Developing a telepharmacy programme with home medication dispensing and informed delivery in a tertiary hospital: description of the model and analysis of the results

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INTRODUCTION

The pandemic caused by coronavirus SARS-CoV-2 (COVID-19) in March 2020 forced the Spanish authorities to place the entire population into lockdown. This historic event increased the pressure on Spanish healthcare services and forced new organisational measures to be implemented in hospitals to ensure the care of all patients. In addition to the general dispensing of medication undertaken by pharmacies in Spain, hospital pharmacy services (PS) also dispense some specific medications to outpatients. Ensuring treatment continuity and avoiding the risks associated with hospital visits became fundamental objectives for PS, as well as providing an opportunity to promote the development of telepharmacy (online pharmaceutical assistance) and new ways of remotely dispensing hospital medications, such as delivery to community pharmacies, health centres or patients’ homes.

As regards the legal framework, with the declaration of the state of alarm in Spain based on Royal Decree 463/2020 of 14 March for the management of the health crisis situation, provisions for dispensing and administering medicines within the scope of the Spanish National Health System (SNS) were established nationally for the first time. Under Article 4.3 of the Royal Decree, the Spanish Ministry of Health passed Order SND/293/2020 of 25 March (Official State Gazette, BOE, of 27 March), authorising the competent body for pharmaceutical provision in each Autonomous Community to establish appropriate measures to ensure the dispensing of these medications outside hospital premises (point 3). Then, in May 2020, the Spanish Society of Hospital Pharmacy (SEFH) published its position on telepharmacy, the definition of which includes a remote pharmacy practice approach through the use of information and communication technologies (ICT). Telepharmacy has been incorporated as a strategic line of care in the Spanish healthcare system. However, despite its enormous potential, there are serious limitations in its development and application, especially in terms of the regulations at a national level on remote medication dispensing and informed delivery. Accordingly, the document ‘Strategic Framework in Telepharmacy’ from the MAPEX (Strategic Outpatient Pharmaceutical Care Map) project by SEFH has established the
objectives and methodology for successful implementation in the
different PS. This document also outlines the strengths of
telepharmacy, as well as its limitations: risk of excluding certain
patient profiles, guarantee of confidentiality and data protec-
tion, and coordination and alignment problems with other
healthcare professionals. Therefore, equal access must be guar-
anteed by avoiding discrimination against patients on the basis of
pathologies, age or socio-economic circumstances; by ensuring
remote assistance through an adequate legal framework; and by
carrying out educational work in search of synergies between
patient associations, public administrations and other healthcare
professionals.

This study aims to describe the actions taken to implement
a telepharmacy programme with home medication dispensing
and informed delivery in an outpatient pharmaceutical care
unit (OPCU) of a tertiary hospital, where approximately 5000
patients are treated per year. It also aims to substantiate the
applicability and benefits of the programme by analysing the
findings and measuring patient satisfaction.

METHODS

Literature search methodology

References were searched using the terms “Telepharmacy”,
“Teledicine”, “Home delivery” and “Hospital pharmacy” to
select successful experiences, to design a pharmaceutical care
model on-site/distance with dispensing and delivery of medicines
from a distance. The PubMed database was searched without
restrictions; in addition, the reference lists of important studies
and reviews were hand searched. Available abstracts and oral
communications from the conferences of the European Journal
of Hospital Pharmacy (EJHP) were also reviewed. Recommendations from different scientific societies were included.

Description of the home delivery programme

Operational and logistical elements

A standard operating procedure (SOP) was developed, which
was approved by the centre’s management. The need for human
resources was defined. The physical spaces required to ensure
proper remote pharmaceutical care, as well as for medication
preparation and storage, were determined. The time at which the
patient would receive in-person care was defined. The different
actions carried out were recorded in the patient’s clinical history.
The periodicity of deliveries was determined, as well as the
location, based on the requirements established by the logis-
tics provider. A workflow adapted to the care environment
was drawn up based on this analysis for telematic patient care
(figure 1).

Incidents identified in the process by the logistics operator
were communicated to the responsible pharmacist by telephone
at the time. In the same way, the patient contacted the PS if an
issue occurred.

In light of the pandemic situation, a patient home delivery
model was chosen. Transport services were provided by an
external provider. This transport model was determined by the
financing model, which was chosen by the hospital centre’s
management.

Technological aspects

Patients were contacted by telephone as it was the most widely
installed means used by all patients.

A Microsoft Access 2010 database was created in the PS for
recording and planning hospital medication deliveries, as well
as for scheduling the pharmacotherapeutic follow-up. The

Figure 1 Workflow for medication dispensing and informed delivery for
telepharmacy assistance. PS: pharmacy service; SMS: short message service/ text.

programme included patient data: name, age, sex, address, tele-
phone number, Spanish Population Information System (SIP)
number, medication and dosage regimen. A master drug list was
included alongside an appointment schedule that enabled the
units being dispensed to be calculated and successive medication
deliveries to be planned. In addition, this application made it
possible to record incidents and extract activity indicators, as
well as information on the profile of the patients (demographic
data, type of medication, distance to the hospital) and the char-
acteristics of the deliveries (thermolability). These data and the
Google Maps application were used to estimate the distance and
mean time between the locality of each patient and the hospital
PS if they had travelled in their own vehicle.

Training, information and coordination with the care team and
patient associations

Training sessions were held for PS staff. Information on the
telepharmacy programme was disseminated through different
communication channels, such as the corporate website, social
media (Twitter) and conventional media (television, radio and
newspapers), as well as to prescribing doctors and the Patient
Association of Multiple Sclerosis (AEMC) of the hospital
area. Prior to the inclusion of the programme, the pharmacist
trained the patient during a pharmaceutical care consultation.
A leaflet was prepared to inform patients about telepharmacy,
how it works and the technological requirements, as well as the
programme inclusion criteria (online supplemental 1).

Description of the study

To verify the model’s usability and implementation, an observa-
tional, prospective and descriptive study was undertaken, which
included the patients treated by this remote model between the
months of July 2020 and January 2021.

Patient profile

The following inclusion criteria were considered: the chronicity
of treatments (>6 months), adherence (an adherent patient was
considered: adherence >80%) in the last 6 months, measured by

the dispensing record), as well as the proper understanding of the information on the telepharmacy programme and signing an informed consent form.7

Based on the human and economic resources available, at the beginning of the project, priority was given to older patients (>65 years), distance to the hospital centre (patients not residing in the hospital’s municipality), disability or dependency. Neither pathology nor medication were taken into consideration. Likewise, exclusion criteria were established: non-compliance with remote consultations, not being at home to receive the medication and individualised master formulas.

Assessment of patient satisfaction
To assess patient satisfaction, a telephone survey was conducted in January 2021 which included 134 randomly selected patients. The survey was carried out when contacting the patient to arrange for a new medication delivery. The survey was based on the Enopex questionnaire.9

Legal aspects
The study was approved by the local Clinical Research Ethics Committee, in accordance with the principles of the Declaration of Helsinki. All patients with inclusion criteria who agreed to take part in the telepharmacy programme were required to sign an informed consent form authorising the use of their personal data, both for remote care and for medication dispensing and informed delivery. This consent form was drafted by the PS and endorsed by the hospital’s legal department. This document was digitised and included in each patient’s medical record.

The confidentiality of the treatment was guaranteed at every stage of the process, in compliance with Spanish Organic Law 3/2018 of 5 December on the Protection of Personal Data and Guarantee of Digital Rights.

Statistical analysis
Quantitative variables were expressed as mean and SD when they followed a normal distribution, and if not, median and interquartile range (IQR) were used. Categorical variables were shown with frequency and percentage. Statistical analysis was performed using Stata 14.2 software.

RESULTS
Of the 91 citations obtained from PubMed, 19 fulfilled were included and four citations were hand searched.

One pharmacist, one administrative assistant and one pharmacy assistant was established as telepharmacy personnel. Pharmaceutical care (face to face and telepharmacy) was done in the pharmacist’s office and medication preparation and storage at the OPCU store. A remote appointment schedule was created. The time at which the patient would receive in-person care coincided with their in-person medical consultation at the same hospital centre. Daily deliveries were set up based on the healthcare area.

The workflow defined was the following: 1–2 weeks before delivery an administrative assistant contacts the patient by telephone to arrange the day of the delivery. Next, the pharmacist does remote pharmaceutical care (resolves any doubts about the medication, identifies potential interactions, etc.) and validates the prescription and drug delivery. One day before the delivery, a PS assistant and an administrative assistant prepare and record the dispensing of the medication and an automatic short messaging service or text (SMS) is sent to the patient as a reminder. Finally, the transport company collects and delivers medication to the patient and returns the delivery note signed by the patient to the PS (figure 1).

We created two documents: the first for medication preparation, which included the patient data, in addition to the medication, units and date of the next delivery. The second document detailed delivery destinations and was sent via email to the logistics provider.

Individualised magistral formulas were excluded from the service due to the complexity of their preparation and the close clinical follow-up required. Both proper medicine storage and confidentiality were ensured throughout the process. To this end, medicines requiring storage at room temperature were packaged in opaque white envelopes, and thermolabile drugs, in opaque white insulated bags. Labels were designed for medicine identification which included the minimum patient information required for delivery. Furthermore, delivery notes were signed by the patients and returned to the PS by the logistics provider.

During the period described, 912 patients received the home delivery service, of which 472 (52%) were women, with a mean age of 63 years (SD: 17) (table 1).

A total of 2536 deliveries were made over 144 working days, with a mean of 18 (SD: 6) deliveries per day, and a total of 2854 dispensings (1.1 drugs per delivery) (figure 2).

| Table 1 Delivery information according to patient characteristics, destination locality and medication type |
|-------------------------------------------------|--------|
| Total (n=912)                                   |       |
| Sex, n (%)                                      |       |
| Female                                          | 472 (52) |
| Age, n (%)                                      |       |
| <65 years                                       | 470 (52) |
| ≥65 years                                       | 442 (48) |
| Inclusion request, n (%)                        |       |
| Pharmacist                                      | 773 (85) |
| Patient                                        | 127 (14) |
| Doctor                                          | 7 (<1) |
| Patient association                             | 5 (<1) |
| Locality, n (%)                                 |       |
| Rest of municipalities                          | 613 (67) |
| Hospital municipality                           | 299 (33) |
| Deliveries, n (%)                               | 2536   |
| Thermolabile                                    | 1408 (56) |
| Room temperature                                | 1128 (44) |

Figure 2 Deliveries per patient and number of dispensings during the study period. The black line corresponds to the rolling average of the 7 days prior to dispensings. Each different medication delivered is considered a medication dispensing.
According to the Anatomical Therapeutic Chemical (ATC) classification, the highest percentage of dispensed drugs belonged to group L (antineoplastic and immunomodulating agents), followed by group J (general antimicrobials for systemic use) and group B (blood and blood forming organs) (figure 3). In total, 197 different types of pharmaceutical formulations, with 123 different active ingredients, were delivered.

Of the total number of patients, 613 (67%) resided in localities surrounding the hospital. The median distance (round trip) between the patient’s residence and the hospital was 22 km with a median time of 30 min per patient, covering an interval between 10 and 244 min, and 20 and 200 min (table 2). The distance and time avoided during the study period totalled 1 056 244 km and 1 094 524 min (76 days), whereby the median distance and time per patient were 66 (IQR:122) km and 90 (IQR:90) minutes, with a range of 15.3–30.5 tonnes.10

During the programme, 24 incidents were reported, of which 12 were related to the patient’s absence at the time of delivery, eight to the PS and four incidents were linked to the transport company. All incidents were resolved and represented an approximate reduction in CO2 of 25%.

Nevertheless, the telepharmacy experiences described are limited and include different dispensing and informed delivery models (community pharmacy or home).15–19 Furthermore, most of them present descriptive results in small patient groups selected according to pathology,17,18,24–26 with certain drugs, such as thermolabile or narcotic drugs, excluded in many instances.11,13 Moreover, the degree of implementation is heterogeneous; in the USA, for example, in a study carried out by the American Society of Health-System Pharmacists (ASHP) on pharmaceutical practice in hospital settings, only a quarter of the 265 hospitals surveyed performed telepharmacy.28 These data reveal the huge margin for improvement presented by this pharmaceutical care model.28

In the hospital PS where this study was conducted, around 4700 patients were treated during 2020. There was a total of 26 000 dispensings. Therefore, approximately one fifth of the patients treated were able to benefit from telepharmacy during the study period. Likewise, the programme has made it possible to reduce in-person healthcare activity and reorganise workflows and agendas. The findings indicate that an average of 20 medications were delivered per day, the majority of which were drugs belonging to the groups of antineoplastic and immunomodulating agents, anti-infectives for systemic use, and blood and the patients attended in person and were excluded from the programme. The delivery incident rate was 0.9%.

The satisfaction survey was conducted on a sample of 134 patients. The results described in table 3 show patients’ high acceptance of the home delivery service.

**DISCUSSION**

In Spain, telepharmacy has reduced the necessity for patients to travel to hospital centres during the COVID-19 pandemic, as well as ensuring treatment continuity with hospital-dispensed medication. In a survey of 185 Spanish public hospitals, 83.2% of PS did not include medication delivery as part of their remote pharmaceutical care service prior to the health crisis.11 The declaration of the state of alarm on 14 March 2020 presented PS with an opportunity to develop and implement new models of remote care and remote medication dispensing.12–13

Table 3 Patient satisfaction questionnaire on home medication delivery

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</tr>
<tr>
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Questions Average

Are you satisfied with the transport service? Rate on a scale of 1 to 10, with one being totally dissatisfied and 10 being totally satisfied

What is your opinion of the pharmacy service in terms of home medication delivery? Rate on a scale of 1 to 10, with one being totally dissatisfied and 10 being totally satisfied

Table 2 Median time and distance between the place of residence and the hospital pharmacy service according to Google Maps

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and haematopoietic organs. This same profile of medication dispensed is seen in other studies, such as Zozaya et al., in which antineoplastic agents and immunomodulators accounted for two-thirds of the medication, this is also seen in a study by Peláez et al.,

In light of the urgency of implementation and the novelty of the project, the PS primarily selected the patients to be included in the programme due to the exceptional circumstances of the pandemic and patients’ and doctors’ lack of knowledge about the service. Indeed, 67% of patients included did not reside in the same municipality as the hospital centre; the potential benefit was considered due to certain patients not having their own vehicle, or because no public transport with an adequate frequency was available, or the cost of transportation was not affordable for the patient. In this regard, we can highlight how the model reduces the carbon footprint by lowering the number of trips to the hospital. It also saves time for patients, which provides them with a better work-life balance, and therefore leads to improved quality of life, together with economic savings both directly, through avoiding travelling expenses, and indirectly, through the time spent travelling and loss of labour productivity. Other studies corroborate these benefits; in this way, Zozaya et al estimate that a total of 1939 shipments in 2 months had avoided trips associated with a total saved time of 1374 hours and had saved the patient a total of €23,309, including the costs of avoided trips and avoided productivity losses.

In the study period, 24 incidents with the delivery service were recorded, half of them occurred because the patient was not at home. This highlights one of the limitations of the home delivery model. Most of the published studies do not describe the incidents that occurred. However, Peláez et al identified 10 incidents related to no drug delivery, dosing error, wrong or unnecessary drug, wrong formulation or wrong patient. All of these incidents were resolved, as in our study.

The use of telephones for patient contact is a safe system that most patients prefer to videoconferencing, therefore the majority of studies use this tool to contact patients. The main problem in the study is the ability to guarantee confidentiality during shipment. This is related to pathologies with greater social stigma (HIV and disabling diseases such as multiple sclerosis or amyotrophic lateral sclerosis). In our study, two of the recorded incidents were related to the non-confidential delivery of medication. To improve this aspect, an additional question was added in the initial patient interview regarding the person authorised to receive the shipment.

This study is one of the first to describe a telepharmacy model with direct home delivery of hospital medication and to offer an analysis of the long-term model, in addition to including chronic patients without discrimination on the basis of pathology or medication. Currently, there are studies limited to the first months of the pandemic that proved the viability of telepharmacy; however, they do not specify whether this service continued after this period. In the study hospital, however, the service is currently available to all patients likely to benefit from the process, in line with the principle of equity.

In the same way, this analysis shows the potential benefit that telepharmacy with home medication dispensing and delivery presents in terms of patient satisfaction, similar to that of other published studies such as Peláez et al., which shows an overall average of satisfaction of 9.83 on a 10-point scale, Margusino-Framiñan et al report a score of 9.7. In our study, avoiding travel to the hospital was the aspect patients valued most, as reported by Álvarez et al., while the main inconvenience reported by 21% of our patients was not having a fixed delivery slot. In relation to the referenced OPCU, implementing the model has made it possible to reduce the in-person care burden and to reorganise work flows more efficiently.

However, this study has certain limitations. First, in order to estimate the distance and the mean time saved between each patient’s locality and the hospital, the authors assume patients travel to the PS in their own vehicles, other modes of travel such as public transportation are not considered. Second, the satisfaction survey was conducted over the telephone by PS staff, preventing the anonymisation of patients, which could generate a bias when reporting negative aspects. Finally, the remote pharmaceutical care given to these patients was not monitored, which would have enabled the impact of telepharmacy on aspects such as improving adherence, detecting adverse reactions and incorrect administration of medications to be analysed. It would be interesting to conduct long-term studies to determine telepharmacy’s potential in these pharmaceutical care units in hospital PS.

It is clear that the health crisis caused by the pandemic has been the ideal time for PS to implement different models of telepharmacy and remote medication delivery. The benefits for both professionals and patients are also apparent, giving rise to an essential service that is in demand. However, different informed delivery models for hospital medication have been developed (in community pharmacies, health centres or at the patient’s home), and therefore the most appropriate model for each patient has yet to be defined, as well as for the health system in terms of efficiency. In this sense, more long-term studies are needed that evaluate the impact of these programmes on patients and analyse the associated costs. Furthermore, it would be helpful to stratify the potential beneficiaries of these programmes.

Conclusion

The COVID-19 pandemic has provided the PS with an opportunity to develop and implement a telepharmacy programme with home medication dispensing and informed delivery with worthwhile patient benefits, which has enabled better organisation of the OPCU and greater accessibility for patients beyond the COVID-19 pandemic.

Key messages

What is already known on this topic
⇒ The disruption caused by the COVID-19 pandemic has accelerated the drawing up of a legal framework allowing the implementation of telepharmacy and has favoured the development of different models of telepharmacy and remote medication dispensing in hospital pharmacy services.
⇒ New technologies allow remote patient care with hospital medication.

What this study adds
⇒ Patient satisfaction with telepharmacy shows the high acceptance of this new model and the need to develop new patient care systems adapted to current circumstances and needs.

How this study might affect research, practice or policy
⇒ This study benefits health professionals because it provides a replicable method to implement telepharmacy in hospitals beyond the COVID-19 pandemic.
attending in person. It is a replicable method that is applicable in other PS.

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Contributors MG-C, AS-A, EV-E and PP-H conceived the study, MG-C, AS-A and EV-E analysed, interpreted the data and wrote the paper; MG-C, AS-A and EV-E included data of patients; MG-C and AS-A performed the statistical analyses; MG-C, AS-A, EV-E, AP-B, IBA and RFP reviewed the manuscript and contributed to the final draft. MG-C is responsible for the overall content as the guarantor.

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Competing interests None declared.

Patient consent for publication Consent obtained directly from patient(s)

Ethics approval This study involves human participants and was approved by Comité de Ética del Hospital General Universitario de Castellón. ID: FARTEL-01.

Provenance and peer review Participants gave informed consent to participate in the study before taking part.

Not commissioned; externally peer reviewed.

Data availability statement No data are available. Not applicable.

Supplemental material This content has been supplied by the author(s).

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REFERENCES


¿Qué es la Telefarmaçia?

La telefarmaçia es la práctica farmacêutica a distancia, que incluye las siguientes actividades:

- **Seguimiento farmacoterapéutico**
  - Su farmacêutico realiza de forma continuada un seguimiento de su tratamiento.

- **Formación e información**
  - Le proporcionamos información sobre su medicación y le aclaramos cualquier duda.

- **Coordinación con el equipo asistencial**
  - Mantenemos contacto continuo con su especialista y con usted.

- **Dispensación a distancia de medicamentos**
  - Le acercamos la medicación a su domicilio, siempre bajo la supervisión de su farmacêutico.

¿A quién va destinada la Telefarmaçia?

El programa de telefarmaçia va destinado a pacientes crónicos que cumplen correctamente con su tratamiento. Cualquier paciente que desee participar de un programa de telefarmaçia será valorado previamente por el farmacêutico para su inclusión. Se valorará según los criterios establecidos.

En los casos en que su médico le cambie el tratamiento, deberá acudir al Servicio de Farmacia para realizar la atención farmacêutica de modo presencial y así recibir de modo directo la información sobre su nuevo tratamiento.

¿Cómo funciona la Telefarmaçia en nuestro hospital?

Una vez incluido en el programa de telefarmaçia, usted deberá firmar el Consentimiento Informado para permitirnos realizar la dispensación de su medicación a distancia y contactar con usted por vía telemática (teléfono o videollamada) cuando se considere oportuno. En todo momento se asegurará la confidencialidad de su tratamiento.
Así nos organizamos desde el Servicio de Farmacia...

- **Organizamos la previsión del envío con antelación**, por ello siempre contactaremos con usted entre 1 o 2 semanas antes para confirmar el día del envío.

- El día acordado del envío **recibirá un mensaje en su teléfono móvil** confirmando que su medicación ha sido recogida por la empresa de transporte en el **Servicio de Farmacia del Hospital**.

- El servicio de transporte le acercará la medicación al domicilio durante esa mañana en horario de 8:30h a 15:00h.

- **Usted deberá firmar el albarán de entrega en cada envío de la medicación**, para confirmar que la ha recibido en correctas condiciones.

  El **farmacéutico del Servicio de Farmacia Hospitalaria** podrá contactar con usted en cualquier momento para realizar **atención farmacéutica** y resolver cualquier duda sobre su medicación.

  Cuando usted tenga que acudir al **hospital**, se le citará con nosotros para **recoger la medicación en la farmacia del hospital** ese mismo día tras la consulta médica.

**El Servicio de Farmacia podrá modificar el circuito en cualquier momento.**

*Para cualquier duda contacte con nuestra unidad.*

| Horario: De LUNES a VIERNES de 8:30-20:30h |
| Teléfono: |
| Correo: |

RESUMEN

Objetivos

El presente trabajo tiene como objetivo describir las actuaciones realizadas para la implementación de un programa de Telefarmacia con dispensación y entrega informada de medicación a domicilio, en una Unidad de Atención Farmacéutica a Pacientes Externos de un hospital de tercer nivel, donde se atiende a aproximadamente 5.000 pacientes al año. Así como confirmar la aplicabilidad y beneficios de dicho programa mediante el análisis de los resultados obtenidos y la satisfacción de nuestros pacientes.

Método

Se identificaron las necesidades operativas, logísticas, tecnológicas, legales, de formación e información y coordinación con el equipo asistencial y asociaciones de pacientes. Se elaboró un protocolo normalizado de trabajo en el que se detalló el modelo de dispensación a domicilio y el perfil de paciente candidato a Telefarmacia. Entre julio de 2020 y enero de 2021 se evaluó la actividad asistencial y se llevó a cabo una encuesta para medir la satisfacción de los pacientes basada en el proyecto Enopex.

Resultados

El total de envíos de medicación fue de 2.536 durante 144 días laborables, con una media de 18 (DE: 6) envíos al día, realizándose 2.854 dispensaciones (1,1 fármacos por envío). Se enviaron 197 tipos de presentaciones farmacéuticas distintas correspondientes a 123 principios activos. La distancia y el tiempo evitados durante el período del estudio sumó 105.624 km y 109.452 minutos (76 días); siendo la mediana de distancia y tiempo ahorrados por paciente de 66 (RIQ:122) km y 90 (RIQ:90) minutos, lo que supone aproximadamente una reducción en la huella de carbono de 25 kg de CO$_2$ por paciente y 16,5 toneladas en total. La encuesta de satisfacción llevada a cabo en 134 pacientes reveló una elevada satisfacción de los pacientes atendidos con el servicio descrito en el estudio con 9,88 sobre 10.

Conclusiones

La pandemia de COVID-19 ha supuesto una oportunidad para el Servicio de Farmacia de desarrollar e implementar un programa de Telefarmacia, en términos de beneficios para los pacientes, que ha permitido un entorno más organizado de la unidad y una mayor accesibilidad para los pacientes que acuden de forma presencial, y con una metodología aplicable y reproducible en otros Servicios de Farmacia de características y necesidades similares.

Palabras claves

Telefarmacia, envío a domicilio, protocolo, farmacia hospitalaria, medicación hospitalaria.