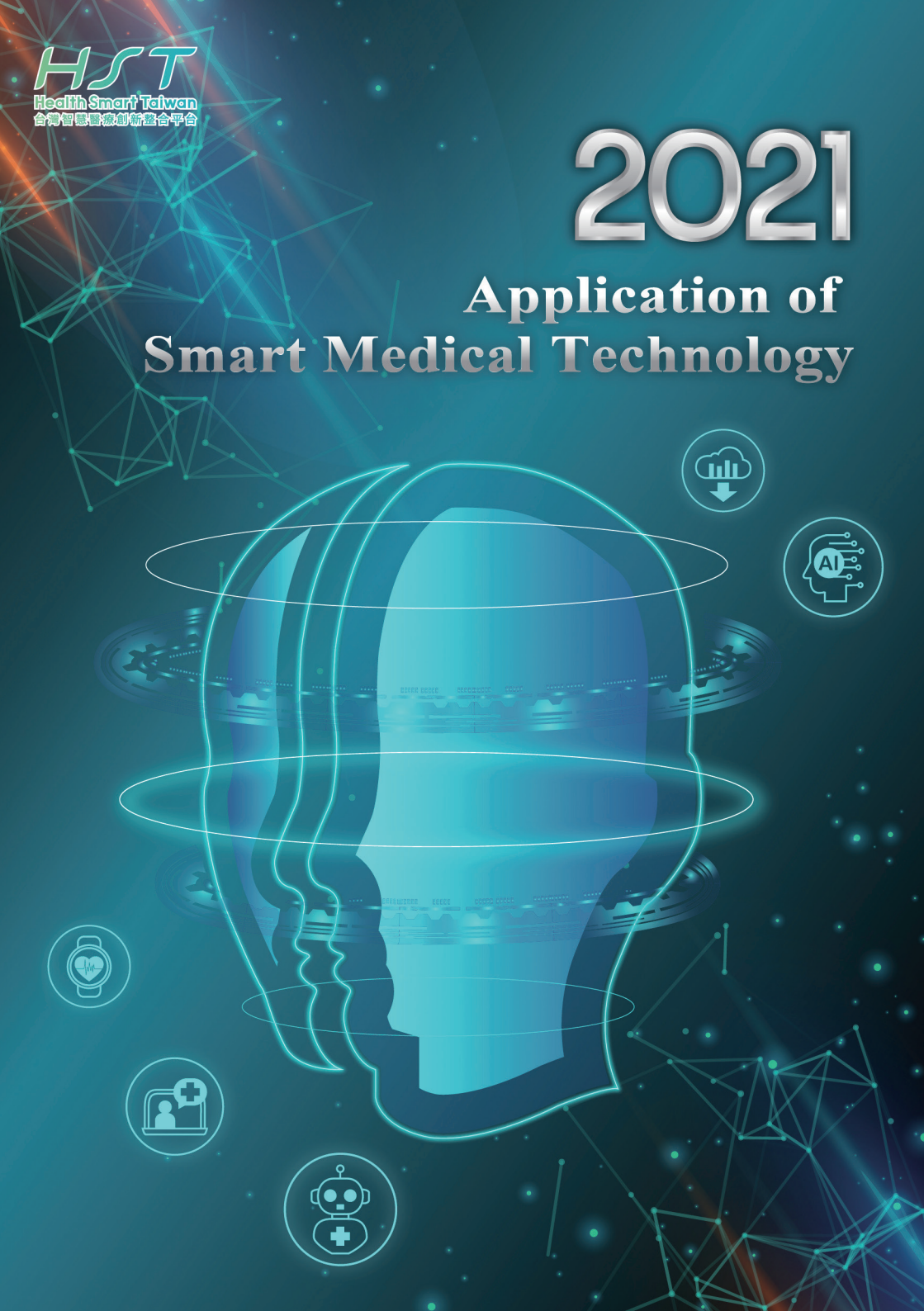
HST
Health Smart Taiwan
台灣智慧醫療創新整合平台

2021

Application of Smart Medical Technology



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Administration Management

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En Chu Kong Hospital

Utilizing Smart Ward Information System to Strengthen the Nursing Station Management Platform

Overview

The hospital began integrating medical operations and handling clinical care process and recording issues in 2008, including nursing information system, chemotherapy monitoring platform, nurse station electronic whiteboard, and bedside monitor automatic transmission in general ward. Clinical nursing has a heavy workload that is highly repetitive. The hospital further planned a smart nursing station management platform to replace paper operations, in order to improve the accuracy and availability of nursing data, reduce the time spent manually organizing data and lower the error rate, and improve the management performance of departments. The platform includes electronic bedside card, bedside care system, hospitalization app, smart electronic whiteboard, and refrigerator temperature monitoring. The hospital integrated 12 information systems to simplify complicated operations, increase the availability of data, and improve administrative management performance.

Benefit

After 1.5 years of planning and software and hardware installation, the smart nursing station management platform has been implemented in 8 wards with 338 beds. The electronic bedside card, bedside care system, hospitalization app, and smart nursing station management platform create healthcare services that involve medical teams and patients.

Benefits obtained after implementation are as follows:

1. Convenient transmission of care information reduces trips to the nursing station to check medical records.
2. Improves data entry between teams to reduce repeated writing.
3. Enhanced the management platform's performance, making it more convenient to check care quality and improve patient safety.

Concrete results include:

1.Improved the timeliness of shift handover: The average amount of time spent on shift handover each day was reduced by an average of 9.8 minutes from 14.4 minutes to 4.6 minutes, and average satisfaction of nurses reached 70.8%.

2.Improved control over patient safety: Average number of dispatch times per shift increased from 0 times to 2.8 times, sharing the care workload of nurses.

3.Reduced instrument management time: Average time spent by each shift was reduced from 10 minutes to 6.8 minutes, and is more effective than conventional management methods.

4.Improved nursing instruction quality: The frequency of nursing instructions received by each patient increased from 1 time to 4.2 times.

5.Improved risk and crisis management: Time spent by each shift on needs survey and task assignment was reduced from 15 minutes to 2 minutes.

About the Hospital

En Chu Kong Hospital has focused on the development of emergency medicine and community medicine since it was opened in 1998. The hospital is located at an important hub – Sanxia Interchange of National Highway 3, and has 503 beds and approximately 1,300 employees. Over the years, En Chu Kong Hospital passed the teaching hospital accreditation, intermediate emergency care evaluation, cancer care quality certification, and health promoting hospital certifications, providing community and health services in coordination with health policies implemented by the Department of Health, New Taipei City Government. The hospital has developed information systems based on patient's care needs since it was opened with the goal of achieving smart care.

Keywords

Information transfer, Smart nursing station management platform, Smart ward

Contact Details

Department of Nursing, En Chu Kong Hospital

Cooperation Partners

FYC Intelligent Engineering Co.

Administration Management

Tungs' Taichung MetroHarbor Hospital

DRG Editor Automated Smart Solution

Overview

The hospital used machine learning and AI technology to develop the user-oriented "DRG editor automated smart solution", and input 560,000 entries of training data, accumulating the experience of 6 disease classification specialists.

Implementation is summarized below:

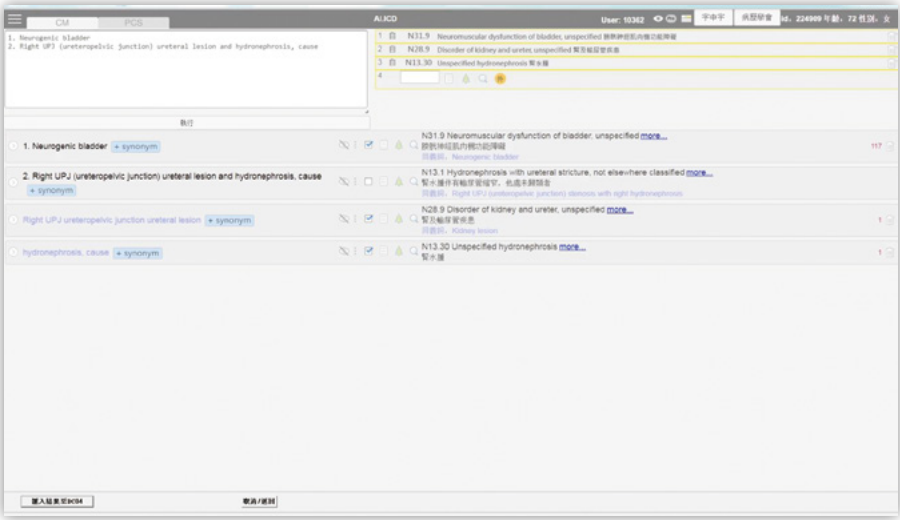
1.The AI-assisted ICD-10 coding platform uses natural language processing technology and user supervised enhanced learning model. The hospital developed the patented algorithm to not affect the writing habits of doctors and provide the most suitable code for linking medical records.

2.The hospitalization real-time editing platform integrates the HIS disease classification system and DRG editor, and is designed with an automated process: (1) Doctors write medical records when a patient is hospitalized. (2) The AI-assisted coding system automatically analyzes the diagnosis and codes the medical record. (3) The code is automatically sent to the DRG coding engine. (4) A DRG code is automatically generated. Humanized functions are provided, such as determining editing priority based on case characteristics, and automatic notice when diagnosis or surgery records are revised, to enhancing editing performance.

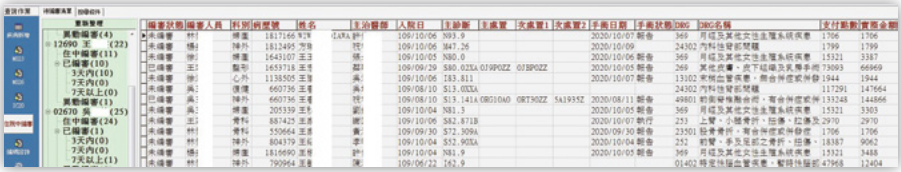
Benefit

The hospital achieved DRG editing automation with the assistance of information technology. The 2 platforms provided 5 benefits: (1) Increases disease coding correctness to 97.7%. (2) Saves coding time: Reduced the time required for coding a single diagnosis from 70 seconds to 10 seconds. (3) Improved the effectiveness of teaching. (4) Real-time AI feedback for self-learning. (5) DRG editing automation.

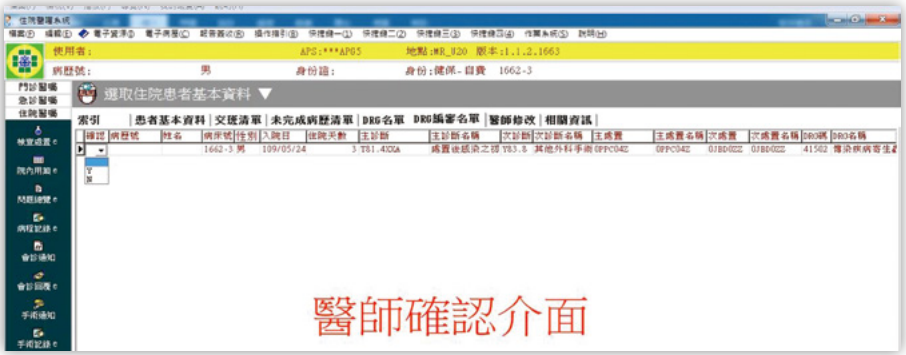
Significantly improved the efficiency and quality of ICD coding, and avoid overlooking important diagnosis and procedure. Monitor DRG resources and the difference with National Health Insurance in real-time to achieve DRG editing automation. This upgrades the role of disease classification specialists from manual coding to AI supervisor and trainer, saving 348.6 days a year (i.e., 1.3 disease classification specialists can be converted into an AI trainer).



AI-assisted coding platform



The hospitalization real-time editing platform



Doctor confirmation interface

About the Hospital

Tungs' Taichung MetroHarbor Hospital respect patients' rights and privacy, provide complete healthcare services, and actively promote disease prevention and health promotion concepts in communities to improve public health. Our vision is to become an international medical center and provide international healthcare services.

Keywords

AI, Automated, DRG editor, Hospitalization real-time editing, ICD

Contact Details

Superintendent Office, Tungs' Taichung MetroHarbor Hospital

Administration Management

E-Da Hospital

Improving the Quality Indicator System's Performance: E-DA Hospital Gets It Done

Overview

As the number of indicators continued to increase, manual data collection for indicators has gradually become a burden to personnel, and creates the risk of incorrect data collection for indicators. The quality indicators cannot be effectively monitored without a complete indicator system for inquiry or data collection. Hence, the hospital developed a case management system with a convenient quality indicator inquiry and monitoring interface and automatically collects data, in order to achieve automatic indicator data transfer and fewer manual operations.

Implementation method:

- The hospital periodically convened cross-team meetings to clarify the definition of indicators, elements of indicators, and source of data, in order to establish a quality indicator system with an automatic transfer function.
- The hospital optimized the quality indicator system via indicator inquiry improvements, access control, data management, indicator abnormality management, and indicator review and improvement.
- The hospital established a case management system that can automatically search for patients and automatically import fields of medical information.

Benefit

Features of Improving the Quality Indicator System's Performance

1. The system automatically interprets and collects data, which significantly reduces manual operations, and increases accuracy and consistency.
2. Visualized management data allow indicator managers and supervisors to monitor changes in data trends, and see abnormal points or warning points at a glance, allowing them to immediately find the problem, analyze it, and make improvements.

3.IT talent cultivated by the hospital developed a system tailored for the hospital, and reduced the massive cost of purchasing external systems.

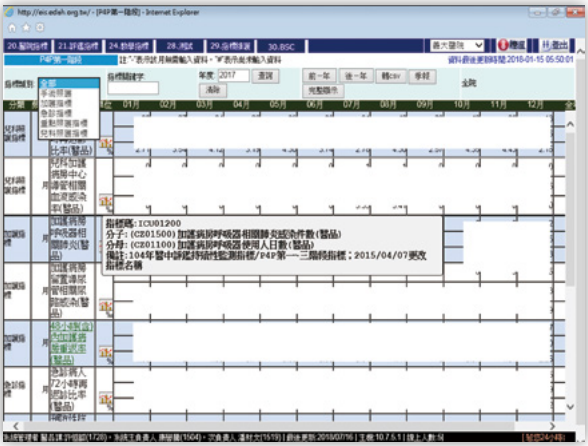
Results of Improving the Quality Indicator System's Performance

1.Informatization of the collection of indicator elements on P4P project:

- Information on 34 indicators are now automatically collected with an achievement rate of 121.43%.
- Information on 68 indicators are now semi-automatically collected with an achievement rate of 117.24%.
- Overall achievement rate was 118.6% and a total of 102 indicator elements are now automatically or semi-automatically collected.

2.Informatization of case management system for patient hierarchy indicator (stroke, pneumonia, and AMI) of P4P project:

- Ratio of fields in forms that are automatically input: 72.1%.
- Ratio of indicator information automatically collected: 100%.
- Ratio of data entries revised: Reduced from 11.7% to 0%.
- Ratio of cases missed: Reduced from 5.9% to 0%.
- Processing time from enrollment to data upload: Reduced from 2.5 days to 1.5 days.
- Processing procedures from enrollment to data upload: Reduced from 112 procedures to 31 procedures.



About the Hospital

E-DA Hospital passed the accreditation to become a would-be academic medical Center in 2017, and passed the JCI international hospital and academic medical center accreditation for the 4th time in 2018. The hospital has a total of 1,259 beds and mainly serves residents of North Kaohsiung. Furthermore, the E-DA medical system consists of 3 hospitals, namely E-DA Hospital, E-DA Cancer Hospital, and E-DA Dachang Hospital.

Keywords

Informatization of indicator, P4P project, Patient hierarchy indicator, Quality indicator system

Contact Details

Department of Medical Quality, E-Da Hospital

Administration Management

Changhua Christian Medical Foundation Yuanlin Christian Hospital

A New Era of Surgical Instrument Tracking Management

Overview

Surgical instrument or device supply is a high frequency, high stress event that ranks third in the source of stress for surgeons during surgery. The issue of surgical device supply accounts for approximately 15% of surgical adverse events. The first step to ensuring surgery safety and prevent surgery from being delayed due to improper preparation of surgical instruments is to have the right instruments and package tray.

The hospital made changes for more effective administrative management of surgical instruments, which are important tools in surgical procedures. The instruments are printed with a unique identification barcode, and automation technology and a big data integration system are used to track the source of instruments, in order to achieve positioning and management. This prevents the issue of incomplete cleaning and mottled barcode when using instrument identification tape on instruments in the past. Instruments have electronic ID that optimize the automation process and reduces error and the workload of personnel, while improving efficiency. It also achieves the core value of hospitals providing safe, efficient, and timely services and ensuring patient safety.

Benefit

The hospital uses laser ink technology to print a unique identification barcode on instruments, and the barcodes are scanned one by one when packaging instruments. The system will automatically match instrument information, and personnel can check the corresponding image, package tray arrangement, and instrument description using the package list and system monitor packaging function, thereby ensuring that instruments are accurately packaged. Benefits of implementation are as follows:

1.Reduced the number of incorrect packaging cases

- Before implementation: 367 cases/6 months, 61.2 cases/month.
- After implementation: 16 cases/6 months, 2.7 cases/month.

- Reduced the number of errors: 351 cases/6 months, 58.5 cases/month.

2.Reduced the cost of reprocessing instruments

- Before implementation: NT$110,100/6 months, NT$18,350/month.
- After implementation: NT$4,800/6 months, NT$800/month.
- Reduce cost: NT$105,300/6 months, NT$17,550/month.

3.Reduced the labor cost of reprocessing

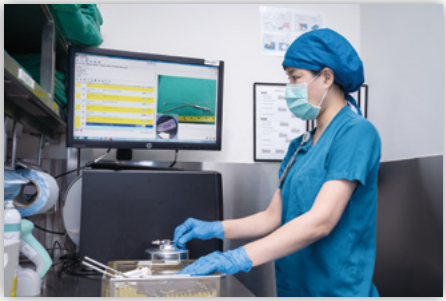
- Before implementation: 183.5 hours/6 months, 30.6 hours/month.
- After implementation: 8 hours/6 months, 1.3 hours/month.
- Reduced labor cost: 175.5 hours/6 months, 29.3 hours/month.

4.Improved the quality of training for new employees and systematic development

The combination of instruments list with multimedia function provides images of instruments or instructional videos and reminders of common errors when handling instruments. This increases the accuracy of the packaging process because personnel can immediately identify instruments and do not need to search for instrument information, saving manpower, reducing uncertainty due to being unfamiliar with instrument information, and effectively shortening the training period for new employees by 60-90 days, which is converted to NT$60,000-NT$90,000 in training cost.

5.Protect patient safety

- Rapidly provide monitoring data and inquiry of equipment, patient information, instrument information, and inventory management.
- Optimizes workflows and reduces workload of personnel.
- Rapidly finds instruments, reduces the probability of instrument damage, and prevents an increase in hospital cost. Can be further connected to the front-end requisition and procurement system and back-end asset management system, making administrative management of instruments more comprehensive.



About the Hospital

The initial purpose of the establishment of Yuanlin Christian Hospital is to satisfy the demands for local emergency and critical illnesses treatment. With the consideration of the great medical demands from the public and under the macro-planning of the President of Changhua Christian Hospital, Yuanlin Christian Hospital was established. The hospital has adopted the latest and highest standards in various aspects of medical care, software and hardware equipment, information technology, architecture space in order to construct a patient-based smart and green hospital.

Regarding the smart hospital development at Yuanlin Christian Hospital, computer-aided technologies have been implemented in order to increase the medical care quality and to reduce the possibility of human errors. Consequently, in all aspects of outpatient clinic, emergency clinic, hospitalization, examination and testing, operating room, administrative management etc., intelligent system has been gradually introduced. Yuanlin Christian Hospital has been awarded with “Smart Hospital Mark” by the Taiwan Joint Commission on Hospital Accreditation in 2018.

Keywords

Instrument identification, Laser marking technology, Surgical instruments, Single instrument, T-DOC instrument tracking management system

Contact Details

Department of Central Sterile Supplies, Changhua Christian Medical Foundation Yuanlin Christian Hospital

Cooperation Partners

FYC Intelligent Engineering Co.

Administration Management

Changhua Christian Medical Foundation Changhua Christian Hospital

Comprehensive Clinical Trial Research Ethics Review and Subject Care Integration System

Overview

The electronic application and review system was developed, implemented, and maintained by managers in the IRB Information Department. The hospital's "IRB electronic application and review system" was launched in July 2013. The system has been simultaneously updated with revisions to the hospital's review process and IRB SOP to ensure consistency between what is said, what is written, and what is done. The "IRB electronic application and review system" and "research project registration and subsidy system" are linked to each other. Only research projects that select human research in the "research project registration and subsidy system" can be submitted in the "IRB electronic application and review system." All items and data on the "IRB electronic application and review system" are imported into the "IRB administrative management system" of the hospital. IRB administrators can use the "IRB administrative management system" to carry out administrative operations and conduct statistical analysis of all operations.

Benefit

Timeliness of Approvals for New Projects

The average number of days to approval by the IRB after the system was launched was reduced from 103.7 days to 69.4 days for full-committee review, and from 49.2 days to 32.6 days to expedited review.

IRB Quality Monitoring

The achievement rate of administrative review ≦ 5 days, pre-review by secretary ≦ 2 days, and principal investigator notified of review results ≦ 10 days reached 99% after the system was established. Achievement rate of full-committee review ≦ 7 days reached 88%. The hospital's IRB has 15 KPI. The IRB can immediately export data needed for

analysis, and then carry out analysis and review during quarterly joint meetings.

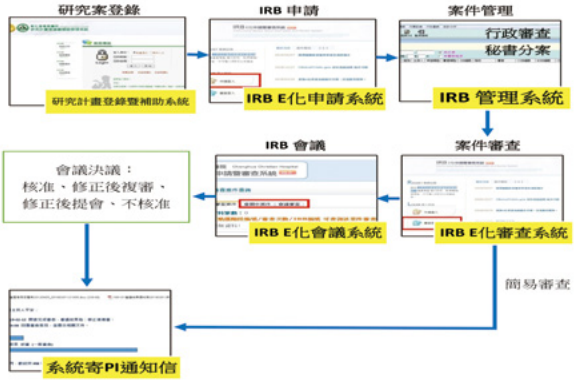
Vendor Satisfaction of IRB Review Efficiency

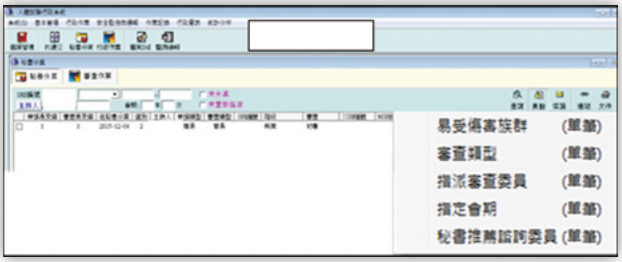
The Clinical Trial Center conducts a questionnaire survey on vendor satisfaction each year, and satisfaction with IRB review efficiency has increased each year from 80% in 2014 to 94.8% in 2019.

Other Intangible Benefits

1.After the system was launched, the review opinion form needs to be completely filled out before being submitted, ensuring that members review cases 100% according to the review opinion form.

2.Improving the meeting environment and storage space: Preparing paper documents for meetings was originally time consuming. The system made meetings paperless and more efficient after it was launched.





About the Hospital

Changhua Christian Hospital and hospitals in the system have a total of 8,500 employees and over 3,600 beds to form a complete healthcare network.

The hospital has expanded its overseas healthcare services in recent years, and engaged in healthcare diplomacy in coordination with the New Southbound Policy, sending medical teams to friendly countries in the Asia Pacific, West Asia, Latin America, and Southern Pacific, where they built relationships with the healthcare industry and donated supplies to improve the quality of healthcare services and professional skills.

Keywords

Clinical trial research ethics review, Human research project management, IRB electronic application and review system, IRB administrative management system, Research project registration and subsidy system

Contact Details

Institutional Review Board, Changhua Christian Medical Foundation
Changhua Christian Hospital

Administration Management

Far Eastern Memorial Hospital

Comprehensive Implementation of UDI Smart System to Improve the Performance of Medical Device Inventory Management and Surgical Instrument Management

Overview

After the hospital implemented the integrated SAP system in 2014, it went on to implement barcode technology for warehouse management, and automatically collects data on medical device delivery and acceptance, warehouse entry/exit, price calculation, and inventory.

The hospital developed a UDI system, ordering and acceptance system for low price medical devices, and tray packaging system that identifies the UDI engraved in surgical instrument, in order to accurately determine its inventory and improve the efficiency of warehouse management for medical devices and surgical instruments.

It also uses characteristics of UDI to track the way, number of times, and efficiency of using medical devices and surgical instruments in the hospital, providing data for application to improvement quality and patient safety.

Benefit

1.UDI implementation process

- The hospital developed a UDI inventory system, adjusted the operating room medical device management process, implemented barcode technology, reduced complex manual operations, and established a warehouse management center with dedicated management personnel. The hospital uses UDI information to link to the warehouse management system, and monitors incoming/outgoing medical devices and price calculation, achieving correct accounting entries while saving human resources.
- The hospital developed an ordering and acceptance system for low price medical devices. Besides directly reading information on the barcodes of medical devices, it can also connect to purchase order information in the warehouse management system to verify the quantity

and quality of medical devices purchased before entering them into the account book.

- The hospital engraved UDI into surgical instruments, and installed a tray packaging system that identifies the UDI and displays information of instruments on the tracking system, including instrument ID, name, and image. The transition from visual inspection to automatic identification improves the surgical instrument identification and tray packaging time.

2.Benefits of system implementation

- After the hospital began using the consignment stock UDI system for operating rooms, the number of medical devices omitted decreased from 392 to 24. The system reduced labor cost by NT$56,384 per month or NT$676,608 per year. It also reduces the workload on nurses and allows them to focus on their field of expertise.
- After implementing the ordering and acceptance system for low price medical devices, the average amount of time it takes to electronically enter medical devices into the account book was shortened from 6 hours to 12 minutes, and the accounts can be immediately verified using the barcode with 100% accuracy.
- The time it takes to make an order was shortened from 70 minutes to 10 minutes because the system automatically categories and sends e-mails for each purchase.
- After implementing the UDI system for surgical instruments, the error rate of instrument tray packaging decreased from 0.031% to 0% each month.
- The average amount of time spent searching and correct errors in tray packaging was 17 minutes and 40 seconds. After making improvements, personnel can immediately determine the error using UDI, improving the performance and correctness of surgical instrument tray packaging.

Reading UDI information on the barcode of surgical instruments

About the Hospital

Far Eastern Memorial Hospital shoulders the responsibility of emergency and critical care. It currently has 64 divisions, 2 centers, and a total of 1,408 beds. It provides over 6,500 outpatient services and nearly 400 emergency medical services each day, the fourth highest in Taiwan, and bed occupancy rate is maintained at 85% and above. There are standard operating procedures for all operations, and the hospital implemented ISO9001 quality management system as early as 2004. The hospital sets quality goals each year and passed care quality certifications of five disease.

The hospital encourages research and established 3 common laboratories, 1 animal laboratory, and a 24-hour electronic library that provides electronic services. The hospital publishes approximately 150 journal papers each year, in which at least 120 are SCI papers.

Keywords

Consignment stock system, Hospital developed UDI system, Medical devices and surgical instrument tracking system, SAP ERP, The ordering and acceptance system for medical devices, Unique device identification (UDI), Unique device identification of surgical instrument

Contact Details

Department of Supply & Material, Far Eastern Memorial Hospital

Cooperation Partners

Ding & Ding Management Consultants Co., Ltd, Prima Surgical Co., Ltd

Administration Management

Far Eastern Memorial Hospital

Comprehensive Epidemic Prevention and Health Management

Overview

COVID-19 has swept the world and preventing its spread is a matter of national security. Infection control is fundamental to hospital operations. The hospital took preemptive measures along with the government, and set up layers of control within a short amount of time, using smart technology to ensure that employees and visitors are not infected:

1. Tracking hospitalized patients with fever, pneumonia, and diarrhea.
2. Real-time monitoring of control processes when entering the hospital.
3. Employee (including part-time, contractors, and interns) health tracking.
4. Provides information to support decision-making and assist with resource reorganization.

Benefit

1. Tracking hospitalized patients with fever, pneumonia, and diarrhea

Due to the incubation period of COVID-19, the hospital tracks all hospitalized patients with fever, pneumonia, and diarrhea. The infection control center receives statistics of hospitalized patients with fever, pneumonia, and diarrhea through the analysis of medical records, IoT automatic uploading equipment, and the big data platform Tableau. It can also determine the length and cycle of the patient's pneumonia diagnosis.

2. Real-time monitoring when entering the hospital

When entering hospitals during the pandemic, visitors are required to swipe their National Health Insurance card or ID card, keep entry records, and fill out a TOCC survey form. The hospital created the QR code e-gate to shorten the time for entering the hospital (including card swiping on car lanes). This saves each person approximately 3 minutes, with 18,000 visitors each day and a QR code usage of 25%, this can save patients 5,062 hours each month.

The hospital's official Line account provides many convenient services. After the outbreak of COVID-19, the number Line members has rapidly increased from 1,500 to 54,000 members. The number of people using mobile payment has also rapidly increased, and the number of payments using e-health pay increased from 500 to 800 each week.

3.Tracking employee health

The hospital implements care by a single team, isolation and triage, and established automatic employee contact tracing. The medical order, nursing order, and dispensing system records the patient's medical record, bed number, and time of contact, so the patient's contact history can be immediately tracked when the patient is diagnosed with COVID-19.

Furthermore, employees record their temperature and symptoms, contact history of their family members, and other TOCC items in the health punch card system. The Occupational Safety Division tracks employees' health

condition each day on this basis to verify if there is any nosocomial infection.

4. Provides information to support decision-making and assist with resource reorganization

The number of people that enter through each entrance, fever screening station in the emergency room, and number of patients suspected of having COVID-19 and the location of their bed are provided on the data analysis platform, in order to analyze off/peak hours of services and the reasonableness of resource use, and achieve optimal allocation of human and material resources and beds.

About the Hospital

Far Eastern Memorial Hospital shoulders the responsibility of emergency and critical care. It currently has 64 divisions, 2 centers, and a total of 1,408 beds. It provides over 6,500 outpatient services and nearly 400 emergency medical services each day, the fourth highest in Taiwan, and bed occupancy rate is maintained at 85% and above. There are standard operating procedures for all operations, and the hospital implemented ISO9001 quality management system as early as 2004. The hospital sets quality goals each year and passed care quality certifications of five disease.

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Keywords

Data analysis platform, Decision support information, Health tracking, Infection tracking and controlling

Contact Details

Department of Planning, Far Eastern Memorial Hospital