Good practice recommendations for paediatric outpatient parenteral antibiotic therapy (p-OPAT) in the UK: a consensus statement

Sanjay Patel¹, Ed Abrahamson², Stephen Goldring³, Helen Green¹, Hayley Wickens⁴,⁵ and Matt Laundy⁶

1. Department of Paediatric Infectious Diseases & Immunology, University Hospital Southampton NHS Foundation Trust, Southampton.


3. Department of Paediatrics. The Hillingdon Hospital NHS Foundation Trust, London.

4. Pharmacy department. University Hospital Southampton NHS Foundation Trust, Southampton.

5. Department of Medicine, Imperial College London.


Corresponding author:

Dr Sanjay Patel, Consultant in Paediatric Infectious Diseases and Immunology, Division of Women and Children, Mailpoint 43, Southampton Children’s Hospital, Tremona Road, Southampton, SO16 6YD. Telephone: +44 (0)23 8120 5360. Email sanjay.patel@uhs.nhs.uk

Background

Although the origins of outpatient parenteral antibiotic therapy (OPAT) lie firmly within paediatrics, with Rucker and Harrison introducing the concept of home intravenous antibiotics for children with cystic fibrosis in 1974 [1], recent advances in OPAT have focused on adult practice [2-4]. Within the UK, the development of adult OPAT services has been driven by the British Society for Antimicrobial Chemotherapy (BSAC). [2]

Children are currently ambulated on intravenous (IV) antibiotics from paediatric units across the country. Formal good practice recommendations for paediatric outpatient parenteral antimicrobial therapy services (p-OPAT), including robust clinical governance frameworks and prospective outcome monitoring, would potentially enhance the patient experience, enable significant cost saving and above all, improve patient safety while reducing adverse events. As a joint collaboration between BSAC and the British Paediatric Allergy, Immunity and Infection Group (BPAIIG), we propose to formalise clinical practice and governance of p-OPAT through these good practice recommendations.

Executive summary

There is compelling evidence to support the rationale for managing children on intravenous (IV) antimicrobial therapy at home whenever possible, including parent and patient satisfaction, psychological wellbeing, return to school / employment, reductions in healthcare-associated infection and cost saving. [5-9] In addition, formalising such services could help overcome some of the challenges currently facing the NHS, such as significant efficiency savings [10, 11], reconfiguration of acute paediatric services [12], delivering care closer to home [13], embedding
antimicrobial stewardship into clinical practice \cite{14, 15} and addressing the deficiencies highlighted in the Francis report. \cite{16, 17}.

In its most basic form, OPAT simply refers to the administration of IV antimicrobials for at least two consecutive days without an intervening hospitalisation \cite{3}. Within paediatrics, this covers a wide spectrum of children, from those with common infections being treated with relatively short courses of antimicrobials in secondary care settings, to those with complex infections, being managed with long courses of antibiotics in tertiary paediatric centres (see Figure 1). In some cases, hospitalisation may be entirely avoided and in others length of admission may be shortened.

The following criteria must be met before a patient can be considered for p-OPAT \cite{18}:

1) The patient has currently no further predictable need for hospital based care apart from the administration of antimicrobial therapy.
2) The infection and any associated co-morbidity should have a stable or predictable course suitable for non-inpatient management.
3) There is no equally safe and effective oral antimicrobial that can be given alternatively. This component should be overseen as part of a formal antibiotic stewardship programme. \cite{14, 15}

Despite a wealth of experience in paediatrics, there remains considerable anxiety about ambulating children with infection. The successful introduction of a p-OPAT service requires appropriate personnel, clear channels of communication and robust clinical governance structures, to ensure that children managed at home receive the same quality of care that they would receive in hospital. Specific consideration about the patient’s suitability for p-OPAT, the most appropriate route of intravenous access and choice of antibiotic is required before the child is discharged home. This is best achieved using a multidisciplinary approach involving medical, nursing and pharmacist input. This document has been divided into 9 key areas to provide practical guidance about developing and running p-OPAT services both in secondary and tertiary care settings (see table 1). These good practice guidelines will not specifically address children with cystic fibrosis (CF). Variation in practice between different respiratory centres meant that the working group felt unable to comment on the optimal strategy for administering IV therapy to this particular cohort of children. However, the principles discussed in these recommendations may be broadly applied to paediatric CF practice.

**Methods**

A working group set-up under the joint auspices of BSAC and BPAIIG was established, consisting of individuals with experience in delivering p-OPAT, ambulatory paediatric care, paediatric infectious diseases, adult OPAT, microbiology and pharmacy. The development of these recommendations forms part of the BSAC national OPAT initiative and complements the adult BSAC/BIA 2012 OPAT recommendations. \cite{2}

A comprehensive literature review was undertaken. The following electronic databases were searched (all 1970 – to June 2012): MEDLINE, EMBASE, WEB OF SCIENCE (Science Citation Index Expanded) and Cochrane Library (including CENTRAL Register of Controlled Trials). Search terms used were: ‘outpatient parenteral antibiotic therapy’, ‘outpatient parenteral antimicrobial therapy’, ‘Home Infusion Therapy’ AND ‘Anti-Bacterial Agents’, ‘Home intravenous antibiotic, outpatient parenteral therapy’ AND ‘antibiotic’ OR ‘antimicrobial’ OR ‘antifungal’ OR ‘antiinfective’, ‘OPAT’, ‘OHPAT’ and ‘POPAT’. Within the initial search results, a separate search for paediatric studies was done using the terms: “child* OR ‘pediatr’ OR ‘paediatr’ OR ‘infant’.
The initial search resulted in 1256 references, of which 273 related to children. These were screened on the basis of the abstract and those lacking relevance were excluded. 73 relevant papers were divided into key areas (see table 1) and the full text articles were obtained. These articles were reviewed by members of the working group and the relevant information to guide good practice recommendations extracted. Papers that covered more than one area were cross-referenced.

Members of the working group then met to review and combine the recommendations into a working draft. This draft underwent a consultation process involving relevant stakeholders and the draft revised and amended in response to these. Appendix 1 lists the stakeholders involved in the consultation process.

**Table 1.** Key areas reflecting the different components of a p-OPAT service

<table>
<thead>
<tr>
<th>Key Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. p-OPAT team – roles and responsibilities</td>
</tr>
<tr>
<td>2. Service structure</td>
</tr>
<tr>
<td>3. Patient suitability for p-OPAT</td>
</tr>
<tr>
<td>4. Pathologies suitable for p-OPAT management</td>
</tr>
<tr>
<td>5. Vascular access</td>
</tr>
<tr>
<td>6. Antimicrobial selection, drug delivery and monitoring of the patient</td>
</tr>
<tr>
<td>7. Clinical governance and outcome monitoring</td>
</tr>
<tr>
<td>8. Developing a business case and obtaining funding to set-up a p-OPAT service</td>
</tr>
</tbody>
</table>

**Figure 1.** Spectrum of patients to whom p-OPAT services can be delivered

- Children with complex infections requiring long courses of antibiotics in tertiary centres *(small numbers)* – e.g. the child with endocarditis
- Children with common infections requiring relatively short courses of antibiotics discharged from general paediatric wards *(moderate numbers)* – e.g. the stable child with pyelonephritis
- Children with possible bacterial infection ambulated directly from short stay units or paediatric accident and emergency departments – e.g. the febrile but stable child with a petechial rash *(large numbers)*
1) p-OPAT team – roles and responsibilities

The key personnel within a p-OPAT service vary according to local resources. The majority of p-OPAT patients will be managed within a secondary care setting, where access to a paediatric infectious diseases specialist is not necessary.

In a secondary care setting, the medical role should be undertaken by a general paediatrician or paediatric A+E consultant (named p-OPAT consultant), with input from a clinical microbiologist where appropriate and community- or hospital-based nursing input. The team should have access to pharmacy support and ideally an IV preparation unit.

In a tertiary centre, the management of complex infections should be overseen by a paediatric infectious diseases consultant who should also take clinical responsibility for patient management and clinical governance of the p-OPAT service. The nursing role is vital in patient selection, logistical support and patient/carer education and clinical pharmacy support is vital to ensure the equivalent pharmaceutical care as would be expected for inpatients with infection and also to support the antimicrobial stewardship process. Ideally a specialist IV preparation unit would be an integral part of the p-OPAT service.

A general framework for delivery of ambulatory and tertiary p-OPAT services can be based on current services with the UK (figures 2 & 3). The roles and responsibilities of the various members of the p-OPAT team are outlined in Table 2. There may be scope to share resources with a co-located adult OPAT service.

2) Service structure

Various service models for p-OPAT are described below and their relative advantages and disadvantages are outlined in Table 3 [19]. They may be used independently or in combination within a single p-OPAT service.

- **Home administration by carer or parent**
  Following training by a competent member of the p-OPAT team, intravenous antimicrobials are administered by the carer or patient at home. [6, 20] This model has been widely used in the United States. Specific patient groups who require regular courses of IV antibiotics and whose families/carers are trained in central line care/access may be managed using this model.

- **Home administration by a paediatric trained nurse**
  Antimicrobials are administered at home by an appropriately trained NHS nurse (hospital- or community-based nurse) or private healthcare provider with the relevant competencies.

- **Infusion centre administration**
  Children receive their antimicrobials at an infusion centre each day. The venue may be a paediatric emergency department, paediatric assessment unit, acute paediatric ward or within an outpatient department. Antimicrobials are administered by a hospital-based nurse with the relevant competencies.
Figure 2. Tertiary hospital p-OPAT service structure

Admitting team identify and refer a child potentially suitable for p-OPAT

Child reviewed by p-OPAT team (consultant / nurse / pharmacist)

If eligible, p-OPAT nurse trains parent/carer on line care and aseptic technique, medication prescribed and CIVAS department informed

Decision to continue IV antibiotics

Weekly outpatient review and weekly discussion in virtual ward round

Child reviewed and antibiotics given daily. Weekly blood tests

P-OPAT nurse communicates with community nurses and child discharged home

Database completed on discharge

Decision to stop IV antibiotics and discharged from p-OPAT service

Figure 3. Ambulatory p-OPAT service structure

Child attends ED or short stay-ward and decision taken that condition is suitable for p-OPAT

Peripheral cannula inserted and suitable microbiological samples taken.

Treatment started as per local antibiotic guidelines

Review in 24 hours either back in the unit of origin, or if home nursing being utilised for administration of next dose, then review back in the unit at 48 hours*

Are criteria for p-OPAT met (see Table 2)

Senior clinical decision about whether admission is required

Admitted on database / virtual ward (BSAC PMS)

Database completed on discharge

YES

NO

YES

*Open access to the unit throughout the ambulatory course
<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibilities</th>
</tr>
</thead>
</table>
| **Named p-OPAT clinical lead** | - Overall responsibility for the governance of the p-OPAT service including development of policies and procedures, audit and benchmarking.  
- Leading the virtual p-OPAT ward round to discuss all patients.  
- Clinical and prescribing responsibility for individual patients during p-OPAT in the absence of another designated p-OPAT paediatrician. These responsibilities may in some circumstances be shared with a specialist referring clinician. |
| **p-OPAT consultant / clinicians discharging children on IV antibiotics** | - Overseeing the management plan in terms of the confirming of the diagnosis, evaluating clinical suitability for discharge, deciding on the choice of antimicrobials and choosing the most appropriate device for delivery (in conjunction with infection specialist and clinical pharmacist).  
- Prescribing antimicrobials (this can be performed by any member of the p-OPAT team with appropriate competencies).  
- Deciding upon the timing of an IV to oral switch if applicable and the total duration of antimicrobial therapy (in conjunction with infection specialist and clinical pharmacist).  
- Monitoring for side effects or clinical deterioration (in conjunction with nursing staff).  
- Taking overall clinical responsibility for p-OPAT patients (responsibility may be shared with referring consultant in a tertiary hospital setting). |
| **Nursing staff involved in discharging children on IV antibiotics** | - Evaluating suitability for p-OPAT in terms of social criteria and caregiver assessment (see table 4).  
- Training parents / carers / patients on line care and if applicable, administration of antimicrobials.\([21, 22]\)  
- Organising appropriate intravenous access.  
- Training of home care nurses / community nurses in the use of novel devices such as elastomeric devices or programmable infusion devices (if applicable).  
- Offering clear verbal and written communication of the p-OPAT plan to the child, family and home care nurses (if applicable), including the pathway for accessing emergency care in the event of complications. \([23]\)  
- Monitoring for side effects or clinical deterioration. |
| **Clinical microbiologist** | - Offering advice on choice of antimicrobial, timing of IV to oral switch and total duration of antibiotics (in conjunction with paediatrician managing the child). |
| **Clinical / antibiotic pharmacist** | - Providing clinical advice on antimicrobial options in terms of selection, pharmacokinetics, tissue penetration, IV-PO switch, dosing, tolerability, allergies, potential drug interactions and side effects, stability and compounding. |
| **Parent / carer** | - Needs to demonstrate competence in line care and an understanding of potential complications including line complications, side effects from medication and exacerbation / relapse of the underlying infective pathology.  
- If parents or caregivers are reconstituting and administering antibiotics, appropriate training and assessment of competency is required. \([6, 20]\) |
<table>
<thead>
<tr>
<th>Model</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
</table>
| Home infusion by carer or parent           | • Independence for families and cost saving for healthcare providers.  
• Enables the use of antimicrobial agents that require multiple daily dosing.                                                        | • There is evidence to suggest that the responsibility of administering antibiotics increases stress for families. [6]  
• Such a model does not include an initial review of the home environment or daily patient review, which may result in delays in identifying deterioration or complications.  
• Adherence to treatment cannot be ensured.  
• Although experience is growing, there are currently no national guidelines in place to formally evaluate the competence of caregivers in administering IV antibiotics. |
| Home administration by a paediatric trained nurse | • Convenience of having antimicrobials administered at home.  
• Visiting nurse is able to review the patient and the home environment each day and inform the p-OPAT team if there are any concerns.  
• Adherence to treatment is ensured.  
• Using pre-existing community nursing teams may reduce staffing costs required to implement the service. | • The time taken for a hospital based nurse to travel to patient’s houses may be excessive if the p-OPAT service covers a wide geographical area.  
• Existing community nursing teams may not have the capacity to take on the increased workload of p-OPAT patients.  
• The cost of providing paediatric trained nurses through a private healthcare provider may be expensive. |
| Infusion centre administration              | • Children can be reviewed each day by the medical team and immediate decisions can be made about stopping antimicrobials. This can be beneficial in certain pathologies such as cellulitis.  
• If vascular access is lost (i.e. tissued cannula), this can be immediately addressed.  
• Cost benefits for healthcare providers in terms of using nursing staff already in place. | • Inconvenience for families having to return to hospital each day.  
• Logistics of providing a seven-day/week service.                                                                                   |
3) Patient suitability for p-OPAT

Assessing the eligibility of a patient for p-OPAT should be formally conducted by both the p-OPAT clinician and p-OPAT nurse, in terms of clinical, social and caregiver criteria (see table 4). Failure to meet these criteria poses an increased risk of an adverse outcome at home and extremely careful consideration should be taken before accepting the patient for p-OPAT. [24]

Decision making about the need to continue intravenous antibiotics should be based on antibiotic stewardship principles. [14]

**Table 4. Evaluation of p-OPAT suitability**

<table>
<thead>
<tr>
<th>Clinical</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Is the patient clinically stable? Any evidence of haemodynamic instability?</td>
<td></td>
</tr>
<tr>
<td>• Is the infection well-defined and is the prognosis predictable?</td>
<td></td>
</tr>
<tr>
<td>• Is the pathology amenable to p-OPAT management and are the risks of complications from the underlying infection minimal?</td>
<td></td>
</tr>
<tr>
<td>• Are there any other reasons for in-patient management apart from the administration of intravenous antimicrobials?</td>
<td></td>
</tr>
<tr>
<td>• Can an oral switch be considered?</td>
<td></td>
</tr>
<tr>
<td>• Is there a suitable p-OPAT antibiotic? (see section 6)</td>
<td></td>
</tr>
<tr>
<td>• Persisting fever is not an absolute contraindication for discharge but a deep seated collection requiring drainage must be excluded.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Is the home arrangement suitable for p-OPAT i.e. general cleanliness, working refrigerator (if applicable)?</td>
<td></td>
</tr>
<tr>
<td>• Does the family have a telephone?</td>
<td></td>
</tr>
<tr>
<td>• Do the family have access to transport?</td>
<td></td>
</tr>
<tr>
<td>• Special consideration should be taken to adolescents who are more likely to engage in risk taking activities.</td>
<td></td>
</tr>
<tr>
<td>• Are there any child protection concerns?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Carer</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Understands the commitment and responsibility required for p-OPAT</td>
<td></td>
</tr>
<tr>
<td>• Demonstrates competence in line care (including administration of antibiotics if applicable) and is aware of potential complications.</td>
<td></td>
</tr>
</tbody>
</table>

4) Pathologies suitable for p-OPAT management

Table 5 outlines the various pathologies that can be considered for p-OPAT management. Not only does p-OPAT offer the potential for early discharge from hospital, but in some cases will allow admission to be avoided.

**Table 5. Pathologies potentially amenable to p-OPAT management (ED= early discharge, AA= admission avoidance)**

<table>
<thead>
<tr>
<th>Pathology / presentation</th>
<th>Admission avoidance (AA) or early discharge (ED)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Febrile infant aged 1-3 months [25, 26]</td>
<td>ED / AA</td>
</tr>
<tr>
<td>Septicaemia [20, 27, 28]</td>
<td>ED</td>
</tr>
<tr>
<td>Central line infection [7, 29]</td>
<td>ED</td>
</tr>
<tr>
<td>Condition</td>
<td>Management</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Infective endocarditis [30]</td>
<td>ED</td>
</tr>
<tr>
<td>Pneumonia +/- empyema [29]</td>
<td>ED</td>
</tr>
<tr>
<td>Pyelonephritis [20, 29]</td>
<td>ED / AA</td>
</tr>
<tr>
<td>Meningitis [27, 31, 32]</td>
<td>ED</td>
</tr>
<tr>
<td>Brain abscess / subdural empyema</td>
<td>ED</td>
</tr>
<tr>
<td>Appendicitis [9, 33]</td>
<td>ED</td>
</tr>
<tr>
<td>Intra-abdominal abscess [20, 29]</td>
<td>ED</td>
</tr>
<tr>
<td>Sinusitis [20]</td>
<td>ED / AA</td>
</tr>
<tr>
<td>Chronic otitis media [20, 34]</td>
<td>ED / AA</td>
</tr>
<tr>
<td>Mastoiditis [20, 35]</td>
<td>ED</td>
</tr>
<tr>
<td>Septic arthritis / osteomyelitis [20, 29, 36-38]</td>
<td>ED</td>
</tr>
<tr>
<td>Cellulitis [20, 29]</td>
<td>ED / AA</td>
</tr>
<tr>
<td>Lymphadenitis</td>
<td>ED / AA</td>
</tr>
<tr>
<td>Pyomyositis [38]</td>
<td>ED</td>
</tr>
</tbody>
</table>

**Special considerations:**

a) **Febrile infants aged 1-3 months** – in the post conjugate vaccine era, the rate of serious bacterial infection in infants aged 1-3 months in developed countries is reported as being less than 3%. [39] Factors supporting the ambulation of these infants on once daily ceftriaxone include a normal CSF white cell count, haemodynamic stability, adequate feeding, cooperative parent and no other reason for admission to hospital. [25]

b) **Children being discharged directly from paediatric A&E / paediatric assessment unit (admission avoidance)** – a number of clinical scenarios are suitable for p-OPAT direct from the emergency department or short stay unit, provided the child is clinically stable, the carers are supportive of the decision, and there is 24 hour access back to the service for reassessment in the event of an unexpected change in the predicted clinical course. Pathologies include urinary tract infections where the indications for intravenous antibiotic therapy are met [40-42], cellulitis [43, 44], preseptal cellulitis [45, 46], acute lymphadenitis, the well child with petechiae and infants between 1 and 3 months of age with fever [25, 26].

c) **Endocarditis** – most patients with endocarditis can be managed within a p-OPAT service once stable after an initial period of hospitalisation. However patients with prosthetic valves, vegetations >10mm in length, recurrent embolic events, persistently positive blood cultures, conduction abnormalities, *Staphylococcus aureus* infection or heart failure are at increased risk of complications. [3] Although none of these risk factors are absolute contraindications to p-OPAT, the initial period of hospitalisation may be longer. [30, 47]
d) **Meningitis** – complications of meningitis occur most frequently by day 2-3 and are very rare after day 3-4. Fever lasts 5-9 days in 13% of patients. [48] Consider p-OPAT management if patient seizure free and afebrile for at least 24 hours. Be cautious about discharging a child with meningitis before day 5 and if abnormal neurology persists. [31, 32]

5) **Vascular Access**

Due to the technological advancements of venous access devices, it is now considerably easier and safer to administer IV therapy in the outpatient setting over longer periods of time. [49] Midlines, peripherally inserted central catheters (PICC), tunneled central venous catheters (CVC) and implanted ports have all contributed to the safe and successful delivery of antimicrobial therapy for patients under p-OPAT. [19, 49] Peripheral cannulae may also be considered for short course home therapy. Table 6 summaries the key indications and complications associated with various IV devices.

a) **Device selection**

Device selection criteria must reflect the individual needs of the patient; clinical status, diagnosis, age, vein condition, current vascular access, antimicrobials prescribed, frequency of administration and the duration of therapy, as well as the clinical expertise available to site the device. [29, 49-51] It is essential that secure venous access is in place prior to p-OPAT discharge.

The use of PICC has surpassed that of any other vascular access device and is now standard practice in p-OPAT. [3] They are commonly used in patients requiring long term therapies and can remain in place for extended periods of time (weeks or months) providing the device is appropriately managed. [3] Compared to tunneled CVCs, PICC can be inserted either under local or general anaesthetic, are generally easier and cheaper to insert, are not associated with complications such as pneumothorax and can be easily removed if necessary. Insertion under ultrasound guidance is associated with improved rates of success, reduced numbers of attempts and can enable larger catheters to be placed in larger vessels. [52, 53] PICC have a relatively low incidence of complications and are well tolerated by patients, also reducing the number of venous punctures required in comparison to the use of peripheral catheters. [3, 54] Even though PICC are more expensive than peripheral cannulas and midlines, they require resiting less frequently and usually allow blood sampling.

b) **Device care and complications**

The UK Department of Health, the Royal College of Nursing and the Infusion Nurse Society have all published standards of practice addressing the maintenance of venous access devices and the administration of IV medications. [21, 22, 55] In addition the United States Centre for Disease Control (CDC) has also developed guidelines for the prevention of catheter-related infection. [50] Practitioners should utilise information from such established national guidelines and local policies, safely adapting them to the unique needs of the patient under their p-OPAT service. Patients and caregivers must also be educated in the care of their venous access device prior to discharge home under p-OPAT and instructed on the early identification of any complications.

Catheter associated complications include mechanical complications (dislodgement, occlusion, clotting, phlebitis, infiltration, embolism, thrombosis and catheter malfunction) and non-mechanical complications (local and systemic catheter infections). Peripheral cannulae have a higher incidence of mechanical complications in comparison to midlines, with PICCs being more problematic than
tunnelled CVCs. [19, 56, 57] Infection rates are comparable between PICCs and tunnelled CVCs. [19, 56] The risk of complications is greater with increased dwell time and therefore close monitoring and conversion to alternative treatment to intravenous therapy is essential at the earliest possible time point. [29] Prevention and early detection of complications in venous access devices is vital for the success of p-OPAT. This can be achieved through the promotion of safe and effective venous access device care and infection control practices. [58] Patients and care givers must also be educated in the care of their venous access device prior to discharge home under p-OPAT and instructed on the early identification of any complications.

**Table 6.** Indications and complications associated with various intravenous devices

<table>
<thead>
<tr>
<th>Access device</th>
<th>Entry Site</th>
<th>Usual recommended treatment period</th>
<th>Complications</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Peripheral Cannula             | Peripheral veins i.e. hand, forearms, (foot)   | <7 days in children                | - Pain  
- Phlebitis  
- Infiltration  
- Dislodgement  
- Clotting  
- Occlusion  
Rare complications:  
- Malfunction  
- Local infection |
|                                |                                                |                                    | - May require repeated re-insertion in hospital                                                   |                                                                          |
| Midline Catheter               | Peripheral veins i.e. forearm, (foot)          | <10 days in children               | - Dislodgement  
- Clotting  
- Occlusion  
- Phlebitis  
Rare complications:  
- Pain  
- Infiltration  
- Malfunction  
- Local infection |
| [3, 19, 49, 51]                |                                                |                                    | - Lower rates of dislodgement and phlebitis than peripheral short catheters                      |                                                                          |
| Peripherally Inserted Central  | Peripheral veins, typically the basilic,      | <6 weeks (but can remain in situ for longer if necessary) | - Insertion phlebitis (usually settles within 24 hours with heat therapy and non-steroidal anti-inflammatory drugs)  
Rare complications:  
- Dislodgement  
- Clotting  
- Occlusion  
- Malfunction  
- Local and systemic infection  
- Embolism  
- Thrombosis |
| Catheter (PICC) [3, 19]        | cephalic or axillary veins                     |                                    | - Complications more common in comparison the tunnelled CVCs  
- Ultrasound guided insertion is associated with fewer complications.                                             |                                                                          |
| Tunnelled Central Venous       | Implanted into the subclavian, internal juglar, (femoral vein) | >6 weeks or in patients with great risk of dislodgement with PICC | - Pain at the site of insertion (short-term post insertion)  
Rare complications:  
- Dislodgement  
- Occlusion  
- Malfunction  
- Local and systemic infection  
- Embolism  
- Thrombosis |
| Catheter (CVC) [29, 51, 56, 57] |                                                |                                    | - Not recommended as first line device choice  
- Requires general anaesthesia to insert and remove  
- Requires technical expertise to insert |
| Implanted Port [19, 29]        | Implanted into the subclavian or internal jugular vein | Not recommended unless already in situ | - Pain at the site of insertion (short-term post insertion)  
Rare complications:  
- Occlusion  
- Malfunction  
- Local and systemic infection  
- Embolism  
- Thrombosis |
|                                |                                                |                                    | - Lowest risk of all access devices of catheter-related infections  
- Requires general anaesthesia to insert and remove  
- Requires technical expertise to insert |

6) **Antimicrobial selection, drug delivery and patient monitoring**

a) **Principles of antimicrobial selection**
It is paramount that the antimicrobial agent chosen reflects microbiological sensitivities (if known) and the tissue penetration is appropriate for the site of infection. Choice of agent should also comply with local antimicrobial stewardship guidance. In addition, the following factors may influence antibiotic choice:

i. Dosing convenience – ideally once daily
ii. Side effect profile
iii. Stability in pre-filled syringes / elastomeric devices
iv. Cost
v. Monitoring required
vi. Pharmacokinetics – relating to renal/hepatic metabolism/clearance and co-morbidities, as well as tissue penetration.

The first dose of antibiotic should be administered in a supervised healthcare setting to ensure that the patient does not develop an anaphylactic reaction. It is extremely unlikely for anaphylaxis to occur beyond the first dose. [59] For this reason, the working group agreed with the adult good practice recommendations that it is not necessary for the patient to be discharged home with adrenaline. [2] The prolonged use of any antimicrobial agent may result in drug fever due to a type IV hypersensitivity reaction.

b) Choice of antimicrobial agent

Table 7 lists various antimicrobial agents that can be used within a p-OPAT service. It is beyond the remit of these guidelines to provide detailed information about drug dosing and long-term stability data. For dosing recommendations, readers are encouraged to refer to the latest version of the BNF for children [60]. The stability data provided in table 8 is for guidance only and can vary from between elastomeric devices; for detailed stability information, readers should refer to manufacturer’s information, consult peer-reviewed on-line resources such as stabilis (http://www.stabilis.org) and liaise with ones local pharmacy department. The BSAC OPAT initiative has a workstream dedicated to drug stability and dosing (http://e-opat.com/workstreams/workstream-five-drug-stability-and-testing/).

c) Drug delivery

All prescriptions should be reviewed by a pharmacist, preferably with specialist knowledge in OPAT and/or antimicrobials, to ensure proper pharmaceutical care including appropriate dosage, potential drug-drug interactions and contra-indications for the antimicrobials chosen, and assistance with selection of diluents and administration regimen.

i) Compounding

The supply of antimicrobials for p-OPAT is generally arranged via the hospital pharmacy or supplied by a homecare company. According to the National Patient Safety Agency alert on the safer use of injectable medicines in the hospital setting, it is preferable to procure ready-to-use/ready-to-administer injectables to minimise the risk of dosing and dilution errors. [61] Where an unlicensed product has to be prepared (e.g. elastomeric devices, syringes), this should take place in a hospital pharmacy aseptic production unit or NHS manufacturing unit, or be obtained from a commercial
specials manufacturer. Where p-OPAT services are outsourced to a private contractor, drugs may be compounded and supplied directly by the contractor.

Reconstitution in the patient’s home may represent a higher risk of contamination and dosing error compared to reconstitution in a manufacturing unit, and should be subject to strict risk assessment. If a drug is to be reconstituted other than in an aseptic manufacturing unit, strict aseptic non-touch technique should be used, and the reconstituted drug used immediately. If parents or caregivers are reconstituting and administering antibiotics, appropriate training and assessment of competency is required. [6, 20]

ii) Devices

There are various devices available for IV drug delivery in p-OPAT, ranging from syringes for administering bolus doses, to more complex infusions involving self –infusing elastomeric devices or programmable pumps that can administer multiple doses of medication (see Table 7). Each technique varies in terms of cost, convenience and reliability. Factors influencing the device chosen include:

- Patient factors - ability to tolerate being connected to a device for 24 hours.
- Resources available including access to compounding department and devices.
- Drug being used - infusion time, stability.
- Type of IV access in situ – 24-hour infusion less suitable for peripheral cannulae.
- Competency of healthcare staff and/or caregivers to manage drug delivery via the chosen method.

iii) Drug delivery and storage

Stability of an antimicrobial in an infusion device can vary from less than 24 hours to over a week, depending on the drug, diluent, concentration, device, and storage temperature amongst other factors; for detailed information, discuss with the hospital pharmacy or compounding unit. However, the majority of compounded drugs and devices require refrigeration, and therefore maintenance of a ‘cold chain’ is required should infusion devices need to be stored in a patient’s home. Where a commercial supplier is involved, they may provide a dedicated drug refrigerator for the patient’s home, deliver the infusion devices via refrigerated transport, and provide calibration, monitoring and maintenance of the refrigerator; this should all be specified in the Service Level Agreement with the provider. In practice, NHS units rarely supply refrigerators. The adequacy of domestic fridges for this purpose is questionable; if used, daily recording of the temperature is recommended.

d) Patient monitoring

The monitoring of p-OPAT patients should be no different to the monitoring of in-patients, in terms of good antibiotic stewardship, pharmacy practice and medical review. Recommended monitoring for p-OPAT patients includes:-

i) Clinical – daily review with monitoring of physiological parameters (temperature / heart rate / respiratory rate) and checking of line site. This can be performed by the hospital-based nurse/doctor within an infusion centre model or by the visiting nurse if antibiotics are being administered at home. Daily clinical monitoring is difficult when parents / carer administer antibiotics and this delivery model should only be considered for patients who are clinically stable on prolonged courses of antibiotics.
ii) Laboratory – for children on long-term intravenous antibiotics, weekly laboratory tests should be performed (full blood count (FBC), renal function, liver function and C-reactive protein). In addition, creatine kinase should be monitored weekly for children on daptomycin, and therapeutic drug monitoring should be performed when indicated (see Table 8).

Table 7. Comparison of the devices available for delivering intravenous antibiotics

<table>
<thead>
<tr>
<th>Drug Delivery Method</th>
<th>Description</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bolus or 'Push' [19, 49]</td>
<td>- Slow administration of a drug (usually over 3 to 5 minutes), - Through an IV access device using a syringe only.</td>
<td>- Low tech, - Most commonly used (hospital and community), - Least expensive (supply and administration costs).</td>
<td>- Not all antibiotic regimens can be delivered; some drugs require longer infusion times to avoid infusion related toxicity or mitigate irritant properties</td>
</tr>
<tr>
<td>Non-electrical Pump (elastomeric devices are the most commonly used) [6, 18, 24, 49, 62]</td>
<td>- Controlled rate low pressure self-infusing devices, - Flow rate relies upon mechanical restriction through a narrow-bore tube.</td>
<td>- Disposable, - Portable, - Lightweight, - Relatively inexpensive (costs dependent on medication regimen), - Closed prefilled system resulting in less handling of the drug, - Fixed rates so programming errors are eliminated.</td>
<td>- Device size and relative rates are fixed, - Pharmacy input is required to fill each device, - Antimicrobial selection is limited due to drug stability; for example a drug selected for a 24 hour infusion must be stable at room temperature for 24 hours</td>
</tr>
</tbody>
</table>
| Electrical Pump [18, 19, 49] | - Programmable high pressure electrical devices. | - Controlled delivery, - Flexible rates extending the range of drugs that can be used. | - Comparatively expensive, - Patient activity restricted due to battery life and transportability of the pump, - Reliant on trained users to programme the pumps, - Device supply and maintenance can be an issue.
<table>
<thead>
<tr>
<th>Drug</th>
<th>Common indications</th>
<th>Mode of administration / stability</th>
<th>Common side-effects / monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Antibiotics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ceftriaxone</td>
<td>Febrile illness in young infants, cellulitis, lymphadenitis, pyelonephritis, osteoarticular infections, pneumonia and meningitis.</td>
<td>Short infusion via syringe. Stable for 7 days if refrigerated (2-8°C) up to concentration of 50mg/ml. [64]</td>
<td>Side-effects uncommon. Potential neutropenia and deranged LFTs with prolonged courses.</td>
</tr>
<tr>
<td>Ceftazidime</td>
<td><em>Pseudomonas</em> infections in children with cystic fibrosis.</td>
<td>Intermittent infusions via syringe but frequency not ideal for p-OPAT administration. Stable at room temperature for 24 hours and refrigerated (2-8°C) for 7 days when diluted to 5-60mg/ml in 0.9% saline. Consider 24-hour infusion via elastomeric device. [65]</td>
<td>Side-effects uncommon. Potential neutropenia and deranged LFTs with prolonged courses.</td>
</tr>
<tr>
<td>Daptomycin</td>
<td>Resistant Gram positive infections including skin/soft tissue infections, osteoarticular infections, infective endocarditis.</td>
<td>Bolus over 2 minutes or infusion over 30 minutes. Unstable once reconstituted, not suitable for pre-compounding.</td>
<td>Check baseline CK and monitor CK to identify myopathy. Eosinophilic pneumonitis in prolonged treatment. Not licensed for children in the UK.</td>
</tr>
<tr>
<td>Ertapenem</td>
<td>Infections with resistant Gram negative bacteria (not <em>Pseudomonas</em>). including intra-abdominal infections, urinary tract infections</td>
<td>Once daily short infusion via syringe. Stable for 5 days if refrigerated (2-8°C) when diluted between 10-20 mg/ml. [66]</td>
<td>Drug-fever may occur with prolonged use.</td>
</tr>
<tr>
<td>Flucloxacillin</td>
<td>Osteoarticular infections, infective endocarditis.</td>
<td>QDS dosing regimen makes it unsuitable for p-OPAT use unless administered as a 24-hour infusion using an elastomeric device. Stable for 24 hours at room temperature and 7 days if refrigerated (2-8°C). [67]</td>
<td></td>
</tr>
<tr>
<td>Gentamicin</td>
<td>Urinary tract infections, cystic fibrosis and infective endocarditis.</td>
<td>Once daily short infusion over 30 minutes via syringe. Stable for 7 days if refrigerated (2-8°C).</td>
<td>Nephrotoxicity, irreversible ototoxicity. Monitor trough levels every 3rd dose until stable levels, then twice weekly.</td>
</tr>
<tr>
<td>Meropenem</td>
<td>Infections with resistant Gram negative organisms including <em>Pseudomonas</em>.</td>
<td>TDS dosing – difficult for p-OPAT unless parent administration. Consider a 24-hour infusion using an elastomeric device. Stable in elastomeric devices at room temperature for 24 hours and refrigerated (2-8°C) for 5 days [68]</td>
<td>Drug-fever may occur with prolonged use.</td>
</tr>
<tr>
<td>Piperacillin /tazobactam</td>
<td>Febrile neutropenia, complicated intra-abdominal infections, <em>Pseudomonas</em> infections.</td>
<td>Intermittent infusions via syringe but frequency not ideal for p-OPAT administration. Stable at room temperature for 24 hours and refrigerated (2-8°C) for 7 days. Consider 24 hour infusion via</td>
<td>Side-effects not common. Potential neutropenia or drug fever with prolonged courses.</td>
</tr>
<tr>
<td><strong>Antimicrobial</strong></td>
<td><strong>Indications</strong></td>
<td><strong>Mode of Delivery</strong></td>
<td><strong>Common Side Effects and Monitoring</strong></td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------</td>
<td>---------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td><strong>Teicoplanin</strong></td>
<td>Infections with Gram positive organisms such as <em>Staphylococcus epidermidis</em> line infections and <em>Staphylococcus aureus</em> infections including MRSA.</td>
<td>Once daily short infusion over 30 minutes via syringe. Stable if refrigerated (2-8°C) for 7 days in a silicone-free syringe (degrades in standard syringe).</td>
<td>Therapeutic drug monitoring is required for all indications apart from the treatment of central line infections. Target trough levels of &gt;10mg/L (HPLC method) for pneumonia, UTI and SSTI and 15-30mg/L (by HPLC method) for osteoarticular infections or endocarditis. Watch for blood dyscrasias (especially neutropenia and thrombocytopenia) with prolonged use.</td>
</tr>
<tr>
<td><strong>Tobramycin</strong></td>
<td>Treatment of <em>Pseudomonas</em> infections in cystic fibrosis.</td>
<td>Once daily short infusion over 30 minutes via syringe. Stable if refrigerated (2-8°C) for 7 days at concentrations of 13.33-40mg/ml in 0.9% saline. [69]</td>
<td>Nephrotoxicity, irreversible ototoxicity. Monitor trough levels every 3rd dose until stable levels, then twice weekly.</td>
</tr>
<tr>
<td><strong>Vancomycin</strong></td>
<td>Infections with Gram positive organisms such as <em>Staphylococcus epidermidis</em> line infections and <em>Staphylococcus aureus</em> infections including MRSA.</td>
<td>Intermittent infusions via syringe but frequency not ideal for p-OPAT administration. Stable at room temperature for 24 hours and refrigerated (2-8°C) for 7 days – consider 24 hour infusion via elastomeric device. [70]</td>
<td>Nephrotoxicity, irreversible ototoxicity. Monitor trough levels every 3rd dose until stable levels, then twice weekly.</td>
</tr>
<tr>
<td><strong>Antifungal drugs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Liposomal amphotericin B</strong></td>
<td>Invasive fungal disease including <em>Candida</em> or <em>Aspergillus</em> species.</td>
<td>Once daily infusion via syringe (minimum 2 hours) or via an elastomeric device.</td>
<td>Disturbances in renal function including hypokalaemia.</td>
</tr>
<tr>
<td><strong>Caspofungin</strong></td>
<td>Invasive fungal disease including <em>Candida</em> or <em>Aspergillus</em> species.</td>
<td>Once daily infusion via syringe over 1 hour or via an elastomeric device. Stable if refrigerated (2-8°C) for 48 hours at concentrations up to 0.5 mg/ml. [71]</td>
<td>Side-effects uncommon.</td>
</tr>
<tr>
<td><strong>Antiviral drugs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Aciclovir</strong></td>
<td>HSV encephalitis, VZV infection in the immunocompromised host</td>
<td>Intermittent infusions via syringe but frequency not ideal for p-OPAT administration. Consider 24 hour infusion via elastomeric device. Stable at room temperature for 7 days at concentrations up to 10 mg/ml. [72]</td>
<td>Side-effect are not common. Rarely reversible nephrotoxicity due to crystallisation in renal tubules or neurotoxicity. Extravasation can cause severe local inflammation and phlebitis.</td>
</tr>
</tbody>
</table>

*Table 8. Indications, mode of delivery, common side effects and monitoring of various antimicrobial agents suitable for p-OPAT*
7) Clinical governance and outcome monitoring

The OPAT service must be first and foremost a safe service. A safe, effective p-OPAT service requires robust clinical governance structures in place. Mapping out the p-OPAT pathway within the organisation is a useful process to identify risk inherent in the existing system.[73] Risks can be identified at every stage of the p-OPAT process and can be reduced with suitable safeguards and checks. Common themes emerge and the following actions help to ensure a safe service:

a) Establish clinical responsibility

Overall clinical responsibility for the patient must be clearly defined before the patient leaves the hospital. Within a tertiary hospital, this may involve shared care between the p-OPAT team and the referring team. Failure to assign responsibility can result in patients being overlooked in the community, difficulties in the readmission process and ultimately resulting in suboptimal care.

b) Ensure effective communication

While this is essential in all clinical care, the multiple agencies involved in the p-OPAT process, and the increased distance between healthcare provider and the patient, makes good communication vital. Examples of good communication include: regular meetings between the community team and hospital staff including virtual ward rounds, notification of the patient’s GP that the patient has been discharged on p-OPAT and regular clinical review. If applicable, the referring clinician needs to be kept informed and any follow up clinics need to be arranged. There needs to be a system for providing contact points for both parents/carers and community staff. An out-of-hours service needs to be provided to cover acute clinical issues.

c) Develop and maintain good documentation

Good documentation either in electronic or written format is important. This needs to be readily available to community nursing staff and hospital staff who may need to readmit patients. Parent/carer owned folders is one way to achieve this. Standard care pathway documentation is an effective way to capture and standardise clinical information. The development of standard operating procedures and policies based on good practice guidelines is encouraged. Patient and parent education information detailing contact details, service description, common problems and instructions on what to do in the event of adverse events aid compliance and understanding. Examples of documentation for parents/carers and trouble-shooting guides for doctors can be found on the e-OPAT website (http://e-opat.com)

d) Establish a pathway for urgent review and readmission

Some patients will require readmission, and a clear pathway for urgent review and readmission needs to be established to facilitate this process. All staff, including those providing out-of-hours care, must be aware of this pathway.

e) Organisational governance

There should be an identified lead for p-OPAT. The p-OPAT service should come under the oversight of local paediatric clinical governance committees or, if the service is sufficiently large, could have a separate clinical governance committee. The committee should include all the partners involved in
delivering the service. If the community service is provided by a third party then a contract monitoring process should be in place with agreed key performance indicators.

f) Outcome Measurements

The measurement of outcomes in p-OPAT is an important part of good clinical governance. Recommendations for outcome measures have been made in the US IDSA OPAT guidelines as well as suggestions by the UK BSAC Adult OPAT guidelines. [2, 3] Data required for benchmarking includes the clinical outcome, p-OPAT programme outcome, microbiological outcome, adverse drug events, adverse line events, and antibiotics used (see table 9). There should be a regular program of audit against local and national standards and guidelines.

The BSAC OPAT initiative has developed a freely available database tool for standardising the collection of data (http://e-opat.com/outcomes-registry/). The patient management system (PMS) allows data to be recorded within a virtual ward on patients being actively managed within a p-OPAT service (http://e-opat.com/opat-pms/). It also has the potential to generate quarterly summary reports, which can be used to inform the local p-OPAT service as well as being uploaded to the national BSAC registry. This ability to share data will allow centres to benchmark themselves against other similar services in the UK and may provide data of how best to manage this cohort of patients in order to support further development of p-OPAT services across the country and to guide future research.

Patient/parent/carer satisfaction is an equally important part of a p-OPAT service. Units should routinely undertake patient/parent/carer surveys to ensure the service is providing what is required. Other outcomes such as the child’s ability to return to education and parent’s ability to return to work should also be captured. The parent information questionnaire on the BSAC PMS allows these data to be captured in a standardised format.

Activity data such as bed days saved and patient numbers should be routinely collected to provide evidence regarding the benefits of p-OPAT to commissioners if required.

<table>
<thead>
<tr>
<th>Patient infection outcome on completing OPAT</th>
<th>p-OPAT outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cure:</strong> Cure: Completed OPAT therapy +/- oral step down for defined duration with resolution of infection and no requirement for long term antibiotic therapy (usually relates to less severe infections eg SSTI)</td>
<td><strong>Success:</strong> complete p-OPAT therapy with no change in Abs, no adverse events, cure of infection and no readmission</td>
</tr>
<tr>
<td><strong>Improved:</strong> i. Complete OPAT therapy +/- oral step down with partial resolution of infection but need for further follow up OR ii. Completed OPAT therapy but required escalation of antimicrobial therapy during OPAT (without admission) +/- oral step down with ultimate cure</td>
<td><strong>Partial success:</strong> completed therapy in p-OPAT with either change in antimicrobial agent or adverse event not requiring readmission</td>
</tr>
</tbody>
</table>
or partial improvement (as above)

**Failure:** Progression or non-response of infection despite OPAT, required admission, surgical intervention or died for any reason

**Failure:** readmission due to worsening infection or adverse event. Death due to any cause during p-OPAT.

**Indeterminate:** readmission due to unrelated event

<table>
<thead>
<tr>
<th>Table 9. Standardised outcome definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>8) Developing a business case and obtaining funding to set-up a p-OPAT service</strong></td>
</tr>
</tbody>
</table>

Although additional funding may not be required to introduce a p-OPAT service in a secondary care setting, additional staff such as a p-OPAT nurse and an antibiotic pharmacist may be required to deliver a p-OPAT service within a tertiary setting. Obtaining such funding is likely to require the development of a business case.

The first step is to quantify the potential cost saving delivered by a p-OPAT service within one’s own organisation. Identifying the number of patients on IV antibiotics who could safely be managed at home allows the number of potential bed days saved to be calculated. There is no standardised tariff for children being managed within a p-OPAT service which means that at present, individual organisations must determine how their p-OPAT service is funded, either in terms of revenue generation or cost savings. Although a detailed description of the development of a business case is beyond the scope of these guidelines, an interactive business case toolkit is available on the BSAC e-opat website ([http://e-opat.com/toolkit/](http://e-opat.com/toolkit/)) and information about funding options is available from [http://e-opat.com/assets/ppt/opatworkshop2012/enigma_of_the_OPAT_code_DebbieCumming.pptx](http://e-opat.com/assets/ppt/opatworkshop2012/enigma_of_the_OPAT_code_DebbieCumming.pptx) [Accessed December 20 2013].

**Conclusions**

There is compelling evidence to support the rationale for managing children on IV antimicrobial therapy at home whenever possible, including parent and patient satisfaction, psychological wellbeing, return to school / employment, reductions in healthcare-associated infection and cost saving. [5-9] As a joint collaboration between BSAC and the BPAIIG, we have developed good practice recommendations to highlight good clinical practice and governance within p-OPAT services across the UK.

Although there are a number of differences between p-OPAT services delivered in secondary care settings as compared to those in tertiary care settings, especially in terms of the clinical team members available and treated conditions, the fundamental principles of p-OPAT remain identical. These principles are robust clinical governance systems, clear channels of communication and accurate outcome monitoring. To help support these principles in p-OPAT BSAC has by developed a paediatric patient management system which allows prospective data to be collected on all p-OPAT patients ([http://e-opat.com/tpat-pms/](http://e-opat.com/tpat-pms/)) and an OPAT registry, which allows benchmarking between centres ([http://e-opat.com/outcomes-registry/](http://e-opat.com/outcomes-registry/)).
The time has come for p-OPAT to reassert its early lead in OPAT and emerge from the shadow of its older brother!

References


36. Greenhow TL, Hung YY, Herz AM. Changing epidemiology of bacteremia in infants aged 1 week to 3 months. *Pediatrics* 2012, **129**:e590-596.


### Appendix 1. List of stakeholders involved in the consultation process

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academy of Medical Royal Colleges</td>
<td><a href="http://www.aomrc.org.uk">www.aomrc.org.uk</a></td>
</tr>
<tr>
<td>Association for Nurse Prescribing</td>
<td><a href="http://www.anp.org.uk/">www.anp.org.uk/</a></td>
</tr>
<tr>
<td>Association of Surgeons of GB &amp; Ireland</td>
<td><a href="http://www.asgbi.org.uk">www.asgbi.org.uk</a></td>
</tr>
<tr>
<td>Association of the British Pharmaceutical Industry (ABPI)</td>
<td><a href="http://www.abpi.org.uk">www.abpi.org.uk</a></td>
</tr>
<tr>
<td>British Association for Cancer Surgery</td>
<td><a href="http://www.baso.org">www.baso.org</a></td>
</tr>
<tr>
<td>British Association of General Paediatrics</td>
<td><a href="http://www.bagp.org.uk">www.bagp.org.uk</a></td>
</tr>
<tr>
<td>British Association of Paediatric Nephrology</td>
<td><a href="http://www.renal.org/bapn">www.renal.org/bapn</a></td>
</tr>
<tr>
<td>British Association of Paediatric Surgeons</td>
<td><a href="http://www.baps.org.uk">www.baps.org.uk</a></td>
</tr>
<tr>
<td>British Association of Plastic, Reconstructive and Aesthetic Surgeons</td>
<td><a href="http://www.bapras.org.uk">www.bapras.org.uk</a></td>
</tr>
<tr>
<td>British Cardiac Patients Association</td>
<td><a href="http://www.bcpa.co.uk">www.bcpa.co.uk</a></td>
</tr>
<tr>
<td>British Cardiovascular Society</td>
<td><a href="http://www.bcs.com">www.bcs.com</a></td>
</tr>
<tr>
<td>British Dental Association</td>
<td><a href="http://www.bda.org">www.bda.org</a></td>
</tr>
<tr>
<td>British Heart Foundation</td>
<td><a href="http://www.bhf.org.uk">www.bhf.org.uk</a></td>
</tr>
<tr>
<td>British Heart Valve Society</td>
<td><a href="http://www.bhvs.org.uk">www.bhvs.org.uk</a></td>
</tr>
<tr>
<td>British HIV Association</td>
<td><a href="http://www.bhiva.org">www.bhiva.org</a></td>
</tr>
<tr>
<td>British Infection Association (formed on merging Association of Medical Microbiologist and British Infection Society)</td>
<td><a href="http://www.britishinfection.org/drupal/">www.britishinfection.org/drupal/</a></td>
</tr>
<tr>
<td>British Lung Foundation</td>
<td><a href="http://www.blf.org.uk">www.blf.org.uk</a></td>
</tr>
<tr>
<td>British Medical Association</td>
<td><a href="http://www.bma.org.uk">www.bma.org.uk</a></td>
</tr>
<tr>
<td>British Orthopaedic Association</td>
<td><a href="http://www.boa.ac.uk">www.boa.ac.uk</a></td>
</tr>
<tr>
<td>British Paediatric Allergy, Immunology &amp; Infection Group (BPAIIG)</td>
<td><a href="http://www.bpaiig.org/">www.bpaiig.org/</a></td>
</tr>
<tr>
<td>British Paediatric Respiratory Society</td>
<td><a href="http://www.bprs.org.uk">www.bprs.org.uk</a></td>
</tr>
<tr>
<td>British Pharmacological Society</td>
<td><a href="http://www.bps.ac.uk/">www.bps.ac.uk/</a></td>
</tr>
<tr>
<td>British Society for Antimicrobial Chemotherapy</td>
<td><a href="http://www.bsac.org.uk/">www.bsac.org.uk/</a></td>
</tr>
<tr>
<td>British Society for Childrens Orthopaedic Surgery</td>
<td><a href="http://www.bscos.org.uk">www.bscos.org.uk</a></td>
</tr>
<tr>
<td>British Society for Echocardiography</td>
<td><a href="http://www.bsecho.org">www.bsecho.org</a></td>
</tr>
<tr>
<td>British Society for Medical Mycology</td>
<td><a href="http://www.bsmm.org/">www.bsmm.org/</a></td>
</tr>
<tr>
<td>British Society for Paediatric Gastroenterology, Hepatology and Nutrition</td>
<td><a href="http://www.bspghan.org.uk">www.bspghan.org.uk</a></td>
</tr>
<tr>
<td>Care Quality Commission</td>
<td><a href="http://www.cqc.org.uk">www.cqc.org.uk</a></td>
</tr>
<tr>
<td>C diff Support</td>
<td><a href="http://www.cdiff-support.co.uk">www.cdiff-support.co.uk</a></td>
</tr>
</tbody>
</table>
Central Sterilising Club  www.csc.org.uk
Children’s Cancer and Leukaemia Group  www.cclg.org.uk
Children’s HIV Association  www.chiva.org.uk
Clinical Virology Network  www.clinicalvirology.org
Community Pharmacy Scotland (formerly Scottish Pharmaceutical General Council - SPGC)  www.communitypharmaceuticalscotland.org.uk/
Consumer Council for Northern Ireland  www.consumercouncil.org.uk/
Consumer Futures (formerly the National Consumer Council)  www.consumerfutures.org.uk
Department of Health and Children (Ireland)  http://www.dohc.ie
Department Of Health Social Services & Public Safety (NHS Northern Ireland)  www.dhsspsni.gov.uk/
Faculty Of Pharmaceutical Medicine  www.fpm.org.uk/
Faculty of Public Health  www.fph.org.uk/
General Dental Council  www.gdc-uk.org/
General Medical Council  www.gmc-uk.org/
General Pharmaceutical Council  www.pharmacyregulation.org
Guild Of Healthcare Pharmacists  www.ghp.org.uk/
Health Protection Scotland  www.hps.scot.nhs.uk/
Healthcare Improvement Scotland (NHS)  www.healthcareimprovementscotland.org
Healthcare Infection Society  www.his.org.uk/
Heart Research UK  www.heartresearch.org.uk
Heart Rhythm UK  www.heartrhythmuk.org.uk
Infection Prevention Society  www.ips.uk.net
Institution of Decontamination Sciences  www.idsc-uk.co.uk/
Medical Defence Union  www.themdu.com/
Medical Protection Society  www.medicalprotection.org/
Medical Research Council  http://www.mrc.ac.uk
Medical Schools Council  www.medschools.ac.uk
MONITOR  www.monitor-nhsft.gov.uk
MRSA Action UK  www.mrsaactionuk.net
National Infusion and Vascular Access Society  www.nivas.org.uk
National Institute for Health and Clinical Excellence  www.nice.org.uk
National Institute for Health Research  www.nihr.ac.uk
National Pharmaceutical Association  www.npa.co.uk/
Neonatal and Paediatric Pharmacy Group  http://www.nppg.org.uk
NHS Commissioning Board Special Health Authority (formerly the National Patient Safety Agency)

NHS Confederation

NHS England

UK Paediatric Intensive Care Society

UK Paediatric Microbiology Group

Patients Association

Pharmaceutical Quality Group

Pharmaceutical Society for NI

Public Health England

Public Health Medicine Environmental Group

Public Health Wales

Quality Improvement Scotland (NHS)

Research Quality Association (formerly the British Association of Research Quality Assurance)

Royal College of Anaesthetists

Royal College of Midwives

Royal College of Nursing

Royal College of Obstetricians & Gynaecologists

Royal College of Ophthalmologists

Royal College of Pathologists

Royal College of Paediatrics and Child Health

Royal College of Physicians & Surgeons

Royal College of Physicians of London

Royal College of Psychiatrists

Royal College of Radiologists

Royal College of Surgeons

Royal College of Surgeons (Edinburgh)

Royal Pharmaceutical Society

Royal Society for Public Health

Royal Society for Tropical Medicine and Hygiene

Scottish Association of Health Councils

Scottish Intercollegiate Guidelines Network

Scottish Medicines Consortium
<table>
<thead>
<tr>
<th>Organization</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>Society for General Microbiology</td>
<td><a href="http://www.sgm.ac.uk/">www.sgm.ac.uk/</a></td>
</tr>
<tr>
<td>Society of Critical Care Medicines</td>
<td><a href="http://www.sccm.org">www.sccm.org</a></td>
</tr>
<tr>
<td>Surviving Sepsis Campaign</td>
<td><a href="http://www.survivingsepsis.org">www.survivingsepsis.org</a></td>
</tr>
<tr>
<td>The Association of Paediatric Emergency Medicine</td>
<td><a href="http://www.apem.me.uk">www.apem.me.uk</a></td>
</tr>
<tr>
<td>The British Society for Allergy &amp; Clinical Immunology</td>
<td><a href="http://www.bsaci.org/">www.bsaci.org/</a></td>
</tr>
<tr>
<td>The British Thoracic Society</td>
<td><a href="http://www.brit-thoracic.org.uk/">www.brit-thoracic.org.uk/</a></td>
</tr>
<tr>
<td>The College of Emergency Medicine</td>
<td><a href="http://www.collemergencymed.ac.uk">www.collemergencymed.ac.uk</a></td>
</tr>
<tr>
<td>The Consumers' Association (Which?)</td>
<td><a href="http://www.which.co.uk/">www.which.co.uk/</a></td>
</tr>
<tr>
<td>The Parliamentary and Health Service Ombudsman</td>
<td><a href="http://www.ombudsman.org.uk/">www.ombudsman.org.uk/</a></td>
</tr>
<tr>
<td>The Society for Acute Medicine</td>
<td><a href="http://www.acutemedicine.org.uk">www.acutemedicine.org.uk</a></td>
</tr>
<tr>
<td>UK Clinical Pharmacy Association</td>
<td><a href="http://www.ukcpa.net">www.ukcpa.net</a></td>
</tr>
<tr>
<td>Welsh Assembly Government</td>
<td><a href="http://www.wales.gov.uk/?lang=en">www.wales.gov.uk/?lang=en</a></td>
</tr>
</tbody>
</table>