

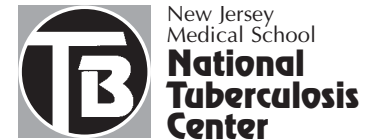
OUTPATIENT INFUSION THERAPY FOR MULTIDRUG-RESISTANT TUBERCULOSIS: A PRACTICAL GUIDE



New Jersey
Medical School
**National
Tuberculosis
Center**

A Founding Component of the International Center for Public Health

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PURPOSE AND ORGANIZATION OF THIS GUIDE

This guide is designed for health departments, health centers, and clinics that already have the responsibility for treating tuberculosis (TB) patients on an outpatient basis using directly observed therapy (DOT), but do not currently use outpatient infusion therapy for multidrug-resistant TB (MDR-TB). It is intended to provide practical guidance on an effective alternative method of treatment delivery. It is not intended to provide complete information on MDR-TB, anti-TB medications, or medication side effects.

The guide offers a rationale for providing outpatient infusion therapy for MDR-TB in a clinic setting. It then describes how to organize the clinic to provide infusion therapy.

There are three sections in this guide, each of which is intended for a different group of users. It is helpful, however, if individuals from all three audiences read the entire manual.

I. Rationale for Providing Outpatient Infusion Therapy for MDR-TB

This first section is intended for **directors and administrators** who are responsible for making an initial decision to provide outpatient infusion therapy for MDR-TB in an institution.

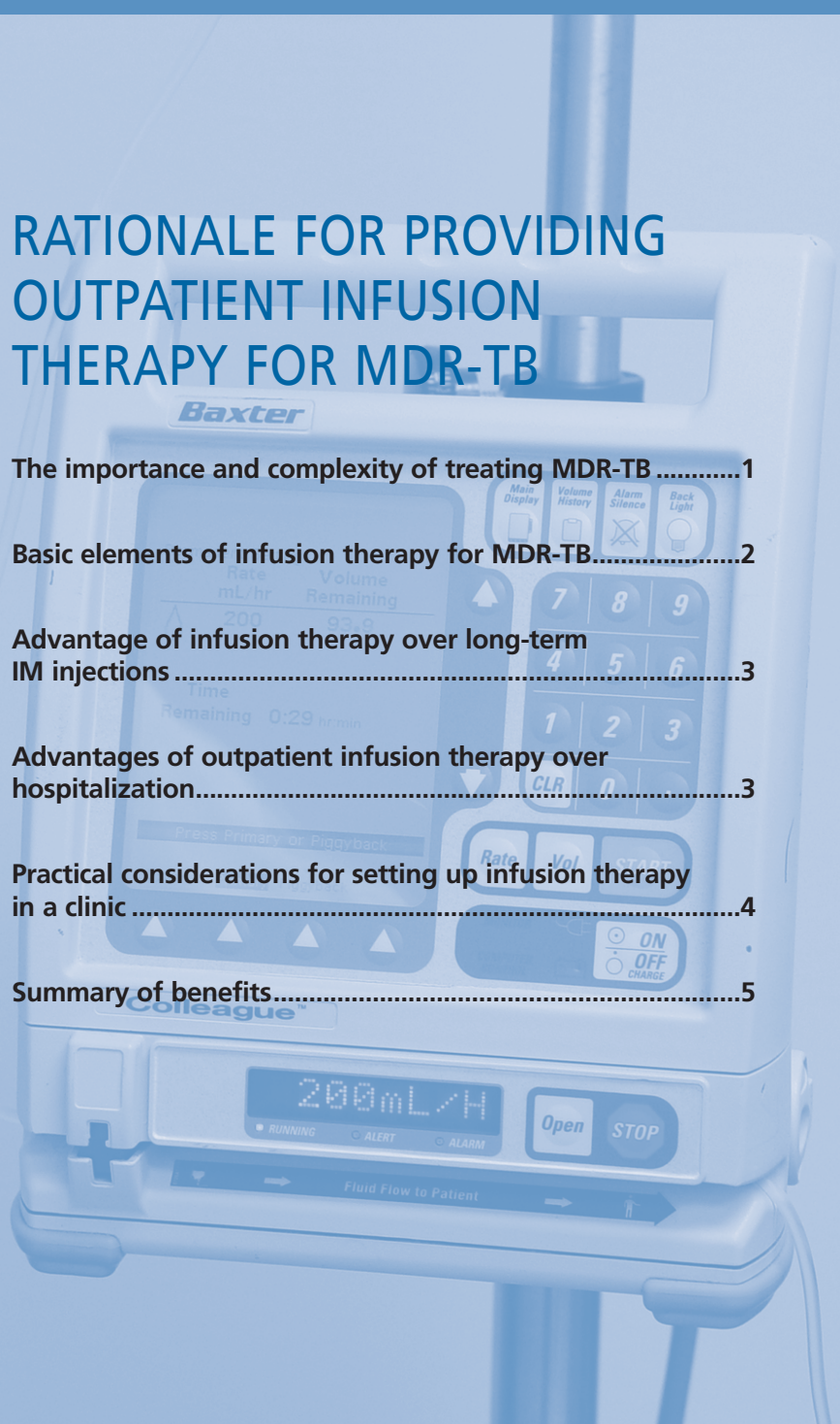
II. Guidelines for Organizing a Clinic to Provide Outpatient Infusion Therapy for MDR-TB

Once a decision is made to provide outpatient infusion therapy for MDR-TB, this second section will be especially useful to the **nursing supervisor** who is responsible for organizing a clinic to provide the therapy.

III. Nursing Procedures to Provide Outpatient Infusion Therapy for MDR-TB

The third section is intended for **nurses or other qualified health care workers** directly providing infusion therapy.

RATIONALE FOR PROVIDING OUTPATIENT INFUSION THERAPY FOR MDR-TB



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I. RATIONALE FOR PROVIDING OUTPATIENT INFUSION THERAPY FOR MDR-TB

The information in this section is intended to assist directors and administrators in making an **initial decision** to adjust treatment methods to include infusion therapy for MDR-TB. This section describes:

- Dangers of MDR-TB and the importance and complexity of treating MDR-TB as part of TB control efforts
- Basic elements of infusion therapy for MDR-TB
- Advantages of infusion therapy over long-term intramuscular (IM) injections
- Advantages of outpatient infusion therapy over hospitalization
- Practical considerations for setting up infusion therapy in a clinic (e.g., basic personnel and equipment needs, examples of patient needs such as transportation or financial services)

THE IMPORTANCE AND COMPLEXITY OF TREATING MDR-TB

MDR-TB is resistant to at least two of the first-line drugs (isoniazid and rifampin) that are commonly used to treat tuberculosis.¹ MDR-TB requires a longer treatment period (18 to 24 months) and the use of second-line anti-TB drugs that are more expensive, are difficult to tolerate, and cause more adverse effects than first-line anti-TB drugs. Treatment of patients with MDR-TB should be supervised by physicians who have experience treating MDR-TB.

MDR-TB is more common in people who:

- Have spent time with someone who has drug-resistant TB disease
- Do not take their anti-TB drugs regularly
- Do not take all their prescribed anti-TB drugs
- Develop TB disease again, after having taken anti-TB drugs in the past
- Come from areas where drug-resistant TB is common

¹ First-line and second-line drugs for treatment of tuberculosis are listed in the drug card entitled *Treatment of Tuberculosis: Standard Therapy for Active Disease*, available from the New Jersey Medical School National Tuberculosis Center at www.umdnj.edu/ntbcweb or 973-972-0979.

Between 1% and 2% of the total number of annual TB cases in the United States are MDR-TB cases, requiring prolonged and complex treatment. Patients with MDR-TB continue to be infectious for extended periods and may spread the disease until effective treatment is given, or the patient dies.

Because of the necessity of adherence to treatment for a long period, the likelihood of adverse effects, and reliance on injectable, second-line drugs, management of MDR-TB has traditionally been carried out on an inpatient basis. However, hospitalization merely for delivery of drugs is difficult to justify, considering the expense and potential disruption of the patient's life over a prolonged period.

Using cancer chemotherapy infusion clinics as a model, the New Jersey Medical School National Tuberculosis Center developed a system for outpatient treatment of MDR-TB. The clinic provides daily intravenous therapy along with direct observation of ingestion of prescribed oral anti-TB drugs. Up to six MDR-TB patients have been treated concurrently without the need for hospitalization. It is hoped that other public health clinics can adapt a similar model.

BASIC ELEMENTS OF INFUSION THERAPY FOR MDR-TB

Treatment of MDR-TB patients on an outpatient basis involves:

- Placement of an **implanted port or peripherally inserted central catheter (PICC) line** (a non-tunneled venous catheter)
- Using **intravenous (IV) therapy** to infuse injectable drugs for 30 to 60 minutes, 5 days per week²
- **Direct observation of ingestion** of prescribed oral anti-TB drugs
- **Monitoring for adverse reactions** and reporting these to the supervising physician
- Extensive **patient education and support** to help ensure adherence

IV therapy may be given via an implanted port (placed surgically under the skin, usually in the chest) or by PICC line (placed in the forearm and threaded into the superior vena cava). Both methods have their advantages and disadvantages, and the choice is usually made by the physician based upon the needs of the patient.

2 Although most TB programs provide treatment Monday to Friday, the number of days per week during which infusion therapy is offered may vary for individual programs.

ADVANTAGE OF INFUSION THERAPY OVER LONG-TERM INTRAMUSCULAR (IM) INJECTIONS

Traditional treatment for MDR-TB has required injectable drugs (e.g., aminoglycosides or capreomycin). The patient often complains of the discomfort and pain involved with IM injections and, in time, may develop sterile abscesses at the injection sites. Discomfort may frequently become an obstacle to extended periods of IM injections.

One way to overcome this obstacle is to provide anti-TB drugs intravenously through an implanted port or by PICC line. Patients receiving infusion therapy may have less discomfort and better adherence to treatment.

ADVANTAGES OF OUTPATIENT INFUSION THERAPY OVER HOSPITALIZATION

When IV drugs are needed, patients are usually hospitalized to receive the therapy. The costs of hospitalization for the treatment of MDR-TB in the United States is estimated to be much higher than costs associated with drug-susceptible TB due to increased length of hospital stay and prolonged treatment.³

Treating MDR-TB with infusion therapy in an outpatient clinic may result in benefits such as decreased costs, increased convenience and comfort for the patient, and increased patient adherence. Staff members follow a clear protocol for outpatient management in a specific clinic area set up for infusions.

Specifically, these advantages may include:

- Cost-effective, safe administration of IV therapy⁴
- Proper monitoring for adverse effects
- Increased patient convenience and comfort
- Advocacy and support provided by the clinic
- Increased patient adherence to therapy

3 Rajbhandary, S.S., Marks, S.M., Bock, N.N. (2004). Costs of patients hospitalized for multidrug-resistant tuberculosis. *International Journal of Tuberculosis and Lung Disease*, 8(8), 1012-1016.

4 It is recommended that TB programs seek prior authorization from insurance companies before making a decision to implement infusion therapy in the treatment of MDR-TB patients.

PRACTICAL CONSIDERATIONS FOR SETTING UP INFUSION THERAPY IN A CLINIC

Since infusion therapy for each MDR-TB patient lasts for 30 to 60 minutes, 5 days per week, it requires a room within the clinic that can be used solely for this purpose. For infectious patients, it must be an airborne infection isolation (negative pressure) room to fulfill ventilation requirements for infection control. The Centers for Disease Control and Prevention (CDC) recommendations for airborne infection isolation rooms in health care facilities are: an airflow of greater than or equal to 6 air changes per hour (ACH) for existing rooms and 12 ACH for a new or renovated room.⁵ Appointments should be staggered to allow use of this room for infectious patients. Once a patient is non-infectious (see page 6 in Section II), other comfortable, private areas may also be used to provide infusion therapy.

An infusion pump, a reclining infusion chair, IV tubing and bags, sterile dressing change kits, antiseptic solution, masks, and sterile gloves are examples of basic equipment and supplies that the clinic would need. A more detailed list is provided in the next section, *Guidelines for Organizing a Clinic to Provide Outpatient Infusion Therapy for MDR-TB*. All the necessary equipment and supplies are available through the usual medical supply companies.

A registered nurse (RN)⁶ who is certified in basic life support (BLS) and IV therapy is needed to:

- Insert needles and flush lines
- Administer continuous or intermittent fluids and bolus medications
- Withdraw blood
- Monitor for adverse reactions to medications
- Change dressings
- Remove PICC lines at treatment completion
- Provide emergency care, if needed

5 Centers for Disease Control and Prevention. (1994). Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis* in Health-Care Facilities, 1994. *MMWR*, 43 (No. RR-13). These guidelines provide a useful table (Table S3-1) for determining the time interval between patients for negative pressure rooms based on the number of ACH.

6 Consult the Nursing Practice Act in your state concerning provision of therapy by licensed practical nurses (LPN) or non-nurses, including family members in the home setting.

Another RN must be trained and available to cover during scheduled breaks, as well as absences.

Similar to patients in regular DOT programs, patients receiving infusion therapy for MDR-TB may require considerable support to attend their daily appointments. Some patient needs (such as transportation) may already be met by the clinic as part of providing DOT for regular TB patients. Similar support and incentives should be offered to MDR-TB patients (for example, a grocery voucher for perfect adherence during the week).

SUMMARY OF BENEFITS

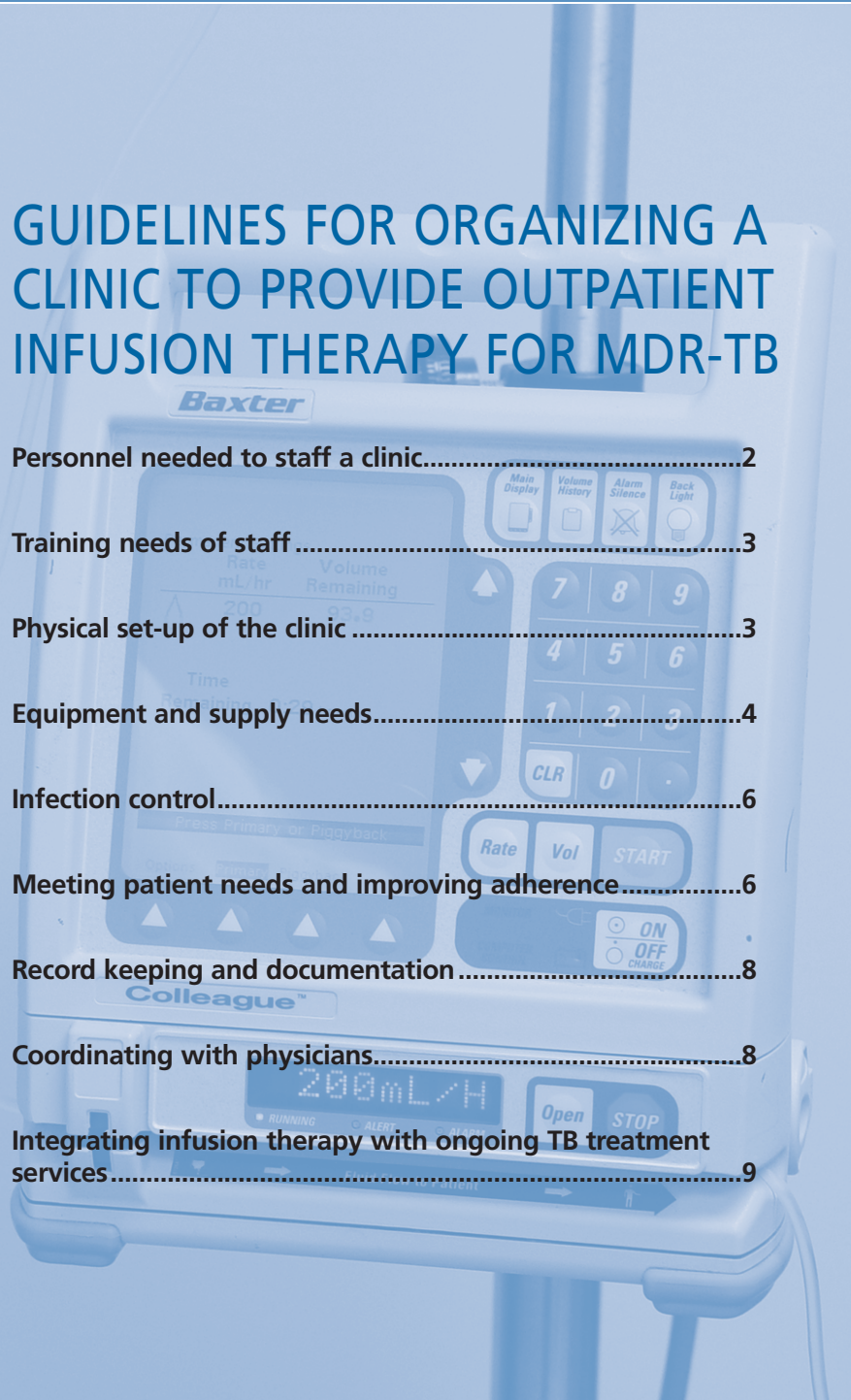
There are many good reasons for clinics treating TB to offer outpatient infusion therapy for MDR-TB patients:

- MDR-TB patients will avoid the expense, inconvenience, and disruption caused by hospitalization or travel to a more distant clinic
- Patients' adherence to treatment may enhance positive outcomes
- Increased adherence will reduce transmission of MDR-TB to others
- Costs to insurance companies and states may dramatically decrease due to fewer days of hospitalization

Experience at the New Jersey Medical School National Tuberculosis Center has shown that even the most complicated MDR-TB cases can be treated with daily infusion therapy on an outpatient basis. In the first years of providing infusion therapy, the Center treated 15 MDR-TB outpatients with 14 cures and one death unrelated to MDR-TB therapy. Even patients who had prior records of poor adherence achieved adherence rates of 90% to 95% and above. Outpatient infusion therapy for MDR-TB offers the benefits of increased patient comfort, convenience, and adherence, along with reduced costs.

GUIDELINES FOR ORGANIZING A CLINIC TO PROVIDE OUTPATIENT INFUSION THERAPY FOR MDR-TB

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II. GUIDELINES FOR ORGANIZING A CLINIC TO PROVIDE OUTPATIENT INFUSION THERAPY FOR MDR-TB

Once a decision is made to provide outpatient infusion therapy for multidrug-resistant tuberculosis (MDR-TB), these guidelines will be helpful to the nursing supervisor assigned to organize and set up the clinic to provide infusion therapy. As background information, the nursing supervisor may also wish to read Section I, *Rationale for Providing Outpatient Infusion Therapy for MDR-TB*. For more detailed information on the daily tasks in a clinic, refer to Section III, *Nursing Procedures to Provide Outpatient Infusion Therapy for MDR-TB*.

The guidelines in this section are intended for experienced nursing supervisors in health departments, health centers, or clinics that already have responsibility for treating TB but do not currently use outpatient infusion therapy for MDR-TB.⁷ These nursing supervisors should be familiar with directly observed treatment principles for TB.

As part of setting up and organizing a clinic to provide infusion therapy, the nursing supervisor is responsible for such practical issues as the following, which are described in this section:

- Personnel needed to staff a clinic
- Training needs of staff
- Physical set-up of the clinic
- Equipment and supply needs and sources
- Infection control
- Meeting patient needs and maintaining adherence
- Record keeping and documentation
- Coordinating with physicians
- Integrating infusion therapy with ongoing TB treatment services including clinic or field-based directly observed therapy (DOT)

It is recommended that written protocols be developed to address these issues.

⁷ Some clinics with limited facilities may provide outpatient infusion therapy only to patients who are no longer infectious. These clinics may include community-based health centers, rural health clinics, and college health centers. Some of the requirements described in this section may not apply to these clinics, as noted on pages 5 and 6.

If a clinic is part of a hospital setting, protocols may already exist that can be used as a model. Protocols should specifically answer questions such as:

- Who can administer medications or have this task delegated to them according to standards of practice?
- What system will be in place to contact physicians for emergency or routine staff consultation?
- Which procedures need to be ordered by a physician, and which tasks can a trained staff member initiate based on clinical judgment (e.g., sputum collection, medication changes, etc.)?
- What are the trouble-shooting interventions for managing central venous access devices and what are the guidelines for utilizing these interventions?
- What are maintenance requirements for equipment, and who will perform these tasks?
- What incentives and enablers will be offered to improve adherence and meet patient needs?
- What are the requirements for record keeping and documentation?

PERSONNEL NEEDED TO STAFF A CLINIC

A registered nurse (RN)⁸ with the appropriate training can provide infusion therapy and other patient care to MDR-TB patients. Depending on the number of patients, this may be the nurse's primary or sole responsibility. One nurse may be able to treat as many as six MDR-TB patients concurrently if appointments are carefully staggered.

The nurse should be certified in basic life support (BLS) and intravenous (IV) therapy to:

- Insert needles and flush lines
- Administer continuous or intermittent fluids and bolus medications
- Withdraw blood
- Monitor for adverse reactions to medications
- Change dressings
- Remove peripherally inserted central catheter (PICC) lines at treatment completion

⁸ Consult the Nursing Practice Act in your state concerning provision of therapy by licensed practical nurses (LPN) or non-nurses, including family members in the home setting.

- Provide emergency care, if needed

Another RN must be trained and available to cover during scheduled breaks, as well as absences.

Some personal characteristics are needed such as an ability to multi-task, a patient and caring attitude, and an ability to encourage and motivate patients to adhere to therapy.

It is helpful if the nurse already has knowledge of basic information about TB disease, its transmission, and treatment by DOT.

TRAINING NEEDS OF STAFF

If not already familiar with TB disease and current treatment services (e.g., DOT), nurses will need basic education about TB, including anti-TB therapy, the use of second-line drugs, and an orientation to the clinic. Services for MDR-TB patients will be integrated into existing services, so familiarity with the clinic is essential for cooperation and sharing resources.

Most nurses can provide infusion therapy for MDR-TB with a minimal amount of additional clinical and practical training. These nurses usually already know how to use and manage implanted ports and PICC lines for infusion therapy, but they may need review or refresher training. Many hospitals or local health care training institutes can provide courses. Training in how to use a specific type of infusion pump may be needed from the manufacturer of the pump.

Nurses should carefully study the next section of this guide, *Nursing Procedures to Provide Outpatient Therapy for MDR-TB*. Appendix A includes a list of additional resources that may be helpful to nurses.

PHYSICAL SET-UP OF THE CLINIC

Since infusion therapy for each MDR-TB patient lasts for 30 to 60 minutes, 5 days per week, it requires a room within the clinic that can be used solely for this purpose. It must be an airborne infection isolation (negative pressure) room to fulfill ventilation requirements for infection control. It should also have a sink for handwashing.

Appointments should be staggered to allow use of this room for infectious patients. If possible, non-infectious patients should be scheduled earlier in the day and later appointments reserved for infectious patients to decrease the risk of transmission. Once a patient is non-infectious, other comfortable, private areas may also be used to provide infusion therapy. Ideally, as with all anti-TB medication, infusion therapy should be administered at the same time each day. However, times may vary based on the clinic structure, other staff responsibilities, and changes in the patient's schedule.

Waiting times for MDR-TB patients should be avoided. On arrival, the patient should go immediately to the room in which he or she will receive infusion therapy. This room should be equipped as described below and on the next page.

EQUIPMENT AND SUPPLIES NEEDED

The clinic's usual procedures should be followed for obtaining and ensuring adequate supplies of prescribed drugs for MDR-TB patients. All the necessary equipment and supplies for infusion therapy are generally available through medical supply companies. If issued through a hospital, the hospital supply personnel may be responsible for inspection and maintenance of the equipment. However, often a medical supply company can assist in this process. At the end of each patient's period of treatment, that patient's pump should be returned to the supply company or to the hospital supply unit.

In each infusion room, the following equipment and supplies are needed:

- A reclining infusion chair (if necessary to accommodate a number of patients, a comfortable office chair with arm rests may be used instead)
- An infusion pump (e.g., Baxter Colleague Pump or a similar type) and instruction manual for its use
- IV tubing
- IV bags
- Leverlock cannula
- IV needles
- Right angle non-coring needles
- Huber needles with extension set

- Luer lock adapter
- Gauze and tape
- Central venous dressing kits
- Syringes: 2 to 3 ml with needleless device, 5 ml, 10 ml, and 20 ml
- Heparin (100 units/ml)
- Saline solution (0.9% NaCl)
- Alcohol swabs
- Betadine swabs
- Adhesive bandages
- Surgical masks (for use by infectious patients in a non-airborne infection isolation room)
- N-95 respirators (for health care worker in contact with infectious patients)
- Gloves (non-sterile and sterile)
- Tissues
- Small drinking cups
- Antimicrobial soap for handwashing
- Hand lotion
- Emergency kit

Periodically, blood may need to be drawn from infusion patients, so the necessary supplies for drawing blood should also be available.

Near the treatment area, the nurse will need:

- Access to separate refrigerators for storing medications and food
- Food items such as pudding or yogurt to mix with oral medications
- A desk and basic office supplies (pens, pencils, etc.)
- Required records, forms, or logs for documentation
- A filing cabinet or other filing system
- A computer with record-keeping software, if applicable

Clinics that provide outpatient infusion therapy only on a limited basis to non-infectious patients do not require an airborne infection isolation room.

For instances in which it is not feasible for a patient to receive infusion therapy in the clinic, treatment may be arranged through an outside agency that provides infusion therapy in the home. Similar equipment and supplies would be needed for a visiting nurse, health aide, or other designated caregiver assigned to do infusion therapy in the home setting. However, how these items are supplied and stored will vary. Record keeping and documentation may or may not be done on site.

INFECTION CONTROL

Procedures for infection control are included in the next section, *III. Nursing Procedures to Provide Outpatient Infusion Therapy for MDR-TB*.

It is important to separate infectious and non-infectious TB patients (those with negative sputum smears, resolving symptoms, and no cough). Infectious patients should not be transported with non-infectious patients, nor should they share a waiting area. Infectious patients should be treated in an airborne infection isolation room.

Nurses should use N-95 personal respirators when treating infectious TB patients. Infectious patients should be offered tissues when coughing and wear surgical masks if not in an airborne infection isolation room. All equipment should also be wiped down daily.

MEETING PATIENT NEEDS AND IMPROVING ADHERENCE

TB patients will have many needs that, if not met, may be barriers to adhering to treatment. For example, it may be difficult to find transportation for a daily appointment. Or it may be necessary to find childcare in order to come to the clinic.

Since infusion therapy for MDR-TB lasts, in most instances, for at least 6 months, and requires 30 to 60 minutes per day, 5 days per week, the barriers to treatment can be even more pronounced. In addition to time-consuming visits for infusions, MDR-TB patients periodically must schedule visits for evaluation of infusion site placement (e.g., radiology, resuturing). It is important for the clinic to find ways to provide support to meet the MDR-TB patient's needs and help overcome barriers.

Some patient needs (such as transportation) may already be met by the clinic as part of providing DOT for other patients. Infusion therapy patients should have access to the same types of assistance and services to enable them to attend their appointments.

Some clinics have a financial services office to help patients deal with insurance, Medicare, disability paperwork, or applications for food stamps. This type of assistance can be especially helpful to MDR-TB patients throughout their prolonged treatment.

It is especially important that MDR-TB patients have an adherence contract (preferably written and signed) that clearly specifies treatment goals and the responsibilities of both the patient and the provider. A similar contracting process may be used with MDR-TB patients as with all TB patients. The process should involve concrete discussions about specific behaviors, expectations, and rewards; the patient's involvement is critical. A sample adherence contract is provided in Appendix B.

Incentives may also be used to improve adherence. Incentives are small rewards given for positive patient behavior. Incentives should be tailored to the patient's interests or needs and be offered according to an established policy. For example, an incentive may include a gift certificate to a grocery store or a fast food restaurant at the end of the week if adherence for that week was 100%.

The nurse who provides care to an individual patient should assess that patient's needs and barriers to adherence. Section III, *Nursing Procedures to Provide Outpatient Infusion Therapy for MDR-TB*, will describe more about assessing and overcoming barriers for a particular patient. For example, a nurse may discover that a certain patient needs a wake-up call to be ready for transportation to the clinic. Or, to provide patient education more effectively, the nurse may find that an interpreter is required, and that culturally and linguistically appropriate patient education materials must be provided.

The most critical factor in maintaining or improving patient satisfaction and adherence is a relationship with a caring provider. The nurse should be able to recognize and address both the patient and the family members' feelings and fears about TB disease and its treatment. Compassion and a non-judgmental attitude are important in all communication with the patient.

The clinic should be organized so that the patient feels confident that it is a place for specialized treatment of MDR-TB, where all the staff members are focused on the patient's well-being and ultimate cure.

The following organizational characteristics are critical:

- The clinic should be physically safe and comfortable
- MDR-TB patients should be seen immediately on arrival, with no waiting time
- Clinic staff should be good listeners, courteous, respectful, and culturally sensitive
- Interpreters should be available as needed
- All staff must hold patient information in strict confidence

RECORD KEEPING AND DOCUMENTATION

Documentation is an integral part of all steps in treatment of MDR-TB patients, as with all TB patients. Every intervention and encounter with the patient should be documented in a clear and concise style to ensure continuation of appropriate care.

Documentation must be consistent with both internal and external standards. Training regarding documentation may be required for nurses. Supervisors should provide samples of appropriate documentation and orient staff members before they begin work. Documentation should be checked periodically for accuracy and completeness, legibility, and use of standard language and abbreviations.

As with all TB patients, a form such as a "directly observed therapy log" should be completed in writing immediately after care is provided. If the medical or DOT record is computerized, records should also be kept on the computer and entries made as soon as possible.

COORDINATING WITH PHYSICIANS

Daily review of each patient's chart will help to determine if there have been any changes in the supervising physician's orders. This is especially important after a physician's examination, when changes are most likely to be made.

During each patient's visit, nurses should look for possible side effects and adverse reactions that require notification of the supervising physician (listed in Appendix C). Protocols should specify what constitutes an emergency (requiring immediate efforts to contact the physician) versus what situations require consultation with the physician at the earliest convenience.

Protocols should also specify what procedures need to be ordered by a physician and what tasks can be initiated by trained staff based on clinical judgment (e.g., sputum collection, medication changes, etc.).

It is important to establish an "on call" system with physicians who supervise the treatment of infusion therapy patients. A list of these physicians should be prominently posted in all exam rooms with their contact information, and the times that they are on call.

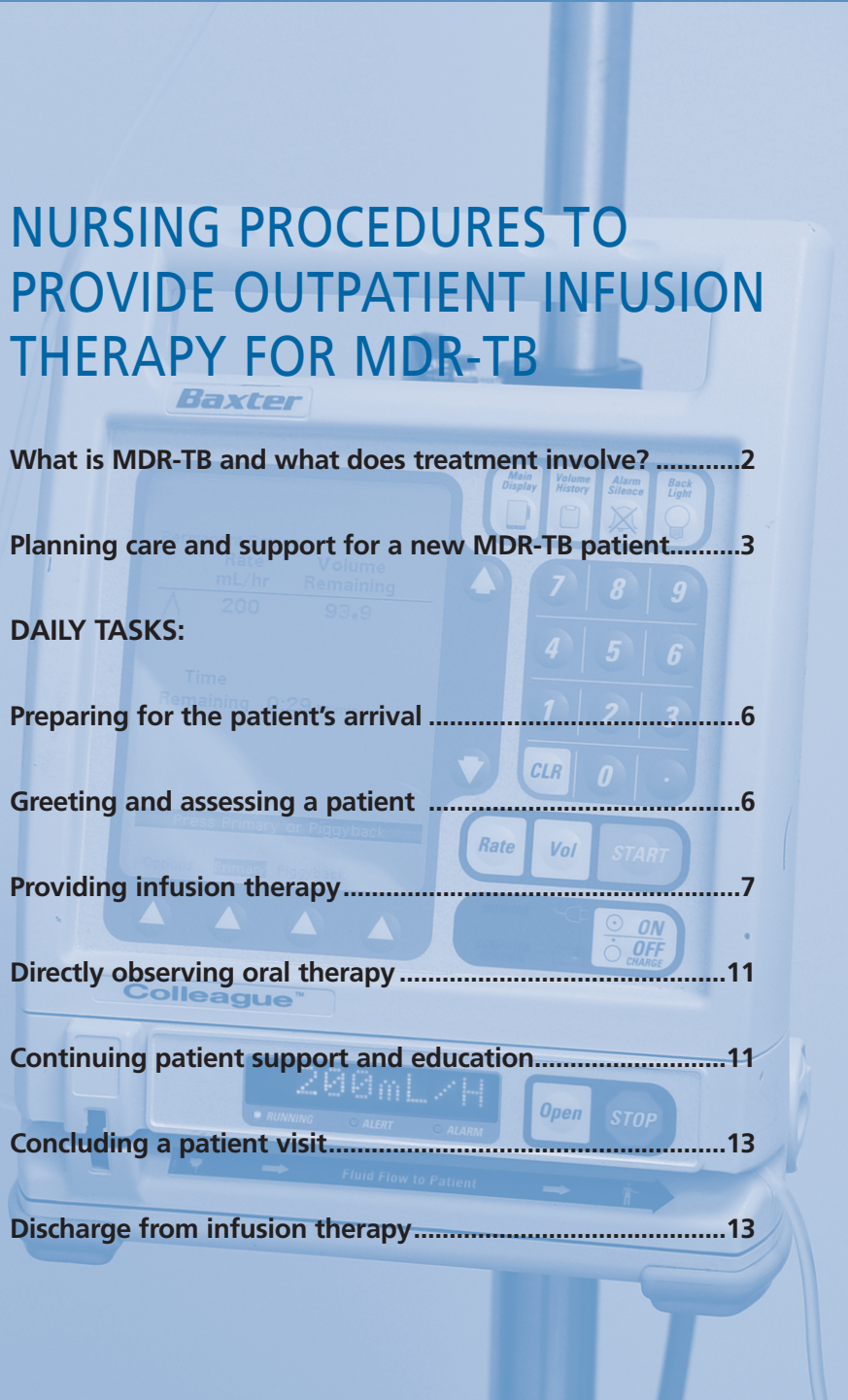
INTEGRATING INFUSION THERAPY WITH ONGOING TB TREATMENT SERVICES

Although providing infusion therapy will require dedicated space in the clinic, some special equipment and supplies, and additional staff, this service can reasonably be integrated with existing medical and nursing services.

The same principles of careful supervision of daily therapy, combined with patient education and support, apply. Many of the same forms used for DOT patients (such as the adherence contract or DOT log) can be used or easily adapted for infusion therapy patients. Many of the same incentives and patient support services (such as transportation or financial services) offered to DOT patients will be needed, used, and may be appreciated even more by infusion therapy patients.

Any change in an organization may cause some staff tension, particularly as resources are shared or shifted, but tensions can be lessened by careful preparation. Before initiating changes, be sure that all staff members are informed about what will occur, when, and why. Be clear about how changes will and will not affect their work. Introduce and orient new staff members thoroughly, being sure that they understand existing procedures in the clinic. After introduction of infusion therapy, at staff meetings or other meetings, openly discuss and try to resolve any problems.

NURSING PROCEDURES TO PROVIDE OUTPATIENT INFUSION THERAPY FOR MDR-TB



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III. NURSING PROCEDURES TO PROVIDE OUTPATIENT INFUSION THERAPY FOR MDR-TB

This section is intended for registered nurses (RNs) assigned to provide infusion therapy and other case management for patients with multidrug-resistant TB (MDR-TB) in an outpatient setting.

Nurses providing infusion therapy for MDR-TB patients should be certified in basic life support (BLS) and intravenous (IV) therapy to:

- Insert needles and flush lines
- Administer continuous or intermittent fluids and bolus medications
- Withdraw blood
- Monitor for adverse reactions to medications
- Change dressings
- Remove peripherally inserted central catheter (PICC) lines at treatment completion
- Provide emergency care, if needed

Some personal characteristics are needed by the staff members such as an ability to multi-task, a patient and caring attitude, and an ability to encourage and motivate patients to adhere to therapy.

Most nurses can provide infusion therapy for MDR-TB with a minimal amount of additional clinical and practical training. Some review or refresher training may be needed in how to use and manage implanted ports and PICC lines for infusion therapy and how to remove PICC lines at treatment completion.

It is assumed that nurses assigned to treat MDR-TB patients are already familiar with basic information about TB disease, its transmission, and treatment by directly observed therapy (DOT). They should also be knowledgeable about the second-line drugs and medication side effects. This section will briefly explain how MDR-TB differs from drug-sensitive TB and why it must be treated differently. It will describe ways to support the patient to help increase the patient's comfort level and adherence. It will then describe the tasks to be completed to provide infusion therapy and other case management for MDR-TB.

WHAT IS MDR-TB AND WHAT DOES TREATMENT INVOLVE?

MDR-TB is resistant to at least isoniazid and rifampin, two first-line drugs commonly used to treat tuberculosis.⁹ MDR-TB requires a longer treatment period (18 to 24 months) than sensitive TB and use of second-line anti-TB drugs that are more expensive, are more difficult to tolerate, and cause more adverse effects than first-line anti-TB drugs. The second-line anti-TB drugs are listed in Appendix D. Treatment of patients with MDR-TB should be supervised by physicians who have experience treating MDR-TB.

Treatment of MDR-TB usually requires drugs that must be injected or given by infusion therapy, and the patient must be monitored carefully for side effects and adverse reactions. Management of MDR-TB has traditionally been carried out on an inpatient basis. However, to decrease costs and increase convenience and patient adherence, clinics can be organized to provide outpatient treatment of MDR-TB.

Treatment of MDR-TB patients on an outpatient basis involves:

- Placement of an **implanted port or peripherally inserted central catheter (PICC) line** (a non-tunneled venous catheter)
- Using **intravenous (IV) therapy** to infuse injectable drugs for 30 to 60 minutes, 5 days per week
- **Direct observation of ingestion** of prescribed oral anti-TB drugs
- **Monitoring for adverse reactions** and reporting these to the supervising physician
- Extensive **patient education and support** to help ensure adherence

IV therapy may be given via an **implanted port** (placed surgically under the skin, usually in the chest) or by **PICC line** (placed in the forearm and threaded into the superior vena cava). Both methods have their advantages and disadvantages, and the decision is usually made by the physician based on the needs of the patient.

⁹ First-line and second-line drugs for treatment of tuberculosis are listed in the drug card entitled *Treatment of Tuberculosis: Standard Therapy for Active Disease*, available from the New Jersey Medical School National Tuberculosis Center at www.umdnj.edu/ntbcweb or 973-972-0979.

A nurse may care for as many as six MDR-TB patients who attend the clinic daily (5 days per week) for therapy. The number of patients that can be managed may vary based on the clinic's structure and schedule. This section is addressed to nurses given the responsibility for case management of MDR-TB patients and describes the tasks involved in:

- Planning care and support for a new MDR-TB patient
- Providing continuing care and support for MDR-TB patients

PLANNING CARE AND SUPPORT FOR A NEW MDR-TB PATIENT

When a new patient is assigned, the physician's orders should be reviewed. **A physician's orders are required for treatment of all patients with MDR-TB.**

The nurse will need to ensure that the drugs prescribed by the physician are available in the clinic, or arrange to have them available by the patient's first appointment. It is important to determine how the infusion therapy will be delivered, by PICC line or by implanted port. The port is usually implanted or the PICC line inserted prior to the first treatment session at the clinic. Radiographic assessment is needed to ensure proper placement of the infusion device.

During the first encounter with the patient, time should be allotted for conversation to get to know the patient and his or her lifestyle, concerns, and needs. Even more than regular TB patients, the MDR-TB patient may have fears of:

- The unknown
- The infusion procedure (time required, possible discomfort)
- The PICC or port site being noticeable, uncomfortable, and unattractive
- Interruption of normal life routines and employment
- Costs and coverage by insurance
- Not getting well or dying
- Infecting others

In initial conversations with a patient, the nurse should try to discover the patient's major fears and concerns, and address them with targeted education or support. Patients should be reassured that, if they adhere to treatment, they will become non-infectious and can be cured. Some MDR-TB patients will have been treated for TB before, and they may be hard to convince. Further explanations may be needed to inform patients that their TB bacteria cannot be killed by regular TB drugs, and that they must be treated with different, stronger drugs for a longer time period. The nurse may stress that MDR-TB patients need special treatment, for which the clinic is specialized to provide.

Using an open-minded and non-judgmental method, the nurse should ascertain as much information as possible about the patient's home life and lifestyle to identify any circumstances that may facilitate or be barriers to adherence. Some of this information may already be in the patient's medical record based on the contact investigation interview and any nurse's or social worker's progress notes. For example, the nurse should communicate with the patient to determine:

- Where the patient lives
- Who lives with the patient
- What languages are spoken or what cultural needs the patient may have
- Whether transportation to appointments is available
- What the patient's employment situation is
- Whether there is adequate food in the home
- When the patient usually sleeps and awakens and the daily schedule in the home
- If the patient is a caregiver, whether alternative caregiver arrangements can be made during appointments

Some personal circumstances may facilitate adherence. For example, if a patient has a caring partner or family member, that person can encourage the patient to come for treatment. If the patient has a job to return to, it can be motivating for the nurse to remind the patient that he or she can return to work after successfully completing therapy.

Other circumstances can be barriers that prevent or interfere with adherence. Attempts to find "enablers" or ways to overcome barriers should be done with the patient's needs in mind.

Following are some examples of barriers and enablers:

- If a patient lives alone and needs transportation to the clinic, the nurse may arrange for transportation
- If a patient's lifestyle or sleeping patterns seem unpredictable, either the nurse or a reliable member of the patient's family may provide a wake-up call
- If the nurse does not speak the patient's language, an interpreter should be used to provide patient education more effectively
- If a patient is unlikely to have breakfast before a morning appointment, the nurse may arrange to have a snack (a muffin, yogurt, or other food that the patient likes) available at the clinic
- If a patient usually sleeps through the morning, afternoon appointments can be planned. However, the same patients should be scheduled at the same time for each clinic visit. All oral anti-TB medications should be given at that time as well
- While a patient may not be able to go on extended vacations during therapy, the nurse and the patient's physician may be able to arrange long weekends with only 3 to 4 days of infusion therapy that week

In addition to enablers, incentives may be used to improve adherence. Incentives are small rewards given for positive patient behavior, such as a gift certificate for groceries or fast food restaurants. As much as possible, incentives should be tailored to the patient's interests or needs while following established clinic policy.

It is important to work with every new infusion therapy patient to complete an adherence contract (preferably written and signed) that clearly specifies treatment goals and the responsibilities of both the patient and the clinic. (A sample adherence contract is provided in Appendix B.) A similar contracting process to that used with any other TB patients may also be used with infusion therapy patients. The process should involve concrete discussions about specific behaviors, expectations, and incentives. The patient's choice, control, and involvement are critical. Therefore, describing any enablers and incentives that have been decided upon can be helpful to encourage the patient's involvement. The nurse should also record and give consideration to the patient's preferred appointment times.

The first visit with the patient is critical in gaining trust. The nurse's relationship with the patient is the most important factor in maintaining or improving patient satisfaction and adherence. Compassion and a non-judgmental attitude are important in all communication with the patient. However, it may be challenging to maintain patience in some encounters with very difficult or angry patients. In these circumstances, the nurse may step outside the room to regain composure and ask for help from a supervisor or colleague.

DAILY TASKS: PREPARING FOR THE PATIENT'S ARRIVAL

1. **Check the schedule of appointments** for the day. Check whether there are any patient messages requesting changes. Make calls to re-schedule or confirm appointments as necessary. Some patients may not need reminders, but others may need a daily phone call.
2. **Review the physician's orders** for each patient and determine if there have been any changes. It is important to look in a patient's chart regularly for updates, especially after a physician's examination, when changes are most likely to be made.
3. **Prepare for the patient's prescribed therapy** by:
 - Checking the oral medications (correct medication names and dosages)
 - Checking the IV medications mixed by a pharmacist and preparing IV bags (patient's name and name(s) of medication and dosage should match the physician's orders)
 - Hanging IV bags, priming tubing, and inserting tubing in pump
 - Preparing syringes with heparin and saline solution to be ready for flushing. Note that heparin syringes may be supplied in pre-prepared form

DAILY TASKS: GREETING AND ASSESSING A PATIENT

1. **Follow infection control procedures**, for example:
 - Ensure that infectious patients go directly to the airborne infection isolation room
 - Wear an N-95 respirator when with infectious patients
 - Wash hands before and after touching a patient

2. **Greet the patient and make the patient comfortable.** (Until you know the patient well, identify yourself and confirm the patient's identity at each visit.) Check that the patient is alert and oriented.
3. **Converse with the patient and ask about the patient's current condition**, allergies, symptoms, side effects, and adverse reactions. A list of signs and symptoms suggesting adverse reactions is provided in Appendix C. At the first visits, describe to the patient signs that should be reported to you if they occur (e.g., dizziness, gastrointestinal (GI) distress, headache, and others listed in Appendix C). At later visits, simply ask how the patient is feeling and listen for mention of these signs.
4. **Look at the patient** for signs of adverse reactions (e.g., lethargy, rash).
5. **Assess the infusion site** for symptoms of phlebitis and infiltration (e.g., redness, edema, tenderness, drainage). See Appendix C for a list of symptoms. Ask if the patient is having any trouble with the infusion site and look for any signs of discomfort in the patient's body language.
6. **Document** signs and symptoms of adverse reactions and phlebitis or infiltration (e.g., elevated temperature) according to clinic policy. Any symptoms should be reported to a supervising physician.
7. **Monitor** vital signs as a routine part of the patient's examination.

DAILY TASKS: PROVIDING INFUSION THERAPY

Note: Prior to these steps, all equipment and supplies should be assembled; IV tubing should be attached to bags; and tubing should be primed.

Patients may be infused via PICC line or implanted port. Where the procedures differ, it is indicated in the steps below.

1. **Explain the procedure to the patient.** After a number of visits, the procedure will require very little explanation, but always carefully explain any change. Patients will begin to know the procedure for infusion well and may even learn to clamp and separate their own tubing if they need to step out of the room. While not an issue of major concern, this practice should not be encouraged on a regular basis.

2. **Set the rate and volume to be infused on pump.** (Refer to the manufacturer's manual for specific directions.) Use a slow infusion rate at first and increase the rate gradually, day to day. Watch for signs of fluid overload (e.g., headache, dizziness, breath sounds, not feeling well, skin cold to touch); if present, decrease rate.
3. **Don sterile gloves.** Cleanse area of port or PICC line with 3 different alcohol swabs, using each swab only one time. **Recleanse** with a betadine swab 3 times. When cleansing the area of the port or PICC line, use a circular motion and starting at the middle of the area, work in an outward direction. Allow the area to dry and apply a new dressing.
4. **Confirm placement of the PICC line or implanted port.** Prior to initiating an infusion on any central venous access device, placement must be confirmed by the presence of a brisk blood return or by radiographic testing, when there is no blood return and troubleshooting techniques have been unsuccessful. Confirmation of catheter tip placement by a radiology report must be documented in the patient's medical record.
5. **Flush with saline.** (If blood must be drawn, see note on pages 9 and 10.) All central venous access devices require flushing to maintain patency. It is recommended that a **pulsating motion ("stop and go")** be utilized when flushing central venous catheters. A physician's order is necessary for flushing protocols using heparinized saline. If there is difficulty flushing, check the clamp to make sure it is open. If still having difficulty, check the site for any drainage, swelling, bleeding, or redness. Also, you may have the patient change position; this may move the catheter inside the vein away from the vein wall and enable you to flush. As with any continued procedural difficulties, you should contact the supervising physician.¹⁰

If PICC:

- Cleanse injection cap with an alcohol swab
- Clamp extension set attached to the PICC

¹⁰ Refer to your clinic's policies and procedures for troubleshooting interventions and specific guidelines on managing central venous access devices.

- Attach a 10 cc syringe containing 10 ml 0.9% saline solution; unclamp extension set; and gently aspirate for blood return. *If there is no blood return, do not use and notify the supervising physician.* After blood return, flush with saline
- Insert a leverlock cannula of primary tubing into the injection site of the saline lock

If implanted port, cannulate and flush:

- Palpate port site to locate septum
- Attach intermittent luer lock adapter to the end of the Huber needle. Attach a 10 ml saline-filled syringe to the end of the intermittent luer lock adapter; prime the Huber needle and extension set. Clamp the extension set
- Stabilize the port between the thumb and forefinger by grasping both sides of the device. Palpate the septum with the other gloved hand
- Insert the Huber needle perpendicular to the septum, and push it slowly but firmly, through the skin and portal septum until it comes to rest at the bottom of the portal chamber
- Unclamp the extension set and aspirate for blood return. Inject a flush of 10 ml 0.9% saline solution. The saline should flow easily. *If there is resistance, re-evaluate placement of needle and check that clamp is unclamped. Observe for swelling or burning at the insertion site*
- Clamp the extension set while maintaining pressure on the syringe plunger to prevent backflow of blood
- If needed, place 2" x 2" gauze underneath the bend (right angle) and wings of the Huber needle for support. (If the wings are flush to the skin, this step can be omitted.)
- Apply skin prep to the outer border where the transparent dressing adheres; allow it to dry; and apply a transparent membrane dressing
- Attach the primed IV tubing. Tape the junction tubing securely to the chest

Note: Periodically, blood may need to be drawn on infusion patients. When drawing blood:

- Flush the line with 10 cc saline, draw 10 cc blood, and discard
- Draw the required amount of blood and then flush the line again with 10 cc saline. Be sure to mark on the lab slip that blood was taken from the port or PICC line

- Once infusion therapy is complete, flush the line first with 5 to 10 cc saline and then infuse antibiotics. When the antibiotics have been completely infused, flush the line again with 5 to 10 cc saline and finally, flush with 5 cc heparin. Immediately lock the line to prevent air from getting into the line and to avoid backflow of blood.
5. **Start the pump** to administer infusion.
 6. **Check on the patient** during infusion therapy. Look for symptoms of adverse reactions, phlebitis, or infiltration (listed in Appendix C).
 7. After therapy:

If PICC:

- Flush the catheter with a 10 cc syringe containing 10 ml 0.9% saline
- Follow by flushing with a 10 ml syringe containing 5 ml heparin (100 units/ml)
- Apply tape and gauze to hold the PICC line in place, paying attention to the patient's preferences for placement of gauze and tape; the patient's arm should be allowed to bend freely for daily activities

If implanted port:

- Clamp the extension set. Disconnect the IV tubing. Clean the luer lock PRN adapter on extension set with a betadine swab for 30 to 35 seconds
- Flush with 10 ml saline. Attach a 10 cc saline-filled syringe to the luer lock PRN adapter on the extension set. Unclamp the extension set and flush; then clamp the extension set. (Clamping prior to removing the needle prevents backflow of blood into the port.)
- Groshong Ports do not require heparinization. If using another type of port that requires heparinization, also flush with 10 ml heparin solution; then clamp the extension set
- Carefully remove the transparent dressing and gauze
- Stabilize the device between the thumb and forefingers by grasping both sides of the device
- Remove the Huber needle by pulling it straight up
- Wipe the insertion site and apply an adhesive bandage

** A helpful mnemonic is SASH: Saline flush, Antibiotics, Saline flush, Heparin flush**

8. **Discard the IV tubing and bag after use.**
9. **Change dressing weekly.** Watch for signs of infection, especially in immuno-compromised patients. Change the dressing at the site of insertion of the PICC line or port weekly, unless it needs to be changed sooner (e.g., because dressing is wet or itchy). When changing dressing, ask the patient to turn his or her head away from the site to avoid possible infection of the open area. Additionally, if the patient is infectious, the nurse should wear an N-95 respirator or the patient should wear a surgical mask to decrease the spread of infection. You may use self-adherent wrap, if available, to keep the line covered and not dangling while the patient is away from the clinic.

DAILY TASKS: DIRECTLY OBSERVING ORAL THERAPY

During the 30 to 60 minutes of infusion therapy, there is plenty of time to give the patient any prescribed oral medications and observe ingestion. Use the standard clinic procedure for DOT.

1. **Set out the oral drugs, a cup of water, and any food** to be given with the drugs (e.g., yogurt, pudding).
2. **Show the drugs to the patient and say what they are.**
3. **Observe the patient ingesting all the drugs.**
4. **Document the drugs taken.**

DAILY TASKS: CONTINUING PATIENT SUPPORT AND EDUCATION

Every visit is an opportunity to communicate that you care about the patient and his or her progress. As you provide therapy and check on the patient throughout the visit:

1. **Make conversation** if the patient is in the mood to talk. At least always ask how things are going with the patient and how he or she is feeling.

2. **Ask open-ended questions to find out about any changes in the patient's circumstances** that may create barriers to adherence (problems with transportation, childcare issues, financial problems, discomfort taking oral medications, side effects). Acknowledge the barriers with the patient, and discuss ways to overcome them.

3. **Provide education about MDR-TB and the therapy** as needed. Answer questions about the disease or therapy if you can, or obtain answers for the patient when you talk with the physician. As needed, periodically review available educational literature about TB with the patient. Be sure that the patient understands the following key messages:

- MDR-TB is especially serious and difficult to cure because the bacteria cannot be killed by the usual anti-TB drugs
- With special treatment provided in the clinic, using different and stronger drugs, patients with MDR-TB can be cured and live normal lives
- To be cured, patients must come for every appointment (5 days per week) and take all the drugs prescribed
- Tests (such as sputum smears and chest X-rays) will be done to find out when a patient is no longer infectious
- While infectious, the patient should:
 - Wear a surgical mask around others
 - Cover the mouth with tissues when coughing, and then dispose the tissues in a closed paper sack
 - Stay home from work, school, social, and group activities
 - Avoid close contact with others, and sleep separately from other family members
 - Ventilate living areas by using fans or opening windows (if it is not too cold)
- The best way to avoid spreading MDR-TB to others is to attend all clinic appointments to take the prescribed drugs
- The patient should care for the infusion site while away from the clinic by not disturbing the site (for example, by bathing with a plastic bag over the PICC line dressing). The patient should also be given instructions to seek medical attention at the nearest emergency department if the site is accidentally disturbed or adverse reactions occur

DAILY TASKS: CONCLUDING A PATIENT VISIT

1. **Provide any oral medication to be taken later at home**, and give careful instructions of when and how to take it. (Most patients will not have to take medications at home, but occasionally it may be necessary.)
2. **Discuss or confirm arrangements for the next clinic appointment**, and be sure that it is correctly entered in your appointment book.
3. **Give any special instructions from the physician**, and assist the patient in following them. For example, the physician may instruct the patient to see a radiologist to check the placement of the PICC line. If so, you may need to help the patient make the appointment and to provide directions. Or the physician may request sputum collection; if so, you will need to provide a sputum container and give collection instructions.
4. **Encourage and praise the patient for adherence**. Tell the patient that you look forward to seeing him or her tomorrow or after the weekend.
5. **Complete documentation of the treatment session**. Complete the written record immediately; you may transfer information to the computer later in the day.
6. **After the visit, communicate with the patient's physician as needed**. Describe any problems reported by the patient, as well as any signs of side effects or adverse reactions observed in your daily assessment of the patient, any problems with medications, etc.

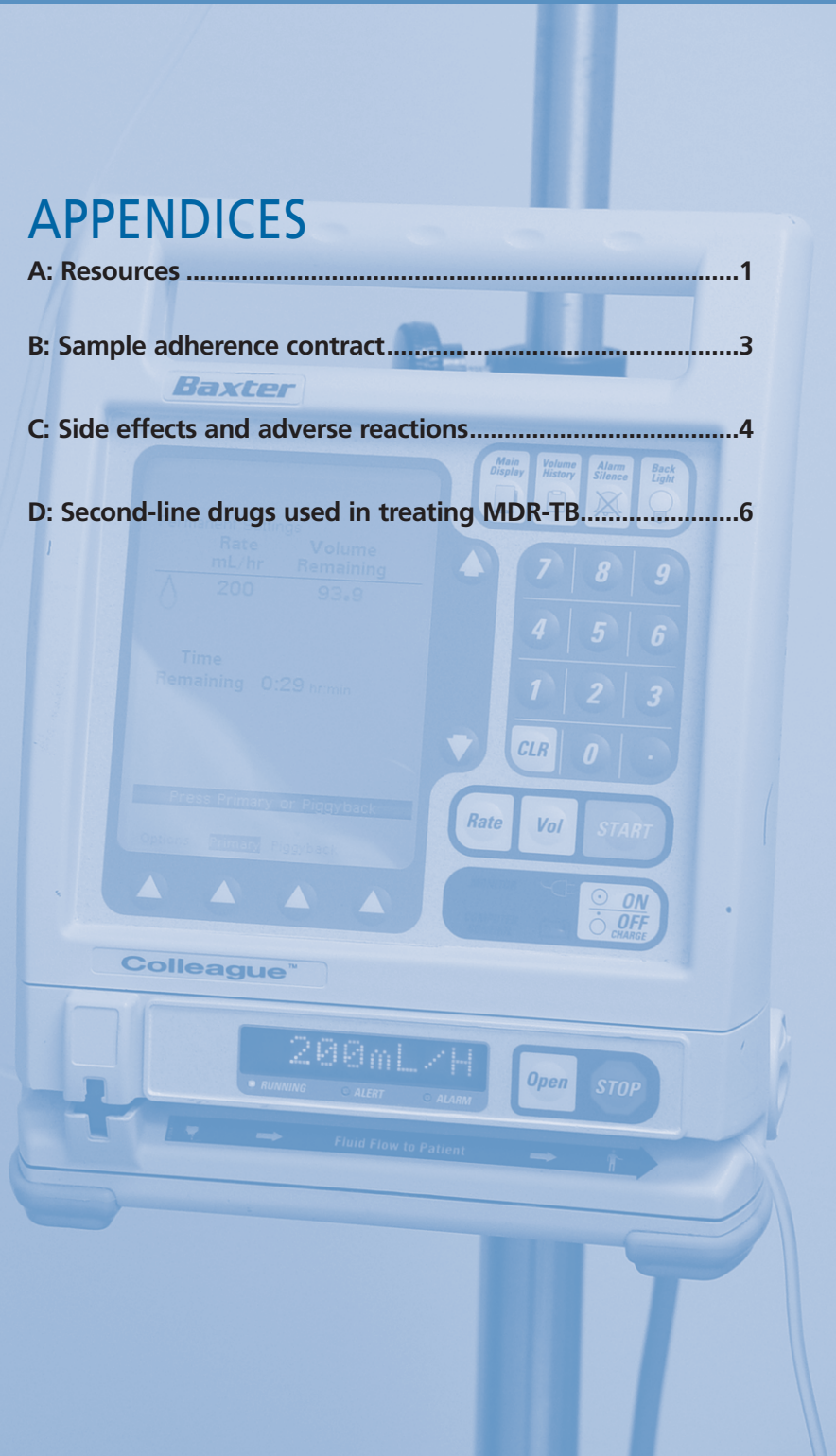
DISCHARGE FROM INFUSION THERAPY

When the patient is discharged from infusion therapy the implanted ports and the PICC line should be removed. Return the pump used by the patient to the supply company or to the hospital supply unit, according to clinic policy.

The patient may still be seen regularly for monitoring and for taking oral medications. Therefore, rapport established during the period of infusion therapy will facilitate continued treatment.

APPENDICES

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APPENDIX A: RESOURCES

Documents and medical references supporting infusion therapy for MDR-TB

1. Bastian, I. & Colebunders, R. (1999). Treatment and prevention of multidrug-resistant tuberculosis. *Drugs*, 58(4), 633-661.
2. Centers for Disease Control and Prevention. (1994). Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis* in Health-Care Facilities, 1994. *MMWR*, 43 (No. RR-13).
3. Centers for Disease Control and Prevention. (2003). Treatment of tuberculosis. *MMWR*, 52 (RR-11).
4. Mukherjee, J. S., Rich, M. L., Socci, A. R., Joseph, J. K., Viru, F. A., Shin, S. S., et al. (2004). Programmes and principles in treatment of multidrug-resistant tuberculosis. *Lancet*, 363(9407), 474-481.
5. New Jersey Medical School National Tuberculosis Center. (2002). *Tuberculosis Case Management for Nurses: Self-Study Modules*. Available at www.umdnj.edu/ntbcweb or by calling 973-972-0979.

Training and information resources for nurses

1. Centers for Disease Control and Prevention. (2005). *Interactive Core Curriculum on Tuberculosis: What the Clinician Should Know*. (electronic version) Available at <http://www.cdc.gov/nchstp/tb/webcourse/corecurr/index.htm>.
2. Centers for Disease Control and Prevention. Self-Study Modules on Tuberculosis (1995 and 1999). Atlanta, GA. Web-based version available at <http://www.phppo.cdc.gov/phtn/tbmodules/default.htm>
3. Manufacturer's instruction manual for the infusion pump used at the clinic.
4. Intravenous Nurses Society, Waldman Lonsway, R. A., Hedrick, C., Perdue, M.B. & Hanskins, J. (2001). *Infusion Therapy in Clinical Practice*. (2nd ed.). New York: WB Saunders.

5. New Jersey Medical School National Tuberculosis Center. (2002). *Tuberculosis Case Management for Nurses: Self-Study Modules*. Available at www.umdnj.edu/ntbcweb or by calling 973-972-0979.

Training courses

Tuberculosis Case Management for Nurses is an interactive workshop for registered nurses designed to enhance the case management skills of nurses working in TB control programs. It is offered annually by the New Jersey Medical School National Tuberculosis Center. Applications and a schedule may be found at www.umdnj.edu/ntbcweb or by calling 973-972-0979.

Local hospital-based infusion therapy training courses.

APPENDIX B: SAMPLE ADHERENCE CONTRACT

I, _____ have been informed that:
(patient)

1. Tuberculosis (TB) is a disease that can be spread to others through the air.
2. TB is usually treated with several different medications for six months or more.
3. It is important take all the medications as explained to me and for as long as they are prescribed.
4. If I do not take the medications as prescribed, I may not get better. This means I will have to take more medicine for a longer period of time, and I could spread TB to others.
5. If I do not take the medications as prescribed or if I have incurable TB, I may be considered a threat to the health of others, and, therefore, legal action may be taken against me. This may include being committed or confined to a medical facility until I can no longer spread TB to others or for the duration of my treatment.

In order to make sure I complete the medications as prescribed, as well as follow the clinic instructions, I will:

1. Be observed taking the medication as needed by the TB Control Program Staff.
2. Attend all scheduled appointments on time at the _____ until my treatment is complete.
(facility name)
3. Call the facility in advance at (_____) _____ if for any reason I cannot make my scheduled appointment.
4. Notify the facility of any change in my address or telephone number.
5. Tell the physician, nurse, or caseworker if I have any complaints, questions, or concerns about any aspect of my care.

_____ I understand and agree to follow the above instructions.

_____ I understand and choose not to follow all of the above instructions.

Patient/Guardian's (if minor) Signature

Clinic Representative's Signature

Date Signed

Witness (if patient refuses to sign)

APPENDIX C: SIDE EFFECTS AND ADVERSE REACTIONS

The following signs and symptoms suggest possible adverse reactions to second-line drugs prescribed for multidrug-resistant tuberculosis (MDR-TB). If observed or reported, all medications should be discontinued and side effects/adverse reactions reported to the supervising physician. These side effects may be attributed to one or more anti-TB drugs:

central nervous system (CNS) effects	malabsorption syndrome
coagulopathy	metallic taste
depression	neurotoxicity
dizziness	ototoxicity
electrolyte abnormalities	peripheral neuritis
endocrine effects	psychosis
gastro-intestinal (GI) intolerance	rash
headache	renal toxicity
hearing loss	seizures
hepatotoxicity	vaginitis
hypersensitivity	vestibular dysfunction
lethargy	

The IV site (Port or PICC line) should be assessed for symptoms of phlebitis and infiltration daily, before and during infusion of medication. The following symptoms should be reported to the supervising physician immediately:

Phlebitis:

- Edema
- No streak formation
- No palpable cord
- Redness
- Warmth to touch
- Pain
- Fever

Infiltration:

- Blanched skin
- Edema
- Coolness to touch
- Tight, leaking skin
- Discolored, bruised, swollen skin
- Circulatory impairment
- Infiltration of any blood product, irritant, or vesicant (extravasation)
- No blood return

Other possible side effects; handle as indicated:

- Allergic reaction to iodine swabs – report to physician
- Irritation from tape – adjust placement or use a different type of tape
- Latex allergy – use latex-free gloves

APPENDIX D: SECOND-LINE DRUGS USED IN TREATING MDR-TB

These recommended second-line drugs are often used in treatment of multidrug-resistant tuberculosis (MDR-TB) and are listed here alphabetically so that nurses can become familiar with their names. Other drugs, not listed here, may be used as well.

Since toxicities are greater when using second-line drugs, these medications should **only** be used for patients with drug resistance or drug intolerance in **consultation with a physician experienced in management of drug-resistant TB**. Never add a single drug to a failing regimen.

All patients with drug-resistant TB should be placed on directly observed therapy (DOT). Second-line drugs are not intended for intermittent use and should be given daily. During pregnancy, exercise extreme caution when using these drugs due to known and unknown risk to the fetus.

Drug	Method of Administration
Amikacin / kanamycin (AM/KM)	IM/IV
Capreomycin (CM)	IM/IV
Cycloserine (CS)	PO
Ethionamide (ETA)	PO
Gatifloxacin (GAT)	PO/IV
Levofloxacin (LEV)	PO/IV
Moxifloxacin (MOX)	PO/IV
p-Aminosalicylic acid (PAS)	PO
Streptomycin (SM)	IM

IM = intramuscular; IV = intravenous; PO = oral

Ciprofloxacin, clarithromycin, clofazimine, and ofloxacin are no longer considered second-line anti-TB drugs but are often used as alternatives to the above listed drugs.

For complete information, please refer to the drug card entitled *Treatment of Tuberculosis: Standard Therapy for Active Disease*, available from the New Jersey Medical School National Tuberculosis Center at www.umdnj.edu/ntbcweb or by calling 973-972-0979.



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