



A CLINICIAN'S ROADMAP TO MRSA MANAGEMENT

Stewardship for Optimal Care

E-NEWSLETTER #4

Addressing MRSA Infections Through OPAT

FROM THE EDITOR'S DESK

In today's environment of shrinking hospital resources and greater emphasis on cost containment, hospital-acquired infections, particularly those caused by methicillin-resistant *Staphylococcus aureus* (MRSA), can place a substantial burden on institutional resources. This is likely due to prolonged length of stay.

Here are just two examples. One retrospective cohort study evaluating the costs of MRSA versus methicillin-susceptible *S. aureus* (MSSA) nosocomial bloodstream infections in 182 consecutive patients in a tertiary care hospital in Rhode Island, revealed significantly higher costs (median total hospital cost=\$113,852 vs. \$42,137) and length of stay (20.5 vs. 10.5 days) with MRSA infections.¹ Another study comparing ventilator-associated pneumonia caused by MRSA or MSSA revealed that patients with MRSA consumed excess resources—4.4 additional days of mechanical ventilation, 3.8 days of inpatient length of stay, and 5.3 ICU days.²

One strategy to minimize the length of stay is through the use of outpatient parenteral antimicrobial therapy (OPAT). Since its introduction in the 1970s, OPAT has become an important tactic for treating several types of infections that require long-term intravenous antimicrobial therapy. Its estimated growth by over 10% per year is attributed to increased emphasis on cost containment, greater availability of antimicrobials that can be administered once daily, technological advances in vascular access and infusion devices, increased acceptance by both patients and physicians, and increased availability of structured services.³

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The safe and effective utilization of OPAT, however, requires that clinicians have a thorough understanding of the variables involved in ensuring the success of this treatment modality for their patients. This issue will review the benefits and considerations when utilizing OPAT as an option for treating difficult infections, such as those caused by MRSA.

E-NEWSLETTER #4 ADDRESSING MRSA INFECTIONS THROUGH OPAT

TARGET AUDIENCE

This activity is designed for physicians, pharmacists, and other healthcare professionals on the frontline of managing patients with serious MRSA infections.

LEARNING OBJECTIVE

Healthcare professionals participating in this educational activity will be able at its conclusion to:

- Discuss the appropriateness and benefits of outpatient parenteral antimicrobial therapy for serious MRSA infections

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ACCREDITATION

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OPAT: Clinical and Economic Benefits

When used appropriately, OPAT can be effective in reducing healthcare costs, primarily by reducing hospital length of stay. The success of OPAT, however, depends on whether it achieves comparable clinical outcomes as in hospitalized patients. Several studies have evaluated the safety and efficacy of OPAT.

The effectiveness of OPAT was demonstrated in a retrospective chart review that compared 539 patients who received OPAT with daptomycin (of which 273 received some inpatient parenteral antimicrobial therapy [IPAT]) and 410 who received only IPAT with daptomycin.⁴ Staphylococci accounted for 76.1% of infections for which a pathogen was identified and *S. aureus* was associated with over half of these infections. Overall, success rates were 94.6% for OPAT compared with 86.3% with IPAT ($p < 0.001$; **Table 1**). OPAT patients were also less likely to experience adverse events (9.3% vs. 19.8%; $p < 0.0001$).

Table 1. Success of OPAT Versus IPAT for Various Types of Infection⁴

Type of Infection	Success	
	OPAT Patients	IPAT Patients
cSSSI	169/177 (95.5%)	110/123 (89.4%)
uSSSI	97/99 (98.0%)	34/36 (94.4%)
Osteomyelitis	89/98 (90.8%)	18/18 (100%)
Bacteremia	71/73 (97.3%)*	116/143 (81.2%)
Endocarditis	13/14 (92.9%)*	6/15 (40.0%)
Other	71/78 (91.0%)	70/75 (93.3%)

* $p < 0.01$

Larioza and colleagues evaluated the use of OPAT to treat infective endocarditis.⁵ A total of 43 patients discharged from a single institution were included; native valve and left-sided valves each constituted approximately 75% of the patients. Staphylococci were responsible for about 35% of the infections and all patients received over 4 weeks of therapy. After 1 year, no patients died from infective endocarditis. However, 23% were hospitalized during OPAT from intravenous catheter, antibiotic, or other complications.

Promising results on the safety and efficacy of OPAT in treating various types of infection, such as bone and joint infections and infective endocarditis,^{6,7} as well as for different methods of OPAT delivery have been documented in other studies as well.^{8,9} A large retrospective analysis that spanned 13 years and 2059 OPAT episodes compared patients receiving self-administered OPAT versus those receiving OPAT from a healthcare professional.⁹ The evaluation found no excess complications or hospital re-admissions with the self-administered OPAT compared to OPAT given by a healthcare professional.

The economic benefits of OPAT can be substantial. One study from the United Kingdom analyzed data from 334 episodes of treatment administered by the Sheffield OPAT service during 2006–2008.¹⁰ The predominant type of infection was skin and soft tissue (59%) and the most common type of antimicrobial used was ceftriaxone (99.5% of episodes). 87% of all OPAT resulted in cure or improvement upon completion of therapy and the readmission rate was 6.3%. Patient satisfaction was rated high with OPAT and the cost was only 41% of equivalent inpatient costs for an Infectious Diseases unit.

When is OPAT Appropriate?

The main goals of OPAT are to allow patients to complete treatment for infections safely and effectively in the comfort of their home or another outpatient setting and to avoid the inconveniences, complications, and expenses of hospitalization.³ When considering OPAT, clinicians must determine hospitalization is not needed and that alternate routes of drug delivery are not feasible or appropriate.

PATIENT-SPECIFIC CONSIDERATIONS³

1. Is parenteral antimicrobial therapy needed for the patient?
2. Do the patient's 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?

ANTIMICROBIAL-SPECIFIC CONSIDERATIONS³

- Dosage schedules: Antimicrobials with longer half-lives (and thus less frequent dosing) are generally preferred.
- Long-term toxicity: Patient tolerance and low incidence of adverse reactions are critical for antimicrobial usage outside of the hospital since patients are not as closely monitored.³
- Drug stability: Drugs requiring less frequent mixing and longer storage times are preferred.
- *Note:* The initial dose of the IV antimicrobial should be given in a supervised setting (such as a physician's office, ambulatory care department, or the hospital) before a patient's discharge to home care.

TYPES OF INFECTIONS

OPAT has become a common mode of treating serious MRSA infections.^{3,11}

- Soft-tissue infection
 - Cellulitis and wound infection
- Osteomyelitis
- Septic arthritis or bursitis
- Prosthetic joint infection
- Pneumonia and/or severe lower respiratory tract infection
- Sinusitis (complicated)
- Endocarditis
- Bacteremia
- Intravenous catheter-associated infection
- Vascular graft infection
- Intra-abdominal infection or peritonitis
- Complicated urinary tract infection



How is OPAT Delivered?

The delivery of OPAT can be performed in a variety of settings—infusion center, visiting nurse, self-administration, and nursing home. Each setting has its distinct advantages and disadvantages (**Table 2**). The patient's needs and abilities should guide the ideal delivery method for the individual patient.¹²

Table 2. Delivery of OPAT: Common Vehicles¹²

OPAT Delivery	Advantages	Disadvantages
The Infusion Center		
OPAT provided in a hospital clinic, an emergency department, a physician's office, or a free-standing OPAT facility	<ul style="list-style-type: none"> • Readily available medical staff, equipment, and supervised administration • Transition from hospital to home care less drastic than going directly to home care, so favorable for both patient and physician 	<ul style="list-style-type: none"> • Overhead costs and maintenance of the facility, patient must travel to the facility to be treated • May be burdensome for patients requiring treatment more than once daily
Visiting Nurse*		
OPAT administered to the patient in a home setting by a qualified nurse or other healthcare professional; antimicrobials given once daily preferred	<ul style="list-style-type: none"> • Medical supervision provided during administration of OPAT • Allows the visiting nurse to evaluate the home situation for factors often overlooked in the hospital, such as physical limitations or hazards, disability, and drug or alcohol abuse among family members 	<ul style="list-style-type: none"> • Cost of a nurse specialist's time and travel—in more rural areas increased travel time can make this approach cost-prohibitive
Self-Administration*		
The patient and/or family members are trained to provide OPAT in the home setting	<ul style="list-style-type: none"> • Financial savings, especially for prolonged therapy and for antimicrobials requiring multiple doses per day 	<ul style="list-style-type: none"> • Lack of medical supervision to monitor compliance or address adverse reactions or infection at the vascular access site
Nursing Home		
OPAT delivered by qualified personnel at nursing home or other long-term care facility	<ul style="list-style-type: none"> • Readily available medical staff, medical supervision during administration • May be more cost-effective for patients who already reside in a nursing home setting or other long-term care facility 	<ul style="list-style-type: none"> • Cost of being a resident in a long-term care facility

*When utilizing the visiting nurse or self-administration, a home infusion company may be involved in coordinating patient care. These companies often have nurses and pharmacists specially trained in OPAT medication and IV equipment and play several roles, including provision of the drugs, expert infusion nurse backup, or nursing care.¹²

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Self-administration of OPAT is the most common method of OPAT delivery. Its success was evaluated in a population of 205 patients discharged from a VA tertiary medical center who self-administered 231 courses of home IV antimicrobials.¹³ The most common infections were osteoarticular infection (52%), bacteremia (14%), and skin and soft tissue infection (13%), and *S. aureus* was the most common pathogen (39% of all episodes). Vancomycin was the most frequent antimicrobial used (46% of all episodes) and cefazolin, ceftriaxone, and ertapenem comprised the majority of the remaining episodes. The results of home OPAT for younger and older patients indicate that home OPAT can be a viable option, even for older adults (**Table 3**).

Table 3. Home OPAT in Younger and Older Adults¹³

Outcome	Patients <60 years (124 courses)*	Patients ≥60 years (107 courses)*
Cure	27 (22%)	27 (25%)
Success**	89 (72%)	70 (65%)
Failure	7 (6%)	9 (8%)
Nephrotoxicity	10 (4.3%)	

*The results from one course in each patient group were lost to follow-up.

**Stable or improved condition at the conclusion of IV therapy.

Hospitalists and Hospital-Based OPAT Clinic

Institutions are increasingly utilizing hospitalists to help bridge the hospital-to-home transition and can play an integral role in OPAT initiation.¹⁴ Some hospitalist groups have developed discharge clinics or have procedures in place, such as follow-up phone calls, which can decrease readmission rates and improve patient satisfaction.¹⁴ At the University of California, Davis Medical Center, hospitalists assisted in the development of an OPAT clinic designed to help ease the patient's transition from hospital to home.¹⁴ Over a 13-month period, 80 patients accounted for 618 visits, with the most common cause for treatment being cellulitis (59 patients). Of those with cellulitis, 55% were caused by MRSA. Only 2 (3%) patients required subsequent admission to the hospital (one for fever and one because he lost his means of transportation to the clinic). The potential savings generated by the clinic were substantial. Each clinic visit had a mean cost of \$385, compared to a cost of \$1180 for hospitalized patients with similar types of infections. This resulted in mean savings of \$7080 per patient, or total savings of \$375,240 over the 13-month period.

What are the Key Elements of an OPAT Program?

A team approach is critical to the success of OPAT programs as communication and coordination of effort is needed among the physician, pharmacist, nurse, and patient.¹²

– HEALTH CARE TEAM³

- 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 reimbursements
- Access to other health care professionals, including a physical therapist, a dietitian, an occupational therapist, and a social worker

– COMMUNICATION³

- Physician, nurse, and pharmacist available 24 hours per day
- System in place for rapid communication between patient and team members
- Patient education information for common problems, adverse effects, precautions, and contact lists

– OUTLINE OF GUIDELINES FOR FOLLOW-UP OF PATIENTS WITH LABORATORY TESTING AND INTERVENTION AS NEEDED³



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INSTRUCTIONS FOR CREDIT

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POST TEST Please select the most appropriate response.

1. In an OPAT study with daptomycin, what was the success rate of OPAT in treating endocarditis?

- 54% 72% 81% 93%

2. Which is the most cost-efficient method for OPAT delivery?

- Infusion center Visiting nurse
 Self-administration Nursing home/long-term care facility

3. OPAT can be considered for which of the following MRSA infections?

- Soft-tissue infections Osteomyelitis Endocarditis All of these

4. During a 13-month period of the UC Davis OPAT program, what percentage of patients required readmission to the hospital?

- 3% 10% 18% 32%

5. For OPAT, antimicrobial agents dosed twice daily are preferred to those dosed once daily.

- True False

COMMITMENT TO CHANGE

As an accredited provider of continuing education, Center for Independent Healthcare Education is increasingly focusing on the outcomes of our offerings, particularly as reflected in changes and improvements in clinical practices. Accordingly, we are now asking our learners to reflect on how they might alter their practices as a result of participating in our CE activities. The following request solicits your commitments to change, based on what you have learned. We hope that you will find this exercise useful and thank you in advance for participating.

Do you wish to make commitments to change in your practice?

- Yes No

As a result of what I learned participating in this activity, I intend to make the following practice changes:

OVERALL EVALUATION

	Yes	Somewhat	No
1. The following learning objective was achieved. • Discuss the appropriateness and benefits of outpatient parenteral antimicrobial therapy for serious MRSA infections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. The content was relevant to my practice and educational needs.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. The activity format enhanced achievement of learning objective.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. This activity was fair, balanced, and without commercial bias.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If you answered "No" to any of the above, please explain.

5. Quality of Guest Editor. Excellent Good Fair Poor

6. Do you have (1) any suggestions for improving this activity or (2) any additional comments?

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