Safe handling and delivery of biological medications during the COVID-19 pandemic

Amnah Mukhtar PharmD | Murooj Shukry PharmD | Douha Bannan PhD

1Pharmaceutical Care Division, King Faisal Specialist Hospital and Research Center, Jeddah, Saudi Arabia
2Faculty of Pharmacy, King Abdulaziz University, Jeddah, Saudi Arabia

Correspondence
Douha Bannan, Department of Pharmacy Practice, King Abdulaziz University, P.O. Box 80260, Jeddah 21589, Saudi Arabia. Email: dbannan@kau.edu.sa

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Abstract
What is known and Objective: During the coronavirus disease of 2019 (COVID-19) pandemic, there were periods when patients were not able to collect their medications from the hospital. The purpose of this study is to report on our management of the handling and delivery of biological medications to patients during periods of lockdown in the Kingdom of Saudi Arabia (KSA).

Methods: A descriptive study conducted at our 380-bed tertiary care hospital. Managing the delivery of the biological medications was organized in six phases: (1) taskforce development, (2) identification of the relevant biological medications, (3) identification of patients, (4) organization of transportation, (5) medication delivery/pickup and (6) locating patients with unidentified addresses. The study was approved by our hospital’s Institutional Review Board.

Results and discussion: Biological medications were delivered to 1235/1373 (90%) patients. This included 1875/2036 (92%) prescriptions. 900 prescriptions were delivered to 570 patients living in 95 cities and villages across the kingdom. 141 patients received 183 prescribed oral biological medications and 477 patients received 787 prescribed parenteral biological medications delivered with temperature control. 224 parenteral biological medication were delivered by car to 116 patients living in less accessible cities in the west of the country. The car deliveries of parenteral biological medications required particularly careful handling, packaging and temperature control. Delivering biological medications to patients during the curfew was a unique experience. However, the approach we have used ensured safe access to medications under appropriate conditions.

What is new and Conclusion: Delivering biological medications to patients during the lockdown was challenging. With the possibility of a second wave of COVID-19, hospitals should have a standardized process in-place for delivering such medications.

Keywords
biological, COVID-19, delivery, handling, safety
INTRODUCTION

A biological medication is “a substance that is made from a living organism or its products.” Biological medications such as antibodies, interleukins, blood components and vaccines are used in the prevention and treatment of a variety of conditions such as diabetes, heart attacks, autoimmune disorders and cancer. Biological medications differ from conventional medications, as they are complex mixtures that are susceptible to thermal stress and can be easily affected by excessive shaking. Therefore, they should be carefully transported and stored to prevent spoiling.

Some oral and parenteral biologic medications are defined as hazardous per their risk of occupational exposure and require special handling, storage, preparation and administration precautions. Some oral biological medications may not pose a significant risk of direct occupational exposure because of their dosage formulation (eg coated tablets or capsules—solid, intact medications that are administered to patients without modification of the formulation). Dispensing a single tablet to a patient may pose a relatively low risk to a healthcare worker who uses a single pair of gloves.

Parenteral medications are normally given in a hospital, and special considerations are taken to ensure safe handling of these medications. However, some of these medications can also be given subcutaneously via self-injection at home because they are dispensed in a ready-to-use form (eg prefilled injection). If given at home, a healthcare personnel specializing in home treatments would deliver the medication to the patient and make sure the patient knows how to self-administer it.

In an effort to control the spread of COVID-19 infection, the Kingdom of Saudi Arabia (KSA) enforced a very restricted curfew. During that curfew, there were periods when patients were not able to collect their medications from the hospital pharmacy as usual. Therefore, the pharmaceutical care division in our institution developed a taskforce to ensure patients were able to receive their medications from electronic medical records to pick up the medications. This is because the last 3 months were included in the study. Reconciling patient contact and address information required a lot of effort and time.

RESULTS AND DISCUSSION

Over two and a half months, both oral and parenteral biological medications were delivered to 1235/1373 (90%) patients. This included 1875/2036 (92%) prescriptions, refer to Figure 1.

A total of 48 parenteral biological medications were delivered to 1023 patients (1606 prescriptions); 23 oral biological medications were delivered to 212 patients (269 prescriptions) in the west of the country. A breakdown of the delivery method for oral versus parenteral medications is described in Table 2. The top 20 oral and parenteral biological medications are displayed in Figures 2 and 3.

Among the total number of patients, 488/1373 (35%) patients’ addresses were updated to be able to receive their medications. After communication with patients, 466 (95%) successfully received their medications (Table 3).
TABLE 1 The process and timeline of handling and delivering biological medications.

| Phase                                  | Period                | Responsible team                                                                 | Task                                                                 |
|----------------------------------------|-----------------------|----------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Phase I                                | 12 April 2020         | Clinical pharmacist (n = 7)                                                       | Brainstorming, planning and dissemination of assignments             |
| Taskforce development                   |                       | Ambulatory care pharmacist (n = 4)                                                |                                                                      |
|                                        |                       | Medication safety officer (n = 1)                                                  |                                                                      |
|                                        |                       | Drug information pharmacist (n = 1)                                                |                                                                      |
|                                        |                       | Pharmacy informatician (n = 1)                                                     |                                                                      |
|                                        |                       | Pharmacy Technician (n = 1)                                                         |                                                                      |
|                                        |                       | Volunteer (n = 2)                                                                  |                                                                      |
| Phase II                               | 12 April 2020–20 April 2020 | Pharmacy informatician                                                           | 1. Identify a list of formulary biological medications (oral and parenteral) |
| Identification of the relevant biological medications |                       | Medication safety officer                                                         | 2. Identify eligible biological medications for mail delivery         |
|                                        |                       | Drug information pharmacist                                                        | 3. Identify special handling, packaging and stability instructions of medications and classify them to: oral biological medications eligible for shipping via mail service (Appendix A), parenteral biological medications eligible for shipping via mail service (Appendix B) and parenteral biological medications not eligible for shipping via mail service (car delivery) (Appendix C). |
| Phase III                              | 27 April 2020–12 June 2020 | Clinical pharmacy team                                                            | Compile a list of patients who have been on biological medications for at least 3 months. |
| Identification of patients             |                       | Volunteers                                                                       | Compile a list of patients on biologic medication per city. Patients with unidentified addresses were compiled for later action. |
|                                        |                       |                                                                                    | Update patients’ contact and address information per the electronic medical record. |
|                                        |                       |                                                                                    | Contact patients to verify their phone number, correct medications, quantity on hand since last dispensed date and whether they want their medications to be delivered versus picking them up. |
|                                        |                       |                                                                                    | Prioritize active prescriptions for refill.                          |
| Phase IV Organization of transportation | 29 April 2020–12 May 2020 | Clinical pharmacists                                                              | Brainstorm potential methods to deliver biologic medications to patient's home |
|                                        |                       | Ambulatory care pharmacists                                                        | Coordinate with hospital transportation services and ambulatory care pharmacy staff to schedule for car delivery of medications. |
|                                        |                       | Ambulatory Care Pharmacy Technicians                                               | Utilize mail service to ship oral biological medication to patient's home |
|                                        |                       |                                                                                    | Implement special handling and packaging requirements:                |
|                                        |                       |                                                                                    | Parenteral biologic medications                                      |
|                                        |                       |                                                                                    | Packed in plastic bubble rub to minimize shaking.                    |
|                                        |                       |                                                                                    | Utilize iced packed container and temperature logger to maintain proper temperature control per manufacture recommendations during delivery |
|                                        |                       |                                                                                    | Oral biologic medications:                                          |
|                                        |                       |                                                                                    | Packaged in Biohazard plastic bags                                   |
| Phase V                                | 20 May 2020–7 June 2020 | Clinical pharmacist                                                               | Prioritize reachable cities in the west of the country and schedule ambulatory care pharmacists and technicians for car delivery |
| Medication delivery/ pickup            |                       | Ambulatory care pharmacist                                                         | Mail all oral and eligible parenteral biologic medications to patient’s home |
|                                        |                       | Ambulatory care technicians                                                         | Communicate with patients living in out of reach cities/ villages as well as patients living in Jeddah to pick up their parenteral biologic medications from drive-through pharmacy outside the curfew hours |
|                                        |                       | Volunteers                                                                       |                                                                      |

(Continues)
Nine hundred prescription were delivered to 570 patients living in 95 cities and villages across the kingdom. 141 patients received 183 prescribed oral biological medications, and 477 patients received 787 prescribed parenteral biological medications delivered with temperature control, refer to Appendices A and B.

As listed in Appendix C, 224 parenteral biological medications were delivered by car to 116 patients living in less accessible cities in the west of the country, refer to Figure 4. The car deliveries of parenteral biological medications required particularly careful handling, packaging and temperature control. A drive-through pharmacy served 751 patients; 730 (97%) were living in Jeddah, and the pickup time was restricted to several hours (from 6:00 am to 3:00 pm).

Delivering biological medications to patients during the curfew was a unique experience. However, the approach we have used ensured safe access to medications under appropriate conditions. Almost all patients on biological medications during the COVID-19 curfew received them successfully within the study time of 2.5 months. Our paper describes the process and the associated challenges the pharmaceutical care division taskforce faced to quickly, safely, and effectively dispense and deliver biological medications during the COVID-19 curfew.

While there are guidelines and recommendations for safe handling of biologics in healthcare settings, there is no guideline for how biological medications should be handled and delivered to patients’ homes safely and effectively through mail services. Therefore, having patients pick up medication was preferred to shipping it through mail service. Internationally, there are some regulations regarding medication shipment through mail services, such as in the United States and Europe. However, these regulations vary from one country to another. To our knowledge, there are no regulations regarding medication shipments in KSA, so it was preferred that patients pick up their medications rather than having them shipped. If patients could not pick up their medications, they were mailed. In our efforts to deliver medications to patients, recommendations for special handling and packaging requirements were based on the NIOSH and medication package inserts from manufacturers.

With the possibility of a second wave of COVID-19, hospitals should have a standardized process in-place for delivering such medications. This might be possible by establishing national guidelines for safe handling and delivery of medications through mail by air or car.

| Phase                              | Period                | Responsible team                                | Task                                                                 |
|-----------------------------------|-----------------------|-------------------------------------------------|----------------------------------------------------------------------|
| Phase VI locating patients with unidentified addresses | 17 June 2020 - 29 June 2020 | Ambulatory care pharmacy team | Contact patients to verify contact number, update patients address information, verify correct medication, quantity on hand since last dispensing date and need to deliver their biologic medications versus picking up. Prioritize active prescription for refill to be prepared first. Inactive prescriptions (no refill) were shared with primary care providers to verify prescriptions validity and renew it as applicable. Prioritize reachable cities in the west of the country and schedule car delivery. Communicate with patients living in out of reach cities/villages, and patients living in Jeddah to pick up their parenteral biologic medications from drive-through pharmacy, outside the curfew hours. |

### TABLE 2 Delivery method for biological medications

| Biological medications | Number of medications | Number of patients |
|------------------------|-----------------------|--------------------|
| Oral                   |                       |                    |
| Drive-through          | 86                    | 71                 |
| Mail order             | 183                   | 141                |
| Needed medical evaluation | 3                    | 3                  |
| Parenteral             |                       |                    |
| Car delivery           | 154                   | 116                |
| Drive-through          | 665                   | 430                |
| Mail order             | 787                   | 477                |
| Needed medical evaluation | 158                  | 135                |
| Total                  | 2036                  | 1373               |

![Figure 1](http://example.com/figure1.png)  
**Figure 1.** Number of biological medication prescriptions per delivery method
In addition, having practices that hospitals can adopt might also help standardize the process between hospitals.

Patients used to pick up their medications from hospitals. Therefore, the pharmacists’ major role was ensuring the safe handling of these medications while in the hospital. However, our experience during the COVID-19 pandemic shed light on an additional important role of the pharmacy, which is ensuring safe handling of these medications while in transit. Our hospital serves patients not only in Jeddah, but also in other cities in the west of the country. Given our experience in handling and delivering these medications and the importance of the temperature of medications in transit, educating patients about safe handling is crucial. There should be written procedures for the safe handling of biological medications—both for the patients, if they are going to pick up the medication, or for the healthcare providers responsible for delivering it.

We successfully delivered 2036 medications to 1373 patients in the west of the country during the curfew. This is an achievement, given the situation in question. However, we did not assess the challenges faced by the people delivering these medications and ways to...
improve the process. Future work might focus on identifying these challenges, especially those facing patients living in rural areas and who have to drive long distances.

While in transit, the majority of parenteral biological medications need to be refrigerated (2°C to 8°C), compared to the storage of most oral biological medications (20°C to 25°C). We were able to mail 787 parenteral biological medications successfully to 477 patients in the west of the country. This required complex measures such as controlling temperature and humidity, which are very high in cities such as Jeddah and Makkah (Temperature can reach 50 degrees in summer).

We brainstormed numerous ideas for delivering medications that were not executable due to many factors. The study period was not long enough to start new contracts, and the lockdown affected patients’ access to any hospital. Moreover, contracting with mail couriers that follow special handling and packaging requirements for all parenteral biological medications was not practical because of the limited resources mail couriers offer trained staff, especially during this high-demand period. Accordingly, the approved solutions were as follows: (1) All oral and eligible parenteral biological medications were mailed to patients’ homes all over the country. (2) All patients living in the same city (Jeddah) or with access during curfew-free hours were served at the drive-through pharmacy, supporting the COVID-19 infection control recommendations. (3) Pharmacy staff arranged car delivery to reachable cities for the rest of the patients on parenteral biological medications who could not pick up their medications.

Some major limiting steps affected the study timeline: extracting the list of patients on biological medications from the electronic health information system, reconciling and updating each patient’s contact and address information, and the study overlapping with a religious holiday (10-day interruption). The members of the various teams helped overcome this issue via their active contributions to catch up with the planned timeline.

There was quite a delay on the mail courier’s part in delivering medications on time during the curfew period. There were two main reasons for this; the mail courier’s transportation permits took time to be released from the government authorities, and mail-order services experienced huge demand during this time from all sectors. Close follow-up with mail couriers for each patient to ensure the receipt of medications was essential.

Many lessons were learned from conducting this study, and the following recommendations may make the handling and delivering of biological medications easier, safer and more effective:

- Prepare a list of patients on special medications from the hospital’s information system for easy access when needed.
- Update and correct patients’ contact numbers and addresses in the electronic medical records to ensure that staff can communicate with patients and deliver services in an efficient and timely manner.
- Provide special training to pharmacy staff with evidence-based references on handling and packaging special medications in the formulary that require specific handling instructions; apply safety and monitoring measures to ensure implementation of the recommendations.
- Ensure availability of supplies for special packing and monitoring materials, such as bubble wrap, ice packs and temperature loggers in the ambulatory care pharmacy to be used when special medication handling and packaging are desired.
- Establish a contract with medication carrier that specializes in medication delivery and has the ability to maintain the medications’ stability and apply special handling precautions, especially for biological medications.
- Organize and execute a mail delivery schedule for biological medications for all patients in their homes.
- Request and monitor availability of special packing and monitoring materials at all times in the ambulatory care pharmacy.
- Initiate collaborative agreements with treating physicians to ensure continuity of care for this patient population and the active validity of prescriptions.
- Contract with mail and car delivery couriers that can guarantee appropriate handling of all medications, including temperature- and shaking-sensitive medications, that comply with national and international medication safety standards and best practices.

4 | WHAT IS NEW AND CONCLUSION

Delivering biological medications to patients during the lockdown was challenging. With the possibility of a second wave of COVID-19, hospitals should have a standardized process in-place for delivering such medications.

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CONFLICT OF INTEREST

No conflicts of interest have been declared.

DATA AVAILABILITY STATEMENT

The data that support the finding of this study are available from the King Faisal Specialist Hospital and Research Center. Restrictions apply to the availability of these data, which were used under license for this study. Data are available from Amnah Mukhtar with permission of King Faisal Specialist Hospital and Research Center.

ORCID

Douha Bannan □ https://orcid.org/0000-0001-5231-9636

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## APPENDIX A

### Oral biological medications eligible for shipping via mail service

| Drug name                        | Special storage and handling instruction                                                                 |
|----------------------------------|----------------------------------------------------------------------------------------------------------|
| CRIZOTINIB 250 MG CAPSULE (XALKORI®)* | Store between 20°C and 25°C; hazardous agent: gloves (single) should be worn during receiving, unpacking and placing in storage and single gloving for administration of intact tablets or capsules |
| DASATINIB 70 MG TAB               | Store at 20°C to 25°C; hazardous agent: gloves (single) should be worn during receiving, unpacking and placing in storage and single gloving for administration of intact tablets or capsules |
| DESMOPRESSIN ORALLY DISINTEGRATED(MELT), 120 MCG TABLET | Store in the original package in a dry place at a temperature between 15°C and 25°C                     |
| ERLOTINIB 150 MG TABLET (TARCEVA®)* | Store at 25°C; hazardous agent: gloves (single) should be worn during receiving, unpacking and placing in storage and single gloving for administration of intact tablets or capsules. |
| IMATINIB MESYLATE 100 MG TAB*     | Store at 25°C, protect from moisture, hazardous agent: gloves (single) should be worn during receiving, unpacking and placing in storage and single gloving for administration of intact tablets or capsules. |
| NILOTINIB 200 MG CAPSULE*         | Store at 25°C; hazardous agent: gloves (single) should be worn during receiving, unpacking and placing in storage and single gloving for administration of intact tablets or capsules. |
| OSIMERTINIB MESYLATE 80 MG TABLET* | Store at 25°C, not on the NIOSH list it meets the criteria for a hazardous drug, gloves (single) should be worn during receiving, unpacking and placing in storage and single gloving for administration of intact tablets or capsules. |
| PAZOPANIB 400 MG TABLET (VOTRIENT®)* | Store at 20°C to 25°C; hazardous agent: gloves (single) should be worn during receiving, unpacking and placing in storage and single gloving for administration of intact tablets or capsules. |
| PONATINIB 15 MG TABLET (ICLUSIG)* | Store at 20°C to 25°C; hazardous agent: gloves (single) should be worn during receiving, unpacking and placing in storage and single gloving for administration of intact tablets or capsules. |
| RUXOLITINIB 5, 10, 15 MG ORAL TABLET (JAKAVI®) | Store at 20°C to 25°C                                                                                   |
| PAZOPANIB 400 MG TABLET (VOTRIENT®)* | Store at 20°C to 25°C; hazardous agent: gloves (single) should be worn during receiving, unpacking and placing in storage and single gloving for administration of intact tablets or capsules. |
| SUNITINIB 25, 50 MG CAPSULE*       | Store at 25°C; hazardous agent: gloves (single) should be worn during receiving, unpacking and placing in storage and single gloving for administration of intact tablets or capsules. |
| LENALIDOMIDE 5, 25 MG CAPSULES (REVLIMID®)* | Store at 20°C to 25°C; hazardous agent: gloves (single) should be worn during receiving, unpacking and placing in storage and single gloving for administration of intact tablets or capsules. |
| DESMOPRESSIN ORALLY DISINTEGRATED(MELT), 60, 120 MCG TABLET | Store at 15°C to 25°C in original container. Protect from moisture                                       |
| TRANEXAMIC ACID 500 MG TAB        | Store at 25°C                                                                                           |
| ELTROMBOPAG OLAMINE TABLET 25, 50 MG | Store at 20°C to 25°C excursions are permitted between 15°C and 30°C (59°F and 86°F). Dispense in original bottle |

* Hazardous/ cytotoxic medications were dispensed in hazardous bag
## APPENDIX B

### Parenteral biological medications eligible for shipping via mail service

| Drug name | Special storage and handling instruction |
|-----------|------------------------------------------|
| CHORIOMON CHORIONIC GONADOTROPIN 5000 UNITS PWD FOR INJ IBSA | Store at controlled room temperature from 15°C to 30°C |
| HUMALOG MIX 50/50 KWIKPEN INSULIN-LISPRO-INSULIN-LISPRO-PROTAMINE 50/50 UNITS/ML INJ (PEN) LILLY | Store in a refrigerator at 2°C to 8°C |
| LANTUS SOLOSTAR INSULIN GLARGINE 100 UNITS/ML INJ (PEN) SANOFI-AVENTIS | Store in the freezer and do not allow to freeze. Discard if it has been frozen. Protect from direct heat and light |
| LEVEMIR FLEXPEN INSULIN DETEMIR 100 UNITS/ML INJ (PEN) NORDISK | Store in the refrigerator from 2°C to 8°C. Do not store in the freezer or directly adjacent to the refrigerator cooling element. Do not freeze |
| MENOGON 75 IU MENOTROPINS 75 UNITS PWD FOR INJ FERRING PHARMA | Store in the refrigerator or at room temperature from 3°C to 25°C. Protect from light |
| MIXTARD 30 HM INSULIN-MIXTARD-70/30 UNITS/ML INJ NORDISK | Store in the refrigerator at 2°C to 8°C, away from the cooling element. Do not freeze |
| NORDITROPIN NORDIFLEX SOMATROPIN 5 MG/1.5 ML INJ (PEN) NORDISK | Store in refrigerator at 2°C to 8°C. Do not freeze. Avoid direct light. |
| NOVOMIX 30 FLEXPEN INSULIN_ASPART/INSULIN_ASPART протамин 70/30 UNITS/ML INJ(PEN) NORDISK | Store in refrigerator at 2°C to 8°C. Do not freeze |
| NOVORAPID FLEXPEN INSULIN-ASPART 100 UNITS/ML INJ (PEN) NORDISK | Store in refrigerator at 2°C to 8°C. Not in or too near the freezer section or cooling element |

## APPENDIX C

### Parenteral biological medications not eligible for shipping via mail service (car delivery)

| Drug name | Special storage and handling instruction |
|-----------|------------------------------------------|
| ADALIMUMAB INJ 20 MG/0.2 ML, 40 MG/0.4 ML (PRE-FILLED SYRINGE) | Refrigerate (2-8 degrees C), do not freeze, protect from light and store in original container |
| ADO-TRASTUZUMAB EMTANSINE 100 MG VIAL (KADCYLA®) | Store vials in a refrigerator at 2°C to 8°C (36°F to 46°F) until time of reconstitution. Do not freeze or shake. |
| ANAKINRA 100 MG PRE-FILLED SYRINGE KINERET® | Refrigerate (2-8 degrees C), do not freeze, protect from light and store in original container |
| ANTIHEMOPHILIC FACTOR (RECOMBINANT (FC FUSION PROTEIN)) POWDER FOR SOL INJ. 250 IU, 500 IU, 1000 IU VIAL (ELOCTA®) | Prior to reconstitution, store refrigerated at 2°C to 8°C; do not freeze. May also store at room temperature (not to exceed 30°C) up to 6 months; do not return to refrigerator. Store in original package to protect from light. Use within 6 hours of reconstitution; do not refrigerate after reconstitution. |
| ANTIHEMOPHILIC FACTOR VIII (RECOMBINANT) INJ, 250 IU, 500 IU, 1000 IU VIAL (XYNTHA®) | Store under refrigeration, 2–8°C; can be stored at the room temperature (<25°C) for up to 3 months for one single period (cannot be returned to the fridge). Use within 3 hours of reconstitution. Do not refrigerate after reconstitution, and a precipitation may occur. |
| CANAKINUMAB POWDER FOR SOLUTION FOR INJECTION 150 MG, VIAL (ILARIS®) | Refrigerate (2-8 degrees C), do not freeze, protect from light and store in original container |
| CERTOLIZUMAB 200 MG PRE-FILLED SYRINGE (CIMZIA®) | Refrigerate (2-8 degrees C), do not freeze, protect from light and store in original container |
| DENOSUMAB SC SOLUTION FOR INJECTION 120 MG / 1.7 ML VIAL (XGEVA®) | Refrigerate (2-8 degrees C), do not freeze, protect from light and store in original container |
| DENOSUMAB SC SOLUTION FOR INJECTION 60 MG / ML, 1 ML PREFILLED SYRINGE (PROLIA®) | Refrigerate (2-8 degrees C), do not freeze, protect from light and store in original container |
| DESMOPRESSIN ACETATE INJ 4 MCG/ML, 1 ML AMP | Refrigerate (2-8 degree C) |
| Drug name                                                                 | Special storage and handling instruction                                                                                                                                                                                                 |
|-------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DESMOPRESSIN ACETATE INTRANASAL SOL 0.1 MG/ML 2.5 ML BTL                | Nasal spray: store at 20°C to 25°C (68°F to 77°F). Keep nasal spray in upright position.                                                                                                                                                   |
| DUPILUMAB SOLUTION FOR SC INJECTION 300 MG/2.25 ML PRE-FILLED SYRINGE   | Refrigerate (2–8 degrees C), do not freeze, protect from light and store in original container                                                                                                                                              |
| ERYTHROPOIETIN (EPOTIN ALFA) 1000 U/0.5 ML, 2000 U/0.5 ML, 4000 U/0.4 ML, 10,000 U/1ML PRE-FILLED SYRINGE (EPREX 1000, 2000, 4000, 10,000) | Store in refrigerator at 2°C to 8°C in the original package. Do not freeze or shake. Protect from light. Discard any unused portion                                                                                                                |
| ETANERCEPT INJ 25 MG (PRE-FILLED SYRINGE)                                | Refrigerate (2–8 degrees C), do not freeze, protect from light and store in original container                                                                                                                                              |
| ETANERCEPT INJ 50 MG (MYCLIC)                                            | Refrigerate (2–8 degrees C), do not freeze, protect from light and store in original container                                                                                                                                              |
| EVOLOCUMAB 140 MG, 420 MG/3.5 ML PREFILLED SYRINGE (REPATHA)             | Refrigerate (2–8 degrees C), do not freeze, protect from light and store in original container                                                                                                                                              |
| FACTOR VIII (RECOMBINANT) INJECTION, 1 MG, 2 MG VIAL                    | Refrigerate (2–8 degree C). Avoid exposure to direct sunlight                                                                                                                                                                               |
| FACTOR VIII AND VON WILLEBRAND (HUMAN) INJ 500 IU VIAL (HAEMATE P 500®) | Store up to 25°C. Avoid freezing                                                                                                                                                                                                                                                                   |
| FACTOR XIII CONCENTRATE (HUMAN) 250 IU, 1250 IU POWDER FOR INJECTION, 20 ML VIAL | Store at 2°C to 8°C; do not freeze. Protect from light. May be stored at room temperature max of 25°C for up to 6 months; do not return to refrigerator if stored at room temperature.                                                      |
| FILGRASTIM (GCSF) INJ 30 MU (300 MCG/ML) 1 ML VIAL                       | Store in refrigerator at 2°C to 8°C in the carton. Do not freeze or shake. Protect from direct sunlight. Discard any unused portion                                                                                                               |
| FILGRASTIM (AAFI) INJ 30 MU (300 MCG/0.5 ML) (PRE-FILLED SYRINGE) (NIVESTIM®) (BIOSIMILAR) | Store in refrigerator at 2°C to 8°C in the carton. Do not freeze or shake. Protect from direct sunlight. Discard any unused portion                                                                                                               |
| INHIBITOR C1 ESTERASE (HUMAN), POWDER FOR INJECTION 500 UNIT/VIAL       | Store intact vials at 2°C to 30°C; do not freeze. Store in original carton; protect from light. Use within 8 hours of reconstitution (Canadian labelling recommends immediate use after reconstitution); do not reconstitute or freeze reconstituted solution. Discard any unused product |
| INTERFERON BETA −1A INJ, 30 MCG/ 0.5 ML PRE-FILLED PEN (AVONEX®)         | Store intact vials at 2°C to 8°C (36°F to 46°F)                                                                                                                                                                                        |
| INTERFERON BETA −1A (RECOMBINANT) INJ (S.C.) 6 MIU/0.5 ML (PRE-FILLED SYRINGE) (REBIF−22®) | Store at 2°C to 8°C; do not freeze. Protect from heat and light                                                                                                                                                                            |
| INTERFERON BETA −1A SOLUTION FOR INJECTION 44 MCG, 132 MCG/1.5 ML CARTRIDGE (MULTI DOSE REBIF®) | Store at 2°C to 8°C; do not freeze. Protect from heat and light                                                                                                                                                                            |
| INTERFERON BETA−1A (RECOMBINANT) INJ (S.C.) 12 MIU/0.5ML(PRE-FILLED SYRINGE) (REBIF−44®) | Store at 2°C to 8°C; do not freeze. Protect from heat and light                                                                                                                                                                            |
| PEGFILGRASTIM 10 MG/ML (0.6 ML) PRE-FILLED SYRINGE                       | Store at 2°C to 8°C; do not freeze or shake. Protect from sunlight                                                                                                                                                                         |
| PEGINTERFERON ALFA-2A 135 MCG, 180 MCG/0.5 ML PRE-FILLED SYRINGE (PEGASYS®) | Store in refrigerator at 2°C to 8°C. Do not leave out of the refrigerator for more than 24 hours. Do not freeze or shake. Protect from light. Discard any unused portion                                                                       |
| PEGINTERFERON ALFA-2B 50 MCG/0.5 ML PEN (PEG-INTRON®)                    | Store intact vials. Sensoready pens and prefilled syringes refrigerated at 2°C to 8°C (36°F to 46°F). Protect from light; keep in original carton                                                                                                                                                        |
| RITUXIMAB INJ 10 MG/10 ML VIAL                                           | Refrigerate (2–8 degrees C), do not freeze, protect from light and store in original container                                                                                                                                              |
| RITUXIMAB SOLUTION FOR SC INJECTION 1400/11.7 ML, VIAL (MABthera)       | Prior to reconstitution, store Redipen at 2°C to 8°C. Do not freeze                                                                                                                                                                       |
| ROMIPLOSTIM POWDER FOR SOLUTION FOR INJECTION 250 MCG VIAL               | Refrigerate (2–8 degrees C). Do not freeze, protect from light and store in original container                                                                                                                                              |
| SECUKINUMAB 150 MG/ML SOLUTION FOR SUBCUTANEOUS INJECTION (COSENTYX®)   | Store intact vials, Sensoready pens and prefilled syringes refrigerated at 2°C to 8°C (36°F to 46°F). Protect from light; keep in original carton                                                                                                                                                        |
| TOCILIZUMAB SOLUTION FOR INJECTION 20 MG/ML (80 MG/4 ML, 200 MG/10 ML VIAL) | Refrigerate (2–8 degrees C), do not freeze, protect from light and store in original container                                                                                                                                              |
| TOCILIZUMAB SOLUTION FOR SUBCUTANEOUS INJ 162 MG/0.9 ML, 1ML PREFILLED SYRINGE | Sensoready pens, prefilled syringes and vials must be refrigerated at 2°C to 8°C (36°F to 46°F). Protect the product in the original carton to protect from light until the time of use                                                                 |
| Drug name                                                                 | Special storage and handling instruction                                                                 |
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| TRANEXAMIC ACID SOLUTION FOR INJ 100 MG/ML, 5 ML AMP                       | Store at 2°C to 8°C; do not freeze. Protect from heat and light                                         |
| TRASTUZUMAB INJ 440 MG VIAL (HERCEPTIN®)                                   | Vials of herceptin are stable at 2–8°C (36–46°F) prior to reconstitution.                              |
| TRASTUZUMAB SOLUTION FOR INJECTION SC 600 MG/5 ML VIAL                     | Store vials at 2°C–8°C. Do not freeze. Store in the original package in order to protect from light     |
| USTEKINUMAB INJ 45 MG/0.5 ML, 90 MG/1 ML PRE-FILLED SYRINGE (STELARA)      | STELARA® vials and prefilled syringes must be refrigerated at 2°C to 8°C (36°F to 46°F). Store STELARA® vials upright. Keep the product in the original carton to protect from light until the time of use. Do not freeze. Do not shake |