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Practical clinical reviews

Palliative outpatient parenteral antimicrobial therapy (OPAT): A single center experience and systematic scoping review

Oyewole Chris Durojaiye [a,b,*], Ihsan Jibril [a], Evangelos I Kritsotakis [c,d]

[a] Department of Infection and Tropical Medicine, Royal Hallamshire Hospital, Sheffield S10 2JF, UK
[b] Department of Microbiology, Royal Derby Hospital, Derby DE22 3NE, UK
[c] Laboratory of Biostatistics, School of Medicine, University of Crete, Heraklion 71003, Greece
[d] School of Health and Related Research, Faculty of Medicine, Dentistry and Health, University of Sheffield, Sheffield S1 4DA, UK

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ABSTRACT

Traditionally, outpatient parenteral antimicrobial therapy (OPAT) is used to treat infections with predictable course and anticipated response to therapy. However, there has been little consideration of OPAT for palliation as opposed to cure. This study presents a scoping review of literature and the experience of palliative OPAT at a tertiary referral hospital in Derbyshire, UK. Over the 5.5-year study period, six patients received OPAT for palliation (mean age 61 years). They accounted for 0.6 % (6/1044) and 3.1 % (1135/36658) of the total numbers of OPAT patients and bed-days saved, respectively. The literature search yielded 2375 articles, of which 5 case studies were eligible for review. Palliative OPAT provided positive experiences and outcomes for patients and their families. However, delivering palliative OPAT could be complex, time-consuming, and associated with clinical complications. There is a need for more research to address significant gaps in knowledge, especially regarding patient experiences and perspectives.

Introduction

Intravenous (IV) antimicrobials are increasingly administered in outpatient settings to treat a wide range of infections. Outpatient parenteral antimicrobial therapy (OPAT) has been shown to be a safe and effective, with high levels of patient satisfaction and acceptability (Bryant and Katz, 2018; Durojaiye et al., 2018). Traditionally, OPAT is used to treat infections with predictable course, anticipated response to therapy and low probability of progression (Seaton and Barr, 2013). However, a small number of patients with incurable infection or terminal illness require parenteral antimicrobial therapy but are relatively well not to desire hospitalization. 'Palliative OPAT' refers to OPAT management of patients who require life-long parenteral antimicrobial therapy to control, rather than cure, an infection as well as management of superadded infections in terminally ill patients (e.g., metastatic cancer with complicated intra-abdominal abscesses) (Farmer and Seaton, 2021). Palliative OPAT is an emerging concept and has been incorporated in the good practice recommendations in the UK as one of the treatment aims of OPAT (Farmer and Seaton, 2021; Chapman et al., 2019). A preliminary search of MEDLINE, the Cochrane Database of Systemic Reviews and *JBI Evidence Synthesis* was conducted and revealed no current or ongoing systematic or scoping reviews on this topic.

In this paper, we describe our experience administering lifelong IV antimicrobial therapy for incurable infections and infections co-occurring with life-limiting (terminal) conditions in an OPAT setting. Owing to the fact that there has been little consideration of OPAT for palliation as opposed to cure, we also reviewed available research literature to provide an overview of palliative OPAT in terms of delivery, benefits, disadvantages and broader outcomes; identify its key concepts; and clarify knowledge gaps. We adopted scoping review as this study forgoes a critical appraisal of potential sources of evidence, risk of bias assessment and statistical *meta*-analysis due to the limited literature on the subject. Put simply, this scoping review explored studies that examined IV antimicrobials delivered outside the hospital setting to patients with incurable infections and coincidental infections in terminally ill patients.

Materials and methods

Institutional experience

We conducted a retrospective review of patients with incurable

* Corresponding author.
E-mail addresses: docwolex@yahoo.co.uk (O.C. Durojaiye), ihsan.jibril@nhs.net (I. Jibril), e.kritsotakis@uoc.gr, e.kritsotakis@sheffield.ac.uk (E.I. Kritsotakis).

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infection (i.e., no prospect of cure) or life-limiting/terminal illness (where death was anticipated) managed via OPAT at the Royal Derby Hospital (Derbyshire, England, UK) between September 2016 and April 2022. We excluded patients who had repeated courses of OPAT for the same infective process (e.g., recurrent infective exacerbations of bronchiectasis) and those in whom response to antimicrobial therapy was anticipated. The Derby OPAT service, established in 2013, is run by a multidisciplinary team of infection specialists, antimicrobial pharmacists, and specialist nurses. The OPAT service maintains an electronic database to prospectively record patient demographics, clinical diagnosis, antimicrobial agents, and duration of antimicrobial treatment. The clinical responsibility for patients receiving OPAT and their follow-ups were shared between the referring clinicians and the OPAT team, unless otherwise agreed. Patients were regularly reviewed during their OPAT treatment, and their progress was discussed at a weekly multidisciplinary meeting. Patient selection and individualized OPAT treatment plans were the responsibility of the OPAT infection specialists.

Data extracted from the OPAT database and hospital electronic records included patient demographics, comorbidities, microbiology culture results, antimicrobial regimens, duration of OPAT therapy, mode of OPAT delivery and clinical outcomes. Age (years) was determined at the time of commencing OPAT. Weighted Charlson comorbidity score was calculated for each patient and was determined at the time OPAT was commenced (Charlson et al., 1987). Ethical approval was not deemed necessary because the data were routinely collected for clinical governance, service development and service evaluation activities.

Scoping review

This scoping review was registered at the Open Science Framework (identifier: DOI https://doi.org/10.17605/OSF.IO/9JA8F). We followed the Joanna Briggs Institute approach in the conduct of the review (Peters et al., 2020) and complied with the preferred reporting items for systematic reviews and *meta*-analyses extension for scoping reviews (PRISMA-ScR) checklist (Tricco et al., 2018) (Appendix Table A.1).

Inclusion criteria

The inclusion criteria were formed by applying the PCC (population, concept, and context) framework (Peters et al., 2020), as follows:

- Population: adult patients (aged 18 years or older) with incurable infection or terminal illness.
- Concept: parenteral antimicrobial treatment.
- Context: outpatient-based or home-based care.

Studies of any research design were considered (with the exception of reviews, guidelines, commentaries and editorials). Studies were excluded if they were not specifically related to palliative care, or if the full text of the article was unavailable.

Search strategy, information sources and selection of studies

The source of evidence and search strategy were developed after an initial review of existing literature. The search strategy aimed to identify both published and unpublished (gray literature) studies. A three-step search strategy was employed in this review. An initial limited search of MEDLINE (PubMed) and CINAHL was performed followed by an analysis of the text words contained in the titles and abstracts of retrieved papers, and of the index terms used to describe the articles. A second search using all identified keywords and index terms was then undertaken across the following databases: MEDLINE, CINAHL, EMBASE (Ovid), Ovid Emcare and the Cochrane Library. Thirdly, the reference list of identified reports and articles was searched for additional sources. Supplementary searches of Web of Science Conference Proceedings, Google/Google Scholar, WorldCat and the website of the British Society for Antimicrobial Chemotherapy were conducted to identify relevant unpublished work. Only studies published in English were considered for inclusion in this review, regardless of their year of publication. The latest electronic search was carried out on 5 May 2022 (Appendix Table A.2).

The search terms were generated based on consideration of the population (patients with incurable infection or terminal illness, aged 18 years or over), the concept of interest (parenteral antimicrobial treatment) and the context (community, home or outpatient setting). The full search strategy is presented in the Appendix Table A.2. After removing duplicate records, all identified articles were screened independently against the eligibility criteria by two reviewers (OCD and IJ). Disagreements were resolved by discussion and consensus, or with a third reviewer (EIK).

Data extraction

Data were extracted independently from retrieved studies by two reviewers (OCD and IJ) using a standardized pro forma (Appendix Table A.3). Extracted data included citation details (first author and year of publication), study purpose, design, location, duration, population details and clinical characteristics (e.g., indication for antimicrobial therapy), models of antimicrobial delivery (hospital outpatient, self/carer administration or visiting nurses), topic area (palliative/lifelong antimicrobial therapy), antimicrobial parameters (e.g., type, treatment dose), outcome measures and key findings. Disagreements between the reviewers were resolved by discussion, or with a third reviewer (EIK).

Results

Institutional experience

Of the 1044 patients who received OPAT at our center during the 5.5-year study period, six (0.6 %; 6/1044) fulfilled the criteria for palliative OPAT with a mean age of 61 (range, 54–71) years. The total number of OPAT treatment days (bed-days saved) for the palliative cohort was 1135 days (median 140; range 21 to 510 days) – accounting for 3.1 % (1135/36658) of the total number of bed-days saved during the period.

Table 1 shows the demographic and clinical characteristics of the patients. A wide range of infections was managed. There were no suitable oral therapies, and IV antimicrobials were administered in all the patients via peripherally inserted central catheters (PICCs) with no clear endpoint. Half of the patients had incurable infections. In deceased patients, OPAT was administered until death. All patients had more than one underlying comorbidity (median Charlson comorbidity score: 5.5; range 2 – 7). The majority (4/6; 67 %) of the patients were readmitted to hospital more than twice during OPAT treatment due to relapse of infection or OPAT-related complication. The longest course of treatment (510 days) was administered to a patient who had a history of alpha-1-antitrypsin deficiency and secondary biliary cirrhosis; he was treated for a complex hepatic abscess with associated hepatic artery thrombosis that developed six years after a liver transplant. Oral therapy was complicated by recurrent relapses and antimicrobial-related toxicities. Catheter drainage was unsuccessful, and retransplantation was deemed too risky.

Teicoplanin was the most frequently prescribed antimicrobial agent. Combination IV antimicrobial therapy was administered in all but one patient. All patients had one or more OPAT-related complications including adverse drug reaction, catheter-related bloodstream infection and thrombosis.

Scoping review

Selection results and characteristics of the studies

The search identified 2375 non-duplicate publications, of which five met the eligibility criteria and were reviewed (Fig. 1). Details of the studies included in the review are presented in Table 2. The studies were published between 2006 and 2021. Most (4/5; 80 %) appeared in the last three years (Hart et al., 2020; Hitzenbichler et al., 2021; Irvine et al.,

Table 1
Patient demographic and clinical characteristic ($N = 6$).

Patient Case No.	Age (Sex)	Indication for OPAT (infection treated)	Organism(s) cultured	Underlying pathology	CCI score	Antimicrobials (IV) and model of OPAT	Duration of OPAT (days)	No. of Readmissions during OPAT	Clinical complications	Outcome	Comments
Patients who had an incurable infection											
1	54 Male	Liver abscess	*Escherichia coli, Enterococcus faecium, Klebsiella oxytoca Anaerobes*	• Alpha-1 antitrypsin deficiency Liver transplant	4	• Ertapenem and teicoplanin Visiting nurse	510	3	Blood dyscrasia	Alive	• Relapsed on oral antibiotics Catheter drainage was unsuccessful Liver retransplantation was deemed too risky Few relapses of infection on IV therapy which required repeated drainage
2	61 Male	Paraspinal abscess with vascular graft infection	*E. coli, anaerobes, Enterococcus*	• Aortoiliac stent Relapsed multiple myeloma	7	• Meropenem and daptomycin Self-administered	252	2	Blood dyscrasia	Deceased	Readmitted with worsening infection
3	71 Male	Infected EVAR graft and infective endocarditis	*Streptococcus sanguinis Pseudomonas aeruginosa E. faecium*	• Endovascular aneurysm repair Gastrointestinal stromal tumour	7	• Teicoplanin and piperacillin/tazobactam Visiting nurse	129	3	Blood dyscrasia Deranged LFTs	Deceased	Short readmissions during OPAT due to complications and sepsis
Patients who had a terminal condition with superadded infection											
4	70 Female	Cholangitis with infected biliary stent	*E. coli, E. faecium*	Inoperable cholangiocarcinoma	2	• Daptomycin and ertapenem Family delivered	72	2	Catheter-related blood stream infection	Deceased	• Relapsed on oral antibiotics Short readmissions during OPAT due to complications and sepsis
5	54 Male	Chronic mandibular osteomyelitis	*E coli, anaerobes, K. oxytoca, E. faecalis*	Locally advanced oropharyngeal cancer	2	• Teicoplanin and piperacillin/tazobactam Family delivered	151[a]	3	Catheter-related venous thrombosis	Alive (still ongoing)[a]	Short readmissions during OPAT due to complications
6	56 Male	Mucormycosis	*Mucor* spp.	Relapsed acute myeloid leukaemia	7	• Liposomal amphotericin B Visiting nurse	21	3	Catheter-related blood stream infection	Deceased	Short readmissions during OPAT due to complications and sepsis

CCI, Charlson Comorbidity Index; CDAD, *Clostridium difficile*-associated diarrhoea; EVAR, endovascular aneurysm repair; IV, intravenous; LFTs, liver function tests; OPAT, outpatient parenteral antimicrobial therapy.
[a] As at 15/05/2022.

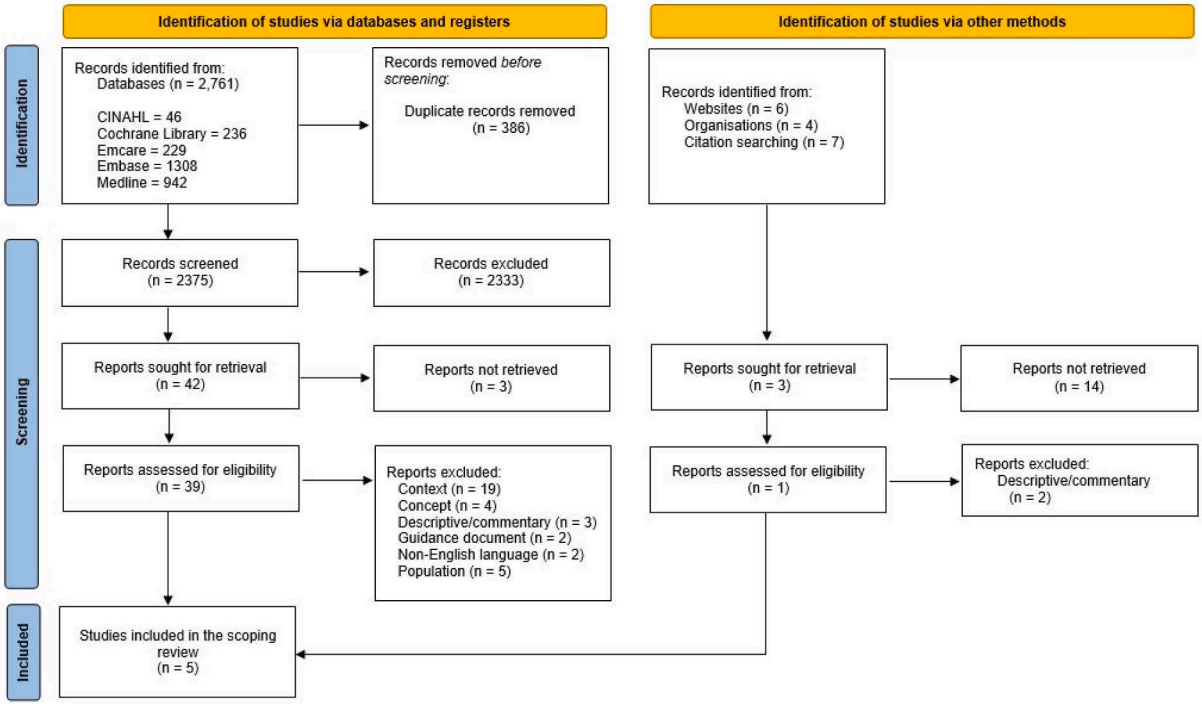

Fig. 1. Preferred Reporting Items for Systematic reviews and meta-Analyses (PRISMA) 2020 flow diagram of the scoping review process (Page et al.,).

2019; Spaziante et al., 2019) and were conducted in Europe. Two studies were case series with 9 and 4 patients (Hart et al., 2020; Hitzenbichler et al., 2021) respectively, and three studies were case reports (Irvine et al., 2019; Spaziante et al., 2019; Terpling et al., 2006).

Target population and indications for treatment

The most commonly reported indication for treatment was infection of non-removable prosthetic devices - principally endovascular infections. One study reported other indications (including pelvic abscess, bone and joint infection, and sepsis) and treatment of superadded infection in terminally ill patients (Hart et al., 2020). In all the studies, oral antimicrobial therapy was deemed ineffective or unsuitable due to antimicrobial-related toxicity or antimicrobial resistance. One study reported that a trial of oral antibiotics led to relapse of infection, necessitating IV therapy (Page et al.,). The patients in all the studies had multiple comorbidities. Patients treated for inoperable infections were deemed not fit for surgical treatment (source control) due to high anesthetic risk from underlying comorbidities.

Antimicrobial management and delivery

A wide range of IV antimicrobial agents were prescribed. Dalbavancin was administered in two studies but at different dosing regimens (Hitzenbichler et al., 2021; Spaziante et al., 2019). The model of OPAT delivery was specified in all but one study. One study reported multiple models of delivery (Hart et al., 2020), while in another study antibiotics were delivered by general practitioners on an outpatient basis due to absence of a formal OPAT service (Hitzenbichler et al., 2021). Limited information was provided about the outpatient or home settings, or the suitability or challenges of the model of delivery.

Clinical monitoring

The frequency of clinical and laboratory monitoring was not consistently reported. In one study, clinical review and blood tests were performed weekly (Irvine et al., 2019). One study reported challenges with regular monitoring in some of their patients, which led to concerns regarding the balance between the risks and benefit of treatment (Hart et al., 2020).

Patient outcomes and clinical governance

The duration of treatment in OPAT ranged from 19 days to 5 years. The primary endpoint of death was reported in all but two of the studies (Spaziante et al., 2019; Terpling et al., 2006). Most of the deaths were related to the underlying pathology. Two studies reported acquired antimicrobial resistance which necessitated modification of antimicrobial therapy (Hart et al., 2020; Irvine et al., 2019). Relapses of infection on antibiotic therapy were also reported (Hart et al., 2020; Hitzenbichler et al., 2021; Irvine et al., 2019; Terpling et al., 2006). Other clinical complications such as vascular access complications, readmissions, adverse drug reactions and healthcare associated infections (e.g., *Clostridium difficile*-associated disease and catheter-associated infections) were not consistently reported.

Adverse drug reactions necessitated change or discontinuation of antibiotic and hospital readmissions in one study (Hart et al., 2020). However, another study reported mild rash in a patient, which did not lead to cessation of therapy (Hitzenbichler et al., 2021). Other studies reported that no adverse drug reactions occurred (Spaziante et al., 2019; Terpling et al., 2006).

Some patients were readmitted for brief periods during their course of OPAT therapy. Across all studies, the primarily reported reasons for hospitalization were worsening infection, new bacteremia, adverse drug reactions, recurrent *Clostridium difficile*-associated disease, acute renal failure and exacerbation of pre-existing comorbidities (e.g., acute decompensated heart failure).

None of the studies reported a priori criteria for a successful outcome of palliative OPAT. Success was implied through the proportion of antimicrobial treatment course completed in the community or outpatient setting (rather than as inpatient). One study suggested treatment outcomes based on treatment aim (i.e., palliation) as proposed by the UK Good practice recommendations (Irvine et al., 2019). Two studies reported on patient and family experiences, and patient's quality of life (Hart et al., 2020; Irvine et al., 2019). However, the mechanisms of assessment were not clear. There was no in-depth qualitative analysis conducted. In both studies, OPAT allowed patients to travel on holidays. Both studies concluded that palliative OPAT has proved invaluable and can optimize the quality of life for patients and their families.

Table 2
Summary of studies included in the review.

Study	Design/ Duration/ Sample size/ Age	Treated infection (s)	Microbiology	IV antibiotic agent(s)	Indication for OPAT (incurable/ coincident infection in terminally ill patients)	Mode of OPAT delivery	Duration of treatment in OPAT	Key outcomes	Noted authors' comments/ recommendations
(Hart et al., 2020) Nottingham; UK (Hart et al., 2020)	Case series 2013 to 2017 9 patients Mean age: 72 years (range 60 – 81 years)	Bone and joint infection, pelvic abscess, sepsis, vascular graft infection	Coliforms; CoNS; *Enterococcus* spp. (including VRE); MRSA; MSSA	Ceftriaxone, Daptomycin, Ertapenem, Meropenem, Teicoplanin, Tigecycline, Vancomycin	Incurable (inoperable) and coincident infections	Self/carer administered, Visiting nurse and OPAT clinic	19 days to 38 months	• The palliative cohort accounted for a disproportionate number of bed days saved Presence of multiple comorbidities Non-vascular patients experienced more antibiotic side effects Some patients were readmitted during OPAT, but reasons were less clear 2 cases of acquired antimicrobial resistance 2 patients alive; 7 deceased	• Palliative OPAT can be successful and lead to positive outcomes for patients and their families
(Hitzenbichler et al., 2021) Regensburg; Germany (Hitzenbichler et al., 2021)	Case series 2018 to 2019 4 patients Mean age: 72 years (range 59 – 81 years)	Prosthetic valve endocarditis, LVAD infection, TAVI endocarditis	*Enterococcus* spp.; MRSA;	Dalbavancin	Incurable (inoperable) infections	Outpatient facility (by GP)	2 weeks to > 12 months	• Presence of multiple comorbidities Long-term therapy was well tolerated with few side effects (one reported case of mild rash) One patient had recurrence of bacteraemia while on antibiotic therapy Three patients were readmitted during OPAT 1patient alive (ongoing treatment); 3 deceased	• Dalbavancin is an attractive option for outpatient antibiotic therapy including patients in need for a long-term suppressive therapy Long-term side effects of dalbavancin therapy cannot be rule out due to small sample size
(Irvine et al., 2019) Glasgow, UK (Irvine et al., 2019)	Case report 1 patient Age: 69 years	Vascular graft infection	MRSA	Daptomycin with ertapenem	Incurable (inoperable) infections	Self/carer administered	32 months	• Emergence of antibiotic-resistant bacterial isolates Patient was readmitted with new bacteraemia which necessitated a change of antibiotic therapy Deceased	• OPAT may be used for long term suppression where there no oral antimicrobial options. OPAT was invaluable to the patient and her family The patient's management demonstrated the importance of a robust OPAT service structure with regular monitoring, communication and escalation protocols
(Spaziante et al., 2019) Rome, Italy (Spaziante et al., 2019)	Case report 1 patient Age: 78 years	Prosthetic valve endocarditis	Methicillin-resistant CoNS	Dalbavancin	Incurable (inoperable) infections	Not reported	189 days	• Presence of multiple comorbidities No adverse events were observed Alive	• Appropriate target concentration for guiding dalbavancin dosing intervals is not yet established
(Terpling et al., 2006)		Vascular graft infection	*Pseudomonas aeruginosa*			Visiting nurse/ Self-administered	~5 years	• No adverse events were observed	• Implementation of long-term OPAT is practicable and

(*continued on next page*)

Table 2 (*continued*)

Study	Design/ Duration,/ Sample size/ Age	Treated infection (s)	Microbiology	IV antibiotic agent(s)	Indication for OPAT (incurable/ coincident infection in terminally ill patients)	Mode of OPAT delivery	Duration of treatment in OPAT	Key outcomes	Noted authors' comments/ recommendations
Aalborg, Denmark (Terpling et al., 2006)	Case report 1 patient Age: 68 years			Tobramycin (with oral ciprofloxacin)	Incurable (inoperable) infections			A relapse of infection occurred while on treatment which was associated with an increased MIC for ciprofloxacin Alive (ongoing treatment)	compatible with high quality of life

CoNS, coagulase-negative staphylococci; GP, general practitioner; LVAD, left ventricular assist device; MIC, minimum inhibitory concentration; MRSA, methicillin-resistant *Staphylococcus aureus;* MSSA, methicillin-susceptible *Staphylococcus aureus;* OPAT, outpatient parenteral antimicrobial therapy; TAVI, transcatheter aortic valve implantation; VRE, Vancomycin-resistant Enterococcus.

Discussion

This study presents our experience of managing patients with incurable infections and infections in terminally ill patients at an OPAT service based in a large teaching hospital in the UK, together with a systematic review of the literature to summarize data regarding the delivery of palliative OPAT. All papers included in this review were observational studies. Although it would have been ideal to include randomized control trials and systematic reviews, none of those identified by the search strategy met the inclusion criteria. Nevertheless, observational studies can provide important insight into 'palliative OPAT' and identify long-term effects, rare events, and risk factors for OPAT failure (Gilmartin-Thomas et al., 2018). The lack of comparison between palliative patients who received OPAT and those treated as inpatients is a significant weakness of the existing literature. Consequently, we lack an accurate estimate of the effectiveness of palliative OPAT.

Palliative care is the active holistic care of individuals across all ages with serious health-related suffering due to severe illness and especially of those near the end of life (Radbruch et al., 2020). Palliative OPAT is an emerging concept (Farmer and Seaton, 2021; Chapman et al., 2019). In addition to the numerous benefits of OPAT (Berrevoets et al., 2018), palliative OPAT may improve quality of life, symptom distress, patient and family well-being, and prolong life in patients with terminal infections. A cost-effectiveness analysis of palliative OPAT would include (among others) inpatient bed days saved, prolongation of life and improvement in health-related quality of life, that requires complex mathematical modelling beyond the scope of our study.

In our center, we identified two distinct groups of patents (i.e., patients with incurable infection, and those with terminal illness and superadded infection) deemed to have received palliative OPAT to treat a wide range of infections. There were no suitable oral antimicrobial options (due to resistance profile and/or side effects) or definitive surgical treatment (due to high anesthetic risk), and IV therapies were administered to control the infections. Although we did not conduct a quality-of-life assessment, OPAT provided the patients time in their own home environment, and helped them and their families achieve as much quality of life as possible. Similar to other case studies (Hart et al., 2020; Hitzenbichler et al., 2021; Irvine et al., 2019), patients in our cohort had multiple comorbidities. Multimorbidity has been associated with increased risk of OPAT failure (Durojaiye et al., 2021). The increased risks of adverse drug reactions, vascular access complications, drug-drug interactions, *C. difficile* infection and emergence of antimicrobial resistance due to prolonged antimicrobial therapy are also major concerns in palliative OPAT. For instance, Hart et al. (Hart et al., 2020) and Irvine et al. (Irvine et al., 2019) reported cases of acquired antimicrobial resistance in their patients while receiving lifelong OPAT for palliation. Thus, a careful selection of patients for palliative OPAT, with a defined therapeutic goal, is essential to minimize risk of patient harm and optimize outcomes. For some patients, ongoing inpatient care may be required. Some may not require antimicrobial therapy and for others, oral therapy is appropriate. When comfort is desired, antimicrobials may be inappropriate or only selectively appropriate for symptom relief (Datta and Juthani-Mehta, 2017).

The scoping review identified limited literature on use of OPAT for palliation. The operationalization and delivery of OPAT for palliation varied widely. Palliative OPAT was mostly delivered to treat inoperable (incurable) prosthetic device-related infections within formal OPAT services or through ad hoc arrangements. All the articles reviewed were case studies. As a result, most of the studies provided only basic descriptive findings with no variance estimation. There is lack of clarity on what represents a successful or unsuccessful outcome of palliative OPAT. The UK Good Practice Recommendations recognize the role of OPAT in suppression of infection and palliation (Chapman et al., 2019), and propose outcomes based on treatment aim and whether the intended treatment aim was attained. There were also limited data relating to

frequency of patient monitoring and laboratory tests during OPAT, clinical efficacy and safety. The evidence in the literature is not directly comparable due to variations in patient mix, follow-up period and reported outcomes. These findings undoubtedly reflect real-world practice.

Every effort should be made to deliver palliative OPAT with minimal inconvenience and OPAT-related complications. Use of antimicrobial agents that minimize vascular access devices and can be administered once daily or less frequently can potentially reduce disruption of daily life and reduce risk of complications. However, the use of broad-spectrum once-daily agents such as ceftriaxone and ertapenem rather than narrow-spectrum agents with multiple daily doses undermines the principles of antimicrobial stewardship. Elastomeric devices and continuous infusion pumps can be pragmatic solutions, provided stability data of the desired antimicrobial agent supports their use. Also promising are the roles of long-acting parenteral agents such as teicoplanin, dalbavancin and oritavancin. Licensed for once daily maintenance dosing, teicoplanin has been used thrice weekly in OPAT with good outcomes (Asumang et al., 2021). Although licensed for the treatment of acute bacterial skin and soft tissue infections, dalbavancin was successfully administered weekly/biweekly as salvage therapy in patients with Gram-positive bacteremia due to an intravascular source in one of the studies we scoped (Hitzenbichler et al., 2021). In terms of mode of OPAT delivery, self/carer administration (after appropriate training) and administration by visiting nurses may be more suitable than the 'infusion center' model where patients attend an outpatient facility daily. The infusion center model requires reliable transportation and often limited to once-daily antimicrobial regimen.

Patient-centered care is one of the key aims of OPAT (Chapman et al., 2019). OPAT in the palliative context requires an interdisciplinary team approach and should be concordant with patient and family goals of care and preference. Effective communication and shared decision-making are crucial components of good end-of-life care and major elements of a person-centered approach to care (Caswell et al., 2015). Early and continuous discussion with patients, their families and among healthcare professionals involved in the patients' care about individualized management plan (including antimicrobial treatment, goals of care, frequency of clinical and laboratory monitoring, limitations of OPAT and protocols of escalation) are critical to the success of palliative OPAT. Likewise, the patient's family doctor and palliative care teams should be involved as relevant to individual needs.

One key knowledge gap within the reviewed literature relates to patient and family experiences, satisfaction, and perspectives of use of OPAT for palliation. Further information is required regarding the various factors that may influence experience and quality of life for patients and their families such as underlying comorbidity, age, nature of infection and mode of OPAT delivery.

Our study has several limitations. It was a retrospective case series with a relatively small sample and restriction to a single-center experience. The data were originally collected prospectively, which reduces the risk of poor accuracy of clinical records. Due to the retrospective nature of our study, we were not able to conduct a qualitative assessment of the patients' and their families' perceptions and experiences of OPAT. A limitation of our scoping review is that only studies published in English were considered for evaluation due to lack of language resources (e.g., professional translators). Relevant articles written in non-English languages could have been omitted. Furthermore, since no methodological assessment of the studies selected and formal synthesis were performed, implications for practice cannot be provided (Peters et al., 2020). Although this review used a robust and iterative methodological approach, its conclusions are limited by the lack of studies comparing use of OPAT for palliation with traditional inpatient IV treatment. Nevertheless, within its constraints, the findings of this study show that the use of OPAT for palliation (as its traditional use) offers a number of benefits to patients, their families and healthcare systems.

Conclusions

This study sheds light on the use of OPAT for palliation as opposed to cure. Delivering palliative OPAT could be complex, time-consuming, and associated with clinical complications. Despite the positive outcomes extracted from the reviewed articles, there is a need for further research to address significant gaps in knowledge, especially regarding patient experiences and perspectives. Palliative OPAT is likely to grow due to the rising problem of antimicrobial resistance, increasing population of complex patients and focus on moving healthcare out of hospital settings (Salisbury and Purdy, 2007).

Implications for research

Future research should include in-depth qualitative studies of patients who received OPAT for palliation, and their families to explore their expectations, perceptions and experiences of treatment. In addition, quality-of-life studies comparing palliative OPAT with inpatient IV treatment may improve patient experience, and support and improve use of OPAT for palliation. Future studies should also define indicators for a successful palliative OPAT. National OPAT registries that include palliative OPAT would offer a mechanism to share experience and allow benchmarking between services.

Ethics approval

In line with NHS (UK) Health Research Authority guidelines, ethics approval was not required because the data were routinely collected for clinical governance, service development and service evaluation activities.

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CRediT authorship contribution statement

Oyewole Chris Durojaiye: Conceptualization, Data curation, Investigation, Methodology, Writing – original draft, Visualization. **Ihsan Jibril:** Investigation, Writing – review & editing. **Evangelos I Kritsotakis:** Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.clinpr.2022.100205.

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