

Outpatient Intravenous Antibiotic Therapy: Reduces economic burden of patients

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ABSTRACT

OPAT it is a frequent source of questions and formal infectious diseases consultations. OPAT is always less expensive than inpatient therapy. Financial savings have been found with OPAT when compared with in hospital stays. The use of intravenous (IV) antibiotics for the treatment of serious infections has become common around the world. It is accepted as the standard treatment for many infectious diseases including other chronic infection like sepsis, meningitis, endocarditis etc. The goals of OPAT program are to provide expert care to patients on IV antibiotics, manage side effects and infections, reduces the need for hospital readmissions. The OPAT having a series of program patient care team includes doctors, nurses, and clinical and hospital pharmacists who are skilled in management of infectious diseases. Intravenous therapy outside the hospital, has only recently become possible, with the introduction of new Antibiotics, better catheters for vascular access, and improved infusion devices. Health care professionals have pioneered the development of OPAT and worked together to develop safe and effective programs. The antibiotics used for OPAT care are chosen for safety, effectiveness and ease of administration and money saving. The IV delivery system needed in the home is much simpler than the large, complicated IV pumps you see in the hospital. OPAT allows suitable patients on intravenous (IV) antibiotics to be discharged early from hospital and treated in their home or community setting by a team of specialist nurses.

Keywords: Outpatient parenteral antibiotic therapy, Intravenous treatment, PICC

INTRODUCTION

Outpatient parenteral antibiotic therapy (OPAT) is now the standard care for a wide range of infections in most communities. An outpatient approach to therapy allows patients to return home more quickly while providing substantial cost savings. Despite its widespread use, OPAT is a frequent source of curbside questions and formal infectious diseases consultations. This article answers some of the most common questions encountered in routine practice. Antibiotic therapy may be given at home, in an office-based setting or through a hospital-based infusion program.

OPAT offers several advantages to patients, health care providers, and insurers. Primarily, the length of hospital stays can be markedly reduced. Some patients may return home and resume their daily routine days or weeks before finishing therapy. In other cases, OPAT can be started as soon as the diagnosis is made, and hospitalization can be

completely avoided. Secondary, OPAT is almost always less expensive than inpatient therapy. Substantial savings have been found with OPAT when compared with in hospital stays (Williams DN 1993, Bernard L 2001).

TYPES OF OPAT

There are 3 basic types of intravenous access used for OPAT:

- Peripherally inserted central catheter (PICC) lines
- Midline catheters
- Peripheral lines

Peripherally Inserted Central Catheter: PICC lines are typically inserted into either the cephalic or basilica vein and terminate in the mid to distal superior vena cava (SVC). A PICC line should be considered for any treatment course lasting more than 2 weeks. A catheter that terminates in the SVC

is mandatory for hyperosmolar solutions and medications with a pH of less than 5 or greater than 9. Penicillin G potassium, nafcillin, oxacillin, and vancomycin require central access if they are to be infused at standard concentrations. If these antibiotics are diluted, peripheral infusion may be possible.

Midline Catheter: A midline catheter is inserted in a manner similar to that of a PICC line but runs only 8 to 10 cm into the vein. Because the tip of the midline catheter rests in the peripheral circulation, this type of catheter is best reserved for shorter courses (3 to 14 days) of less irritating antibiotics.

Short Peripheral Lines: Short peripheral lines can be used to temporize for brief periods (1 to 7 days). However, the frequent need to replace these lines makes them unwieldy for longer treatment courses. (Mortlock NJ 1998, Gilbert DN 1997)

CATEGORIES OF ANTIBIOTICS USED IN OUTPATIENT PARENTERAL ANTIBIOTIC THERAPY

These are categorized into 3 types and well are explained by using examples (Cohen E., 2002) in tabulated form below Table No. 1.

Table No. 1: Category of Antibiotics, Use and Examples.

Category	Use	Example
Category 1	Can typically be dosed daily	Aminoglycosides Amphotericin B Caspofungin Ceftriaxone Daptomycin Ertapenem Vancomycin
Category 2	Are stable for more than 24 hours at room temperature or if refrigerated and can be used in syringe pumps or electronic infusion pumps	Aztreonam Cefazolin Cefepime Ceftazidime Clindamycin Nafcillin
Category 3	Have limited stability and are difficult to use in the outpatient setting	Ampicillin Imipenem Meropenem

The use of intravenous (IV) antibiotics for the treatment of serious infections has become common around the world. It is accepted as the standard treatment for many infections including sepsis, meningitis, endocarditis, intra-abdominal infections, pneumonia, and osteomyelitis. Intravenous antibiotics have traditionally been given in the hospital but increasingly they are given at home or in a clinic or physician's office. One of the few areas of medicine that offers the potential to save money as well as improve the quality of patient care is that of home and OPAT (Hindes R., 1995).

MODELS FOR DELIVERY

The most common models for delivery of outpatient infusion therapy may be classified as

- a. The visiting nurse model
- b. The infusion center model
- c. The self-administration model (Tice AD.1995)

a. The visiting nurse model: A visiting nurse service is already established and well developed in a country and this model may work well to provide parenteral antibiotic therapy, especially if it needs to be given only once a day. The nurse simply visits the home and gives an intra-muscular injection or uses an intravenous line to infuse the antibiotic. This model offers the safety of supervised administration by a nurse and is a particular advantage for a patient who is confined to bed (Kravitz RL1994).

b. The infusion center model: The infusion center model is an easy one to establish. Patients travel to the infusion center for therapy. In this model, the infusion center may be located in a hospital clinic, a doctor's office, an emergency room, nursing home, or a free-standing infusion center. This model offers the advantages of ready access to professional staff as well as medical equipment, medications, and often laboratory and x-ray facilities as well. The center may also be used for other intravenous therapies such as chemotherapy, blood transfusions and fluid therapy. In this model it is convenient for the doctor to observe and diagnosis the patients. Again, the ability to use a once-a-day antibiotic is an advantage. The major limitation to the model is difficulty for the patient and often the family to travel to the facility. In some countries, pharmacists may administer parenteral medications in pharmacy

stores, especially if there are no restrictions on medication use and ordering. An interesting variation is the use of a mobile health services to move towards the patient to provide parenteral medication in the home or inside the ambulance (Tice AD.1995, Poretz DM 1993)

c. The self-administration model: This model of self-administration has the advantage of avoiding even the once-a-day travel. Patients who are stable on IV antibiotic therapy usually need to be seen only once or twice a week by the physician if they can administer their own medications. Infusions are given by the patient or family member using a gravity drip system or with an automatic system such as a battery-driven, computer-operated pump that can be easily carried around. Generally, patients can be trained to be efficient in self-administration and may do as good job as hospital nurses (Stivers HG., 1978).

INTRAVENOUS TREATMENT AT HOME

Patients were provided with a printed information sheet explaining about the drugs to be used and the duration of treatment. Patients or their careers were trained to prepare and administer the injections on the ward and observed to ensure correct practice on two occasions. They were provided with instructions to take home. These instructions listed the supplies required, provided a quick reference reminder followed by detailed instructions for preparation and administration, outlined possible complications to watch out for and provided a list of contact telephone numbers. Patients were asked to return to the ward at least weekly to review IV access and clinical condition. Support for patients while at home. Patients were advised to communicate with one of the Infectious diseases wards or to ask the receptionist to connect a call to doctor for Infectious diseases. The Infectious diseases unit is maintained a 24/7 on-call service with no cross-cover (Malek 1992).

Intravenous Antibiotic Use: Antibiotics given intravenously are commonly used in both high-income and low-income countries. Available evidence from well-established antibiotic stewardship programmes in high-income settings suggests this is frequently unnecessary Intravenous

therapy may result in harmful complications such as phlebitis, extravasation injury, thrombosis, and local or systemic infection including bacteraemia (Boyles TH., 2013). Intravenous therapy also prolongs the duration of inpatient stay, causing pain and inconvenience to the patient and financial cost to the health care system. The risk of bacteraemia in intravenously i.e., peripherally inserted or central venous catheters can be as high as 0.1%, 2.4%, and 4.4%, respectively (Maki DG., 2006).

PRESENT AND FUTURE CHALLENGES

While OPAT has provided many patients with improved satisfaction in care, saved health care resources, and helped to offload emergency departments and inpatient beds, a number of challenges and controversies remain compared with inpatient care. OPAT is clearly cost saving, however issues remain with respect to its funding because it may shift costs from hospitals to patients (Fisher DA., 2006).

OPAT PROGRAMS CAN HELP MANAGE MANY TYPES OF INFECTIONS, SUCH AS

Heart infections (endocarditis).
Bone infections (osteomyelitis).
Skin and soft tissue infections.
Brain (CNS) infections.

THE GOALS OF OPAT PROGRAM ARE TO

- Provide expert care to patients on IV antibiotics.
- Manage side effects and infections.
- Reduce the need for hospital readmissions.

PATIENT CARE IN THE OPAT MANAGEMENT PROGRAM

The OPAT program patient care team includes doctors, nurses, and on-site pharmacists who are skilled in management of infectious diseases. Doctors design a complete and personalized treatment plan for patient with intravenous antibiotics. Nurses take care in intravenous administration and help patients with their medication and pharmacists work with doctors to monitor the IV antibiotic treatment (<http://www.upmc.com>).

When OPAT first emerged as an alternative to hospitalization, almost all candidates were still

admitted for at least a brief period after diagnosis. The admission allowed the physician to at least initiate therapy and assure a stable clinical status prior to discharge. In contrast, today a high percentage of OPAT patients in many communities are never hospitalized at all prior to beginning parenteral therapy (<http://www.upmc.com>). The only exceptions may be those presenting with more complex infections, or an overall clinical status that requires evaluation or care safely provided at least initially in a tertiary setting (Barbara 1998).

Patient Information

Patients and their families should have a basic knowledge of health care to allow safe, effective outpatient therapy. It is also important that they have a positive attitude toward this and be willing and able to learn about out-patient therapy (Chrijvens G., 1995).

Outside the hospital IV Therapy

Intravenous therapy outside the hospital, has only recently become possible, with the introduction of new Antibiotics, better catheters for vascular access, and improved infusion devices. Health care professionals have pioneered the development of OPAT and worked together to develop safe and effective programs. The involvement of a team of health care workers, including a physician, nurse, and often a pharmacist and social worker is particularly important (Rehm SJ 1983).

Intravenous (IV) Antibiotics

The antibiotics used for OPAT care are chosen for safety, effectiveness and ease of administration. The IV delivery system needed in the home is much simpler than the large, complicated IV pumps you see in the hospital. A few pharmacies have been licensed to provide OPAT antibiotics and IV supplies. These pharmacies may not be located at your home medical center. However, the delivery procedures are in place to make sure you get the medication in a timely fashion. For example, a pharmacy at Kaiser Permanente San Francisco (the French Campus pharmacy on Geary St.) provides the IV medications for much of the surrounding Bay Area. Delivery of the antibiotics and other needed supplies is usually made directly to either your home or to your nearby Kaiser medical office.

About Discharge of Patient

If you are being discharged from the hospital to your home, you and your family will be trained to perform OPAT therapy. Before you are discharged, training is provided by nurses who are expert with IVs and home delivery plans. They ensure that the patient and family know how to flush the catheter and give the medication using aseptic techniques to prevent any infections related to the IV line. The IV site needs to be inspected and have a new dressing applied every week. In addition, blood tests need to be done every week and are typically done the same day as the dressing change. If the patient is discharged to a skilled nursing facility, the nursing staff will handle the OPAT. If the patient is home but unable to travel, the visiting home health nurse will arrange for the dressing change and blood drawing in the home. If the patient recovers to the point that he or she can drive or get transportation to a local facility, the blood tests and dressing changes will be done at the local Kaiser Permanente facility.

Lifestyle Management:

The ability to continue IV antibiotics in the outpatient setting can be a welcome alternative to remaining in the hospital. Be sure that you follow all instructions carefully and finish the prescription. Before going home, we will review with you your antibiotics and the time of day for each dose. The times can often be adjusted to your bed time, special appointments, etc. Maintain good hygiene by making sure your hands are washed with soap and water or an alcohol-based solution before you touch your IV line. Do not allow others to touch the tube without cleaning their hands first (<https://mydoctor.kaiserpermanente.org>).

OPAT (Outpatient Parenteral Antimicrobial Therapy):

None of the patient wants to reside in hospital unless they absolutely need to be. If avoiding a hospital stay or being let out early were available options most people would choose to receive their treatment at home. OPAT allows suitable patients on intravenous (IV) antibiotics to be discharged early from hospital and treated in their home or community setting by a team of specialist nurses.

There are 2 options available:

- a. A nurse will call to administer your IV antibiotic treatment. This is called H-OPAT.
- b. You can opt to self-administer your IV antibiotic treatment. This is called S-OPAT.

Clinical Governance:

- Patient remains under the care of the hospital consultant while receiving their IV antibiotic treatment at home.
- Patients are called back for weekly review by hospital team.
- Providers of the National OPAT Service
- TCP Homecare and Fannin Health were awarded the contract to deliver the National OPAT Service.
- TCP Homecare provide the nurse visits, drug dispensing, cold chain delivery, medical waste management and patient care reports.
- Fannin Health provide the aseptically compounded antibiotics needed for the service.

Benefits of OPAT:

- It removes the stress of staying in hospital
- Equivalent clinical outcomes
- Promotes admission avoidance
- Promotes early discharge from acute beds
- Promotes antibiotic stewardship
- Runs 7 days a week, 365 days a year
- Treatment is provided close to family support
- Reduces risk of patient acquiring a hospital infection
- Patient sleeps and eats better at home
- Allows patients return to work / normal routine
- No charge for the patient (<http://www.tcp.ie>)

Medical Assessment:

Determination of the status of the patient's infection and any underlying medical condition is a critical component of the assessment process. The increasing use of OPAT without initial hospitalization makes the challenge of medical assessment even more important. The patient's risk of sudden or life-threatening changes in health should be low. OPAT may be appropriate for patients with terminal conditions, if the therapy contributes to their quality of life and comfort. Often the patient's participation is more dependent on medical and psychosocial factors other than the type of infection present. Table No.: 2 lists the more common infections and

antimicrobials used at several different OPAT centers. For most programs, soft-tissue and bone infections are the most common diagnoses. Patients with a sepsis syndrome or infections such as meningitis, endocarditis, septic arthritis, or severe pneumonia should usually be hospitalized for initiation of parenteral antimicrobial therapy because of the risk that the patient's medical condition may suddenly worsen or that hospital-based procedures may be needed. Once their condition has stabilized, however, many of these patients may be appropriately discharged to receive OPAT (Rehm Joseph R., 2004).

Physician-directed OPAT program:

The key elements of physician-directed OPAT programs are outlined in Table No.: 2. Although any physician can legally order OPAT, not all physicians are expert in doing so. The responsible physician should be knowledgeable about infectious diseases and OPAT so that poor clinical responses or problems such as therapeutic failure, adverse events, drug toxicity, and infusion device and vascular access issues are avoided or appropriately and promptly addressed. In some clinical settings, an infectious diseases consultation is required before a patient can be sent home to receive OPAT (Rehm 1983).

Table No. 2: Key elements required for an outpatient parenteral antimicrobial therapy (OPAT) program are given below as tabulated form.

System	Objectives
Health care team	<ul style="list-style-type: none"> - An infectious diseases specialist or physician knowledgeable about infectious diseases and the use of antimicrobials in OPAT - Primary care or referring physicians available to participate in care - Nurse expert in intravenous therapy, access devices, and OPAT - Pharmacist knowledgeable about OPAT - Case manager and billing staff knowledgeable about therapeutic issues and third party re-imburements - Access to other health care

	professionals, including a physical therapist, a dietitian, an occupational therapist, and a social worker
Communications	<ul style="list-style-type: none"> - Physician, nurse, and pharmacist available 24 h per day - System in place for rapid communication between patient and team members - C-Patient education information for common problems, side effects, precautions, and contact lists
Outline of guidelines for follow-up of patients with laboratory testing and intervention as needed	
Written policies and procedures	<ul style="list-style-type: none"> - Outline of responsibilities of team members - Patient intake information - Patient selection criteria - Patient education materials
Outcomes monitoring	<ul style="list-style-type: none"> - Patient response - Complications of disease, treatment, or program - Patient satisfaction.

Patient Evaluation and Selection:

Initiation of OPAT requires that a physician determine that such therapy is needed to treat a defined infection, that hospitalization is not needed to control the infection and that alternate routes of drug delivery are not feasible or appropriate. Factors to consider in patient evaluation and selection are out-lined in Table No. 3. The primary goals of outpatient therapy programs are to allow patients to complete treatment safely and effectively in the comfort of their home or another outpatient site and to avoid the inconveniences, complications, and expense of hospitalization. However, OPAT is not appropriate if the patient's medical care needs would be better met in the hospital. Financial concerns in selection of patients for OPAT should not take precedence over the patient's welfare. There is potential for both overuse and underuse of OPAT. A careful analysis of patients referred for home therapy will demonstrate that a subset of referrals

may be inappropriate some patients require hospitalization for ongoing care; for others, oral therapy is appropriate, and for some, antimicrobial therapy may not be needed. Because of the risks of progressive infections and for adverse events, physicians with training in the specialty of infectious diseases or with experience and knowledge of OPAT should be involved in the evaluation of candidates for therapy.

Table No. 3: Specific considerations in evaluating patients for outpatient parenteral antimicrobial therapy (OPAT).

1. Is parenteral antimicrobial therapy needed?
2. Do the patient medical care needs exceed resources available at the proposed site of care?
3. Is the home or outpatient environment safe and adequate to support care?
4. Are the patient and/or caregiver willing to participate and able to safely, effectively, and reliably deliver parenteral antimicrobial therapy?
5. Are mechanisms for rapid and reliable communications about problems and for monitoring of therapy in place between members of the OPAT team?
6. Do the patient and caregiver understand the benefits, risks, and economic considerations involved in OPAT?
7. Does informed consent need to be documented?

CONCLUSION

As we know that outpatient antibiotic therapy is more cost effective than inpatient. Nearly half of the populations with acute illness prefer only OPAT. It is useful but at the same time it may harm in case of intravenous antibiotics that are less frequent in outpatient services. So it should be carefully handled before taking the iv antibiotics as a OPAT. The OPAT treatment should be done properly with the complete course. If a doctor or physician prescribes for 4 days the OPAT should be followed strictly and after few days it should be reported.

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