

COVID-19 Epidemic Prevention Plan: Reducing the Operational Risk in Pharmacy by the Isolation and Triage Mechanism

Ya-Ling Wang

Kaohsiung Medical University Chung Ho Memorial Hospital

Ying-Hao Lu (✉ yhlu@kmuh.org.tw)

Kaohsiung Medical University Hospital <https://orcid.org/0000-0002-5885-4469>

Li-Yao Lee

Kaohsiung Medical University Hospital

Chen-Chun Kuo

Kaohsiung Medical University

Mei-Chiu Shen

Kaohsiung Medical University Chung Ho Memorial Hospital

Tang-Chia Chung

Kaohsiung Medical University Chung Ho Memorial Hospital

Yu-Sheng Hsu

Kaohsiung Medical University Hospital

Chun-Chen Lee

Kaohsiung Medical University Hospital

Jia-Hong Wang

Kaohsiung Medical University Hospital

Ching-Tzu Hung

Kaohsiung Medical University Hospital

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Abstract

Background: Taiwan medical centers mainly use "Central Pharmacy" to carry out pharmaceutical operations and human resources management. The pharmacy is a 24-hour medication supply center for all units in the Hospital. Therefore, how to make the pharmacy run continuously in the potential impact of COVID-19 pandemic is an important issue in the epidemic prevention of the medical center. The purpose of this study is to design to reduce the incidence of cross or cluster infection in the event of nosocomial infection and to maintain the continuous operation of pharmaceutical service.

Methods: The planning of "isolation and triage" of pharmaceutical operations is based on the epidemic level of COVID-19, the closing situation of outpatient service, the number of outpatients receiving medicine service and the number of inpatient beds.

Results: After the overall planning, in the case of the low epidemic level (level A1), the emergency pharmacy took advance deployment, and fixed personnel was assigned to work in fixed location in the isolation, while other units started the isolation mode in the case of the moderate epidemic level (level B). Grouping mode was added for the severe epidemic level (level C). Different management measures should be planned according to the different level of risk area evaluated by the infection control center.

Conclusions: In this study, the risk reduction management mechanism of "isolation and triage" was effectively used to make proper manpower allocation and work planning for all pharmaceutical service in Hospital.

Background

1. Isolation and Triage of Epidemic Prevention in Hospital

Since February 2020, COVID-19 has spread from China to other countries in the world, leading to an explosion of imported cases in Taiwan and a potential crisis of community infection. Therefore, epidemic prevention in hospitals has become particularly important. In general, triage is mainly based on patients, and the isolation is mainly based on hospital staff. As for the isolation and triage of inpatients, in addition to the negative pressure isolation ward, a special epidemic prevention ward should also be set up to treat suspected patients, and the principle of one room for one person should be followed. As for the related medical staff, it is necessary to divide the area to avoid cross-area working¹. The most important challenge of isolation and triage is the personnel allocation, because the more detailed the division, the more people are needed. An "isolation and triage" mechanism allows COVID-19 to be "well-managed". After the work in the hospital has been "grouped", if there is a nosocomial infection, the scope of isolation area and the number of isolation personnel will be relatively reduced. This mechanism has become the key to keep the medical workforce in operation during the epidemic of COVID-19. Taiwan Central Epidemic Command Center (CECC) required hospitals to propose an "Isolation and Triage" plan during the epidemic prevention period of COVID-19 [1].

2. Current Pharmaceutical Services in Hospital

To effectively manage and distribute the pharmacy manpower in Taiwan medical centers, the mode of “Central Pharmacy” has been adopted in the past 10 years, and the “patient-centered” mode has been designed to plan the manpower distribution in each workplace of the pharmacy. The pharmacy is a medication supply center for all units of the hospital (e.g., outpatient and emergency, hospitalization, surgical treatment, chemotherapy and TPN), and continues to provide clinical pharmacy and drug counseling services. Therefore, the pharmacy must ensure that medicines to be available and distributed to hospital patients during an emergency such as pandemic [2]. In addition, in order to meet the modern needs of various pharmaceutical operations, the pharmacy has a number of large-scale operating equipment (e.g., oral drug packaging machines, powder grinding machines, dispensing tables, BSC (Biological Safety Cabinets) for chemotherapy, TPN (Total Parenteral Nutrition) sterile operation tables, mobile drug storage cabinets and drug refrigerators). They are all fixed devices, and they are indispensable elements in modern pharmaceutical service [3]. Taking the Hospital as an example, by March 2020, there were 125 pharmacists in charge of the above work. Therefore, under the limitation of immovable environmental equipment, how to effectively plan the manpower of each unit in the pharmacy in the face of the COVID-19 outbreak and make the sustained operation and service of the pharmacy to provide the most basic pharmaceutical services become an important issue in the epidemic prevention work of the medical center [4,5].

3. Research Purposes

By planning the isolation and triage of pharmaceutical service in different epidemic levels, the incidence of cross or cluster infection in the event of nosocomial infection is expected to be effectively reduced, and sufficient pharmacy services can be maintained.

Methods

1. Term Definition and Evaluation Items

Working in different buildings means that people work in different buildings. If one building is closed due to severe infection, the energy of working in another building can be retained. Working in an isolation means that people work in a fixed place instead of changing places. Working in groups means dividing people into two or more groups; while one group is at work, other groups are on standby at home. Working at different times means that people go to work at different times on the same day.

Due to the positive correlation between the manpower allocation and work planning of the pharmacy and the “medical service volume”, the medical service volume was mainly evaluated based on the number of outpatients receiving medicines and the number of inpatient beds. In addition, the epidemic level of COVID-19 was combined with the epidemic situation and the outpatient closing situation to plan for isolation and triage (Table 1). There are seven work areas and three administrative areas, which are distributed in four different buildings and four different floors.

2. Countermeasures for Risk Management

According to the “Operation Manual for Risk and Crisis Management” [6], the Infection Control Center of the Hospital took “risk reduction” as the main countermeasure for risk management in this study. Its definition of risk reduction was to use appropriate techniques and management principles to reduce the risk or its probability of occurrence. Moreover, it combined with the current epidemic situation of COVID-19 to adopt the main management measures of “working in different buildings, areas, groups and time” (hereinafter referred to as “Isolation and Triage”). There were other countermeasures of risk management designed in other pharmaceutical services. The risk avoidance meant to decide not to get involved in a risk situation or decide to get out of the situation, such as suspended pharmacy service in Hospital. The risk retention was to bear the loss caused by the risk intentionally or unintentionally, or to be responsible for the property loss of the organization, such as setting up standard for personnel and environmental cleanliness [7].

Results

When it is at low epidemic level (level A1) of the Hospital, it is planned in advance that fixed personnel were assigned to only work in the Emergency Pharmacy. When it is at the moderate epidemic level (level B), personnel of all units should work in fixed locations. When it is at the severe epidemic level (level C), personnel should work in groups except for the emergency pharmacy. Due to the closure of C10F (Red Zone) in the chemotherapy preparation room, the outpatient chemotherapy operation was suspended, and only the inpatient chemotherapy prescription was dispensed, so we planned to transfer the patients undergoing chemotherapy to E21F in another building. Pharmacists in the administrative areas should work in different buildings at level B, and be added to group at level C, because they are not limited to the factors of large immovable equipment. The outdoor dispensary was set up for patients only returning to the Hospital with refilling prescriptions. The planning and personnel assignment of isolation and triage of each unit in the pharmacy are listed in Table 2.

After the on-site investigation and discussion by the nurses of infection control, it was assessed that the chemotherapy preparation room was located at C10F, near C11F negative pressure isolation ward, which is a high-risk area where all personnel must be evacuated. When C10F was closed, outpatient chemotherapy was suspended, and inpatients chemotherapy preparation was transferred to E21F in another building. In addition, two new BSCs that can be operated independently were urgently purchased. The Emergency Pharmacy is the medium risk area due to be at Emergency. The isolation of fixed staff was necessary, starting with Level A1. The outpatient dispensary, drug consultation room and the outdoor dispensary that patients get medicine with refilling prescriptions are the medium-to-low-risk areas. The staff in this risk area will go to or leave work through the individual entrance, and a separate dining area will be set up. Others are low risk areas. Based on the different level of the risk area, different management measures (Figure 1).

Discussion

During the planning process, the outpatient service volume at level B was estimated to decrease by only 20%, so the proportion of manpower in the outpatient pharmacy in the isolation but not in groups was 49.6%. Once an outpatient pharmacist is diagnosed with an infection, there will be a shortage of manpower when the other outpatient pharmacists need to be isolated. The emergency alternative is to make a minimum of 20 people to work overtime and extend the waiting time of patients when it is necessary. Personnel shall be transferred on a proportional basis from other units of the pharmacy.

According to the data of the Hospital in 2019, the number of patients receiving the refilling prescriptions for chronic disease accounts for 23.3% of the total number of medication recipients. Therefore, in order to reduce the risk of hospital infection and hospital cluster infection for the people who return to the hospital for only taking medicines of chronic diseases, it was planned such patients to receive medicines outside. First, through the reservation online system, people can use computers or mobile phones to book online or with the assistance of the nursing staff in the clinic. The pharmacy will complete the drug dispensing one day before the designated drug receiving date. People only need to take the health insurance card and the refilling prescription to the designated place for outdoor dispensing area on the designated date. It is about 3-5 minutes, which shortens the waiting time of patients. In addition, special lanes for cars were also planned like Drive-Through [8], which is convenient for driving population to refill the medicine.

Apart from the “isolation and triage” as the main operation process planning, various pharmaceutical services can be reviewed. Some non-urgent main operations can be suspended at level B or level C after evaluation, and they can be resumed after the end of the epidemic (Table 3). This plan can achieve the effect of risk avoidance. In addition, the manpower saved from the suspension of business can be allocated to the overall manpower planning of isolation and grouping, such as outpatient pharmacy business with more manpower demand. After the personnel and working environment of the pharmacy were assessed, relevant cleaning standards were developed to prevent the personnel of the pharmacy from being infected (Table 4) [9], due to environmental pollution under the daily risks, so as to achieve the purpose of risk retention.

Conclusions

In this study, the risk reduction management mechanism of “isolation and triage” was effectively used to make proper manpower allocation and work planning for all pharmaceutical services, and it was hoped that the pharmacy could still ensure the basic drug supply when the pharmaceutical staff was diagnosed with infection through the management measures of “isolation and triage”. This study can also be used as a reference for “isolation and triage” planning of pharmaceutical service when other medical centers are faced with COVID-19 or other emerging infectious diseases.

Declarations

Ethics approval and consent to participate

Because this study did not involve the data of human subjects, the need for ethics approval and consent was waived by the IRB of Kaohsiung Medical University Hospital.

Consent for publication

Not applicable.

Availability of data and material

The data that support the findings of this study are available from the HIS of Kaohsiung Medical University Hospital.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

YLW and YHL contributed equally to the conception and design of the work and to write the manuscript. LYL, CCK and MCS contributed equally in the literature review and collecting and analysis of the data/information. TCC, YSH, CCL and JHW provided actual advice and quality control during the entire study process. CTH provides the professional support of infection control. All authors have read and approved the final manuscript.

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Abbreviations

TPN: Total Parenteral Nutrition; BSC: Biological Safety Cabinets

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Tables

Table 1 Epidemic Situation and Service Volume Assessment

Epidemic level		0	A1	A2	B	C
Epidemic situation		There is the first community transmission case outside the City where the imported source of infection cannot be found.	There is the first confirmed case of hospital-acquired infection in Taiwan.	There is the first community transmission case in the City where the imported source of infection cannot be found.	There is the first confirmed case of medical staff infection in the City or the first confirmed case of hospital-acquired infection in the City	There is the first confirmed case of medical staff infection in the Hospital or the third confirmed case of medical staff infection in the City
Closing situation		January 2020	From February 2020 to April 2020		Outpatient Department on Saturday & Evening Clinic	Outpatient Department on Saturday & Evening Clinic
Service volume	Number of outpatient receiving medicines per day	4,844	↓10.1%		↓20%	↓50%
	Number of inpatient beds per day	1,111	↓12.6%		↓20%	↓50%

Table 2 Planning and Personnel Assignment of Isolation and Triage of Each Unit in the Pharmacy

Epidemic Level	0	A1	A2	B	C
Emergency Pharmacy	Current situation	Isolation (6.0%)*		Isolation (6.0%)	Isolation (6.0%)
Outpatient Pharmacy		Current situation	Preparation	Isolation (49.6%)	Isolation & grouping (24.8%)
Inpatient Pharmacy				Isolation (17.1%)	Isolation & grouping (8.6%)
Chemotherapy Preparation Room				Isolation (4.3%)	1. Isolation & grouping (2.2%) 2. C10F will be closed. Inpatient chemotherapy preparation will be transferred to E21F.
TPN Room/Liquid Agent Room				Isolation (1.7%)	Isolation & grouping (0.9%)
Drug Storage Room				Isolation (4.3%)	Isolation & grouping (2.2%)
Chinese Medicine Pharmacy				Isolation (3.4%)	Isolation & grouping (1.7%)
Administrative Division (3 in total)				Separation in different buildings (13.7%)	Separation in different buildings and grouping (6.8%)

*: the percentage of all pharmacists

Table 3 Suspended Pharmacy Service for Level B/Level C

Item	Types	Level B/C	Work content
1	Allocation of sterile preparations	B/C	Only pediatric and HPN cases will be deployed, and the rest will be converted to commercial formulations.
2	Drug inspection	B/C	Drug inspection of all units is suspended.
3	Clinical pharmacy	C	The drug consultation room is closed at E1F, and online consultation by telephone is adopted.
		B/C	Clinical pharmacists do not go to the ward and they contact by online operation or telephone and pharmacist clinic is suspended.
			The pharmacist consultation in all the wards is suspended. Instead, the system is used for direct communication and reply. The pharmacist does not go to the ward.
4	Drug distribution	B/C	A large number of fluid infusion distributions are suspended on Saturday.
5	Traditional Chinese drugs dispensing	C	Consultation of traditional Chinese medicine and dispensing has been suspended.

Table 4 Standard for Personnel and Environmental Cleanliness

Personal	Cleanliness standard
Work clothes	General work clothes shall be changed and cleaned at least a week; emergency pharmacists shall wear protective suits at work.
Wearing a mask	The mask can only be taken off when drinking and eating. Dirty or wet masks shall be discarded.
Taking temperature	The temperature shall be taken twice a day and recorded in the computer system. See a doctor in time if there is a fever or respiratory symptom and inform the supervisor.
Washing hands	Standard hand washing procedures shall be followed.
Having meals	Separate meals are required, and no conversation is allowed during the meal. After the table is cleaned, the next group can have the meal.
Personal environment preparation	Drink water at work and wipe personal work area, especially the keyboard and desktop with 75% alcohol at least once a day.
Environmental	Cleanliness standard
Outpatient and emergency dispensary and drug consultation room	Wipe the tabletop with 75% alcohol once every half an hour.
The medicine cart of the ward	First, disinfect it with 75% alcohol once in the cross-connecting area of the inpatient pharmacy, then push it to the operation area for drug withdrawal, and then disinfect it again once after the completion of the operation.
Entrance and exit of each area	Arrange the operator on duty to disinfect the door and handle with 75% alcohol at least twice a day.
Inter-area delivery	The deliverer shall not stay in each unit for more than 15 minutes.

Figures

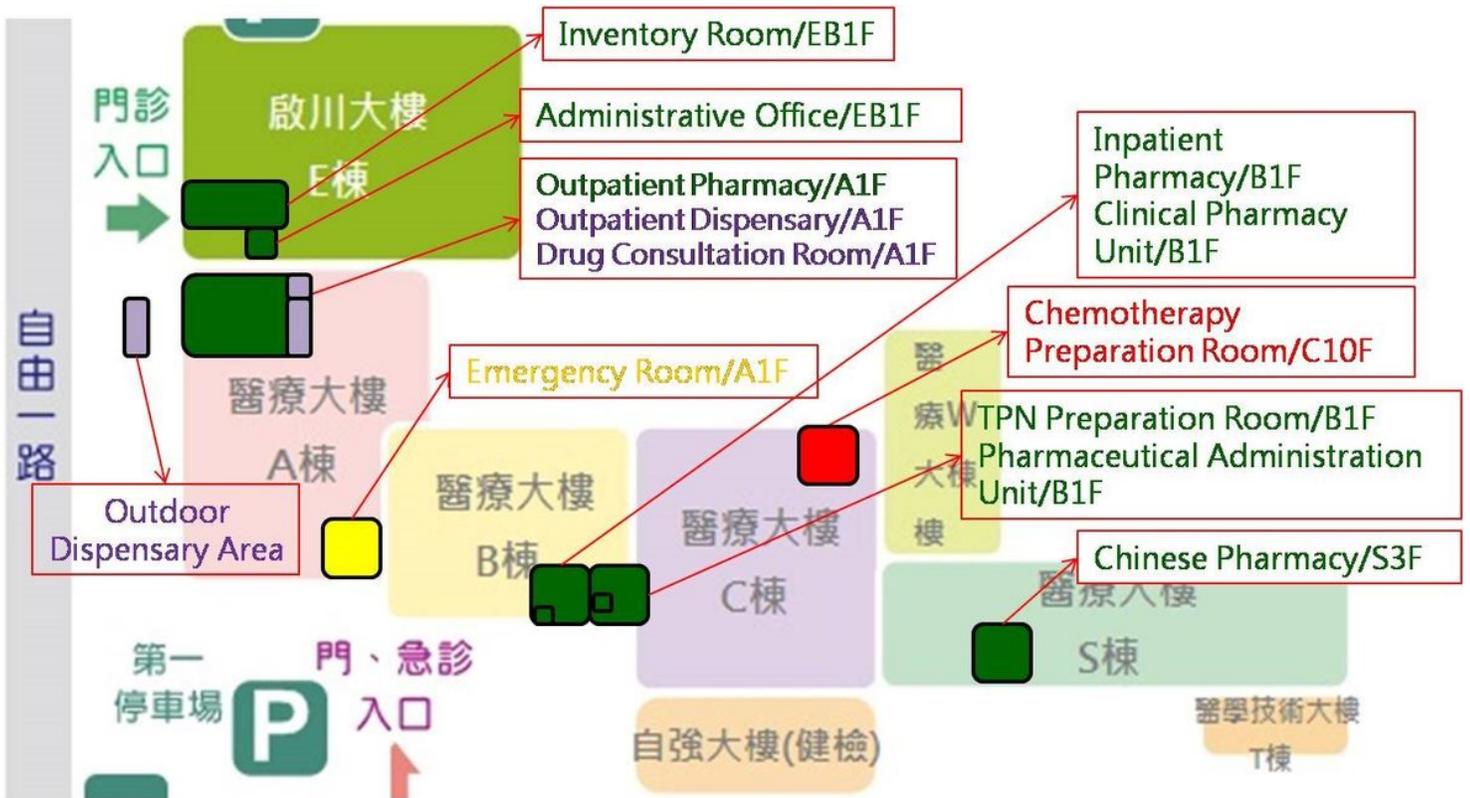


Figure 1

Different management measures based on the different level of the risk area.