Nurse-led management of uncomplicated cellulitis in the community: evaluation of a protocol incorporating intravenous ceftriaxone

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Objectives and methods: A management protocol for specialist nurses was developed for ambulatory management of uncomplicated cellulitis requiring initial intravenous (iv) antibiotic therapy. Patients were all managed through an outpatient parenteral antibiotic therapy (OPAT) service. Those with cellulitis were compared pre- and post-intervention.

Results: One hundred and fourteen patients were compared with 230 retrospective controls all managed through the OPAT service. Protocol management was associated with reduced duration of outpatient iv therapy from 4 to 3 days, P = 0.02, and reduced need for physician review (100% to 19%). Outcomes, complications and readmissions were similar.

Conclusions: Specialist nurse-led management is safe and effective in the management of uncomplicated cellulitis in the context of an OPAT service and reduces the need for regular medical review without compromising clinical care.

Keywords: outpatient parenteral antibiotic therapy, intravenous antibiotic therapy, cellulitis, patient group direction, skin and soft tissue infections

Introduction

Cellulitis is a common infection frequently necessitating hospital admission, usually for the administration of intravenous (iv) antibiotic therapy or the exclusion of other conditions such as deep-venous thrombosis. In North America, experience with community management of uncomplicated cellulitis and other skin and soft tissue infections (SSTIs) is well established through outpatient parenteral antimicrobial therapy (OPAT) programmes.1 Eron et al. have produced recent guidelines on SSTIs stating that OPAT may be appropriate for patients who have stable co-morbidity after assessment by a physician.2 In the UK, patient acceptance and clinical experience with OPAT is growing.3–6 Such a service has been in place in Glasgow since 2001 and care is provided for ~300 patients per year. The commonest infections managed through our service are SSTIs, accounting for 60–70% of referrals. In view of the high volume of referrals, pressure on medical staff time and relative uniformity of management, we developed a management protocol enabling experienced nurse-specialists to manage the clinical episode of moderately severe, uncomplicated cellulitis without recourse to routine physician review. Herein, we outline the management protocol, evaluate its implementation and compare outcomes with a retrospective control group also managed through OPAT.

Patients and methods

Pre-intervention practice

The OPAT service comprises two full-time specialist nurses with support from a clinical pharmacist, an infectious diseases physician and junior medical staff based on the infectious diseases unit. Ambulant patients with a variety of infections including cellulitis, who require iv antibiotic therapy, are referred to OPAT by hospital- and community-based doctors. Between January 2001 and July 2003, medical staff based within the infectious diseases unit routinely reviewed all patients referred to OPAT including those with cellulitis. Ward-based medical staff were responsible for clinical decisions, particularly the timing of switch to oral therapy. Antibiotic therapy for cellulitis...
Management of cellulitis

was 1 g iv ceftriaxone daily with switch to either oral clindamycin or flucloxacillin after clinical improvement and at the discretion of the reviewing doctor. The first iv dose was administered by the referring doctor, unless a general practitioner. Nursing staff were responsible for assessing suitability for home care, for management of the intravascular device, administration of antibiotic therapy, patient transportation/logistics, daily review of the patient and administration of dressings (if appropriate). Nursing staff however did not have authority to switch from iv to oral therapy. Patients were given the telephone number of the OPAT service or the infectious diseases ward to be contacted if any concerns or problems arose. Weekly meetings were held between medical, nursing and pharmacy staff to discuss patient progress and blood results of all current patients.

Intervention

The management protocol incorporated a patient group direction (PGD),7 which was developed to enable trained nursing staff to prescribe iv ceftriaxone, oral flucloxacillin and oral clindamycin for a ‘group’ of patients with cellulitis with pre-defined exclusion criteria (Table 1). The PGD was approved by our institution’s Medicines Management Committee. Specialist nurses working within the OPAT service were trained and proficient in iv cannulation, iv drug administration and phlebotomy and had considerable previous experience in assessing patients with SSTIs through OPAT and through inpatient experience in infectious diseases and orthopaedics. Each was trained and assessed by the lead physician (RAS) in the recognition of severity markers, indications for iv and oral therapy and triggers for prompting medical review of patients (Table 1 and outline of protocol).

Following protocol introduction in July 2003, patients continued to be assessed as suitable for OPAT and referred by medical practitioners as before, however, further medical review occurred only when certain criteria were met (as above).

Table 1. Nurse-led management protocol exclusion criteria

1. Admission required (but may be suitable for protocol after inpatient assessment)
   - Severe localized pain
   - Confusion
   - Rapidly evolving skin lesions or skin blistering
   - Systolic blood pressure < 100 mmHg
   - Sepsis syndrome (any two of: heart rate > 100, respiratory rate > 20/min, temperature > 38 or < 36°C, white cell count > 12 or < 4/mm³)
   - Active drug or alcohol misuse
   - Active mental health morbidity or learning difficulties and lack of appropriate carer
   - Other uncontrolled co-morbidity requiring hospitalization
   - No means of transport or telephone communication with hospital

2. Medical review required but potentially suitable for OPAT without admission
   - Penicillin or cephalosporin allergy (teicoplanin may be used first line)
   - Associated ulcer or wound
   - Bacteraemia
   - MRSA infection
   - Infection related to trauma or recent surgery
   - Possible joint involvement or bursitis

Criteria for inclusion and exclusion (Table 1)

Patients suitable for OPAT under the supervision of the specialist nurses were those with lower or upper limb cellulitis (localized or demarcated erythema and induration, localized heat and tenderness) or facial erysipelas. Exclusion criteria for the management protocol are given in Table 1. Patients initially assessed as unsuitable for the protocol could be re-referred after a period of hospitalization if criteria had changed. Likewise some patients not suitable for the protocol could still be suitable for management through the OPAT service under a different management protocol.

Outline of protocol

If iv therapy was required, 1 g ceftriaxone was given daily. Tinea pedis was treated with miconazole cream twice daily for 7 days. At baseline, random glucose, routine biochemistry, liver function, haematology and blood cultures were performed. Daily nurse review noted skin heat, erythema, pain, swelling, temperature, pulse rate, respiratory rate and blood pressure. Therapy continued until there was a significant reduction in local signs of infection (reduction in heat, erythema, induration and tenderness). Infectious diseases medical staff were informed of any local or systemic deterioration, rash, blood abnormalities at baseline, positive blood cultures or no improvement at 72 h. Following improvement, patients were switched to 7 days of oral therapy with either clindamycin or flucloxacillin. The duration of oral therapy was deliberately conservative to reduce the risk of relapse and based on published consensus that most uncomplicated SSTIs can be treated with 1–2 weeks of therapy.2 Patients were reviewed on the last day of iv therapy and on completion of oral therapy.

Medical staff continued to review all other patients referred to OPAT with alternative diagnoses (such as wound infections, bone and joint infections, endocarditis, etc.). The weekly multidisciplinary OPAT meeting also continued where all patients managed would be discussed and medical follow-up arrangements made when necessary.

Data analysis

Patients managed via the protocol were compared with those consecutively managed prior to protocol introduction. Pre-intervention patients were excluded from analysis following case record and database review by retrospectively applying the same criteria as detailed in the protocol (Table 1). Hence patients with sepsis syndrome or other severity markers or co-morbidity preventing inclusion were excluded.

Data for both cohorts were prospectively stored and analysed using Epi Info 6. Duration of iv therapy, admissions, readmissions and outcomes were compared. Non-normally distributed, continuous data were compared using Mann–Whitney U-test. P values <0.05 were regarded as significant.

Results

A similar number of patients with SSTIs were seen pre- and post-intervention (11 and 12 per month) of whom, 8 and 9 per month were suitable for the protocol. Cohorts were similar in age, sex and referral source (Table 2) and by definition had no severity markers at the time of referral. Less than half of
Table 2. Comparison of patients pre- and post-introduction of the protocol

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pre-intervention (30 months)</th>
<th>Post-intervention (12 months)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. patients with SSTI managed with OPAT⁴</td>
<td>339</td>
<td>148</td>
<td></td>
</tr>
<tr>
<td>No. patients with cellulitis suitable for protocol</td>
<td>230 (68%)</td>
<td>112 (76%)</td>
<td></td>
</tr>
<tr>
<td>Age [years](median, range)</td>
<td>49 (15–92)</td>
<td>50 (24–96)</td>
<td></td>
</tr>
<tr>
<td>Male sex</td>
<td>119 (52%)</td>
<td>68 (61%)</td>
<td></td>
</tr>
<tr>
<td>A&amp;E referral</td>
<td>89 (39%)</td>
<td>53 (47%)</td>
<td></td>
</tr>
<tr>
<td>GP referral</td>
<td>27 (12%)</td>
<td>18 (16%)</td>
<td></td>
</tr>
<tr>
<td>Hospital inpatient referral</td>
<td>104 (45%)</td>
<td>40 (36%)</td>
<td></td>
</tr>
<tr>
<td>Median duration (days) of iv therapy (range)</td>
<td>5 (1–37)</td>
<td>4 (1–23)</td>
<td>0.01</td>
</tr>
<tr>
<td>Median duration (days) of outpatient iv therapy (range)</td>
<td>4 (1–37)</td>
<td>3 (1–22)</td>
<td>0.02</td>
</tr>
<tr>
<td>Cure/improved</td>
<td>225/228 (99%)</td>
<td>106/109 (97%)</td>
<td></td>
</tr>
<tr>
<td>Readmission</td>
<td>13/229 (6%)</td>
<td>8/109 (7%)</td>
<td></td>
</tr>
<tr>
<td>Required incision/drainage of abscess</td>
<td>1 (0.4%)</td>
<td>3 (2.6%)</td>
<td>0.1</td>
</tr>
<tr>
<td>Drug reaction</td>
<td>8/226 (4%)</td>
<td>8/110 (7%)</td>
<td></td>
</tr>
<tr>
<td>Switched to non-protocol antibiotic³</td>
<td>11 (5%)</td>
<td>5 (4%)</td>
<td></td>
</tr>
<tr>
<td>Medical review during therapy</td>
<td>230 (100%)</td>
<td>21 (19%)</td>
<td></td>
</tr>
</tbody>
</table>

⁴ SSTI, skin and soft tissue infections included cellulitis, bursitis, surgical and non-surgical wound infections, MRSA SSTIs and patients with penicillin allergy.

³ Non-protocol antibiotic was usually teicoplanin.

Discussion

Practice guidelines published in the United States have advocated once or twice weekly patient review by a physician whilst undergoing OPAT but do not specify frequency of review for patients with cellulitis.¹ Recent guidelines published in this journal suggest daily review is required in SSTIs and suggest that most patients with uncomplicated infections should be switched after 3 or 4 days (P=0.01) and median outpatient iv therapy was reduced from 4 to 3 days (P=0.02). A small number of patients in both groups were not to require prolonged iv therapy. All of such cases were reviewed by medical staff (as per the protocol). In all cases, clinical signs of infection were slow to settle and there were concerns over possible underlying bone or joint infection or methicillin-resistant Staphylococcus aureus (MRSA) infection. Cure or improvement, readmission, drug reaction and change in therapy rates were similar (Table 2). Medical review was required for 21 (19%) patients post-intervention. In five, this was because of other medical problems, in eight patients a rash developed, in three incision of an abscess was required and in a further five patients substantial clinical improvement had not occurred by 72 h of therapy and a change in therapy (to teicoplanin usually) or admission was required.

This observational study has shown that using a well-supervised management protocol, specialist-nursing staff can safely and effectively manage moderately severe cellulitis without recourse to admission or routine medical staff input. The patient journey has therefore been markedly simplified and direct medical input into patient management has been simplified without compromising clinical care. A small number of patients required incision of an abscess as an outpatient. The difference in numbers pre- and post-intervention was not statistically significant and there was no evidence that surgery was delayed in patients who were managed after introduction of the protocol.

The introduction of the protocol has also been associated with a reduction in the duration of outpatient iv therapy from 4 to 3 days. This may reflect the experience of the specialist nurses who had worked in OPAT for at least 3 years by the time of the protocol introduction, or may be due to a more systematic evaluation of patients compared with the ad hoc assessment by junior medical staff prior to the introduction of the protocol. Alternatively, this difference may reflect delays in patient review by junior medical staff who often have competing clinical commitments. Median total duration of antibiotic therapy of 4 days although less than that seen pre-intervention, is in keeping with others’ observations and recommendations for duration of parenteral therapy in SSTIs.² It is possible that more complex cases requiring greater duration of therapy have been included in the pre-intervention analysis, which was assessed retrospectively. A randomized controlled trial is needed to confirm these findings.

There have been concerns that antibiotic prescribing should not be devolved to non-medically qualified practitioners because of the risk of increased selective pressure leading to antimicrobial resistance. However, these data suggest that prescribing is well regulated as part of a well-supervised PGD in a close clinical team. There was no evidence that prescribing was overly prolonged. There were no additional financial costs incurred in performing or sustaining this service development. Savings were made in junior doctor time and in the cost of iv antibiotic therapy although no formal economic assessment was undertaken.
This is the first published study to evaluate a nurse-led management protocol for iv antibiotic therapy in the community. Since cellulitis is common and there are increasing pressures on resources, we encourage others to consider this expanded role for properly experienced and trained nurse-specialists in the context of a well-supervised OPAT service.

References


