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The importance of teamwork for outpatient parenteral antibiotic therapy

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Abstract

A variety of treatment models can be constructed to provide intravenous antibiotic therapy outside the hospital. The type and details of each model must be adapted to local needs and resources, but those that coordinate the resources of all the primary members of the team necessary to care for patients, offer the greatest potential for a safe and efficient programme. We believe that the teamwork of the physician, nurse, and pharmacist in our clinic-based, physician-directed model can provide a safe and effective service, which is appreciated by the patients we care for.

Keywords: Outpatient parenteral antibiotic therapy (OPAT); Teamwork; Home care models

1. Introduction

Serious bacterial infections have traditionally been treated in hospital in order to provide close monitoring and supervision of the disease process, as well as to allow the provision of intravenous antibiotics. The success of these intravenous antibiotic therapies has been, in part, responsible for the growth of the large medical centres that have developed in most communities in the USA. In the past, intravenous antibiotic therapy has been considered unsafe outside the hospital, although it is almost uniformly used once a patient is admitted. With the accumulating costs of medical care, however, alternatives to hospital care have been sought. Numerous studies have now shown that outpatient parenteral antibiotic therapy (OPAT) can be safe and effective [1-3].

Coincident with this growing interest in alternatives to hospitalization have been significant advances in technology and pharmacology that have helped to facilitate antimicrobial therapy in the home. New antibiotics, such as ceftriaxone and teicoplanin, have been developed with such long half-lives that they need not be given more than once a day. A wide variety of new intravenous catheters have also come on the market which enable reliable and long-term venous access. In addition, an assortment of simple to complex pumps are available to administer medication safely, reliably and conveniently. With these advances, and the interest of medical professionals in testing and applying them in outpatient care, hospital wards are gradually being abandoned and intravenous therapies are increasingly being provided outside the hospital. OPAT has now grown to over a billion dollar business in the USA [4].

2. Assembling a team

The concept of providing intravenous antibiotic therapy without hospitalization is not an easy one. It requires careful planning as well as insight and understanding. Patients cannot simply be discharged from the hospital without careful screening, education, and plans for support services to ensure that their outcomes will be as good as in the hospital.

There are many considerations to be taken into account before an outpatient intravenous therapy programme is started. Resources must be allocated for facility use, staffing, antibiotic acquisition, medication preparation and special equipment. Protocols must also be drawn up for patient selection, appropriate antibiotic use, vascular access and pump technology. None of this is possible without a significant financial commitment.

Probably the most important factor in beginning a safe

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and effective outpatient parenteral therapy programme is assembling a proper team of health care professionals to share their particular areas of expertise and to develop a coordinated programme of therapy [3,5].

The most consistent and probably critical members of the patient care team are the physician, the nurse and the pharmacist. Physicians are relied upon for their medical knowledge to correctly diagnose the infection and to prescribe and authorize appropriate antimicrobial treatment. It is their skills and experience that begin the process, and their decision as to whether a patient is appropriate to be considered for outpatient therapy, after evaluating the diseases they have and other factors that may be important. A nurse with training in intravenous therapy brings not only a knowledge of clinical medicine and patient care to the team, but also expertise in ensuring venous access. A reliable intravenous catheter is more important outside the hospital than it is in hospital, where clinically-qualified staff are readily available to restart an intravenous line when required. Nurses are also relied upon for specialized wound care and to provide dressings for venous lines. In practice, nurses often spend the most time with patients once a programme has started and are there to answer most of the many questions regarding the patients' therapy. The role of the pharmacist is to obtain, prepare and provide the antibiotics in a safe and effective manner — that is, to maintain the standards achieved in the hospital. Their knowledge of potential adverse drug effects or medication interactions may be particularly valuable in evaluating prospective patients and educating them in medication use. In addition, the pharmacist in the outpatient setting is usually responsible for the technology related to intravenous antibiotic delivery. Important decisions must be made regarding the type of pump to be used to automatically administer medications at controlled rates or intervals.

Table 1 outlines the areas of particular expertise and insight required by the different OPAT team members. What is particularly striking is the coordination and communication that are necessary to ensure a safe and effective programme. Patient treatment plans should be developed not only by the physician but with the nurse and pharmacist as well. A coordinated effort can bring together the expertise of each team member to tailor the programme to an individual patient's needs and make the programme more efficient and, in addition, cost-effective. An appropriate outpatient treatment regimen requires particular expertise in not only understanding the individual patient, their diseases, and the medications they are to receive, but also the type of venous access available as well as the different types of pumps that can be used to facilitate therapy.

Table 1
A breakdown of the responsibilities of the OPAT team

	Physician	Nurse	Pharmacist
Establish diagnosis	•		
Authorize treatment	•		
Evaluate patient	•	•	•
Develop treatment plan	•	•	•
Train patient		•	•
Coordinate care	•	•	•
Establish venous access		•	
Prepare antibiotic			•
Provide supplies		•	•
Monitor for toxicity	•	•	•
Follow infection status	•	•	
24-h availability	•	•	•

In addition to the basic physician, nurse and pharmacist team members, input from a number of other people is also needed to provide coordinated and effective therapy. A social worker may be invaluable in assessing and understanding the home situation and in helping to determine whether outpatient care is appropriate for an individual — and which model of care should be used [3]. A manager or administrator for an intravenous therapy programme becomes increasingly important as the size of the programme grows. They are able to provide insight in terms of time and cost-management that allows a programme to run successfully. Insurance companies or government representatives may also be important to consider as members of the team as their decisions are essential in providing funding for outpatient care, as well as the terms for that funding which may determine whether a programme can work to its full potential.

Another essential member of the team is the patient, without whose interest and acceptance the programme would be impossible. In a hospital, patients may be treated almost as laboratory animals and are seldom involved in developing their own care plans. Their potential value as active participants in the treatment process and their need to understand their disease and treatments are greatly underestimated. When patients are sent home on intravenous therapy, it is incumbent upon the medical professionals to ensure that their patients are educated about their disease so that they can cope if problems or questions arise. In some situations patients may also be trained to administer their own intravenous antibiotics, a situation which calls for careful training and education about the medication they are receiving and details of how to infuse them safely. With good training and education, patients can be a valuable asset and are often proud of what they can accomplish. Patients are pleased when we award certificates to them at the end of a successful treatment programme.

3. Organization models

A variety of different organizational models exists in the USA to provide outpatient parenteral antibiotic therapy. The key factor in determining the structure of the

Table 2
Organisational model for outpatient parental antibiotic therapy in the USA. Funds received by the home infusion company

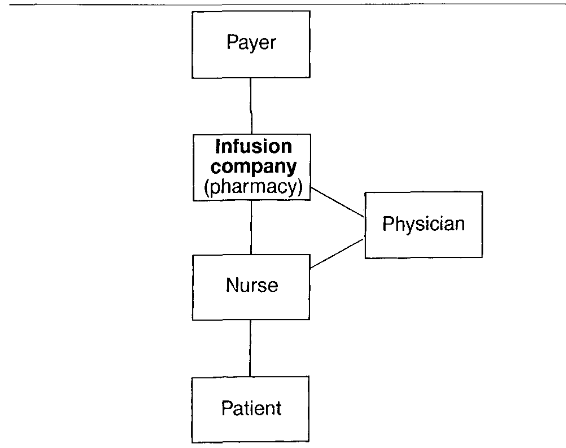
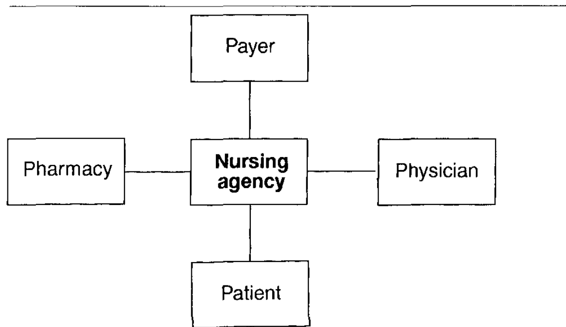
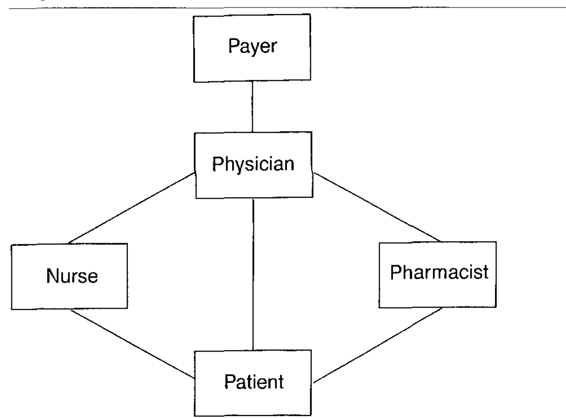


Table 3
Organisational model for outpatient parental antibiotic therapy in the USA. Funds received by nursing agency (visiting nurse model)



In the situations shown in both Table 2 and Table 3, physicians are only peripherally involved in patient care, despite their legal responsibilty

Table 4
Physician-directed organisational model for OPAT. The physician is in direct communication with team members and most importantly, with the patients



organization of the programme is who receives the monies from the payer. The most commonly used model in the USA is one in which monies are paid to a home infusion company — which is usually based around a central pharmacy (Table 2). Nurses are employed or can be contracted to go to the home or deliver care in a clinic. The physician's role is largely to be available for problem solving, reviewing laboratory results, coordinating patient care through the nurses and authorizing payment to the infusion company. In another model, the visiting nurse model, a nursing agency receives the monies and then contracts out to a pharmacy which provides the necessary medication for the patient (Table 3). In this instance, patient care is delivered primarily by the nurse with again the physician serving an accessory role. A third model is one established in many outpatient clinics and physician's offices (Table 4) [5]. The clinic or physician receives the allocated money and employs a nursing staff, as well as a pharmacist, under the direction of the physician. With this organization model, close communication between the nurse, pharmacist, and physician is assured because they all work together in the same physical setting with greater opportunities for all to interact with the patient and communicate about their care. This close communication is becoming more important as more and more complex and seriously ill patients are sent home and the potential for full use of outpatient intravenous therapy is utilized.

4. Delivery models

Delivery models for outpatient parenteral antibiotic therapy must also include the team concept as a vital part

Table 5
Pros and cons of delivery models for OPAT

	Advantages	Disadvantages
Visiting nurse	Opportunity for home inspection	Strong visiting nurse service required
	Supervised drug administration	Cost of nurses time and travel
		Concerns over privacy
Clinic infusion	Expert resources available if problems arise	Cost of clinic overheads
	Can be combined with visits to the physician	Patient has to travel to clinic
Self-administration	Reduced healthcare costs	Lack of immediate support if problems arise
		Requirement for patient education and training

Table 6
OPAT programme outcomes (Infections Limited P.S., 1993)

Completed therapy uneventfully	492 (91%)
Died on therapy	1 (expected)
Failed to comply	3
Hospitalized	42 (7.8%)
Total treated	538

Table 7
OPAT programme outcomes (Infections Limited P.S., 1993)

Hospitalizations on therapy	
Surgery (elective)	20 (3.7%)
Medical (not infection)	13 (2.4%)
Poor response	8 (1.5%)
Adverse effect	1 (0.2%)
Total	42 (7.8%)

of their structure. Selection of the model will depend upon individual patient needs as well as on the ability and expertise of the team in providing it. The three basic models are those of the visiting nurse, clinic administration, and self-administration (Table 5). The model in which the nurse goes to the home requires a strong visiting nurse service, but offers the advantage of home inspection as well as supervised administration of the antibiotic [6]. The limitations of this model are the cost of the nurse's time and travel as well as the potential concerns of invasion of privacy experienced by some patients. In contrast, the clinic infusion model offers a setting comparable to that of the hospital with all necessary resources in terms of medical expertise, equipment, and drugs should there be a problem or a need to change medication [7]. The limitations of this model are the cost of facility use and the difficulties experienced by some patients in getting to the clinic. In practice, most patients are able to get to a clinic. The availability of once-daily antibiotics capable of dealing with even the most serious infections has greatly facilitated this type of programme.

The third model is that of self-administration in which a patient or family member is trained to administer intravenous medications without medical supervision. Despite theoretical concerns expressed about this practice, it has proved a very effective and safe methodology when patients are selected properly [8].

In fact, we have problems when patients trained in self-administration were admitted to the hospital where their intravenous therapies cannot be administered as carefully and safely as they were at home. The self-administration model has a limitation in terms of dealing with possible adverse events without the ready presence of medical staff. It also requires several hours of training and education before patients can administer medications to themselves.

5. On-going care

The initiation of an OPAT programme for a patient involves all aspects of the medical team; however, continued team interaction during the entire period that patients are on the treatment programme is also critical. The concept that intravenous antibiotics can be prescribed on an outpatient basis through a 'cookbook' methodology is misleading: the true expertise of health-care professionals is in tailoring the treatments available to individual needs. The standards of patient care achieved in hospitals must always be upheld on an outpatient basis — a difficult and challenging task given the fragmentation of responsibility that often occurs once a patient leaves the medical institution.

Close monitoring is essential [9]. The initial infection must be followed closely to be sure it is responding. Secondary infections or resistant organisms may develop. Both the physician and the nurse should be involved in monitoring the clinical status of the patient. Other diseases which may affect the provision of outpatient therapy must also be assessed. Each patient contact calls for a clinical determination of whether the complications of diabetes, heart disease, renal failure, or the need for greater nursing care suggest the patient would be better off in the hospital for closer monitoring or additional nursing care. The potential for toxicity from the intravenous antibiotic must also not be overlooked. Significant problems may occur with rashes, fevers, renal, liver or neurological toxicities. In our experience patients should be seen at least twice weekly, depending upon the phase of their disease and their tolerance of the medication. Assessments should be made by the physician, nurse and pharmacist at these intervals, with appropriate laboratory and microbiology studies as needed.

6. Clinical experience

We studied 538 patients who received intravenous antibiotic therapy through the Infections Limited clinic in

Table 8
Reasons for change in antibiotic therapy once on OPAT (Infections Limited, P.S., 1993)

Poor clinical response	21 (3.9%)
Final sensitivity report	5(< 1%)
Superinfection	3(< 1%)
Adverse antibiotic effect	16 (3.2%)
Total	45 (8.4%)

Tacoma, Washington, USA, during 1993. The average age was 45 with a range of 3 months to 92 years. The bacteriological success rate at the end of therapy was 92% and the clinical response rate 98.4%. Cases were reviewed for indicators of problems arising while on OPAT. The factors we examined included:

- death on programme
- compliance problems
- the need for hospitalization once the programme had begun.

During 1993, 492 (92%) patients completed therapy uneventfully (Table 6). During this period, one death occurred involving a patient in the final stages of AIDS. He died, as expected, while receiving intravenous ganciclovir therapy. Three patients failed to comply with the treatment programme; two of those had refused hospitalization initially. All three patients did well on oral antibiotic therapy in the limited follow-up that was possible. Hospitalization during the programme was required for 42 (7.8%) patients. The reasons for hospitalization are shown in Table 7. In 20 cases, patients were admitted for elective surgery. Thirteen patients were admitted for medical problems not due to the infection or antibiotic and 8 for a poor response. In only one instance was a person admitted for an adverse event from the programme — a boy developed Stevens–Johnson syndrome, an allergic disorder, due to the antibiotic. He was admitted, responded well to steroid therapy and a new antibiotic, so was returned to the outpatient programme after a few days and did well.

The same group of 538 patients was also reviewed for changes in antibiotic therapy, in an attempt to identify problems and to determine the need for close medical follow-up (Table 8). Data showed that antibiotics were changed in 45 (8.4%) patients. Reasons for change included: a poor clinical response in 21 (3.9%), final antibiotic sensitivity reports in 5 (< 1%), superinfection in 3 (< 1%), and adverse antibiotic effect in 16 (3.2%). The adverse antibiotic effects which changed therapy were primarily a rash (11 cases) with one case each of leukopenia, neurologic toxicity, renal toxicity, laryngeal oedema, and the 'Red Man Syndrome' from vancomycin. Without the close coordination of our team, it would not have been possible to provide such close follow-up and flexibility in terms of medication and response to disease progress.

The quality of our OPAT programme was also tested by a patient satisfaction survey. Patients were requested to fill out a form at the end of their treatment period. They were routinely asked whether they would prefer to be hospitalized or treated as outpatients should they require another course of intravenous antibiotic therapy. During 1993, 99.5% of patients treated at Infections Limited indicated a preference for outpatient therapy for which most were enthusiastic advocates.

In summary, OPAT can be a benefit to patients and a cost saving but it requires careful planning and a team of health care professionals including a physician, nurse and pharmacist. Together these aspects of medicine can provide a level and quality of care comparable to hospitalization and with great patient satisfaction.

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