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Supervised self-administration of outpatient parenteral antibiotic therapy: a report from a large tertiary hospital in Australia

S. Subedi *, D.F.M. Looke, D.A. McDougall, M.M. Sehu, E.G. Playford

Infection Management Service, Princess Alexandra Hospital, Brisbane, Queensland, Australia

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SUMMARY

Introduction: Outpatient parenteral antibiotic therapy (OPAT) has become established as a standard of care in most Australian hospitals to treat a variety of infections. Since 1998, the Alternate Site Infusion Service (ASIS) has provided an OPAT service to five hospitals in southern Brisbane, Queensland, using predominantly a patient or carer administration model (self-administered, S-OPAT). The aim of this study was to evaluate outcomes of our S-OPAT programme.

Methods: Consecutive patients treated by ASIS at the Princess Alexandra Hospital from January 1, 2011 to December 31, 2011 were reviewed. Data on patient demographics, diagnoses, microbiology, antimicrobial therapy, duration, outcome, and complications were sourced from a prospectively collected database and from patient medical records.

Results: There were 150 episodes involving 144 patients resulting in 3520 days of OPAT; the median duration on the programme was 22 days (range 4–106 days). Patient or carer administration occurred in the majority of episodes. The most common indication by far was bone or joint infection (47% of patients), followed by infective endocarditis (9%). *Staphylococcus aureus* was the most frequently treated organism. The overall cure rate was 93%. On multivariate analysis, patients with two or more comorbidities had an increased risk of failure. Line-related complications occurred in 1.4/1000 catheter-days. Rash was the most common drug-related event. Despite the extensive use of broad-spectrum antibiotics there were no cases of *Clostridium difficile* infection during therapy and for up to 28 days post cessation of intravenous antibiotics. The cost of OPAT per patient excluding drug administration and home visits was approximately A$ 150.00/day, significantly lower than the cost of an inpatient bed, which is estimated to be A$ 500–800/day.[5]

Conclusion: OPAT using a patient or carer administration model is an effective and safe option for the management of selected patients with infection requiring intravenous antibiotics.

1. Introduction

The first reports of outpatient parenteral antibiotic therapy (OPAT) came from the USA in the 1970s. Since then, OPAT has been adopted worldwide and in Australia[1–5] in various healthcare settings.[6–10] With appropriate patient selection, it has been shown to be safe, efficacious, and cost-effective.[9–14] The ability to manage patients in the community setting provides the freedom for patients to return to work or educational facilities, reduces pressure on hospital bed utilization, and reduces the risk of developing nosocomial infections.[9–13]

There are various models of care for OPAT, which include hospital-based infusion centres, nursing outreach services to patient homes for the administration of antibiotics, and administration by self or family members.[15] In Australia, most hospitals provide hospital-centred nursing outreach programmes to patient homes for the administration of antibiotics,[1,2] which allows daily direct supervision of the patient. However, the nursing costs in this model can be significant.[15] Self-administration of intravenous antibiotic therapy involves training the patient or their carer to administer parenteral antibiotics that are pre-packaged ready for use with ambulatory devices. The reduction in nursing costs and increased patient autonomy are advantages of this model, although adequate patient or carer training is essential to facilitate drug administration in a safe and effective manner with minimal complications.[15–17] A peripherally inserted central catheter (PICC),

* Corresponding author.
E-mail address: subedi_82@yahoo.com (S. Subedi).

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or less commonly, a peripheral cannula, is used as an access device. Antibiotics can be administered as intermittent or continuous infusions via an electronic pump or elastometric device.[18,19]

This is the first report from an Australian hospital on outcomes of a successful self-administered OPAT (S-OPAT) programme. The results of this study will provide assistance to clinicians and administrators who are involved in making decisions regarding the development of future hospital services.

2. Methods

We reviewed patients treated by the Princess Alexandra Hospital Alternate Site Infusion Service (ASIS) from January 1, 2011 to December 31, 2011. Information on patient demographics, diagnoses, microbiology, antimicrobial therapy, duration, complications, and outcome were obtained from a prospectively collected database and by reviewing the patient medical records. The Metro South Health Services District Human Research Ethics Committee granted ethics approval for the study (HREC/12/QPAH/38). The statistical analysis was performed using Stata v. 11 (StataCorp LP, College Station, TX, USA). A multivariate logistic regression model was developed to identify potential risk factors for treatment failure. Odds ratios (OR) with 95% confidence intervals (95% CI) were reported. A p-value of <0.05 was considered statistically significant.

2.1. Definitions

Success was defined as cure or a major improvement as shown by clinical progress, a significant decrease in C-reactive protein, and the absence of relapse within 28 days of cessation of intravenous antibiotics. Although the majority of patients were continued on oral antibiotics at the end of OPAT, monitoring of this was not included in the present study. Failure occurred when the prescribed course of OPAT did not result in cure or a major improvement as defined by criteria used in a previous study:[2] (1) there was a need to continue intravenous therapy beyond the original prescribed course; (2) there was a need for unanticipated surgery for source control within 4 weeks of completion of the originally prescribed intravenous course; (3) hospital re-admission related to OPAT complications; or (4) any evidence of relapse or recurrence of infection within 4 weeks of completion of the originally prescribed course. Drug-related complications included rash, hepatitis, gastrointestinal symptoms, *Clostridium difficile* infection, and acute kidney injury requiring either cessation or a change of parenteral antibiotics. Line-related complications included line infection, thrombosis, inadvertent removal of the intravenous access by the patient, and lymphatic leakage. Administration was categorized as either a 24-h continuous infusion or intermittent boluses.

2.2. Setting

Princess Alexandra Hospital is one of three tertiary hospitals in Brisbane, Queensland and provides care in all major adult specialties excluding obstetrics. The hospital has 780 beds and provides an extensive range of acute medical, surgical, trauma, mental health, cancer, and rehabilitation services, as well as a state-wide transplantation service for livers, kidneys, bone, cartilage, and corneas. ASIS is an OPAT service that was established at the Princess Alexandra Hospital in 1998. ASIS is integrated within the Infectious Diseases Department at the Princess Alexandra Hospital and consists of a multidisciplinary team that includes medical, nursing, and pharmacy personnel. Since then, the service has expanded to provide services to Ipswich, Logan, Queen Elizabeth II, and Redland hospitals. A visiting consultation service is provided to the other hospitals by infectious diseases physicians from Princess Alexandra Hospital.

2.3. Patient selection

An infectious diseases physician or a registrar assessed the suitability and medical stability of patients for enrolment into ASIS. Further in-hospital assessment of suitability was performed by dedicated ASIS nursing staff, and the patient was provided with training on self-administration of antibiotics prior to discharge. Training took place on the day before discharge and usually required 1–2 h of nursing time at the bedside. A visit to the home was usually scheduled for the day of discharge and whenever required thereafter. Training the patient to administer the antibiotics safely was the main focus of ASIS. However, in situations where patients were unable to self-administer antibiotics, training was provided to the carer. The majority of patients were able to return to work or studies whilst on ASIS, provided their infection did not pose functional limitations. Only four of the 144 patients were unable to self-administer and did not have carers who could be trained to administer antibiotics. Nursing staff visited those patients' homes daily to administer intravenous antibiotics. The inability to self-administer was not a criterion for exclusion from OPAT care. Patients treated by ASIS were under the care of an infectious diseases team and were required to attend a weekly clinic where they were reviewed by an infectious diseases specialist or a registrar.

3. Results

In 2011, 150 OPAT episodes were treated by ASIS in 144 patients. One hundred and six patients (74%) were male. The median age was 55 years (range 16–90 years). Hypertension was the most common comorbidity, occurring in 59 patients (40%), followed by diabetes mellitus (37 patients, 25%), ischaemic or valvular heart disease (30 patients, 21%), and chronic kidney disease (25 patients, 17%). Forty-two percent of patients had at least two or more comorbidities. All patients had a PICC line inserted for the administration of intravenous antibiotics.

The patient self-administration model was used in 140 patients and the nursing administration model in the remaining four patients. During the 12-month period, 466 home visits were made for 84 patients. Sixty-six patients did not require home visits during their OPAT care. The median duration of time spent on patient/carer training was 105 min.

3.1. Diagnoses and microbiology

Bone and joint infections (BJI) were the most common primary diagnoses, occurring in 71 patients (47%). Osteomyelitis accounted for 85% of BJI and septic arthritis for 15%. Other diagnoses were infective endocarditis (13 patients, 9%), infected intravascular catheters (12 patients, 8%), skin and soft tissue infection (10 patients, 7%), surgical site infection (10 patients, 7%), blood stream infection (nine patients, 6%), central nervous system infection (six patients, 4%), and intra-abdominal infection (six patients, 4%). Table 1 summarizes patient demographics and diagnoses.

Causative organisms were identified from blood cultures, surgical specimens, or wound swabs. A confirmatory microbiological diagnosis was made in 130 patients (87%). Twenty (13%) patients were recorded as having 'no growth' from cultures. Polymicrobial infection was present in 27 patients (18%). The most frequent microorganism isolated was *Staphylococcus aureus*, found in 72 patients (48%). Methicillin-resistant *S. aureus* (MRSA) was isolated in nine patients (6%). Of the nine MRSA isolates, seven