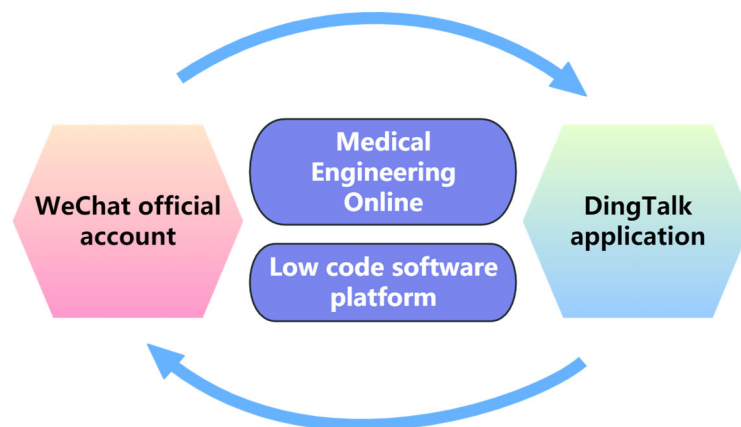


Figure 1. Medical equipment management system based on WeChat official account

3. Integrated Management of Delivery Notice and Arrival Confirmation

The supplier's agreement on the delivery date and liability for breach of contract are indispensable to the management of the medical equipment procurement contract. The supplier must deliver the goods before the agreed date of arrival. If the goods are delivered late, the supplier will bear the liability for breach of contract according to the contract [10]. Therefore, the delivery and arrival management is a work involving the management of economic compensation for breach of contract, and its importance is self-evident. Under the background of one hospital and many districts, limited by the space distance barrier, the traditional arrival management mode of "running away" in offline hospitals has high operation cost, low work efficiency, and it is difficult to achieve homogenization and fine management. Unable to meet the management needs of multi-hospital development[2-3].

Based on the above situation, this study combines with the low code platform to design and develop the above online acceptance management platform for integrated medical equipment from online delivery notification to arrival confirmation. The purchasing department of our hospital fills in the contract name, contract number, brand, model, quantity, arrival date,

supplier name, contact information and other information, and clicks on the platform to send the delivery notice. The delivery notice will be sent to the supplier in the form of short message. The supplier can download the delivery notice by entering the [medical equipment] module through the WeChat official account of our hospital, print and fill in the receipt, stamp and upload it (PDF format), and realize online confirmation. The delivery notice and receipt are shown in Figure 2.



湖州医药大学 第二临床医学院
附属第二医院 | 青美儿童医院
The 2nd School of Medicine, HZMU/The 2nd Affiliated
Hospital and Qingmei Children's Hospital of HZMU

Delivery notification letter

No. SBFH2024010019

Hangzhou Yidan Biotechnology Co., Ltd.

This is to inform you that we have signed a contract with you for the following items. Please arrange the delivery according to the information in the form!

Project number	CGC-ME-22-130	Type of project	Medical equipment
Project name	Refrigerated centrifuge		
Quantity shipped	1 set		
Delivery address	Biological Sample Library, 1/F, Building 4, Shuangchuang Park, Longwan		
Contact person	Shao Zhangyi	Contact number	13516712957
Supplier contact information			
Handler	Liu Xiaoming	Contact number	13566167760
Remark			

Caution:

1. Before delivery, please contact the contact person (docking engineer) to arrange the follow-up acceptance.
2. Please deliver the goods according to the time agreed in the contract, and deal with the overdue goods according to the contract.
3. Please fill in the receipt and return it with seal, otherwise the time will be calculated according to this notice.

2024 edition

2024-01-22

Receipt

No. SBFH2024010019

The above information has been known!

Salesman's signature		Company seal:
Date received		

Figure 2. Delivery Notice and Receipt of Medical Equipment

At the same time, the above delivery notice will be automatically transferred to the hospital acceptance engineer, when the supplier sends the corresponding goods to the designated location, the hospital engineer can choose the arrival time on the platform, upload the delivery list,copy of the contract and other attachments, and use electronic signature confirmation, the system will automatically compare and judge whether there is overdue. And can automatically calculate and present that specific overdue day. At the same time, through our hospital's WeChat official account, enter the [medical equipment] module to download and print the arrival notice in the standard format for both parties to sign for confirmation and filing. The arrival confirmation form is shown in Figure 3.



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附属第二医院
附属第九医院
Tongji University
Hospital and Tongji University Hospital of 988

Equipment arrival confirmation

No. SHFDH2024010019

Device name	Refrigerated centrifuge		Type of project	Medical equipment
Specifications and model	STBR	Project number	CGC-ME-22-130	
Quantity shipped	1 set			
Delivery address	Biological Sample Library, 1/F, Building 4, Shanghai Chang Pu, Longyan			
Manufacturer	Thermo	Supplier	Hangzhou Yidun Biotechnology Co., Ltd.	
Handler	Lin Xiaoming	Contact number	13566167760	
Remark				
Notify the delivery date	2024-01-22	Arrival date	2024-01-26	
Whether the goods arrive within the time agreed in the contract		Days of late arrival		
Supplier:	Consignee of the hospital:			
	Signature: 顾崇 Date of signature: 2024-01-26			

Print Time: 2025-05-17 13:37:26

Printed by: Xiang Ziqing

Remarks: 1. The following materials must be attached at the time of submission: delivery list and copy of contract.

2. The arrival confirmation sheet is only used as the basis for arrival confirmation, not the basis for acceptance.

Figure 3. Medical Equipment Arrival Confirmation Sheet

Through the information-based online delivery notification, supplier receipt confirmation, and online final arrival confirmation, the integrated closed-loop management from online delivery notification to arrival confirmation is realized, and the default items of overdue arrival managed across departments are set in the platform and handed over to the system for automatic judgment and calculation, so as to avoid the omission of human judgment. To solve the problem of space distance barrier under multi-hospital management mode, improve work efficiency, standardize the delivery and arrival management of medical equipment, and synchronously realize the centralized management of data and accessory information.

4. Online Acceptance Management Platform

After the medical equipment procurement project has completed the arrival and installation of the equipment, the supplier enters the acceptance link through the official account entrance of the WeChat, fills in the equipment name, brand, model, serial number, manufacturer, production date and other conventional equipment acceptance information in the equipment installation and acceptance report plate, and uploads all documents required for acceptance, such as the qualified certification documents, nameplate photos, equipment photos, instructions and contracts. And set the required items, attachment standard name, upload format and other content, farewell to the traditional hand-filled mode, standardized data filling. After completing the field filling and attachment uploading of the acceptance report online, the submission can be automatically transferred to the management department for acceptance and audit, and then transferred to the technical support team responsible for checking and supplementing engineers, and then transferred to the archivist to complete the data review, after the audit is completed, the standard format acceptance report is exported from the system (as shown in Figure 4), and the final version is signed and confirmed by all parties. Finally, upload the system for retention. All process nodes automatically notify the department head through Ding Talk application. The business process is shown in Figure 5.



杭州益旦生物 第二届董事会
 第二届监事会
 The 2nd Board of Directors
 The 2nd Supervisory Board
 Hangzhou Yidan Biotechnology Co., Ltd.

Invoice and acceptance report of professional equipment

Report No. ZY3BY5 202402954

Device name	Refrigerated centrifuge	Project budget number	22-130
Registration name	High speed refrigerated centrifuge		Imported products
Funding		Hospital funds	
Brand	Thermo	Specification and model	STBR
Manufacturer		Thermo	
Address	Zweigniederlassung Osterode Am Kaliberg 37520 Osterode am Harz Germany		Contact number 8008105118
After-sales engineer	Huang Lijie		Contact number 13676796663
Supplier	Hangzhou Yidan Biotechnology Co., Ltd.		
Address	Building 9, Xixi No.1 Creative Business Center, 808 Wen'er West Road, Xixi District, Hangzhou		Contact number 05R1-8Rc58023
Receiving department	Biological sample bank		Warranty Period (Months) 24
Serial number	Serial number	Date of manufacture	Production batch number
1	43231224	2023-11-01	43231224

1. Confirmation acceptance (check the contract and configuration list)

2. Acceptance of main KL indicators (check page e of KL response of test U)

3. Clinical use training and assessment records (check the training sign-in form, training content and assessment records)

Confirm

Confirm

Completed

Contents of clinical training and assessment

4. Clinical trainer training and assessment records (check the training content, assessment records, trainer qualification description, trainer qualification certificate)		Completed
5. Maintenance training (check the training sign-in form, training content, assessment record and electronic version of maintenance template)		Completed
Maintenance technical data		
Other standard accessories and technical documents		Certificate of Conformity, Instructions, Maintenance Instructions, Operating Procedures
conclusion	Qualified	
Date of acceptance	2024-02-04	Warranty Expiration Date 2026-02-04
Representative of de (signature)		Person in charge of the receiving department (signature)
		Receiving department participates in acceptance Person
Medical ^a and Equipment Department ^a ... (signature)		Medical ^a and equipment department data review (signature)

Figure 4. Installation and Acceptance Report of Medical Equipment

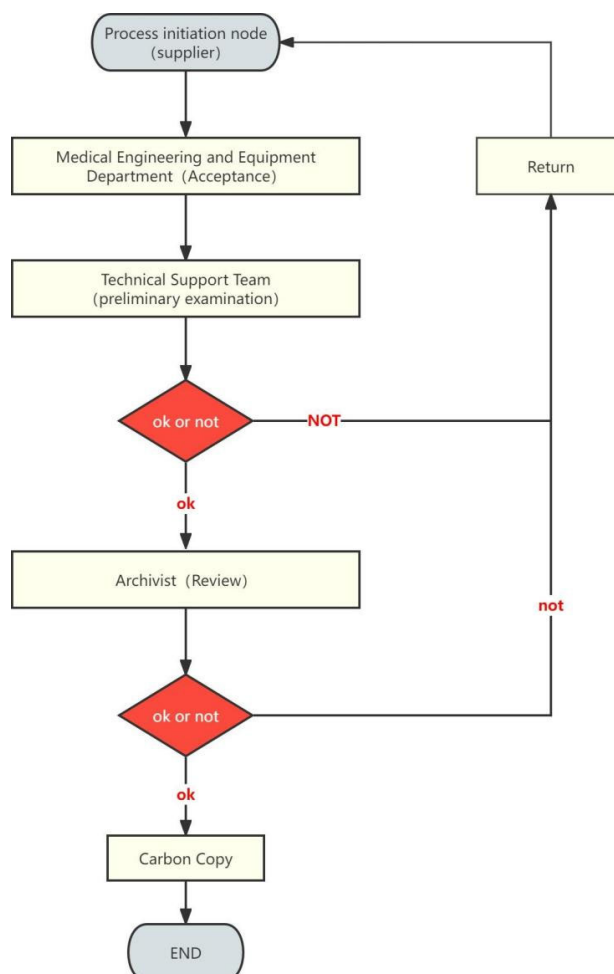


Figure 5. Flow chart of online filling and review of medical equipment installation acceptance report

The online integrated acceptance platform realizes the centralized management of delivery, arrival and acceptance data, which can monitor the progress of each project in real time and arrange special personnel to check the acceptance of each project regularly. Once the progress of project acceptance is slow, we should follow up and understand the reasons in time. Combining with the online processing progress data, we should take timely measures to interview agents and cross-hospital video acceptance to accelerate the acceptance progress. Combining with the online acceptance platform, continuously strengthening the acceptance management, in the case of synchronous operation of six hospital districts, insufficient personnel and inability to arrange resident engineers in some hospital districts, the online acceptance of more than 1300 projects has been completed so far, and the timely acceptance rate (the proportion of projects completed within three months) has been significantly improved. As shown in Figure 6.



Figure 6. Timely acceptance rate of medical equipment percentage (accepted within 3 months)

5. Sum up

With the expansion of hospital scale, multi-hospital operation has become the norm, medical business is also growing year by year, the workload of medical equipment acceptance management is bound to increase, while the quality requirements are constantly improving, actively responding to the needs of digital reform, this study is a very effective way to build a standardized and efficient online acceptance integration management platform. It realizes the online filling, submission and audit functions of acceptance report, acceptance annex, delivery notice, arrival confirmation and other links, standardizes data filling, significantly improves work efficiency, solves multi-hospital operation problems, and realizes the fine management under the integrated operation mode of multi-hospital.

After more than three years of system operation practice, the operation of the online acceptance integrated management platform is stable, reliable and safe. At the same time, the system data is shared according to the authority, which avoids the loss of project data in the process of personnel flow and realizes the safe, effective and comprehensive management of data. However, there are still some unsolved problems, for example, due to cost control and other reasons, the system users are mainly hospital personnel, temporarily unable to achieve the function of returning and modifying the information submitted by suppliers; Due to the requirements of management regulations, some important documents need to be printed and signed and uploaded, which fails to achieve full paperless.

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