



SPECIAL ARTICLE

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**The pharmacy service facing the logistics of safely dispensing, storing and preserving drugs in healthcare units**

**El servicio de farmacia frente a la logística de dispensación, almacenamiento y conservación segura de medicamentos en unidades asistenciales**

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**Abstract**

In response to the SARS-CoV-2 pandemic, the Hospital Pharmacy Services have quickly adapted to respond to a critical situation characterized by the constant and continuous admission of patients with severe pneumonia who needed treatment, requiring a transformation of the hospital in order to increase the number of hospital and critical beds. Moreover, other out-of-hospital spaces have been transformed into hospitalization units to absorb the large number of patients that had to be treated and isolated.

To guarantee the distribution of medicines and the quality of the pharmaceutical care, drug distribution systems, such as unit dose and automated dispensing systems, have undergone transformations. Standard stocks were assigned for COVID units, and different dispensing circuits to avoid the risk of cross-contamination between COVID and non-COVID units were created, as well as disinfection protocols for medication transport systems and medication return protocols. All this without forgetting COVID treatment protocol's changes that were affected by the availability of the drugs.

The increase in the number of beds in out-of-hospital spaces, such as field hospitals, hotels, socio-medical centers and nursing homes, has

**Resumen**

Ante la pandemia por SARS-CoV-2, los servicios de farmacia de los hospitales se han adaptado rápidamente para dar respuesta a una situación muy grave caracterizada por el ingreso constante y continuo de pacientes con neumonía que necesitaban tratamiento, siendo necesaria una transformación del hospital para poder aumentar el número de camas de hospitalización y de críticos que se requerían. Asimismo, otros dispositivos extrahospitalarios se han transformado en unidades de hospitalización para absorber el elevado número de pacientes que debían tratarse y aislarse.

Para garantizar la distribución de los medicamentos y la calidad de la atención farmacéutica, los sistemas de distribución de fármacos, como la unidad dosis y los sistemas automatizados de dispensación, han sufrido a su vez transformaciones. Se diseñaron stocks estándar para las plantas COVID, y circuitos de dispensación diferentes para evitar el riesgo de contaminación cruzada entre plantas COVID y no-COVID, así como protocolos de desinfección de los sistemas de transporte de medicación y protocolos de gestión de las devoluciones de medicación. Todo esto sin olvidar los cambios en los protocolos de tratamiento de la COVID que se vieron afectados por la disponibilidad de los fármacos.

El incremento del número de camas en dispositivos extrahospitalarios, como hospitales de campaña, hoteles, centros sociosanitarios y residencias

**KEYWORDS**

Hospital pharmacy service; Coronavirus; SARS-CoV-2; Pandemic; Hospital drug distribution systems; Crisis intervention.

**PALABRAS CLAVE**

Servicio de Farmacia Hospitalaria; Coronavirus; SARS-CoV-2; Pandemia; Distribución de medicamentos; Intervención durante crisis.



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challenged Pharmacy Services, since new medication dispensing and conciliation circuits have been created forcing the increase of pharmacy staff's presence and modifying work shifts, to afford all the new tasks successfully.

Development of contingency plans for the different Pharmacy Service activities and providing fluent communication channels are key elements for crisis situations or health emergencies such as the current pandemic.

## Introduction: challenges and objective

The SARS-CoV-2 pandemic has put an unprecedented strain on the health system and forced hospitals to rapidly reorganize to respond to an extremely critical situation.

Hospitals adapted their structures to host a massive inflow of patients with SARS-CoV-2 pneumonia. Hospitalization wards were transformed, intensive care units (ICUs) were extended, and the number of beds was increased at an astonishing rate. To such purpose, some spaces were repurposed as hospitalization and critical care wards, including sports centers, exhibition centers, and hotels, to name a few. The capacity and activity of healthcare centers increased dramatically<sup>1</sup>.

The critical extremely demanding health crisis forced pharmacy services (PS) to adapt at an amazing speed to meet new demands, with a set of specific goals:

- Guaranteeing the timely dispensing of the right drugs in the right form.
- Guaranteeing access of inpatients and outpatients to quality pharmaceutical care.
- Guaranteeing a stock of drugs to meet all needs.
- Guaranteeing the quality of the drugs dispensed.

## Strategy developed for in-hospital drug dispensing

### Distribution of work areas

A relevant strategy was the compartmentalization of PS work areas; in other words, the separation of spaces for the differentiated dispensing of drugs to COVID and non-COVID wards.

Another strategy was the transformation of care units (hospitalization wards and critical care units) into units for COVID patients, which forced the creation of new dispensing cycles<sup>2</sup>.

### Drug dispensing

Drug dispensing activity increased by 40% as a result of the addition of new hospitalization and critical-care beds.

#### COVID hospitalization units

##### - Unit dose and floor stock dispensing

In the COVID hospitalization ward, unit dose dispensing was performed as usual, with special attention being paid to returned drugs, which were stored in a separate drawer of the floor stock. Before entering the PS, unit-dose trolleys were disinfected with a 0.1% hypochlorite solution.

The floor stock was adapted by replacing unnecessary drugs with COVID therapies. Restock requisitions were computerized.

##### - Automated dispensing system (ADS)

In our hospital, ADS is in operation in a large number of wards. As wards were transformed into COVID units, stocks had to be adapted.

A standard floor stock was designed for COVID hospitalization wards according to the number of beds. ADS was adapted to the new stock. In some cases, as the demand for drugs increased dramatically, an additional space was established to complement ADS.

geriátricas, ha sido un reto para los servicios de farmacia, ya que se han tenido que crear nuevos circuitos de dispensación y de conciliación de la medicación, obligando a reforzar la plantilla del servicio de farmacia y modificar los turnos de trabajo, estableciendo guardias presenciales para poder llevar a cabo todas las nuevas tareas con éxito.

La elaboración de planes de contingencia de las diferentes actividades del servicio de farmacia y el establecimiento de canales de comunicación fluidos son elementos clave para situaciones de crisis o emergencias sanitarias como la actual.

#### Non-COVID hospitalization wards

The unit dose system used in non-COVID wards required the creation of a differentiated PS space for the preparation of drugs handled outside the COVID dispensing cycle and directly taken from the store. Individualized unit doses were prepared in bags labeled with the name of the patient and distributed in a disposable box rather than in the trolley to avoid cross contamination.

#### Intensive care unit

In ICUs, ADS spaces were redistributed to face the huge demand of sedatives and analgesics. ADS items changed continuously, as shortages forced the use of other forms of presentation.

A standard stock valid both for ICUs with and without ADS was defined.

An added problem of ICUs and hospitalization wards was the replacement of medicines as a result of scarcity. The backlist of dispensing pumps had to be updated continuously to include the new forms. A constant updating of protocols was performed as new evidence emerged and drug availability changed. The purpose was to standardize operating procedures and reduce the risk of errors to the maximum.

#### Field hospital

The need for more space for COVID patients drove health authorities and hospital management boards to repurpose social spaces. Thus, sports and exhibition centers were transformed into hospital extensions and were fitted out to provide healthcare services of the same quality as hospital services. In this sense, PS designed large-volume stocks of drugs and solutions, crash and unit dose dispensing trolleys to meet the new needs.

In our hospital, the Vall d'Hebron sports center, located in front of the hospital, was converted into an extension of the hospital. The volleyball court was transformed into a 130-bedded hospitalization ward distributed in six sectors. Two drug stocks were designed for the whole new center, although medication was prepared in unit doses in the PS. As in hospital wards, prescriptions were electronic. Medicines were prepared in unit doses packaged in individual bags and were transported in disposable boxes instead of unit dose trolleys. The extension worked as another hospital ward.

## Training and education on the computerized electronic prescription and dispensing system

Another characteristic of the pandemic was the need to train new or reallocated staff in the use of electronic prescribing and dispensing systems. To such purpose, graphic handbooks were designed.

## Drug return management

In the floor stock and unit dose system, drug returns generally re-enter the distribution cycle after stock and inventory control movements are completed. However, there was uncertainty in COVID wards about the management of drug returns during the pandemic. Best practices indicate that the nursing staff must adopt the measures necessary for the correct handling of drug returns in any situation. All in all, some caution measures were adopted:

- Drugs that have been in a COVID room cannot be taken out of the room. Disposal of unused drugs must be made inside the room.
- Returned unit dose boxes re-enter the dispensing cycle in COVID wards but never non-COVID wards.
- ADS returns are re-entered in the same dispenser when replenished.
- If a high number of drugs are returned or a COVID ward is repurposed as a non-COVID ward, the returned drugs are stored in closed bags and quarantined for at least 12 days.

## Cleaning and disinfection

Cleaning and disinfection protocols were designed and later reviewed and approved by the Service of Preventive Medicine of the hospital to ensure that drug transport and storage devices were COVID-free. This protocol detailed the disinfectants that could be used (70° alcohol and 0.1% sodium hypochlorite) and described the procedure for cleaning unit dose trolleys, ADSs (when they are where they were located passed from a COVID to a non-COVID area, and vice versa) and floor stock storing devices.

## Strategy developed for the logistics and dispensing of drugs to other healthcare devices

Some patients with SARS-CoV-2 infection seen in Emergency Rooms (ER) were not hospitalized but needed to be dispensed COVID medication. A specific dispensing cycle was designed for the dispensing of drugs to patients in the PS prior to discharge, as follows: an electronic prescription was issued in the ER. The PS was contacted and instructed to prepare the medication (the whole treatment or the medication needed to complete the treatment), which was delivered to the patient in the ER.

PCR was performed in onco-hematologic and some immunosuppressed patients with COVID symptoms seen in ER. These patients were discharged before PCR results were available. In case the test was positive, the treating physician issued an ambulatory electronic prescription, contacted the patient, and a relative picked up the treatment in the area of ambulatory dispensing of the PS.

Several discharge destinations<sup>3</sup> and referral cycles were established, as follows:

- Hotel discharge. A total of 477 patients were discharged to a hotel. Social workers contacted the PS to report cases candidates for hotel quarantine. The PS had two hours to reconcile medication at discharge and prepare the medicines. After the drugs required to complete the COVID treatment along with lifelong therapies were delivered to social workers, the patient was transferred to the hotel with their medicines. After 48 h, the PS was responsible for the dispensing of lifelong therapies.
- Discharge to nursing homes. When a patient was transferred to a nursing home, it was the nursing home who dispensed COVID and lifelong treatments, since they had a stock of COVID medication that had been previously delivered by the hospital. Only outpatient dispensing was provided. In total, 302 patients were transferred to nursing homes.
- Elderly homes and extrahospital centers. The Servei Català de la Salut issued some regulations<sup>4</sup> and designed a dispensing cycle for COVID medicines to be delivered from the hospital of reference.

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COVID therapies were dispensed to 70 elderly homes. These medicines were prescribed by the physicians of elderly homes and intermediate care centers. The health district received requisitions for COVID drugs and dispatched them to the PS of the hospital of reference on a daily basis. The PS prepares therapies in individual bags labeled with the name of the patient. Medication was delivered to these centers aggregately by hospital transport within 24 h from the date of receipt of the requisition. The confidentiality of data was guaranteed through the whole process.

## Strategy developed for human resource management

PS staff was reinforced and work shifts were modified to meet the increase in activity and flows and guarantee staff protection. Two PS teams were created, a telepharmacy and a face-to-face pharmacy team. Work shifts of PS technicians were increased to four to guarantee social distancing, the night shift was reinforced with face-to-face pharmacy care, and PS operators were doubled.

## Significant differences with other autonomous communities

Similar logistics and dispensing systems were established in other PSs of Madrid and the Basque Country, with some variations based on the guidelines of the local authorities and hospital protocols (dispensing to internal and external care units, cleaning protocols, and drug returns, to name a few) to guarantee the provision of quality and safe healthcare.

## Lessons learned. Future applicability in pharmacy services

Our priority was to guarantee a quality safe pharmaceutical care. To such purpose, work plans were designed where the coordinators of each area were designated. This way, the variety of dispensing cycles and adaptations required by the crisis could be confronted.

Another essential element is communication inside and outside the PS, which is essential in rapidly changing situations. In this setting, information and communication technologies were crucial and will be crucial in the future.

In addition, it is necessary that contingency plans are designed for drug procurement, prescribing, preparation and dispensing, among others, to facilitate adaptation to situations of crisis or health emergency.

Finally, in our case, cooperation with all local health resources was crucial (other hospitals, nursing homes, elderly homes, primary care centers, to name a few). To such purpose, the establishment of official communication and information channels is essential.

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