The Community IntraVenous Antibiotic Study (CIVAS): a mixed-methods evaluation of patient preferences for and cost-effectiveness of different service models for delivering outpatient parenteral antimicrobial therapy

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Scientific summary

The CIVAS mixed-methods evaluation

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Scientific summary

Background

Intravenous (i.v.) antibiotic treatment was developed for patients in hospital, but for some years it has been accepted practice in most developed countries to provide this to patients living in the community; this practice is known as outpatient parenteral antimicrobial therapy (OPAT). There is evidence that it is safe and generally welcomed by patients and that there are opportunities for improved cost-effectiveness and increased hospital capacity. However, OPAT has been slow to become established in the UK, with service provision being limited to clinical providers with effective, enthusiastic champions delivering a variety of different models of care. There is limited evidence available for NHS health-care providers and commissioners to facilitate service development.

Objectives

The aim of this research project is to:

1. establish the types of OPAT services available in England and to identify barriers to the use of each service type
2. evaluate patients' preferences for different service models of delivering OPAT
3. assess the cost-effectiveness of different service models for the delivery of OPAT.

Methods

Using a mixed-methods approach, the study included seven centres providing OPAT and covering four main service models:

1. hospital outpatient (HO) attendance
2. specialist nurse (SN) visiting at home
3. general nurse (GN) visiting at home
4. self-administration (SA) or carer administration.

Systematic review

We searched the usual bibliographic databases (e.g. MEDLINE, EMBASE, The Cochrane Library) from 1993 to March 2015. Exclusion criteria included children, papers that aggregated outcomes for all patient groups, non-i.v. antibiotics and no description of the OPAT service. Titles and abstracts were screened (and checked for quality by a second reviewer) and full-text versions of potential papers were obtained for detailed review.

Survey of health-care professionals

We sought the views of health-care professionals involved in OPAT through an online survey, which offered the opportunity to participate in in-depth interviews. These were semistructured and mostly conducted by telephone.

Qualitative study of patient perceptions of outpatient parenteral antimicrobial therapy

Patients were recruited from four sites, which between them provided the following models of care: HO attendance, nurse at home (GN and SN models) and SA. Participants were invited to take part in a

focus group or a qualitative interview. The interviews and focus group discussions were semistructured and explored patient satisfaction, issues and preferences. Data analysis followed the standard methodology for thematic content analysis and also used aspects of framework analysis. The research team and patient representatives met to discuss the relevance and suitability of the themes produced, the ways in which the themes were linked and candidate attributes.

Quantitative analysis of patient preferences

We developed a discrete choice experiment (DCE) based on the systematic literature review data and patient interviews to identify possible attributes and levels. Six key attributes were identified for inclusion in the DCE, along with a number of attitudinal questions. Patients were given eight hypothetical choice scenarios, each time involving the four models of care: HO attendance, GN or SN visit at home and SA. The characteristics of the models of care were described in the form of attributes (e.g. number of treatments per day) and levels within attributes (e.g. once daily, twice daily). The specific combinations of values for the different characteristics to be shown in a given choice task were determined on the basis of a D-efficient experimental design and varied across the eight tasks shown. The aim of this process is to produce data that can then be used in a choice model to understand how the individual characteristics of the service influence the choice patients make between models of care. We conducted a pilot study with 30 patients to gather their feedback on the survey. The main study recruited participants from six NHS acute hospital trusts representing both teaching and district general hospitals and included both short-term (requiring up to 7 days' treatment) and long-term treatment. The data were analysed using an advanced discrete choice model. Attitudinal data were analysed using principal component analysis with Varimax with Kaiser normalisation to identify the underlying structure within the data. These attitudinal constructs were then also used in the choice models.

Cost-effectiveness study

Our health economics workstream examined the value for money of different OPAT service models using two different approaches: cohort Markov modelling and simulation modelling. Two populations were modelled separately: those with skin and soft tissue infections (SSTIs) and other short-term infections and those with longer-term or chronic infections such as joint and bone infections and cystic fibrosis. Data to populate the model came from systematic literature reviews and retrospective hospital data from seven OPAT centres. For the retrospective hospital data, a research nurse reviewed case notes after consent was provided by the patient. These data included patient characteristics (sociodemographic and clinical), measures of infection severity, type of service received, duration of treatment, adverse events, and primary (e.g. general practitioner visits) and secondary (e.g. hospital stays) health-care resource use. Cohort Markov models were constructed with daily cycles until the cohort was healed (or switched to oral antimicrobials) or died.

Expert panel review

The expert panel consisted of clinical experts, researchers, commissioners and a patient representative. All panel members were asked to undertake preparatory reading (systematic review and summaries of the patient interviews, health professional interviews, DCE and economic modelling). The reports each contained an executive summary method section with key results. On the day of the meeting, summary presentations were made to the panel by the research team with the opportunity for questions and initial discussion. The participants were then divided into workshops and asked to consider key questions arising from the project work, prior to reconvening for final discussions and recommendations.

Ethics approval

The study was approved by the Proportionate Review Sub-Committee of the National Research Ethics Committee South West – Frenchay (reference 13/SW/0060).

Results

Systematic review

The search strategy identified 7214 papers, 606 of which met the inclusion criteria and were subject to detailed review. An additional 17 papers were identified from references. The final analysis included 128 papers. The majority were set in the UK, Europe and North America, often with relatively small sample sizes. There were 12 randomised controlled trials, none of which reported the trial methodology. Only 21 studies included a usual-care comparator (hospital inpatient) when evaluating safety and clinical effectiveness. Synthesised studies revealed mixed results for cure/improvement; however, when OPAT models are considered individually, outpatient attendance is least effective and SN is most effective.

Survey of health-care professionals

The response rate to the survey was low, although a wide range of staff and settings was covered. Much more information was obtained from the interviews with OPAT professional leads who delivered services in a range of settings. Service models varied from being well organised with regularly updated business plans to being ad hoc according to professional leads. Interviewees made a number of suggestions on how OPAT service provision might be improved, in particular with regard to commissioning and clinical governance.

Qualitative study

One focus group (four participants) and 28 interviews took place. A good service involved staff who were perceived to be competent and highly skilled. Poor communication could leave patients without the knowledge and confidence needed to be a competent collaborator in their own care and could affect their perceptions of the service. Each of the care pathways was viewed as having its own strengths and weaknesses, and the importance people attached to different attributes seemed to be linked to the age and health of the patient. A nurse at home model was perceived to be particularly well suited to older patients, those needing longer courses of i.v. treatment and those with more complex care needs. Hospital attendance was considered to be most suitable for those who were fitter and younger and who required once daily, short courses (< 1 week) of i.v. treatment. Patients using SA found it convenient but there were some concerns about its safety.

Quantitative analysis of patient preferences

The quantitative analysis provides estimates of the importance of different characteristics of the different models of care. We found that, on average, the type of treatment itself had the biggest influence on choices, with patients showing a strong overall preference for the nurse at home model over hospital treatment and SA. However, the characteristics of the models of care themselves also influenced the choice. The most important effect here was observed in a strong preference for once-daily treatment versus two or continuous treatments closely followed by the preference for the lowest level of adverse event risk. Although other attribute levels were significant in determining respondent's choices, they were less important. People preferred a SN to a doctor or GN to deliver their treatment, preferred having an appointment time to not having one and preferred to communicate with someone they know regarding their care. The order of attribute preference was relatively stable across the short- and long-term infection groups. The choices people make about their health care are influenced by a number of patient characteristics as well as by more general attitudes towards health care. Younger patients tend to prefer to come to hospital for their care, and older people tend towards a preference for a nurse at home model, compared with the alternative treatments. Overall, there was a preference for once-daily antimicrobials and for patients to be followed up face to face rather than by telephone at the end of their treatment.

Cost-effectiveness study

In both short- and long-term infection Markov models, the difference in expected effectiveness [quality-adjusted life-years (QALYs)] across service models was negligible. This is because the time horizon employed (3 and 12 months for short-term and long-term infections, respectively) is relatively short, and, for many, the health event of interest is transient in nature with a very low risk of mortality, as the selection of those suitable for

OPAT excludes the most seriously ill patients. Furthermore, the risk of adverse events was very low across all services. In contrast, there were significant cost differentials between the services, which drove the cost-effectiveness results.

The results from the simulation modelling largely corroborated the Markov model results. A notable difference was a change in the decision for long-term infections based on the deterministic analysis. The results from both Markov and simulation models suggest that the SN is the optimal service in the short term. In the long term, SA appears to be optimal, although the SN model provides slightly higher benefits, but at a higher cost. The simulation yielded several additional useful pieces of information. It showed that net benefit was inversely related to the number of treatment delays and that when resources are exhausted, delays and costs increase and QALYs decrease (especially in the long term). The results also suggested that long-term infections may best be served by a combination of SA and SN services.

Expert panel review

We presented the results to a panel of expert researchers and health-care professionals in the field. We asked them to review the findings and to give their opinions on a number of questions.

There was broad agreement that OPAT services could be based either in an acute hospital trust or in the community. The panel agreed that there needs to be flexibility to accommodate patients with different needs and, therefore, that within any one OPAT service there should be more than one care pathway (e.g. SA, HO attendance, nurse at home).

The health economics evidence suggested that a SN service was the most cost-effective for short- and long-term infections, with SA being less expensive for long-term infections. There was agreement that OPAT services should focus on antimicrobials that can be administered once a day, provided that the treatment selected is clinically appropriate, as this provided the greatest potential for services to treat more patients (thereby freeing up staff who would otherwise be involved in repeat administrations).

It was thought that a nationally commissioned service is needed, rather than local negotiation with clinical commissioning groups. It was agreed that patient choice is important, but that any service should also offer good value for money to the NHS and be appropriate for the individual patient's clinical needs. Local services must both support the needs of the whole community and take into account the skill set of the available providers. The group discussed the implications of patient attitudes when considering the push to move to community-based care. It was agreed that the findings of the study indicate that there may be a need for an attitudinal/behavioural shift by both NHS staff and patients to accept these new ways of delivering health care in the community in general, not just i.v. services. It was suggested that the attitudinal questionnaire developed as part of the DCE would be useful to commissioners for service monitoring within local contracts and would make a welcome component of a commissioner toolkit.

Patient and public involvement

Patients were consulted during the initial design of the project, with one becoming a co-applicant. Owing to the ill health of the patient representatives at times and to the length of the project, we recruited more patients to become part of the patient advisory group, who contributed extensively to the project, in particular through helping with the writing of the patient information leaflets and the design of the DCE and through attending the expert panel meeting.

Conclusions

Our survey of OPAT provision and interviews with health-care providers in England makes it clear that great variation remains both in the extent of services provided and models of care in existence. In addition, some respondents were struggling to maintain or even set up OPAT services because of the lack of clear commissioning directives and/or engagement by senior managers.

Our qualitative studies, while confirming that most patients prefer to receive treatment through OPAT services, did highlight some organisational shortcomings, for example where patients were kept waiting for long periods to receive treatments or where aftercare expectations were not met. This suggests that the governance of such services needs to be improved to meet both specific and general clinical standards.

Our DCE modelling data collected on patient preferences showed that most patients preferred to be treated at home, although certain sociodemographic groups would rather attend a hospital clinic. The health economics workstream similarly showed that the visiting nurse model was the most cost-effective overall. SA is also cost-effective for patients willing and competent to be trained to do this; in practice, this is useful only for those requiring longer or repeated courses of treatment. The simulation model provides a useful method of calculating the capacity of services according to the number of staff employed.

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