

Utilizing a high-performance intelligent surgery scheduling system to promote surgery safety and effectiveness

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Introduction

This project integrates [healthcare information systems](#) (HIS), [medical scheduling systems](#) (SCH), and [nursing information system](#) (NIS) through a smart surgery scheduling system. It ensures secure, continuous, comprehensive, real-time, and efficient cross-system operations (medical records, material systems, and pricing systems). The intelligent design optimizes the traditional surgery scheduling process, enhances scheduling efficiency, and aims to improve patient safety, operating room utilization, and healthcare quality.

Methods

The system was developed using Agile Scrum methodology, implemented on NET Core 2.2, employing technologies such as ASP.NET MVC, Vue.js, and Restful API. The server utilized IIS, and the database employed SQL Server. The dynamic electronic whiteboard environment was built using Microsoft ASP.NET Core technology, integrating surgery data from NIS and scheduling data from SCH.

This project develops:

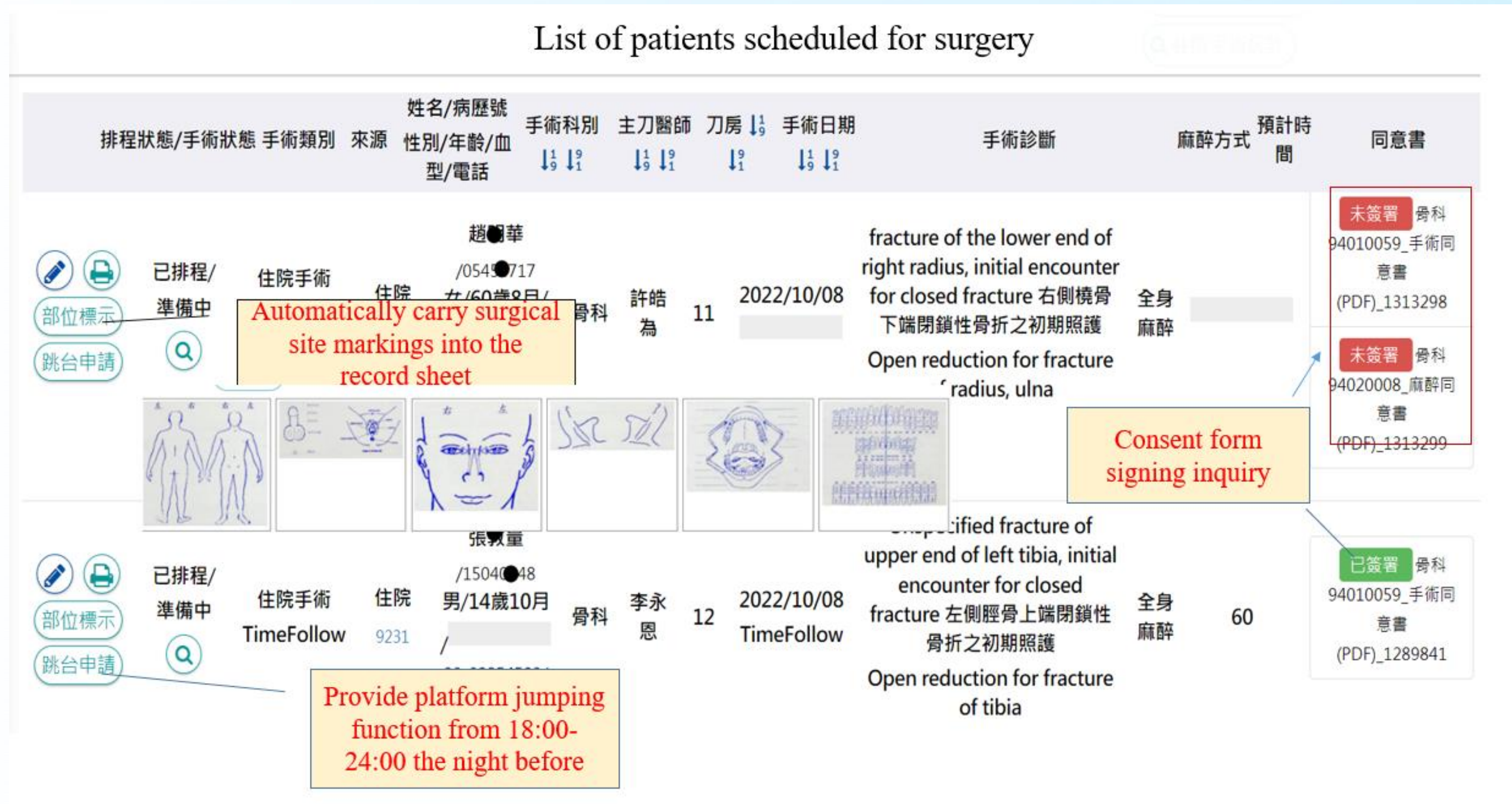
1. Intelligent surgery reservation system (HIS): Simplification of reservation operations, display of critical surgery categories for activating emergency operating rooms, automatic retrieval of patient's anticoagulant medication usage for physician assessment of bleeding risk, display of surgical site markings with reminder mechanisms, information digitization of surgery reservation platforms for efficient operating room utilization.

2. Development of Surgery Control Console System (SCH) Surgery Scheduling:

Linking medical orders with appointment scheduling, integration of surgery scheduling and surgery summary functions, allowing queries and connections within the scheduling interface, interdepartmental teamwork integration via the app to accurately verify patient surgery data.

3. Dynamic electronic surgery dashboard for real-time operating room status monitoring.

Figure 3
Surgery appointment automation combined functions



Results

Enhanced Surgical Safety: Integration of surgery scheduling systems achieved a 100% marking rate for physician-patient-surgery site identification. Improved Healthcare Quality Indicators: Average surgery cancellation rate reduced from 5.2% in 2020 to 0.2% in 2021. Reduction in Emergency Surgery Waiting Time: Percentage of emergency surgeries waiting for over 60 minutes decreased from an average of 34.68% in 2020 to 0% in 2021. Increased Operating Room Utilization: Average operating room utilization rates improved from 90.2% (emergency surgeries) and 76% (routine surgeries) in 2020 to 94% (including emergency surgeries) and 80% (routine surgeries) in 2021, respectively, reducing patient waiting times. Smartphones were utilized for surgical safety checks, ensuring 100% compliance with surgery data verification, preoperative site marking, and intelligent system monitoring.

Table 1
Improved Healthcare Quality Indicators

Items\ Year	2020	2021
Average surgery cancellation rate	5.20%	0.20%
Emergency surgeries waiting for over 60 minutes	34.68%	0%

Conclusion

This project, based on cross-system and integrated system approaches, restructured pre-surgery reservation operations. It streamlined scheduling, reservation platforms, pre-surgery handovers, and safety checks. The utilization of mobile devices such as iPads and smartphones, employing barcode scanning for patient identification, site marking, and specimen transport, enhanced surgical safety checks. Post-surgery, the system seamlessly linked with the Medical Information System (MIS), demonstrating the significant benefits of an efficient and intelligent surgery scheduling system.

Figure 1
One-time conversion from closed mainframe system to open system

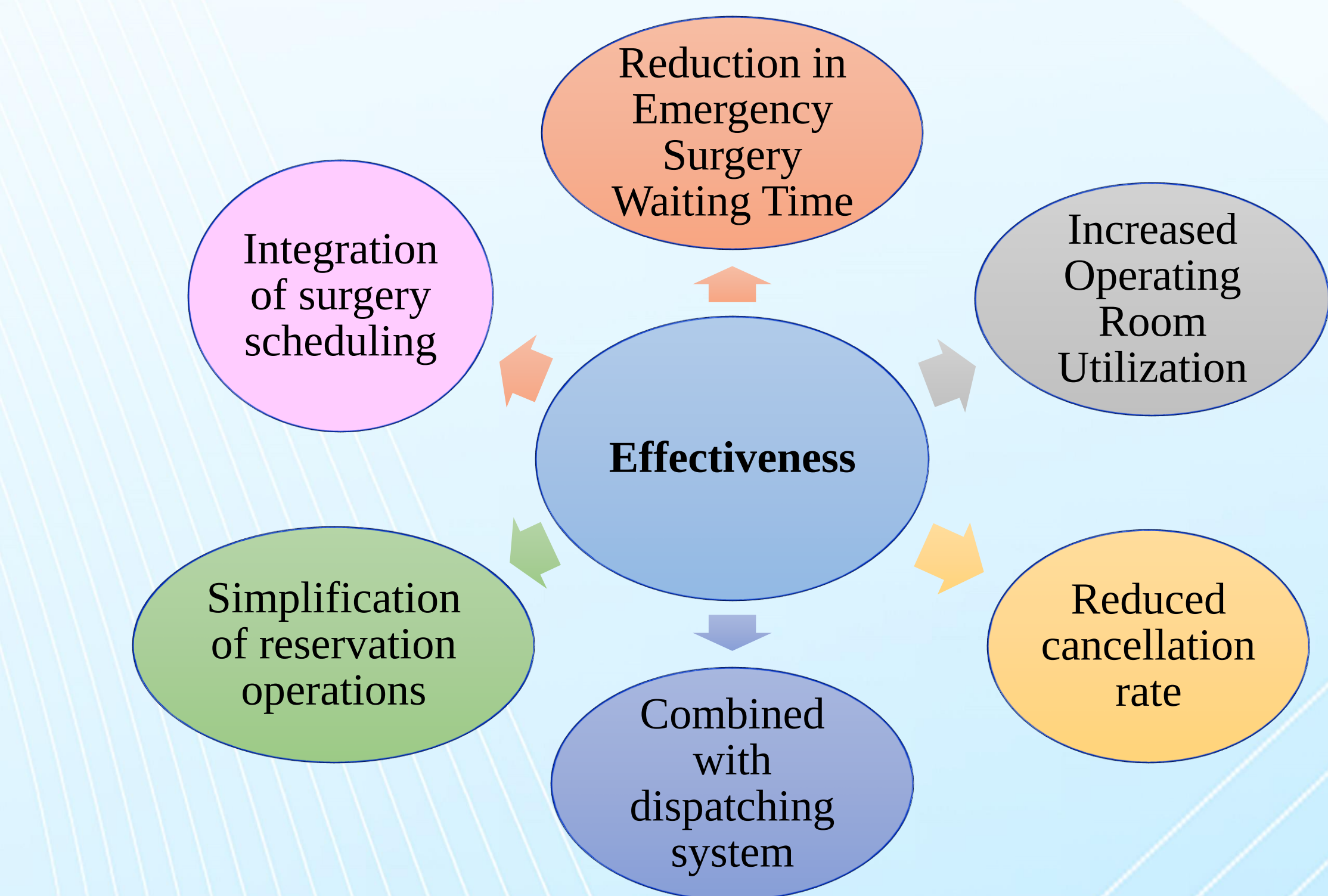


Figure 2
Schematic diagram of intelligent surgical management system

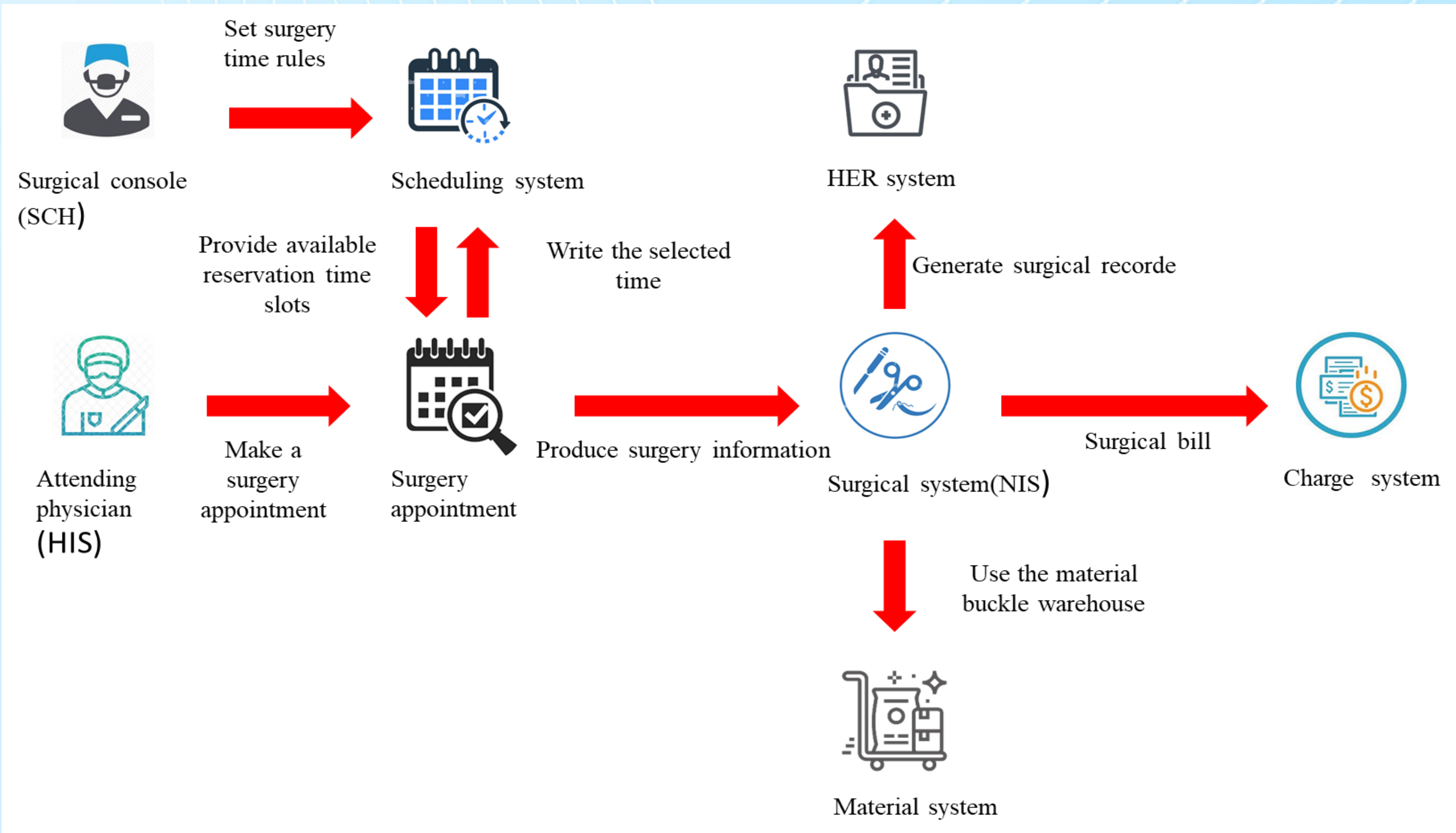
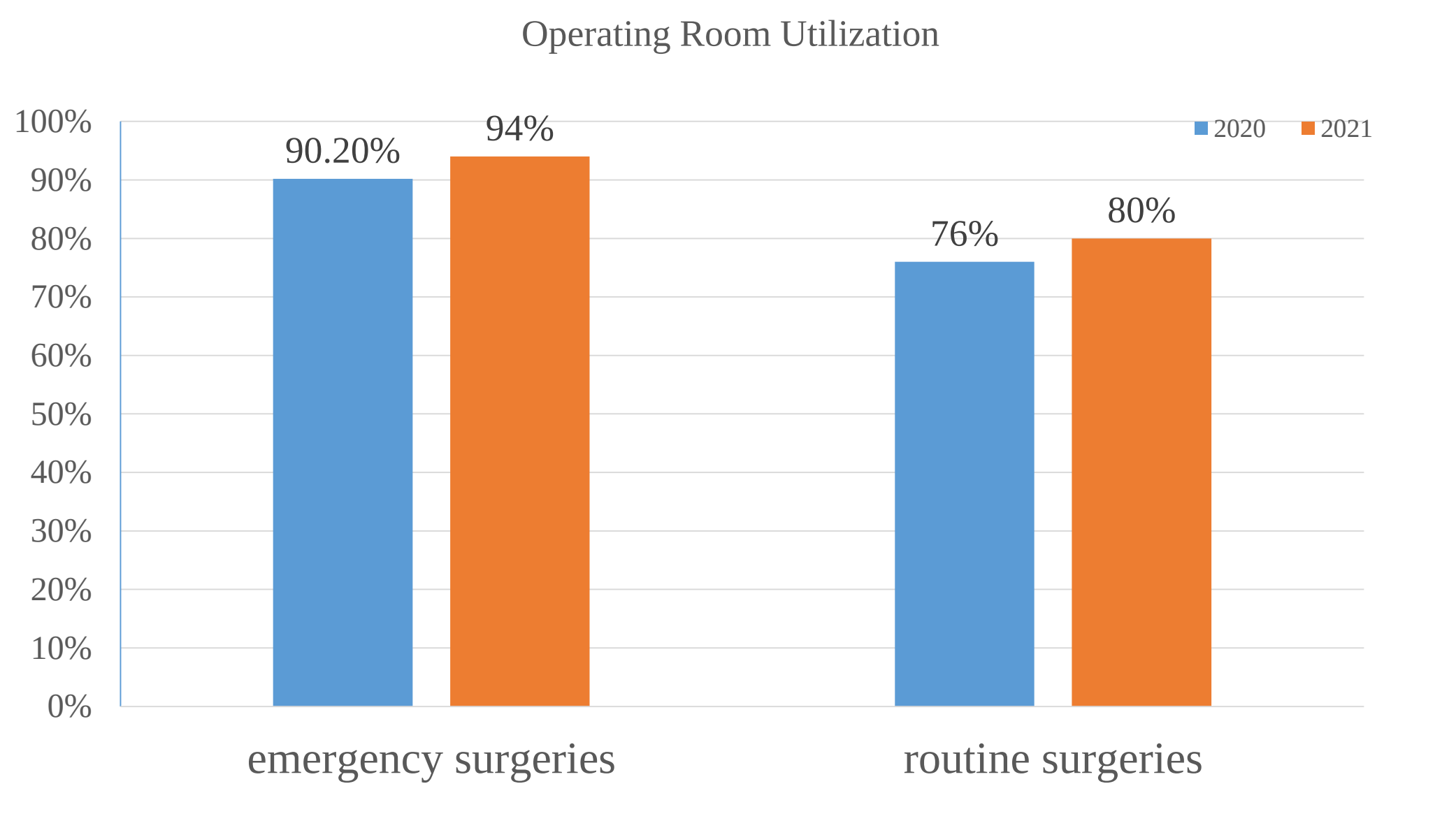


Figure 4
Intelligent surgery scheduling



Figure 5
Operating Room Utilization



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