

Applications of Outpatient Antimicrobial Stewardship and Therapy – *The Parkland OPAT Experience*

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Clinical and Research Interests: Diagnostic and Therapeutic management of patients with bone and joint infections, antimicrobial stewardship, quality improvement and delivery of OPAT services.

The purpose of this talk is to familiarize the reader with outpatient parenteral antimicrobial therapy in the United States and review various service models employed at transitions of care from the inpatient to the ambulatory setting. Historical perspective, advantages and disadvantages of various models and core components of the OPAT program will be described in addition to evidence supporting the safety and effectiveness of this health care delivery model.

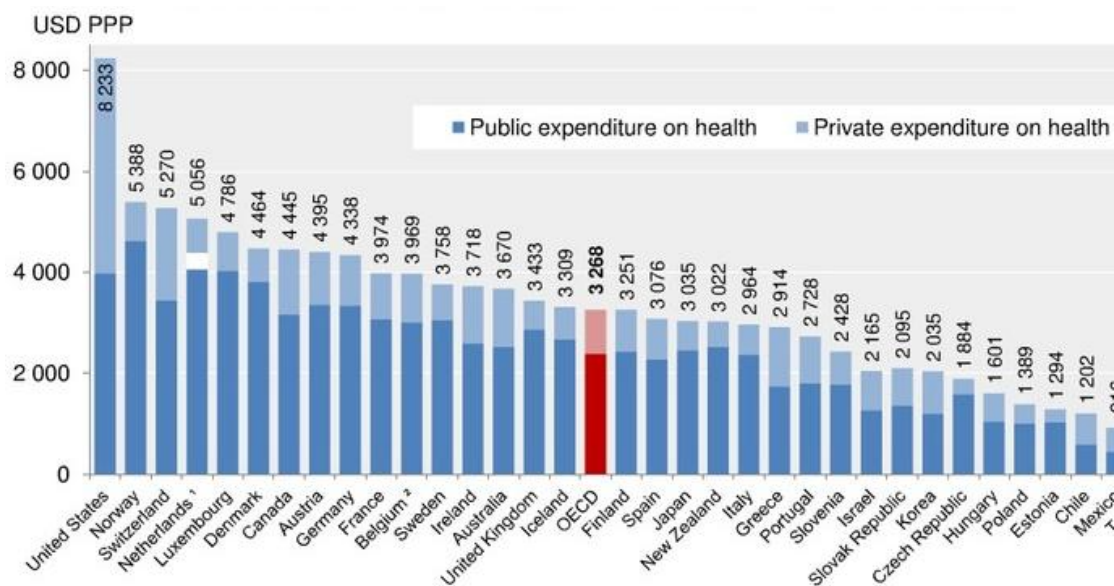
Objectives:

1. To describe the different models of outpatient parenteral antimicrobial therapy services in the United States.
2. To describe the key components of an effective OPAT program.
3. To describe the self- administered model of OPAT at PHHS and the referral process to transition patients from the hospital to ambulatory setting.

Background:

The United States continues to lead all other industrialized countries in health care spending with expenditures steadily rising from \$255 billion or 9% of the GDP in 1980 to \$2.7 trillion in 2011 accounting for 17.9% of the GDP. The Organization for Economic Co-operation and Development [1] tracks and reports on over 1,000 health system measures across 34 industrialized countries, ranging from population health status and nonmedical determinants of health to health care resources and utilization on an annual basis [2, 3]. A recent publication from the Commonwealth Fund reviewed health care spending data from OECD on 13 industrialized countries: Australia, Canada, Denmark, France, Germany, Japan, the Netherlands, New Zealand, Norway, Sweden, Switzerland, the U.K., and the U.S. While the report confirmed that the U.S. spends more than all other countries on health care, the data suggests that expenditures cannot be attributed to factors such as higher income, an aging population, or greater supply or utilization of hospitals and doctors. In fact, while CMS data demonstrated a 4.3% increase in hospital spending to \$850.6 billion in 2011, OECD data from the same year shows that the United States ranked 28th and 29th out of 34 countries surveyed for metrics including the number of hospital beds (131.0 per 1000 population) and hospital discharges (155.1 per 1000 population). [1, 3]

Figure 1: Total Health Expenditure per Capita, Public and Private, 2010 (or nearest year)



1. In the Netherlands, it is not possible to clearly distinguish the public and private share related to investments.

2. Total expenditure excluding investments.

Information on data for Israel: <http://dx.doi.org/10.1787/888932315602>.

Source: OECD Health Data 2012.

Safety net hospitals (SNHs) are defined by a legal mandate to accept a disproportionate number of indigent patients and are often located in poor urban neighborhoods where large populations of racial and ethnic minorities reside. While they serve a critical role in meeting the health care needs of indigent communities throughout the United States, these hospitals are currently challenged with the ability to care for a growing population of uninsured individuals with limited existing resources. [4-6] Some communities have experienced SNH closure or conversion to for-profit status resulting in a negative impact on the ability of uninsured or poorly insured individuals who previously relied on these institutions to access health care . [7]

The overall cost of healthcare has caused policy makers to re-think how care is delivered and providers are paid. As we transition towards a value driven health care system that rewards high quality and cost-effective patient care, fee for service payments are likely to continue to decline. Established under the authority of the Affordable Care Act (ACA), the Center for Medicare and Medicaid Innovation will play an instrumental role in this transition by testing and implementing payment models that demonstrate quality improvement and cost savings. As a result, providers and leaders will need to develop new strategies to deliver care with increased efficiency while reducing or containing costs. [2]

OPAT as Health Care Delivery Model to Increase Efficiency and Contain Costs:

Definition of OPAT:

Previously called “CoPAT” or community based parenteral anti-infective therapy in the literature, the more commonly used term today of outpatient parenteral antimicrobial therapy (OPAT) is defined by the administration of parenteral antimicrobial therapy in at least two doses on different days without intervening hospitalization. The primary goal of an effective OPAT program is to allow patients to complete treatment safely and effectively in the comfort of their home or another outpatient site. Secondary goals include avoiding the inconveniences, complications and expense of hospitalization to complete a prescribed IV antibiotic course. [8]

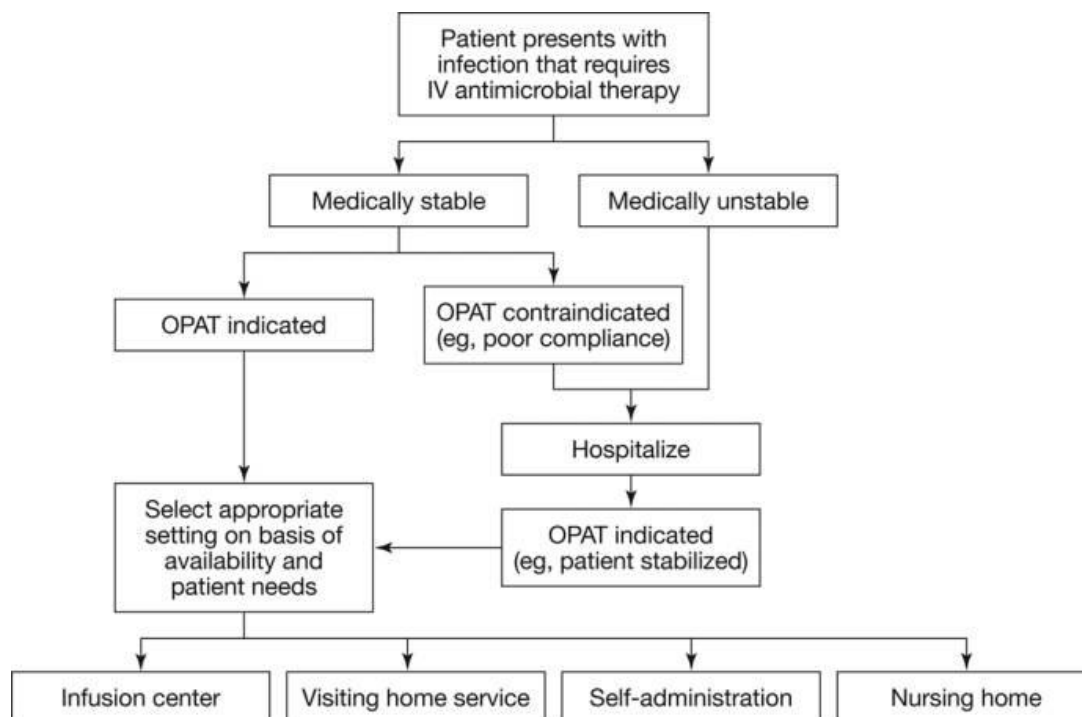
History of OPAT Services in United States:

The first study to show successful use of home IV antibiotic administration can be found in the pediatric literature when Rucker and Harrison demonstrated safe and effective treatment of chronic broncho pulmonary infection associated with cystic fibrosis in a group of children through the use of an indwelling intravenous infusion. [9] In the adult infectious diseases literature, Antoniskis et.al. published findings from their retrospective review in 1978 reporting successful treatment for bacteremia, osteomyelitis and one case of endocarditis among patients sent home with IV antibiotics to complete therapy. The authors compared clinical outcomes including complications and results of therapy between 13 patients sent home on IV antibiotics after initiating treatment in the hospital, to 7 patients who remained in the hospital exclusively to complete therapy for the same diseases and concluded: “if patients are carefully selected and well educated, outpatient administration of antibiotics parenterally is both economical and safe”. [10] In 1982 Poretz et.al published similar results in JAMA describing successful outcomes for

150 patients discharged from a community hospital with home IV antibiotic services to treat a variety of invasive infections including osteomyelitis, bacteremia, septic arthritis, infected orthopedic appliance, pyelonephritis. [11]

The growth rate of OPAT practices (previously called community-based parenteral anti-infective therapy), was estimated to be >10% annually by the late 1990's due to various factors including an increased emphasis on cost containment, the availability of newer antibiotics that could be dosed at more convenient intervals, and technological advances in vascular access and infusion. These factors were thought to contribute to an overall increased acceptance of the practice by both patients and physicians, leading to increased availability of structured services. Approximately 250,000 individuals were being treated with outpatient IV antimicrobials per year in 1998, resulting in an estimated \$2 billion in revenue [12]. By early 2000, the term COPAT was changed to OPAT to describe a growing number of services in the United States operating to deliver IV antibiotics to patients requiring long courses of treatment outside of the traditional hospital setting. The primary models in which such care is delivered is described below in Figure 2 and the associated advantages and disadvantages for each model is described in Table 1. [12]

Figure 2: Models of OPAT



<i>Model</i>	<i>Advantages</i>	<i>Disadvantages</i>
	<i>Reduced health care costs</i> <i>Patient Autonomy</i>	<i>Lack of immediate support if problems arise</i> <i>Compliance issues</i> <i>Requirements for patient education and training</i>
<i>Visiting Nurse</i>	<i>Opportunity for home inspection</i> <i>Supervised drug administration</i> <i>Skilled clinical assessments</i> <i>Availability of a registered nurse on 24 hr basis</i>	<i>Lack of immediate support if problems arise</i> <i>Cost of nurse's time and travel</i> <i>Concerns over privacy</i> <i>Safety concerns for healthcare providers</i>
<i>Infusion Center</i>	<i>Expert resources available if problems arise</i> <i>Ability to directly supervise therapy</i> <i>Can be combined with visits to physician</i>	<i>Cost of clinic facility</i> <i>Patient has to travel to clinic</i>
<i>Skilled Nursing Facility</i>	<i>Medical facility with staff</i> <i>Ability to directly supervise therapy</i> <i>Can deal with medical problems including dementia and drug abuse</i>	<i>Cost of staff and facility</i> <i>Requirements for staff training</i>

Table 1: Advantages and Disadvantages of Different Models of Outpatient Parenteral Anti-Infective Therapy

The OPAT Team:

The development of an effective OPAT team involves incorporating key personnel from various disciplines to ensure effective transitions of care from the inpatient to the ambulatory setting for a patient discharged on IV antibiotic therapy. The necessary components of various aspects of a program are outlined below in Figure 3. At minimum, the multi-disciplinary team should include an Infectious Diseases trained physician, clinical pharmacist and nurse knowledgeable about OPAT services and PICC line care, as well as case management to determine eligibility outpatient parenteral treatment. Patient education is critical to ensure safe delivery of antibiotics in the self-administered model. All models of OPAT services require systematic follow-up of key monitoring labs, therapeutic drug levels, and evaluation for resolution of infection by a designated physician.

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1. Health care team
 - A. An infectious diseases specialist or physician knowledgeable about infectious diseases and the use of antimicrobials in OPAT
 - B. Primary care or referring physicians available to participate in care
 - C. Nurse expert in intravenous therapy, access devices, and OPAT
 - D. Pharmacist knowledgeable about OPAT
 - E. Case manager and billing staff knowledgeable about therapeutic issues and third party reimbursements
 - F. Access to other health care professionals, including a physical therapist, a dietitian, an occupational therapist, and a social worker
 2. Communications
 - A. Physician, nurse, and pharmacist available 24 h per day
 - B. System in place for rapid communication between patient and team members
 - C. Patient education information for common problems, side effects, precautions, and contact lists
 3. Outline of guidelines for follow-up of patients with laboratory testing and intervention as needed
 4. Written policies and procedures
 - A. Outline of responsibilities of team members
 - B. Patient intake information
 - C. Patient selection criteria
 - D. Patient education materials
 5. Outcomes monitoring
 - A. Patient response
 - B. Complications of disease, treatment, or program
 - C. Patient satisfaction
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Figure 3: Key OPAT elements

National OPAT Registry

The United States OPAT Network was developed in 1996 and served as a national repository for outcomes data of OPAT programs throughout the country until 2002. A review of data collected during this period reveals the most commonly treated diagnoses to be nearly identical to what is encountered in programs today including osteomyelitis, prosthetic joint infection, septic arthritis, skin and soft tissue infections, bacteremia and endocarditis and pyelonephritis. [13] The most commonly administered antibiotics listed in the registry also closely resemble the leading agents used in contemporary programs and include Ceftriaxone, Vancomycin, Cefazolin, Oxacillin/Nafcillin. With the advent of newer antibiotic treatments for multi-drug resistant organisms (MDRO), we are now seeing an increased use of Daptomycin in the OPAT setting for MRSA/VRE infections and increased use of Meropenem and Ertapenem for treatment of extended spectrum beta-lactamase infections (Table 2).

OPAT Network (1996–2002) ^a	Cleveland Clinic (1986–2000) ^b	Minneapolis area (1978–1990) ^c	Children’s Hospital San Diego (2000) ^d
Type of infection, ranked by frequency (% of OPAT courses)			
Skin and soft tissue (23)	Musculoskeletal	Cellulitis (15)	Bacteremia (16)
Osteomyelitis (15)	Infected devices	Osteomyelitis (13)	Pyelonephritis (13)
Septic arthritis/bursitis (5)	Bacteremia	Late-stage Lyme disease (10)	Meningitis (13)
Bacteremia (5)	Intra-abdominal	Pyelonephritis and UTI (9)	Intra-abdominal (8)
Wound (4)	Skin and soft tissue	Septic arthritis (7)	Cellulitis (7)
Pneumonia (4)	...	Other (46)	Osteomyelitis (7)
Pyelonephritis (3)	Wound (7)
Antimicrobial, ranked by frequency of use (% of OPAT courses)			
Ceftriaxone (33)	Vancomycin (31)	...	Ceftriaxone (42)
Vancomycin (20)	Penicillins (20)	...	Meropenem (11)
Cefazolin (6)	Antivirals (12)	...	Cefazolin (11)
Oxacillin/nafcillin (5)	Cephalosporins (9)	...	Cefepime (6)
Aminoglycosides (5)	Aminoglycosides (5)	...	Ceftazidime (6)
Clindamycin (3)	Other β -lactams (4)	...	Vancomycin (6)
Ceftazidime (3)

NOTE. UTI, urinary tract infection.

^a Data from OPAT Outcomes Registry (available at <http://www.opat.com>).

^b Data from Susan Rehm, personal communication. Percentage of infections not recorded.

Table 2: Frequencies of Diagnoses and Antimicrobial Use in OPAT Network and Selected Hospital Systems

Outcomes and Cost Savings:

Numerous studies have demonstrated the economic benefits of OPAT with decreased cost associated with outpatient therapy versus inpatient care. As early as 1978, Antoniskis et al described significant cost savings for the management of 13 patients in a Portland hospital who completed their IV antibiotic treatment course (for osteomyelitis, bacteremia and endocarditis) after transitioning from the inpatient to outpatient setting, compared to a control group of 7 patients who remained in the hospital to complete their treatment for the same diagnoses. The authors reported a decreased average daily cost of antibiotic therapy from \$243.22 for inpatients to \$69.35 for outpatients. The average cost of illness for patients treated in both inpatient and outpatient (OPAT) setting was \$6,357.22 compared to \$10,022.23 for patients treated exclusively in the inpatient setting. [10] In a more recent review of OPAT services, Paladino and Poretz report cost per day data ranging from \$122 in 1984 to \$183 in 2000 and \$263 in 2010 excluding additional cost for IV lines and therapeutic drug monitoring for Vancomycin. [12] All of these costs are noted to be considerably lower than one day of inpatient hospitalization which was estimated to be over \$1800 in 2009 per US census data.

In the contemporary health care setting, hospitals are increasingly becoming recognized as dangerous breeding grounds for multi-drug resistant organisms such as MRSA, VRE, ESBL and pose an additional risk of acquiring infections such as Clostridium difficile when effective infection prevention practices are not in place. [14] Another important benefit of OPAT is therefore the potential reduction in acquiring nosocomial infection from prolonged hospitalization. With an estimated 5% of hospitalized patients developing an infection during their hospitalization in the United States, there is also an important economic benefit to completing treatment in the OPAT model. [15] The reported approximate average cost attributed to each of these nosocomial infections is considerable at approximately \$2,100, resulting in a total cumulative cost of >\$2 billion annually. [12]

With regards to clinical outcomes, Table 3 below, taken from the national OPAT registry (1997-2001 data), reveals findings similar to earlier published studies in the literature. [10, 13] A review of data from the registry shows the majority of patients surveyed completed a prescribed treatment program and antibiotic course (92% and 82% respectively), and experienced clinical improvement (97%), with very few patients reporting adverse events. [13]

Table 3: Outcomes Measures from the US Outpatient Parenteral Antimicrobial Therapy Outcomes Registry Based on 7892 Cases and 10,844 Courses of Antimicrobial Therapy 1997-2001

Variable	No. (%) of patients
Clinical outcome	
Improved	7189 (96.6)
Failed	92 (1.2)
No change	153 (2.0)
Bacteriological outcome	
No culture	6614 (88.8)
Culture negative	666 (8.9)
Persistent pathogen	109 (1.5)
New pathogen	60 (0.8)
Program outcome	
Completed	7096 (92.2)
Ended early	323 (4.1)
Hospitalized	275 (3.5)
Died	39 (0.5)
Antibiotic outcome	
Completed	8715 (82.1)
Adverse event	492 (4.6)
Clinical failure	78 (0.7)
Resistant organism	44 (0.4)
Adverse events (n = 593)	
Rash	34
Nausea/vomiting	12.8
Fever	11.4
Nephrotoxicity	7

Reimbursement Issues

Physicians should be aware of key reimbursement issues related to delivery of IV antibiotic therapy in the current US healthcare setting. Medicare and Medicaid reimbursement policies discourage self-referral in the care of beneficiaries. OPAT services can only be delivered with direct supervision by a physician or mid-level practitioner, and the physician's office or hospital-based ambulatory care clinic remain the only settings in which administration of an IV antimicrobial is clearly covered by Medicare reimbursement guidelines. While legislation for Medicare coverage of self-infusion at home has been proposed in the past, this has not been passed into law to date. The United States Pharmacopeia (USP) is a non-profit, private standards-setting entity that plays an important role in the public health sector through several functions including ensuring the quality of medications, in addition to promoting the safe and proper administration of medications. A review of the current US Pharmacopoeia Chapter 797 guidelines shows that all practice settings must now meet stringent requirements for sterile preparation of parenteral drugs, especially those to be dispensed for home administration. [16]

Self-Administration Model of OPAT

The majority of programs in the United States operate within the visiting nurse, infusion center or skilled nursing facility models. To date, there are no published studies in the United States describing outcomes of a uniquely self-administered program. This concept has gained favor however in parts of Europe including the United Kingdom, and there are several studies from England and Ireland demonstrating safety and efficacy for a self-administered OPAT model within their national health system. [17] Matthews et.al. published findings supporting the self-administered model in one of the largest studies in the literature, analyzing over 2000 OPAT episodes collected prospectively from 1993-2005 from a single program in England. There was no difference in variables such as clinical diagnosis, antibiotics or microbiology in the study population when compared to what has previously been reported in the literature. When directly comparing outcomes for patients receiving health care associated OPAT (H-OPAT) versus self-administered OPAT (S-OPAT), the authors found comparable results in metrics such as complications related to therapy and readmissions (See figure 5) and concluded that self-administration of IV antibiotics in selected patients is indeed a viable and safe option for treatment. [17]

Figure 5: Reported Complications of Healthcare Associated OPAT versus Self-Administered OPAT

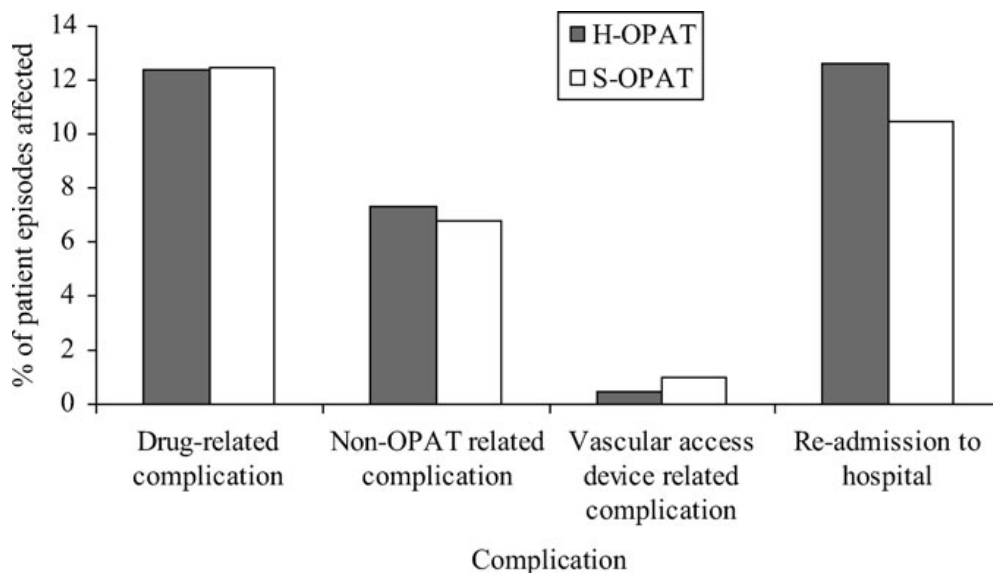


Table 4: Published Data on OPAT Services United Kingdom

Trust	Year	No. patients	Bed days saved	Annual cost saving	References
Tayside	1998	101	1461	N/A	1
Tayside	1998-9	50 (bone & joint)	2090	£ 0.53M	2
Oxford	2005	286	6200	£1.23M	3
Cheshire	2005-8	751 (cellulitis)	7000	£0.56M	4
Sheffield	2006-8	334	NS	47% of Inpatient Costs	5

1) Nathwani D, Morrison J, Seaton RA et al.. Outpatient and Home Parenteral Antibiotic Therapy (OHPAT); Evaluation of the Impact of One Year's Experience in Tayside. *Health Bulletin* 1999; 57:332-7.

2) Nathwani D, Barlow GD, Ajdukiewicz K et al..Cost-minimization analysis and audit of antibiotic management of bone and joint infections with ambulatory teicoplanin, inpatient care or oral Linezolid. *J Antimicrobi Chemother* 2003; 51:391-6. doi:10.1093/jac/dkg061

3) Matthews PC, Conlon CP, Berendt AR et al.. Outpatient parenteral antimicrobial therapy (OPAT): is it safe for selected patients to self-administer at home? A retrospective analysis of a large cohort over 13 years. *J Antimicrobi Chemother* 2007; 60:356-362. doi:10.1093/jac/dkm210

4) Lomas C. Nurse-led community IV therapy service saves the NHS over one million in three years. *Nursing Times* 3 February 2009.

Table taken from: (Outpatient parenteral antimicrobial therapy (OPAT): is it safe for selected patients to self administer at home? A retrospective analysis of a large cohort over 13 years. Philippa C. Matthews^{1,2*} et al).

Local Efforts to Improve Quality and Cost Savings at Parkland Hospital:

ANTIMICROBIAL STEWARDSHIP AND OUTPATIENT ANTIMICROBIAL THERAPY AT PHHS

Scope of the problem

Prior to the development of the OPAT and antimicrobial stewardship programs at PHHS, a significant number of patients received prolonged courses of inpatient and outpatient antimicrobial therapy without documentation of appropriate indications or systematic monitoring of dosing accuracy and clinical measures such as the presence of adverse outcomes. An illustrative example is that of Vancomycin for the treatment of methicillin resistant Staph aureus (MRSA) infections. The MRSA epidemic in this country continues to pose a significant problem for healthcare providers as it is characterized by high morbidity and mortality while treatment options are limited. Current Infectious Disease Society of America (IDSA) guidelines recommend initial dosing of Vancomycin at 15 mg/kg to try and achieve target trough blood levels of 15-20 mcg/ml for invasive infections. [18] While widespread adherence to the guidelines has been noted to be poor, recent studies have demonstrated marked improvement in hospitals actively engaged in stewardship programs. [19]

Another important factor contributing to poor clinical outcomes is the absence of systematic monitoring for the resolution of infection by the managing physician. This in turn can lead to prematurely ending therapy rendering the patient at risk for re-infection, or continuation of ineffective antimicrobial therapy which may lead to resistance. A 2010 review of funded patients receiving home health services and presenting with acute renal insufficiency on IV Vancomycin showed this group to be “at risk” for developing severe complications including kidney dysfunction and blood dyscrasias in the absence of timely follow-up with a physician in the ambulatory setting.

Development of OPAT clinic at Parkland:

Case management and pharmacy have historically coordinated services for patients requiring home IV therapy with payor designated home care agencies when patients have external insurance coverage (including Medicare Part A/B/D and Texas Medicaid). For unfunded patients or patients with gaps in insurance coverage, coordinated efforts were made through pharmacy to dispense the IV antibiotics and case management assisted to ensure follow up care in a Parkland clinic, or arrange home visits with local agencies on a pro bono basis if feasible. Parkland has no existing contractual arrangements, at present, for home care.

Internal review of data related to patients discharged with IV antibiotics over a six month period at Parkland in 2009 revealed a significant rate of 30 day readmissions and ER visits noted to be as high as >50% in Spring 2009. With multidisciplinary input from physicians, nursing staff, pharmacy and case management, a new model was developed to centralize care received by

patients discharged with self-administered IV antibiotic therapy. The Parkland OPAT clinic was opened in November 2009, staffed with an Infectious Diseases physician and two Infectious diseases trained pharmacists in addition to two nurses trained in the care of PICC lines. By early 2010, it became apparent that patients who were discharged home with home health services and not seen in OPAT clinic, were at risk of poor outcomes due to lack of consistent follow-up with a physician in the ambulatory setting. This led to the expansion of OPAT clinic services to include the funded patient population while also developing process improvement measures to standardize care which was later presented at the national Institute for Healthcare Improvement (IHI) forum in December 2010.

Vision statement for Parkland OPAT program is as follows:

“The OPAT program partners with patients as they transition to the community through the use of non-traditional methods and antimicrobial stewardship to improve patient care outcomes and provide value based care that reduces hospital readmissions and maximize hospital resources”.

Objectives of the OPAT program at Parkland

The principal objective of the program is to promote patient safety through stewardship practices to monitor inpatient and outpatient antimicrobial administration. Overarching goals include ensuring that antibiotics are utilized with appropriate indications, concordant with patient microbiology data, and monitored for dosing and duration adequacy and potential adverse outcomes. Ancillary benefits of the program include potential reduction of selection pressure that may lead to antibiotic resistance, and cost-savings resulting from reduction in unnecessary antibiotic exposure.

Patient Selection

The first step in the selection process is determining the need for continued IV antimicrobial therapy. In cases where oral antimicrobial agents with comparable bioavailability can be utilized, patients should be switched preferentially to these agents to avoid complications associated with parenteral therapy, e.g. intravenous catheter-related complications, convenience and lower costs. Examples of antimicrobials with excellent bioavailability include Doxycycline, Minocycline, Clindamycin, Fluconazole, Valganciclovir, Levofloxacin, Ciprofloxacin, Moxifloxacin, Metronidazole, and Linezolid. If a patient is determined to require parenteral therapy, they must undergo a multi-disciplinary screening process with case management, pharmacy and nursing to assess if they meet requisite criteria for discharge on home intravenous antibiotics. The key to optimizing clinical outcomes in the self-administration model of OPAT delivery essentially lies in an aggressive pre-screening process during the patient's hospitalization to ascertain their ability to care for the PICC line, and complete their IV antimicrobial course of therapy as prescribed.

A. Guidelines for patient selection:

1. The patient's medical condition is stable and the physician and nurse believe that the patient does not require hospitalization.
2. The patient and/or caregiver are capable of safely and effectively delivering parenteral antimicrobials (through return demonstration).
3. The patient will be living in a home environment that is safe and adequate to support care with good hygiene and safe/proper storage of supplies/medication. There are no psychosocial factors present which would preclude effective therapy in the home setting.
4. The patient and/or caregiver are aware of the risks of outpatient parenteral therapy.
5. The patient is not currently using illicit drugs or excessive alcohol and the patient is not at risk for using an intravenous catheter for administration of illicit drugs (this includes use of illicit drugs immediately prior to the acute presentation).
6. A working telephone is available to ensure communication between patient and health care provider.
7. The patient has transportation available to keep appointments with the health care provider.
8. The patient has a functioning intravenous catheter, which is appropriate for the duration of therapy ordered.
9. Only patients discharged from Parkland or patients whose parenteral antibiotic therapy was initiated by a Parkland physician are eligible for follow up in the OPAT clinic. Patients whose therapy was initiated at another hospital are not eligible (regardless of funding); the institution initiating outpatient antibiotic therapy is responsible for arranging and providing outpatient therapy until the course of treatment is completed.

NOTE: The possibility of nursing visits in the home is a function of the patient's insurer status. Patients with funding other than PHP (e.g., Medicare, Medicaid, private insurance) are usually eligible for in-home nursing care and referral to an outside home health agency for continuation of parenteral therapy in the home. Patients who are uninsured and patients with PHP are not eligible to receive nursing care in the home environment. In contrast, patients with commercial insurance generally have several visits per week while patients with Medicare generally are eligible for 1-3 visits per week. Patients with PHP are followed at least weekly in the OPAT clinic.

Referral Process:

The most common indications for OPAT at Parkland include completing treatment for invasive infections such as osteomyelitis, bacteremia/endocarditis, pyelonephritis, and cellulitis. The process is initiated by the physician notifying a case manager and clinical pharmacist (enter EPIC pharmacy consult for home IVs) that a patient will require OPAT and the prescriptions are provided to pharmacy. The patient will then be evaluated by pharmacy and case management for

eligibility based on clinical response to therapy, appropriateness of the requested antibiotic dose/duration/choice for the infection, and the ability of the patient/family to self-administer IV antibiotics safely in the home. After notification, the above assessment begins as well as PICC line placement, education of the patient/family, arrangement of weekly follow up, and medication preparation by the pharmacy. Discharges for OPAT patients occur Monday – Friday and the process takes a minimum of 48 hours to complete. A physician places an order for the patient’s nurse to teach and evaluate the patient’s ability to demonstrate the proper technique using an established competency. The nurse will document this in the electronic medical record and the competency will be filed in the patient’s chart. Patients/families who do not meet minimum criteria for administration cannot be safely discharged. Follow up monitoring for patients receiving OPAT is critical and labs are obtained weekly at OPAT clinic visit along with PICC care/dressing changes. (See intranet site “Departments/Parkland Programs/OPAT” for details)

Transitions of Care and Communication:

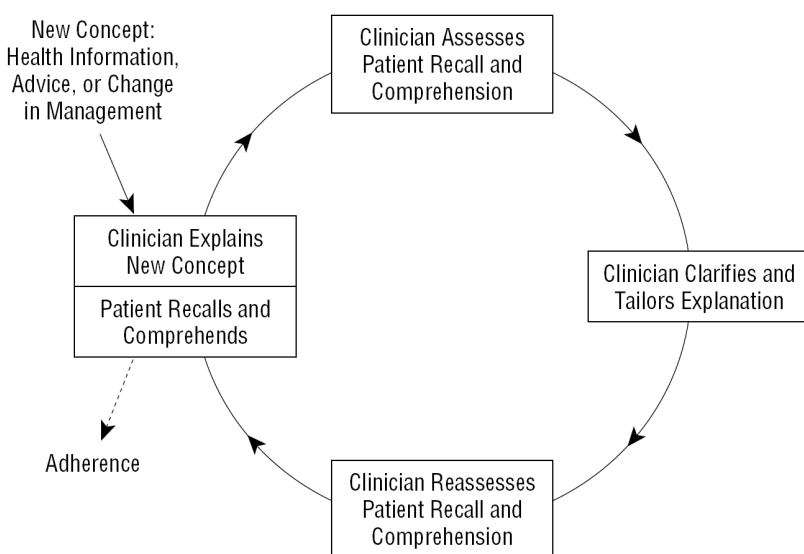
The Agency for Healthcare Research and Quality’s (AHRQ) patient safety culture survey is a tool used to assess staff perceptions of patient safety in more than 1000 hospitals nationwide. Survey results from 2011 showed handoffs and transitions to be the second lowest scoring area among participating hospitals. [20] From the patient perspective, focus groups brought together by CMS and AHRQ in the development of the HCAHPS survey identified “communication with physicians, nurses and hospital staff” as an important measure of hospital quality. While both providers and patients agree that communication is important, particularly at times of transition of care, research has shown that disparities exist between perception and reality. A recent study published in the Archives of Internal Medicine illustrates this problem reporting that among a group of patients with average length of stay >5 days, fewer than 20% were able to correctly name their physician and <50% of patients were able to correctly name their diagnosis. When the physicians caring for these patients were surveyed however, 67% believed that their patient could correctly identify their physician name and 77% could correctly identify their diagnosis. [21] Another study looking specifically at the role of health literacy in thirty day readmissions for patients treated in a Boston safety net hospital found that low health literacy was indeed a significant, independent and modifiable risk factor for hospital re-utilization in the thirty day post-discharge period. [22]

Teach Back Method:

A report by the Institute of Medicine from 2004 estimated close to 90 million Americans experience difficulty in understanding and using health information provided to them, and are more likely to have higher rates of hospitalization and use of emergency services as a result. [23] Numerous studies have demonstrated that patients remember and understand less than half of what clinicians explain to them. [24] While all providers agree that patients benefit from clear

information, the challenge remains identifying patients at risk of misunderstanding the information presented to them. Testing general reading levels does not ensure patient understanding in the clinical setting. [25] The “teach back method” is an important tool in the field of health literacy with great potential to reduce the previously identified knowledge gaps between patients and providers. The method employs the technique of asking patients to repeat in their own words what they need to know or do without causing shame. In this way, it is essentially a test of how well *the provider explained a concept* rather than a test of the patient. The method also provides an opportunity to check for understanding and, if needed, teach the information (Figure 6). [26]

Figure 6: Teach Back Method



(Schillinger D, Piette J, Grumbach K, Wang F, Wilson C, Daher C, Leong-Grotz K, Castro C, Bindman A. Closing the Loop Physician Communication With Diabetic Patients Who Have Low Health Literacy. Arch Intern Med/Vol 163, Jan 13, 2003

OPAT Patient Education at Parkland:

Patient education is critical to ensuring successful clinical outcomes in the self-administered model. As such, educational material was developed in 2010 employing diagrams and language appropriate for elementary school literacy level to optimize communication with the indigent patient population seen in our safety net hospital (Figure 7) Antimicrobial agents with extended half-lives are preferred due to the current lack of infusion pumps for patients receiving OPAT at Parkland. Agents such as Cefazolin, Ceftriaxone, Cefepime, Daptomycin, Ertapenem, and Micafungin are selected for ease of dosing, with the goal to discharge patients with no more than three times a day self-administration. Patients are taught to administer these medications via gravity drip method. Patients with standard PICC lines require normal saline (10 mL) flushes before and after each dose while other PICC lines may also require heparin flushes.

Giving Your IV (Intravenous) Antibiotics Through Your PICC Line At Home



PH-IV-195
R.D. 3/11
Page 1 of 7

Your doctor wants you to have antibiotics through your PICC line at home. These antibiotics treat the infection in _____. You will need to give yourself these antibiotics for _____ weeks.

During this time, you will have appointments at the Parkland clinic. It is very important for you to come to these clinic appointments because this is when we will check your blood, and check to be sure you are getting the right amount of the antibiotic. We will also put a fresh, sterile (no germs) dressing over your PICC line 1 (one) time each week at your clinic appointment. Your nurse will check that there is no infection at the place where the tube goes into your body.

Your first appointment is: _____.
If you cannot come to this appointment, call 214-590-5061 to make another appointment.

Getting ready to give your antibiotic through your PICC line:

1. Clean off a clean, dry, flat place with alcohol, to put your supplies on, or put clean, dry paper towels down before you put your supplies down.

2. The supplies you will need to give your antibiotic through your PICC line are:

- IV medicine bag
- IV tubing
- IV tubing Extension set
- The blue Microclave cap
- 2 pairs of gloves
- Alcohol pads



3. Always wash your hands before you flush the catheter, or give your antibiotics.

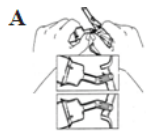
Handwashing is **the most important** way to prevent infection!

- Wash your hands with soap and water for 15 seconds.
Then rinse and dry with a paper towel or clean cloth towel.
- You can also use an alcohol hand rub instead of washing your hands.

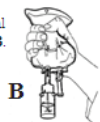


Mix the antibiotic:

- Bend the reconstitution device spike back and forth to break the seal. See picture A.
- Hold the bag so the vial hangs down.



- Squeeze the fluid from the bag into the vial until the vial is half full. See picture B.
- Shake the vial so the powder gets mixed completely into the fluid.



- Hold the bag upside down and squeeze it to push air up into the vial. See picture C.
- Let go of the bag so the mixed antibiotic flows back into the bag.



- Keep doing this until all the antibiotic has flowed out of the vial and back into the bag.
- Leave the vial attached to the bag.

- Close the roller clamp on the tubing and put the spike port into the outlet port of the IV antibiotic bag.

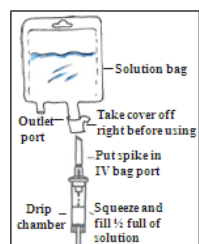


- Squeeze the drip chamber to start the flow of the IV antibiotic. Fill the drip chamber 1/2 full.

- Hang the bag so it is higher than your head.

- Open the roller clamp slowly to let the IV antibiotic fill the tube. This pushes all the air out of the tube.
- Close the roller clamp.

Remember - don't let the end of the tube touch anything.



7. Put on your gloves.



4. Check the label on your IV medicine bag to be sure you have the right IV antibiotics.

5. Label your tubing with the date, time and the name of the IV antibiotics.

Be sure to keep the tip of your tubing very clean. This means that the tip of the tubing where it joins to other tubing should not touch anything. If it does, wipe it off with an alcohol prep pad.



6. Prepare your antibiotic:

- ☐ The name of your IV antibiotic that does **not** need to be mixed is _____.

Check it to be sure it is clear and not have any spots or specks floating in it. If it is not clear, do not use it. Bring it to your clinic appointment. Use another bag that is clear.

Keep this antibiotic in the refrigerator? Yes or No

- Close the roller clamp on the tubing and put the spike port into the outlet port of the IV antibiotic bag.

- Squeeze the drip chamber to start the flow of the IV antibiotic. Fill the drip chamber 1/2 full.

- Hang the bag so it is higher than your head.

- Open the roller clamp slowly to let the IV antibiotic fill the tube. This pushes all the air out of the tube.

- Close the roller clamp.

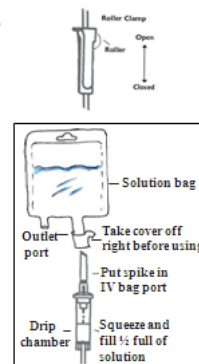
Remember - don't let the end of the tube touch anything.

- ☐ The name of your IV antibiotic that needs to be mixed is: _____.

After you have mixed it, check it to be sure it is clear and not have any spots or specks floating in it. If it is not clear, do not use it. Bring it to your clinic appointment. Use another bag that is clear.

Keep this antibiotic in the refrigerator? Y or N

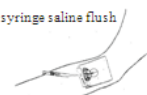
- Mix each dose right before you give it.



8. Clean the PICC line cap or the extension tubing cap with an alcohol prep pad.



☐ If you have a PICC **without** a clamp, flush your PICC with 1 syringe saline flush before and after you give your antibiotics. Use a pulsating method (quickly start and stop, over and over) when flushing with saline - this helps keep the inside of the PICC cleaned out.



☐ If you have a PICC **with** a clamp, you will need to flush it with a heparin flush syringe once a day. To do this, first flush with 1 syringe saline flush, then run in your antibiotic, then flush again with a 10cc saline flush, and then flush last with your heparin flush.

Flush your PICC with one syringe saline flush before and after you give your antibiotics. Use a pulsating method (quickly start and stop, over and over) when flushing with saline - this helps keep the inside of the PICC cleaned out.



Then flush with heparin using a positive pressure flushing method (clamp the catheter at the same time you finish pushing in the heparin). This keeps blood from backing up into the PICC.

9. If you are not able to flush your PICC line, stop, and call 214-590-5061 or go to the Emergency Room.

10. Twist the end of the IV tubing onto the blue cap on your PICC line.



11. Be sure all connections are screwed together firmly.

12. Run in your antibiotic:

☐ If you only have 1 IV antibiotic:

Your IV antibiotic _____, should drip in

(for 60 drops/ml tubing - check the package) at _____ drops in 15 seconds.

It should take _____ minutes for all of it to drip in. Slowly open the IV roller clamp

and count the number of drops in 15 seconds.

Give at these times: _____

Figure 7: OPAT Patient Education Material at PHHS

States over the last twenty years. OPAT therefore affords the healthcare system a unique opportunity to improve patient care and choice while, at the same time, reducing costs. The Parkland model of self-administrated OPAT has similarly demonstrated safety, cost-savings and efficacy while leading to improved utilization of inpatient resources for acutely ill patients presenting to our safety net hospital. Practice guidelines have been written in many countries and need to be updated continually as we learn more through research about clinical outcomes and discover potential limitations. The Infectious Disease Society of America is currently in the process of revising practice guidelines for delivery of OPAT services in the United States. Our safety net hospital experience with a uniquely self-administered model has the potential to help other resource limited settings across the country develop solutions for safe and effective delivery of IV antibiotics at home, as they continue to look ‘outside the box’ of the traditional inpatient setting to improve resource utilization.

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