

# Outpatient parenteral antimicrobial therapy as an alternative to hospitalization

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**SUMMARY** Outpatient parenteral antimicrobial therapy (OPAT) has evolved because of advances in antibiotics and the advent of new technology. It provides a cost-effective means of treating seriously infected patients away from hospital.

Virtually any infection can be treated on an outpatient basis and several treatment programmes have been designed. Housebound patients can be visited by a nurse who will supervise administration; infusion centres, set up in a clinic or a doctor's office, provide on-hand medical staff and the benefit of a medical facility; self-administration provides autonomy for patient and family and is the least costly.

Given the cost-cutting environment in which healthcare now operates worldwide, it is important that OPAT must develop its own procedures and guidelines for quality assurance. For OPAT to work away from the controlled environment of the hospital, it is essential that physicians, nurses and pharmacists adapt to new medical environments and work with the patient to ensure that care is maintained to a high standard.

## Introduction

Hospitals have been extremely beneficial to medicine. Initially they simply housed individuals who had to be segregated from society because of disease. With advances in medicine and technology, hospitals have become a valuable asset and provide resources for education and research. However, over the past few years hospitals have outstripped their economic base. Services have been cut back and beds are being closed to reduce rising health-care expenditures.

Apart from the cost savings, however, there are other reasons to consider alternatives to hospitalization. Even Charles Mayo<sup>1</sup> said 'the sooner patients can be removed from the depressing influence of general hospital life the more rapid their convalescence'. Many patients are also anxious to return to work so that they can support themselves and their families. With advances in antibiotic development, vascular access and infusion devices, outpatient intravenous therapy is both feasible and practical. With the teamwork of physicians, nurses and pharmacists, people

with serious infections can be treated safely and effectively on an outpatient basis.<sup>2</sup>

## Growth of outpatient antimicrobial therapy

Outpatient parenteral antimicrobial therapy (OPAT) is a good example of a treatment that provides an alternative to hospitalization. It was not long ago that treatment with intravenous antibiotics required hospitalization. However, in 1974, Rucker and Harrison treated respiratory infections in children with cystic fibrosis with intravenous antibiotic therapy at home.<sup>3</sup> There has been a progressive increase in the use of OPAT with time; it is now used in more than 250 000 patients annually in the US and its use continues to grow at an annual rate of 15–20%.<sup>4</sup> It is estimated that \$1.5 billion is spent each year on OPAT in the US. It has become the primary type of outpatient intravenous therapy, having surpassed parenteral nutrition, chemotherapy and pain management.<sup>5</sup>

Although the reasons for the growth of OPAT are largely economic, there are many other

contributing factors. In the US the cost to an insurance company for a day in hospital for intravenous antibiotic treatment averages about \$1000 per day. An identical regimen of outpatient parenteral antibiotics may cost \$200 or less.<sup>6</sup> These cost savings are a definite incentive for insurance companies and others to encourage OPAT.<sup>7</sup> However, there are other reasons for the growth of OPAT, besides cost savings. These include benefits for the patient, who can be at home with family and friends and in a familiar environment with usual clothing and food. Many patients are able to return to work or school. The incidence of nosocomial infections also appears to be reduced for outpatients. Additionally, patients are more involved with their care as outpatients than as inpatients. They need to participate in and take responsibility for their treatment and essentially become a treatment team member.

### The outpatient antimicrobial therapy team

OPAT has evolved as the result of the development of new antibiotics and new technology. However, it would not have been possible were it not for the pioneering efforts of nurses, pharmacists and physicians, who have been able to bring hospital quality of care into the community and the home. For successful OPAT, one of the most important factors is for the team to ensure that the quality of outpatient care is maintained. As in the hospital environment, the physician is in charge and has the ultimate responsibility for treatment decisions and outcome. In the hospital, the nurse, pharmacist and physician

know each other and work closely together, whereas in the outpatient setting this may be difficult. Additionally, the patient must be considered as a team member, because in some situations he/she may administer his/her own treatment. The patient may also be relied on to report new problems or side-effects such as nausea, rash or fever directly to a doctor.<sup>8</sup>

### Organizing models of outpatient antimicrobial therapy

OPAT programmes can evolve from a variety of organizations, including hospitals, hospital clinics, physician offices, visiting nurse services and independent home health care agencies. Regardless of the organizational base, there are essentially three distinct models for delivering OPAT (Table 1).

- If the community has an established visiting nurse programme, this can be developed to include the administration of parenteral therapy. A nursing visit to the home has the advantage of allowing an inspection of the home as well as supervision of administration. This can be particularly advantageous for the housebound patient, but may be more expensive than the other models because of the time and travel involved.
- The infusion centre model can be established in a doctor's office, hospital clinic, emergency care centre or even a skilled nursing facility. Because of the presence of physicians and supervised administration, it has the advantages of a medical facility. It does, however, require the patient or the family to do the travelling, and involves the costs of maintaining specialized facilities.

**Table 1. Pros and cons of OPAT delivery models**

Model	Advantages	Disadvantages
Visiting nurse	Inspection of home Supervised administration	Cost of nurse time and travel Privacy concerns
Infusion centre	Medical staff on hand Access to medications and devices Supervised administration Physician available	Cost of facility Patient travel
Self-administration	Reduced costs Patient autonomy	Unsupervised administration Compliance Patient training

Adapted from Tice<sup>2</sup>

- The self-administration model is of particular advantage for the patient and his/her family in terms of freedom and autonomy. Although this method is relatively inexpensive because of low labour and facility costs, it does require patient training. There is also the responsibility for unsupervised administration to be considered.<sup>9</sup>

## Opportunities for OPAT

### Types of infection

There are a number of infections that lend themselves well to OPAT. Initially, OPAT was used to shorten the hospital stay for patients who needed a prolonged course of intravenous therapy for endocarditis and osteomyelitis infections.<sup>10,11</sup> Recently, there has been an increasing interest in avoiding hospitalization completely. This is possible with infections such as cellulitis, wound infections, pneumonia and pyelonephritis.<sup>12,13</sup> With a well-developed OPAT programme, virtually any infection can be treated on an outpatient basis, although some patients should be hospitalized initially if they present with endocarditis or possible sepsis.

The prime reasons for hospitalizing patients should be other medical problems, social conditions or the need for surgery. A comparison of diagnoses for inpatients and outpatients during a single weekend at Infections Limited is presented in Table 2. Infections Limited is an office-based infectious diseases practice which provides specialist consultations and follow-up for patients in a surrounding area of approximately half a million people. It is noteworthy that this group was responsible for more outpatients with intravenous antibiotic therapy than inpatients, even though they

provide almost all of the infectious diseases services at the seven local hospitals.

### Antibiotics and vascular access

Antibiotics and their use have also been adapted to OPAT. There are particular characteristics of antibiotics that are relevant. The antibiotic selected for OPAT should be safe and well tolerated. Additionally, it should be stable if it needs to be mixed days in advance of administration, and should have a half-life that allows it to be given once a day or less often.

Once-daily dosing is possible with a number of antibiotics.<sup>14</sup> The cephalosporin ceftriaxone has been one of the leaders in once-daily therapy. Aminoglycosides have a shorter half-life, but can still be given once a day because of their prolonged post-antibiotic effect and concentration-related killing. As renal function deteriorates in the elderly, vancomycin is potentially a once-daily drug. Some of the new quinolones, such as levofloxacin and trovafloxacin, may also be useful on a once-daily basis. Teicoplanin has a long half-life and can be given three times a week in OPAT. Cidofovir can be administered every one to two weeks for cytomegalovirus retinitis.

Patients on parenteral antibiotics should be closely monitored. There should also be provision for the first infusion to be given in a medical facility in case of anaphylaxis. Some drugs, such as amphotericin and vancomycin, should be given at a controlled rate to avoid toxicity problems.

There has also been progress in vascular access for OPAT. A variety of plastic catheters, which can remain inserted for long

**Table 2. Diagnoses made by Infections Limited, 18–19 October 1997**

<b>Hospital (47 patients)</b>		<b>Office (59 patients)</b>	
Wound infection	14	Wound infection	16
Abdomen	8	Osteomyelitis	14
Cellulitis	4	Septic arthritis	5
Bacteraemia/endocarditis	4	Bacteraemia/endocarditis	5
Fever and neutropenia	4	Cytomegalovirus	5
Chest	3	Chest	5
Other	10	Abdomen	4
		Other	6

Data collected at Infections Limited PS, Tacoma, WA.

**Table 3. Programme outcome**

Site	MINN	WASH	NAIT
Courses	1500	538	623
Death	0	0.2%	10.3%
Compliance	ND	0.6%	ND
Hospitalized	5–6%	7.8%	6.1%

MINN = Minneapolis, Minnesota<sup>19</sup>; WASH = Tacoma, Washington<sup>9</sup>; NAIT = National Alliance for Infusion Therapy<sup>20</sup>; ND= no data  
Adapted from Tice AD. A teleconference on outpatient parenteral antimicrobial therapy (OPAT). Tufts University School of Medicine. Boston, MA, 1997.

periods, are now available.<sup>15</sup> Peripherally inserted central venous catheters have been particularly valuable.<sup>16</sup> A number of infusion devices that can provide intravenous antibiotics in the home setting as reliably as in the hospital, and perhaps even more so, are also now available.<sup>17</sup>

### Quality assurance

With the cost incentives to use OPAT for serious infections, there has been a rapid growth of this industry in the US. Even with the economic benefits, however, there are growing cost constraints. This is partly due to the competitive influence of managed care where one provider competes with another. Because of the need to save money, some quality-of-care issues are being overlooked, particularly in medical environments that are not familiar with them. Without the controls in the hospital and their ongoing quality assurance mechanisms, OPAT must develop its own system for quality assurance. The recent practice guidelines formulated by the Infectious Diseases Society of America should be helpful in this regard.<sup>18</sup> In addition, there need to be ongoing measures of bacterial as well as clinical outcomes, and means of evaluating the problems within the OPAT programmes.

A comparison of several large series of OPAT patients is shown in Table 3. Although there are problems in defining useful indicators, an examination of these reports is worthwhile. The programme in Minnesota<sup>19</sup> reported no deaths, but only deaths that were attributable to the programme were included. The programme in Washington<sup>9</sup> reported several deaths during therapy, but these did not appear to be due to OPAT. The National Alliance for Infusion Therapy series<sup>20</sup> had an

alarmingly high death rate among patients on OPAT, but when the cases were reviewed, most deaths were due to end-stage HIV infections, which accounted for a large percentage of the patients in the study. In the early 1990s, when the study was done, a high death rate from HIV-related infections was not unusual. The hospitalization or rehospitalization rates ranged from 5% to 8%. On review of these cases, most were for elective surgery or for medical or social problems rather than for the infection itself or for complications of OPAT.

Ongoing quality assessment is important, and is becoming increasingly so as people are almost forced out of hospital because of economic incentives by insurance companies.<sup>21</sup> There is an obvious need for multi-centre cooperative networking studies to examine some of the important parameters for outpatient therapy.

### Conclusion

OPAT is a challenging but exciting area, about which more information is needed. It offers a new medical environment that physicians, in particular, may not be familiar with. It requires a new and dedicated team of health-care professionals and a knowledge of new technology and antibiotics. There is a need for ongoing quality assurance and quality improvement in patient selection and ongoing follow-up and monitoring. OPAT will undoubtedly continue to evolve as new resources and services become available, and economic factors are recognized and incorporated into healthcare plans.

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