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Outpatient parenteral antimicrobial therapy (OPAT) in the UK: a cross-sectional survey of acute hospital trusts and health boards

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ABSTRACT

This study reviews the current OPAT service provision in the UK and evaluates concordance with the national OPAT practice guidelines (standards of care). We conducted a survey of acute hospital trusts and health boards in the UK regarding OPAT practices between June and September 2017. 165 (93%) of the 178 acute hospital trusts/health boards that were contacted responded to the survey. 100 (61%) indicated they had an OPAT service. Ten (10%) OPAT services did not involve an infection specialist. Bone and joint infections, and skin and soft-tissue infections were the most common conditions treated. Most OPAT services (74%) hold weekly multidisciplinary meetings/virtual ward rounds to review patient's progress. 73% had a dedicated OPAT database. We identified variations in practice and concordance with the national OPAT good practice guidelines. In an era of increasing demand for home-based care, further studies are required to identify the optimal configuration of OPAT services with regards to quality and patient safety.

1. Introduction

Outpatient administration of intravenous (IV) antibiotics was first described in the USA in 1974 (Rucker and Harrison, 1974) and has now become part of routine care in many developed countries (Howden and Grayson, 2002; Tice et al., 2004). In the UK, outpatient parenteral antimicrobial therapy (OPAT) has evolved slowly but is now becoming widespread as the benefits to patients and healthcare delivery systems are recognized (Chapman et al., 2012). Despite its benefits, OPAT is potentially associated with increased clinical risk due to reduced level of supervision compared to inpatient care. Several professional bodies have produced recommendations regarding the optimal delivery of OPAT (Gallagher et al., 2010; Tice et al., 2004). The British Society for Antimicrobial Chemotherapy (BSAC) has published good practice guidelines commending evidence-based standards for adult and pediatric OPAT services in the UK, with aim of minimizing risks and optimizing the quality of care (Chapman et al., 2012; Patel et al., 2015). OPAT Service was defined as a clinical team that supervises parenteral antimicrobial therapy in a non-inpatient setting. The BSAC guidelines provide recommendations on service structure, patient selection, antimicrobial delivery, patient monitoring, and clinical governance and outcome monitoring. The BSAC OPAT initiative has produced an electronic patient management system (PMS) that enables OPAT services to manage patients and monitor outcomes (British Society for Antimicrobial Chemotherapy). In addition, the BSAC National Outcomes Registry System (NORS) collates outcome reports from all submitting services, aiming to provide a comprehensive picture of OPAT service provision in the UK (British Society for Antimicrobial Chemotherapy).

This study reviews the current OPAT service provision in the UK and assesses concordance with the BSAC OPAT recommendations.

2. Materials and methods

We conducted a cross-sectional survey of acute hospital trusts and health boards (healthcare organizations) in the UK between June and September 2017. At that time, there were 152 acute trusts in England, 14 regional health boards in Scotland, 7 local health boards in Wales, and 5 regional health and social care trusts in Northern Ireland responsible for the provision of healthcare across the UK.

The questionnaires were sent electronically to infection specialists, antimicrobial pharmacists, OPAT lead nurses, OPAT coordinators, and other clinicians who provide OPAT care. Follow-up emails and telephone calls were made to nonrespondents 4 and 8 weeks after the initial invitation. The survey questions (see appendix) sought to explore characteristics of OPAT practice and aspects of clinical governance. The survey asked respondents questions relating to the following:

- Demographics: respondent details, name of the hospital trust/health boards.

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- OPAT team and service structure: year of establishment, where the service is based, the clinical lead, members of the OPAT team, and model of OPAT delivery.
- Patient selection: the number of patient episodes per year and types of infection treated.
- Antimicrobial management and drug delivery: type of intravascular access devices used.
- Monitoring of patients during OPAT: frequency of clinical and multidisciplinary team reviews
- Outcome monitoring and clinical governance: OPAT follow-up clinic, use of dedicated OPAT database, and registration with the BSAC NORS and PMS systems.
- Any future plans: development of service.

For healthcare organizations with multiple responders, a primary respondent was selected based on who gave the most comprehensive answers. Data were recorded and analyzed using Microsoft Excel (Sheffield, UK). Percentages were calculated on the available responses for each survey question. Hence, the denominator for each question varies.

3. Results

One hundred and eighty-three responses were received from 165 of the 178 healthcare organizations, giving a response rate per organization of 93%. Sixteen responses were excluded from the analysis where the same organization provided multiple responses. One hundred (61%) of the 165 healthcare organizations that responded to the survey reported they had an OPAT service. Most of those reporting they did not have OPAT were in the process of setting up a service. Two trusts reported having both adult and pediatric OPAT services revealing 102 OPAT services. Fig. 1 shows the cumulative number of OPAT services by the year of establishment.

3.1. OPAT teams and service structure

The characteristics of the OPAT services are shown in Tables 1 and 2. Table 1 shows the clinical leads for the 102 OPAT services. Seventy-six (75%) OPAT teams included a clinical pharmacist. Ten (10%) did not include an infection specialist (Table 2). In the majority of services, OPAT treatment was administered in the community by visiting healthcare professionals. Thirty-six (35%) services offered all three main models of care.

3.2. Patient selection

Eight-two OPAT services reported a total of 18,765 patient episodes in the previous year, with an average of 229 (range 5–837) episodes per service. Patients with a variety of infections were treated. Bone and joint infections (BJIs), and skin and soft-tissue infections (SSTIs) accounted for the most frequent use of OPAT (Table 2).

Table 1
Characteristics of OPAT services in the UK: team structure, number of patient episodes, monitoring, and clinical governance.

Variable	Number (%)
OPAT team and service structure	
Clinical lead ($N = 102$)	
No formal lead	6 (5.9)
Infectious diseases or microbiology consultant	60 (58.8)
Acute physician	13 (12.7)
Specialist nurse	12 (11.8)
Advanced nurse practitioner	4 (3.9)
Consultant pediatrician	2 (2.0)
Clinical pharmacist	2 (2.0)
Others[a]	3 (2.9)
Number of patient episodes in the previous year ($N = 82$)	
<50	6 (7.3)
50–100	11 (13.4)
100–250	35 (42.7)
250–500	25 (30.5)
500–750	4 (4.9)
>750	1 (1.2)
Monitoring of patient during OPAT	
Multidisciplinary "virtual" ward round ($N = 100$)	
No	20 (20.0)
Daily	1 (1.0)
Weekly	74 (74.0)
Monthly	1 (1.0)
Others[b]	4 (4.0)
Follow-up clinic post-OPAT ($N = 101$)	
Yes	41 (40.6)
No	60 (59.4)
Outcome monitoring and clinical governance	
Dedicated OPAT database ($N = 100$)	
Yes	73 (73.0)
No	27 (27.0)
Registered with BSAC OPAT NORS ($N = 99$)	
Yes	34 (34.3)
No	65 (65.7)
Currently using BSAC OPAT PMS ($N = 101$)	
Yes	17 (16.8)
No	84 (83.2)

[a] Others include general practitioner, respiratory consultant, and IV nurse consultant.
[b] Others include variable (1), biweekly (1), and fortnightly (2).

3.3. Antimicrobial management and drug delivery

Peripherally inserted central catheters were the most commonly used vascular access device, followed by peripheral venous catheters

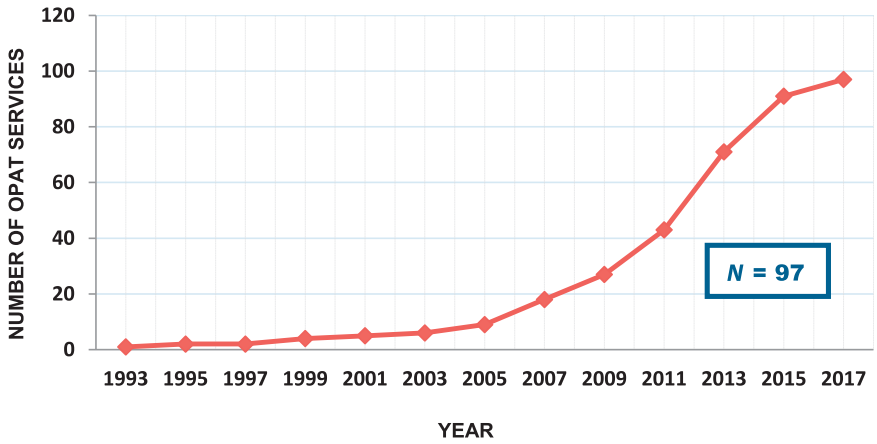

Fig. 1. Cumulative number of OPAT centers by the year of establishment, 1993–2017 ($N = 97$).

Table 2
Characteristics of OPAT services in the UK: model of delivery, members of OPAT team, diagnosis, frequency of clinical review, and type of vascular access devices.

Variable ($N = 102$)	Number
Model of OPAT delivery	
C-OPAT	94
H-OPAT	67
S-OPAT	48
Combined C-OPAT and H-OPAT	23
Combined C-OPAT and S-OPAT	9
Combined H-OPAT and S-OPAT	3
Combined C-OPAT, H-OPAT and S-OPAT	36
Members of OPAT team	
Infectious diseases or microbiology consultant	92
Acute physician or consultant pediatrician	36
Advanced nurse practitioner	17
Specialist nurse	66
Community nurse	52
Staff nurse	32
Clinical pharmacist	76
Administrative/secretarial support staff	44
Doctors in training	21
Others[a]	7
Infection diagnosis	
Bone and joint infection	97
Skin and soft-tissue infection	96
Respiratory tract infection	90
Spinal infections	87
Urinary tract infection	86
Cardiovascular infection	82
Hepatobiliary infection	74
Central nervous infection	69
Ear, nose, and throat infection	69
Invasive fungal infection	44
Tuberculosis (including MDR-TB)	40
Cystic fibrosis	12
Others[b]	6
Frequency of clinical review during OPAT	
Daily	22
Weekly	55
Monthly	13
Infrequently	28
Others[c]	8
Type of vascular device	
Peripherally inserted central catheter	94
Peripheral venous cannula	81
Midline venous catheter	78
Tunneled central venous catheter	53
Implanted port	33

C-OPAT, community-based OPAT; *H-OPAT*, healthcare-administered OPAT; *S-OPAT*, self-/carer-administered OPAT; *MDR-TB*, multidrug-resistant tuberculosis.
[a] Other members include general practitioner, surgeon, associate specialist, clinical scientist, and podiatrist.
[b] Other commonly treated infections include bacteremia, Lyme disease, and syphilis.
[c] Other include biweekly (3), fortnightly (4), and prior completion of OPAT (1).

(i.e., butterfly needles and peripheral venous cannulae) and midline peripheral catheters (Table 2).

3.4. Monitoring of the patient during OPAT

Most OPAT services reported that patients were reviewed at least weekly by a clinician during their treatment. In 28 (27%) services, patients were not routinely reviewed but only when deemed clinically necessary. The majority of services (74 of 100; 74%) held weekly multidisciplinary meetings/virtual ward rounds to review patients' progress (Table 1). Forty-one (41%) services held follow-up clinics to see patients after completion of OPAT (Table 1).

3.5. Outcome monitoring and clinical governance

Most services (73 of 100; 73%) reported they had a dedicated OPAT database (Table 1). However, majority of OPAT services reported they were not registered with the BSAC OPAT NORS (65 of 99; 66%) and did not use the BSAC OPAT PMS (84 of 101; 83%).

3.6. Pediatric OPAT (p-OPAT) service

Six p-OPAT services were identified — 1 ad hoc and 5 dedicated services. The first p-OPAT was established in 2012. The 5 dedicated services reported 609 patient episodes in the previous year (range 45–190) with an average of 122 patient episodes per service. In most services, OPAT was administered in the community by visiting healthcare professionals.

4. Discussion

This study reflects the growth of UK OPAT in the last few decades and describes some elements of current OPAT practice. Until recently, OPAT was limited to a small number of specialist centers (Chapman et al., 2012). In the last decade, OPAT services have expanded according to local needs and circumstances, resulting in a variety of different service configurations and models of care. OPAT is likely to continue to expand given the economic pressures faced by most healthcare systems and the focus on providing care closer to patients' home (Chapman, 2013). p-OPAT in the UK is relatively small when compared to adult OPAT (Patel et al., 2015). p-OPAT has evolved slowly and is currently limited to tertiary pediatric centers.

Thirty-nine percent of the acute healthcare organizations that responded did not have an OPAT service. Most of them reported that there was a need for a local service and were in the process of setting up one. These findings were similar to the results of the 2013 BSAC survey of OPAT in the UK (response rate of 63%) which found that 32% of 193 health trusts/boards had no OPAT service and 87% of these organizations would like one (Seaton). A range of barriers to service development were identified including lack of nurses and clinicians, and financial constraint. In our study, most of the organizations that did not have an OPAT service used “ad hoc” services such as hospital-based ambulatory care, district nursing team, and private homecare services to deliver IV antibiotics in the community.

Within existing UK OPAT services, our study shows variation in team configuration, service leadership, models of service delivery, types of infections treated, monitoring practice, and governance arrangements. Some OPAT services were “dedicated,” while others were part of a wider remit. A number of studies have also shown significant variations in the management and delivery of OPAT services both locally and internationally (Banerjee et al., 2014; Esposito et al., 2004; Lane et al., 2014; Minton et al; Muldoon et al., 2013; Pareja-Cebrian et al., 2014). The delivery of OPAT services may be influenced by a number of factors including, but not limited to, existing local health delivery systems, local needs, geography (inner city vs. rural setting), and available specialist services (Muldoon et al., 2013; Pareja-Cebrian et al., 2014).

The BSAC OPAT guidelines (Chapman et al., 2012) recommend that the OPAT multidisciplinary team should be led by a clinician/infection specialist with OPAT experience and should include, as a minimum, a clinician, an infection specialist [infectious diseases (ID) physician or clinical microbiologist], a specialist nurse, and a clinical antimicrobial pharmacist. We found that OPAT services were predominantly physician led. However, a small number of services had no clearly designated clinical lead. Defining leadership within teams may contribute to improvements in quality of care (West et al., 2015). Moreover, 10% of services did not include an infection specialist. These services did not have a local ID department but may have received ad hoc input from their local clinical microbiology service. Of interest, 1 hospital trust was not able to offer formal microbiology input due to staffing constraints, but microbiologists would recommend the OPAT service to clinicians. Selecting appropriate patients for OPAT is crucial to treatment success. Studies have shown that consultation by an infection specialist prior to commencement of OPAT significantly reduces the need for OPAT via early oral switching or stopping antimicrobial therapy altogether. This

benefits patient safety and convenience, and provides cost savings while maintaining good clinical outcome (Conant et al., 2014; Dryden et al., 2012; Sharma et al., 2005; Shrestha et al., 2012). Twenty-five percent of services did not formally include an antimicrobial pharmacist but presumably relied on ad hoc support. Pharmaceutical care in OPAT should be equivalent to that expected for inpatient care. Pharmacists play a crucial role in the OPAT team in ensuring safe antimicrobial prescribing and high-quality stewardship (Goodall et al., 2013; Heintz et al., 2011; Petroff et al., 2014).

A wide range of infections were treated. BJIs and SSTIs were the most commonly reported. Although we did not explore the number of OPAT episodes due to these infections, SSTIs (mainly cellulitis) are the most common indications for OPAT in the UK (Barr et al., 2012; Chapman, 2013; Durojaiye et al., 2017).

OPAT is potentially associated with increased clinical risk due to reduced levels of clinical supervision. The BSAC guidelines (Chapman et al., 2012) recommend weekly multidisciplinary meeting (MDT)/virtual ward round to discuss progress of patients receiving OPAT, in addition to regular clinical review. In our study, 20% of services did not hold an MDT/virtual ward round, and 59% did not have a follow-up clinic to assess patients following completion of treatment. At least a quarter of patients receiving OPAT will experience an adverse event. These range from mild antibiotic reactions to severe line complications (Chapman et al., 2012). OPAT complications may result in readmission or unplanned healthcare visits with associated morbidity and cost. Adverse events may not be appropriately attributed to OPAT if patients are not followed-up closely.

The BSAC guidelines advocate a local database to facilitate service evaluation and quality assurance. In our study, 27% of the services did not use a local database. The development and expansion of any service require structured quality improvement measures and periodic audit to ensure that patients are receiving safe and effective care (Muldoon et al., 2013). Thirty-four percent of the services reported that they are registered with the BSAC OPAT NORS system. National collection of data on OPAT patients could allow standardization of outcomes and benchmarking.

The effects of these variations in OPAT practices on the clinical efficacy and safety of OPAT are not well studied. However, standardization of practice has the potential to provide significant benefits to patients and healthcare systems (Lehmann and Miller, 2004; Woolf et al., 1999). Formation of regional/geographical networks of OPAT services could support new and existing services, and standardization of practice.

OPAT has been highlighted as 1 of the 5 key antimicrobial stewardship decisions in the Department of Health's antimicrobial stewardship program 'Start Smart — then Focus'. (Public Health England, 2015). Its use is likely to increase. However, there are growing concerns that OPAT is overused especially for patients with mild infections (Brindle, 2013; Goldman et al., 2017). In our study, 4 respondents echoed these concerns. Preliminary results of the OVIVA trial suggest that oral antibiotic therapy is just as effective as IV therapy in treating BJIs (Scarborough et al., 2017). Therefore, it is paramount that the use of IV antibiotics in OPAT and broadly is overseen through a robust antimicrobial stewardship program. Oral antimicrobial therapy may not be appropriate for some infections (e.g., infective endocarditis). OPAT should only be used when there are no suitable alternative oral antimicrobial agents. Patients starting OPAT should have individualized antibiotic plan. The plan should be reviewed regularly and modified based on clinical responses.

A major strength of our study was the high response rate which may be due to the growing interest in OPAT, the relatively short length of our electronic questionnaire, and multiple reminders (Edwards et al., 2009; Van Mol, 2017). However, our study has limitations which may limit the generalizability of the results to OPAT practices in the UK. We did not assess practices in community hospital trusts and private homecare services which also deliver parenteral antimicrobials in the community. Furthermore, responses may be subject to recall bias. Our study did not explore factors that contribute to the decision-making process around commencing OPAT or barriers to OPAT delivery.

5. Conclusions

Our study provides the most comprehensive overview to date of OPAT services in the UK. We demonstrate significant variations in OPAT practices and clinical governance arrangements. The BSAC OPAT recommendations were not completely met. OPAT is predicted to continue to expand. However, it is not without risk. Risk assessment, risk management, and quality assurance systems, including benchmarking, are essential to minimize potential risks and optimize the quality of care, in accordance with existing practice guidelines. Given the variations in practice, further evidence-based studies are required to identify the optimal configuration of OPAT services with regards to patient outcomes and safety.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.diagmicrobio.2018.07.013.

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